

City of Atlanta Climate Action Plan



**Local Actions and Policies for Reducing
City of Atlanta's Greenhouse Gas Emissions**

**City of Atlanta
Mayor's Office of Sustainability
Jul 23, 2015**



2015

Credits and Acknowledgments

This document was elaborated using the **Statewide Energy Efficiency Collaborative (SEEC)** template. SEEC is an alliance to help cities and counties reduce greenhouse gas emissions and save energy. SEEC is a collaboration among three nonprofit organizations and California’s four Investor Owned Utilities.

SEEC members are:

- ICLEI-Local Governments for Sustainability USA
- Institute for Local Government
- Local Government Commission
- Pacific Gas and Electric Company
- San Diego Gas and Electric Company
- Southern California Edison Company
- Southern California Gas Company

The City of Atlanta Mayor’s Office of Sustainability identified and contacted experts for each focus area described in this document to participate in a Technical Steering Committee. The goal of the Technical Steering Committee was to provide advice for each of the strategies selected. The final list of Climate Action strategies will be submitted to the Atlanta City Council for adoption. Experts from the following organizations participated in the Technical Steering Committee:





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Introduction

The City of Atlanta is joining an increasing number of local governments committed to addressing climate change at the local level. The City of Atlanta recognizes the risk that climate change poses to its citizens, and is acting now to reduce the greenhouse gas (GHG) emissions, or “carbon footprint”, of both its government operations and the community at-large through the innovative programs laid out in this Climate Action Plan. Ultimately, local action is needed to reduce the City of Atlanta’s contribution to the problem of climate change and adapt to its current and future effects. This Climate Action Plan takes advantage of common sense approaches and cutting edge policies that our local government is uniquely positioned to implement – actions that can reduce energy use and waste, create local jobs, improve air quality, preserve our local landscape and history, and in many other ways benefit the City of Atlanta for years to come.

Purpose, Scope, and Process Behind the Climate Action Plan

Purpose

By creating a clear course of action so that everyone can have a role in creating and achieving climate and sustainability goals, our Climate Action Plan drives and coordinates local efforts toward a reduction in

GHG emissions by 20 percent below 2009 levels by 2020 and 40 percent below 2009 levels by 2030.

The Climate Action Plan is a framework for the development and implementation of actions that reduce City of Atlanta’s GHG emissions. The Plan provides guiding objectives and strategies to realize City of Atlanta’s GHG reduction goal.

Scope

This Plan covers objectives and strategies for GHG emissions resulting from local government and community-wide activities within the City of Atlanta. It addresses the major sources of emissions in the City of Atlanta, and sets objectives and strategies in four goals that both the City of Atlanta and community can implement together to achieve greenhouse gas reductions:

- Reduce energy consumption in commercial buildings 20% by 2020 and 40% by 2030
- Reduce energy consumption in residential buildings 20% by 2020 and 40% by 2030
- Reduce GHG emissions produced by transportation 20% by 2020 and 40% by 2030
- Increase waste diversion rate to landfills up to 80% by 2020

The plan also creates a framework for documenting, coordinating, measuring, and adapting efforts moving forward.

Process

Beginning in 2010, the Atlanta Mayor’s Office of Sustainability organized several sessions with city stakeholders that included the participation of more than 300 individuals representing neighborhoods, schools, business, community organizations, and government agencies.

During the programmed sessions, stakeholders prioritized the 10 impact areas and their respective mediation goals using a sustainability matrix. The 10 impact areas are compiled in the Power to Change initiative, which is summarized in the following page.

The impact areas are the following:

- Transportation and Mobility
- Energy Efficiency and Renewable Energy
- Air quality
- Materials Management and Recycling
- Water Management
- Land Use
- Community Health and Vitality
- Education
- Sustainability Planning, and
- Growing Business

Once the 10 impact areas and mediation goals were prioritized, the Atlanta Mayor’s Office of Sustainability convened several additional sessions with stakeholder groups and experts to validate the 10 impact areas and discuss possible metrics required for each of the areas.

Some of the identified impact areas such as Transportation and Mobility, Energy Efficiency and Renewables, Air Quality, Material Management, and Land Use, have a direct effect on GHG emissions. While the City of Atlanta has already begun to reduce greenhouse gas emissions through a variety of actions identified in Power to Change Impact Areas, this

Climate Action Plan is a critical component of a comprehensive approach to reducing City of Atlanta’s emissions. This method, developed by the International Council of Local Governments for Sustainability (ICLEI), is called the Five Milestones for Climate Mitigation. The milestones are:

Milestone One: Conduct a baseline emissions inventory and forecast

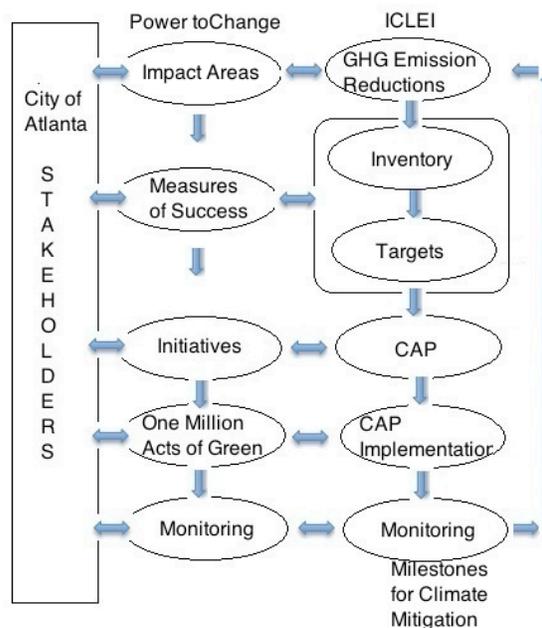
Milestone Two: Adopt an emissions reduction target for the forecast year

Milestone Three: Develop a local climate action plan

Milestone Four: Implement the climate action plan

Milestone Five: Monitor progress and report results

The following diagram shows the correlation between the Power to Change initiatives and ICLEI Milestones for Climate Mitigation:



Atlanta's 10 sustainability impact areas



goals | priorities

Economic



GROWING BUSINESS

Improve business knowledge of resource use while also accelerating job and economic growth to enhance the City of Atlanta's competitive position within the globalized economy.



SUSTAINABILITY PLANNING

Institute sustainable development through participatory planning. To balance growth with environmental stewardship by collaborating with diversified stakeholders and learned experiences.



MATERIALS MANAGEMENT & RECYCLING

Create environmental and economic value to residents and businesses by using less resources and diverting valuable materials from our landfills.



ENERGY EFFICIENCY & RENEWABLES

Reduce energy use through conservation, efficiency best practices, and through the deployment of renewable systems.



WATER MANAGEMENT

Increase watershed protection and preservation practices so that all Atlantans have access to a sufficient supply of clean, healthy water.



LAND USE

Develop land use policies and programs designed to protect greenspace, sustain our tree canopy, bring brownfields back into productive use, and enhance community livability.



TRANSPORTATION & MOBILITY

Provide access to safe, efficient and sustainable transportation choices for Atlantans to reach employment, goods and services, and recreational activities.



AIR QUALITY

Improve our regional air quality and foster the improvement of indoor air quality throughout the city.



EDUCATION

Provide educational opportunities for all Atlantans to see how far the community has come as well as demonstrate what work remains in creating a more sustainable Atlanta.



COMMUNITY HEALTH & VITALITY

Maximize the health and well-being of the community, providing access to affordable sustainable housing choices, nutritious food and efficient transportation.

Environmental

Social

Strong Economy

- Competitive economy
- Sustainable products & services
- Sustainable operations
- Business creation
- Business retention

Participatory Planning

- Parallel collaboration
- Strategic perspectives
- Incremental changes
- Social connectedness
- Sustainable operations

Sustainable Resource Use

- Rethinking purpose
- Lifecycle management
- Waste reduction
- Reuse of valuables
- Recycling

Retrofit & Innovate

- Energy efficiency
- Sustainable site design
- Alternative fuel access
- Affordable renewable technologies
- Energy management

Protect & Conserve

- Watershed planning
- Water security
- Stormwater management
- Water quality
- Water conservation

Smart Growth

- Neighborhood revitalization
- Convenient recreation access
- Complete communities
- Robust habitats
- Cleanup & restoration

Connectivity

- Infrastructure improvements
- Regional planning
- Non-motorized transit
- Safe, easy & convenient travel

Healthy, Breathable Air

- Clean commuting
- Emissions reduction
- Regional planning
- Cleaner fuels
- Green infrastructure

Communitywide Awareness

- Public engagement
- Information access
- Open creativity
- Diversity & inclusion
- Leveraging resources

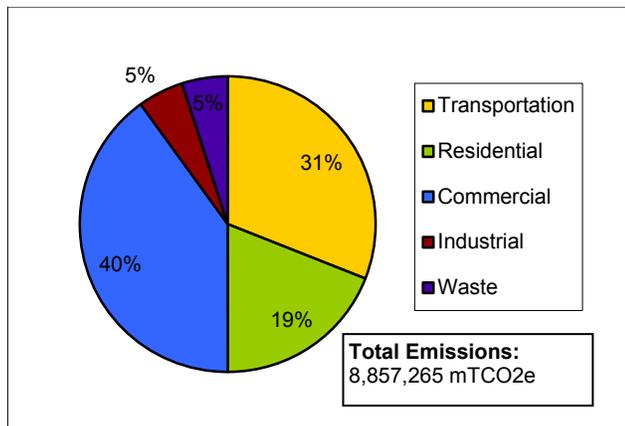
Healthy Neighborhoods

- Local & healthy food
- Walkable communities
- Localized economy
- Strong, safe neighborhoods
- Valuable properties

City of Atlanta's GHG Emissions

Through the completion of a local emissions study, or greenhouse gas inventory, the City of Atlanta has determined emissions levels for the community as a whole and for City of Atlanta's government operations. Community-wide emissions represent the sum total of emissions produced within the City of Atlanta limits as well as emissions resulting from electricity use within the jurisdiction, even if said electricity is generated elsewhere. In this way, the community-wide figures represent all emissions for which the community is responsible.

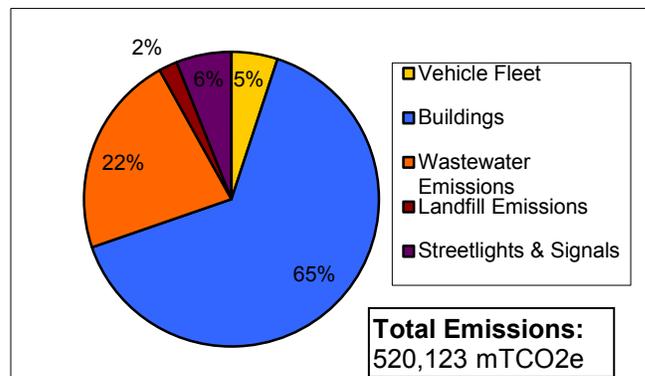
2013 GHG Emissions City of Atlanta Community-Wide



Emissions from the City of Atlanta are embedded within the community-wide totals. For example, emissions from government buildings are included in the commercial sector, and emissions from the City of Atlanta fleet vehicles are included in the transportation figure above. Government operations are therefore a subset of total community emissions.

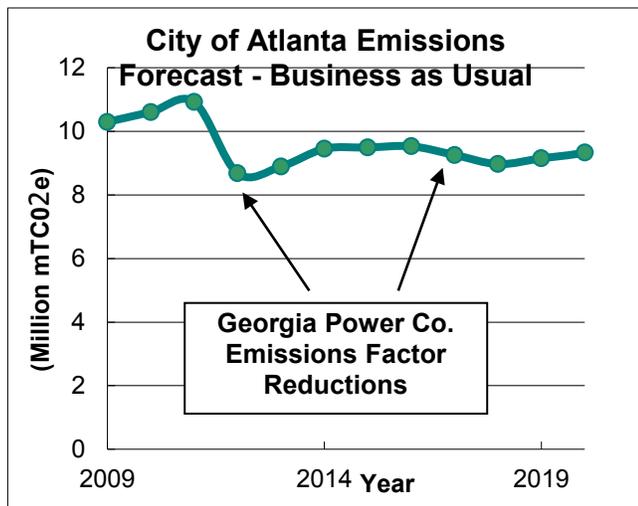
Government emissions include all sources for which the local government exercises direct operational control, including wastewater services, landfills within the city limits (now closed to the public but still sources of GHG emissions), and streetlights.

2013 GHG Emissions - City of Atlanta Operations



The City of Atlanta has also completed an emissions forecast based on projections of current data and expected future trends using the 2013 Georgia Power Integrated Resource Plan (IRP). The emissions forecast is a "Business As Usual" forecast, a scenario estimating future emissions levels, if no further local actions are taken beyond utility plans. The forecast indicates that if we do not take action, GHG emissions will continue to increase regardless of the reductions in emissions by the utility company - Georgia Power. The main factors considered for the expected increase in emission are the increase in population and a consequent increase in the commercial sector.

Projected Growth in GHG Emissions



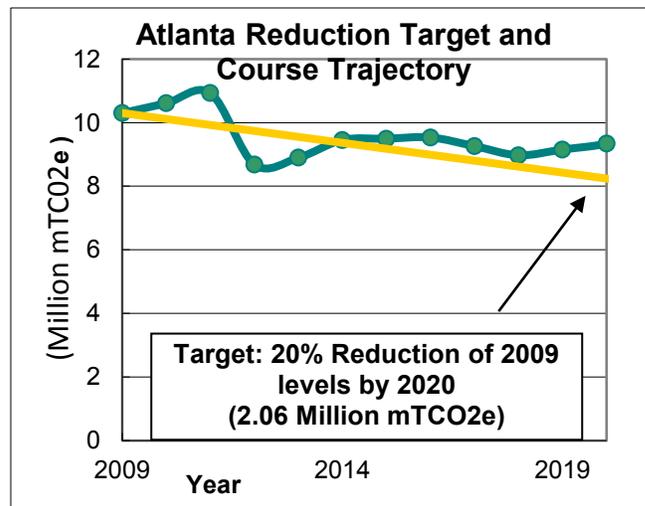
For complete information regarding the 2013 citywide emissions inventory, including methodology and supporting data, please reference to City of Atlanta Emissions Inventory Report located at:

<http://p2catl.com/publications/2013-greenhouse-gase-ghg-inventory/>

City of Atlanta's GHG Reduction Target

The City of Atlanta has set targets to reduce its emissions to 20 percent below 2009 levels by 2020, and 40 percent below 2009 levels by 2030. The combinations of measures that the City of Atlanta has already implemented or has currently planned, which are presented through this Climate Action Plan, are designed to achieve the 2020 targets. The total estimated increase or decrease in emissions by sectors relies on the best information currently available pertaining to population forecasts, future changes to building codes, and vehicle fuel efficiency standards, among other information.

Emissions Reduction Target



The City of Atlanta's targets are consistent with those suggested by national and international agencies, or proposed in federal legislation. Most local governments have a priority target of 15-25% below 2005 levels by 2020. Targets proposed via federal legislation have sought reductions of 17-20% below 2005 levels by 2020. Almost all sources recommend a reduction of 80% by 2050. The City of Atlanta anticipates being ahead of these short-term recommendations as well as being in line with middle-term recommendations via this Climate Action Plan.

City of Atlanta's Climate Action Plan

In the next chapter we will identify the focus areas within the City of Atlanta Climate Action Plan, the specific strategies within each focus area, and the contributions of each focus area toward the GHG reduction goal. Each focus area has a dedicated section within this document where specific actions (both new and those already employed) are described.

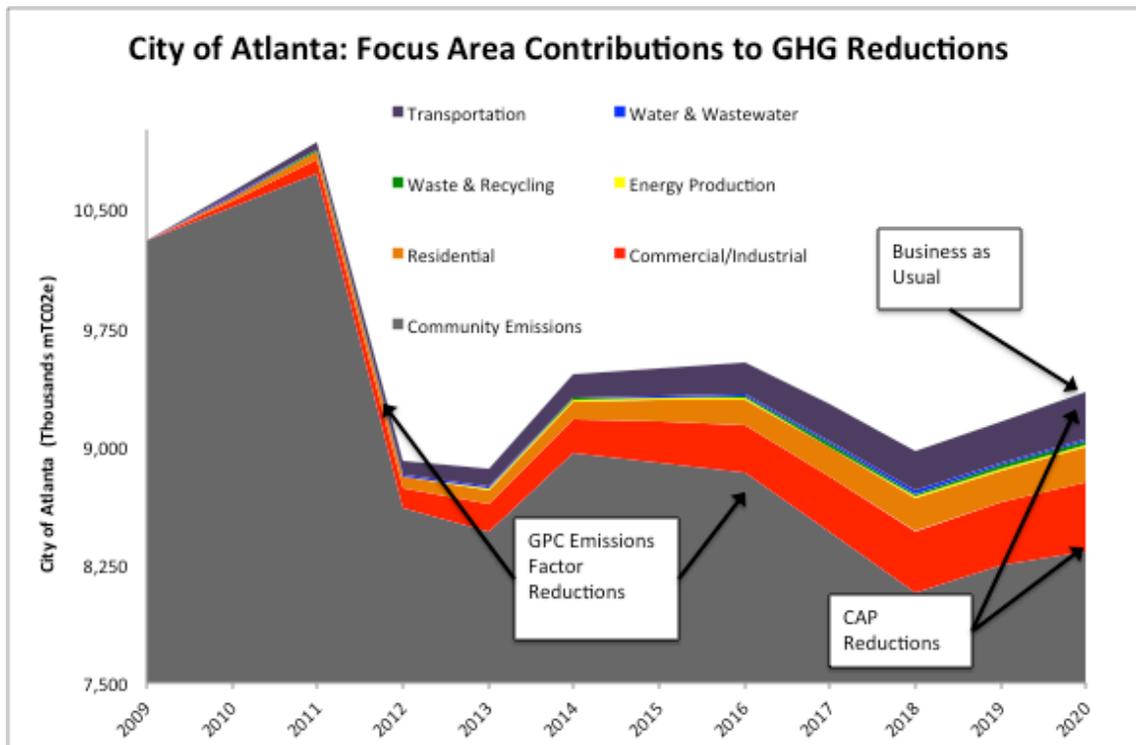
While the City of Atlanta local government cannot address climate change by itself, government policies and practices can dramatically reduce greenhouse gas emissions from a range of sources and help prepare the city for the anticipated impacts of climate change. In addition, the City of Atlanta will assist residents and businesses in their endeavors to reduce emissions through programs explained in this plan. By working together, the City of Atlanta will not only do its part toward achieving a stable climate - we will reap the benefits of healthier air, lower costs for utilities and services, improved transportation and accessibility, generate a more vibrant local economy, and many

other positive side effects of reducing our carbon footprint.

The Impact on Emissions

The figure below displays GHG emissions from 2009 to 2020 and the estimated impact the Climate Action Plan will have on reducing these emissions over time. The reductions are expressed in terms of the estimated impact of each focus area. Taken together, the elements of the Climate Action Plan are capable of reaching City of Atlanta’s adopted reduction target – savings are projected to result in total reductions of 2.06 Million mTCO2e by 2020.

Visualizing GHG Reductions



Emissions Reduction Focus Areas

The emissions reduction for each of the focus areas within City of Atlanta’s Climate Action Plan is explored in the following pages.

Commercial & Industrial Buildings
Residential Buildings
Energy Production
Materials Management and Recycling
Water and Wastewater Management
Transportation
Green Spaces/Food Security

In each focus area, a series of objectives with supporting strategies are explored. An *objective* is a goal, end result, or target that supports a focus area, and a *strategy* is a means of realizing the objective.

Each focus area draws on the actions of both the local government and city residents and businesses, although some areas may be largely one or the other.

Government Operations & Community Strategies

Government operations strategies are specific to the internal operations of the City of Atlanta. They apply to buildings the city owns or leases, vehicles used to provide services such as police and fire protection; the maintenance of streets and other infrastructures; recreational activities and cultural events; land use

and building regulations; solid waste collection and disposal; water and wastewater operations; and operates the world’s busiest airport, the Hartsfield-Jackson Atlanta International Airport.

Community strategies require involvement and participation from citizens.

Each strategy in the Climate Action Plan is noted as either government strategy for internal operations, or community strategies when participation of the community is necessary.

Emissions Reductions

Calculating expected emissions reductions for each objective requires making assumptions about the degree of implementation, technology, and individual behavioral changes several years into the future. The uncertainty associated with these assumptions makes it difficult to assign exact reduction totals to each objective or strategy. To address this uncertainty and provide a simple but useful reference for reduction potential, a series of symbols and percentage ranges has been devised to represent the emission reductions associated with each objective and its strategies. Other symbols represent the status of each of the strategies.

Symbol	Meaning
	GHG Emissions - Small Impact: 0-50,000 mTCO2e
	GHG Emissions - Medium Impact: 50,000 to 100,000 mTCO2e
	GHG Emissions - Large Impact: > 100,000 Million mTCO2e
	Early Stage
	Moderate Stage
	Advanced Stage

Other Benefits of Climate Protection Measures

In addition to addressing climate change, measures taken to reduce greenhouse gas emissions have other important benefits. The most obvious of these is the potential for significant cost savings. In 2013, the City of Atlanta replaced all of City Hall’s inefficient outdoor lighting with LEDs, reducing annual maintenance costs by \$8,000 per year, electricity costs by another \$8,000 per year, and abating 36 tons of GHG. Many of the measures in this plan “pay for themselves” quickly by reducing direct costs, such as fuel or energy used, and also indirect costs, such as maintenance. For instance, a “right-sized” vehicle fleet is less expensive to purchase, fuel, and maintain.

Another key benefit of climate change mitigation activities is enhanced energy security through reduction in total energy demand. Climate protection measures can also spur business and job growth during the design, manufacture, and installation of

energy efficient technologies. Climate change mitigation activities, particularly those related to transportation, help to clean the air by reducing vehicle emissions. Finally, mitigation activities help to engender a greater degree of choice for City of Atlanta residents. For instance, more transit options combined with transit-oriented development practices make for a more vibrant, livable community.

Many of the actions identified here to mitigate GHG emissions will also help City of Atlanta’s government, businesses, and residents to adapt to a changing climate. For example, extreme and prolonged heat waves can put considerable strain on the reliability of energy delivery in peak periods, possibly leading to service disruption during times when cooling is most needed. By increasing efficiency across the City of Atlanta, such service disruptions are less likely and the city will be able to better cope with those situations.

The next tables summarize the focus areas, the number of strategies within each focus area, and the contribution of each focus area toward the GHG reduction goal.

City of Atlanta Climate Action Plan Summary Table – Focus Areas

Focus Area, Objectives and “Power to Change” Impact Areas	Strategies	Actions	Anticipated Citywide Reduction by 2020 (mTCO2e)	Percentage of Citywide Reduction from 2009
<p>Commercial & Industrial Buildings:</p> <p>Objectives: Reduce Energy Consumption by 20% in 2020 using 2009 Baseline</p> <p>Power to Change Impact Areas:</p> 	<p>CB 1 – Benchmark, Disclosure, and Retrofit existing commercial and industrial buildings</p>	<ul style="list-style-type: none"> - Buildings Energy Efficiency Ordinance: Bench Marking – Disclosure (BM) - Code Compliance/LEED Compliance 	91,893.96	1.0%
		<ul style="list-style-type: none"> - Buildings Energy Efficiency Ordinance: Retro-Commissioning (RCx) 	4,375.90	0.05%
		<ul style="list-style-type: none"> - Buildings Energy Efficiency Ordinance: Energy Audits (EA) 	54,698.79	0.6%
		<ul style="list-style-type: none"> - Subsidize Energy Efficient Equipment (Tax credits/low or no-interest loans); Green loans; ESCOS 	218,795	2.5%
		<ul style="list-style-type: none"> - Others: Cool Roofs, Sub-metering, Expand Voluntary Programs, Municipal BM/EA/RCx 	67,826.49	0.8%
	<p>CB 2 – Ensure new commercial and industrial construction is built to maximize energy efficiency</p>	<p>New Code Existing Buildings</p>		
Total			437,590	4.9%

Focus Area, Objectives and “Power to Change” Impact Areas	Strategies	Actions	Anticipated Citywide Reduction by 2020 (mTCO2e)	Percentage of Citywide Reduction from 2009
<p>Residential Buildings</p> <p>Objectives: Reduce Energy Consumption by 20% in 2020 using 2009 Baseline</p>	<p>RB 1 –Retrofit existing Residential buildings/houses</p> <p>RB 2 – Ensure new residential construction is built to maximize energy efficiency</p>	<ul style="list-style-type: none"> - Subsidize retrofits – Rebates - Awareness of tax breaks/Utility programs - Code Compliance - HERS - On Bill Financing: Georgia Power 	314,258	3.1%

<p>Power to Change Impact Areas:</p> 		financing of EE projects		
Total			314,258	3.1%

Focus Area, Objectives and “Power to Change” Impact Areas	Strategies	Actions	Anticipated Citywide Reduction by 2020 (mTCO2e)	Percentage of Citywide Reduction from 2009
<p><u>Energy Production</u></p> <p><u>Objective:</u></p> <p>Encouraging the production and use of clean local energy by 10% of the total 2009 Energy consumption by 2020</p> <p><u>Power to Change Impact Areas:</u></p> 	<p>EP1: Facilitate Renewable Energy Investment</p> <p>EP2: Use of Clean Energy in Municipal Operations</p>	<ul style="list-style-type: none"> - Encourage community partners to finance and install renewable systems on private facilities - Establish energy financing districts; offer renewable energy system financing to small commercial properties - Supply 10% of City of Atlanta local government electricity demand via local renewable generation 	102,959	1%
Total			102,959	1%

Focus Area, Objectives and “Power to Change” Impact Areas	Strategies	Actions	Anticipated Citywide Reduction by 2020 (mTCO2e)	Percentage of Citywide Reduction from 2009
<p>Materials Management and Recycling</p> <p>Objective:</p> <p>Increase diversion from landfill to 80% by 2020</p> <p>Power to Change Impact Areas:</p> 	<p>MM 1 – Building Materials Reuse</p> <p>MM 2 – Divert MSW from landfills (recycling program)</p>	<p>- Promote the reuse of building materials and organizations which main function is the collection of these materials for reuse</p> <p>A. Educate/Enforce Ordinance #130 – Multifamily recycling;</p> <p>B – Formally create a partnership between nonprofits and CarAtlanta to promote recycling education, curbside collection, and proper handling of nontraditional items.</p> <p>C- Continue Work with Profit and Nonprofit organizations to Educate/Implement Recycling Programs</p> <p>D- Pricing mechanisms: Pay-as-you-Throw program</p>	<p>66,931</p>	<p>0.65%</p>
<p>Total</p>			<p>66,931</p>	<p>0.65%</p>

Focus Area, Objectives and “Power to Change” Impact Areas	Strategies	Actions	Anticipated Citywide Reduction by 2020 (mTCO2e)	Percentage of Citywide Reduction from 2009
<p>Water and Wastewater Management</p> <p>Objective:</p> <p>Increase efficiency in the use of water and wastewater treatment by 20% from 2009 by 2020</p> <p>Power to Change Impact Areas:</p> 	<p>WW1 – Optimize water distribution systems</p> <p>WW2 – Reduce water consumption per capita</p>	<p>- Remediate water pipe leaks by 50% to reduce pumping</p> <p>- Upgrade the mechanical and electrical systems at water and wastewater facilities</p> <p>- Promote water conservation measures specified by the Water Supply and Water Conservation Management Plan</p>	<p>602,589</p>	<p>6%</p>

  			
Total		602,589	6%

Focus Area, Objectives and "Power to Change" Impact Areas	Strategies	Actions	Anticipated Reduction by 2020 (mTCO2e)	Percentage of Total Reduction from 2009
<p><u>Transportation</u></p> <p><u>Objective:</u></p> <p>Reduce emissions from transportation by 20% from 2009 baseline by 2020</p> <p><u>Power to Change Impact Areas:</u></p>        	<p>TR1: Increase AFV usage and infrastructure</p> <p>TR2: Reduce VMT emissions and miles by creating/incentivizing transportation options and policies</p>	<ul style="list-style-type: none"> - Promote AFV rebates for vehicles and infrastructure - Organize AFV events - Improve parking schemes - Increase attractiveness to alternatives (bicycle paths - Scooter parking) - Promote TOD 	374,846	3.64%
- Total			374,846	3.64%

Focus Area, Objectives and “Power to Change” Impact Areas	Strategies	Actions	Anticipated Reduction by 2020 (mTCO2e)	Percentage of Total Reduction from 2009
<p><u>Green Spaces/Food Security</u></p> <p><u>Objective:</u></p> <p>Reduce emissions by increasing park land, green spaces, and tree canopy, and assuring local food security</p> <p><u>Power to Change Impact Areas:</u></p> 	<p>GS1- Maintain and Increase park land to 7% by 2020 and 10% by 2025; accessibility to parks (half mile) to 40% of the population by 2020 and 45% by 2025</p> <p>GS2-Increase urban canopy</p> <p>GS3- Increase Urban agriculture activities</p> <p>GS4-Reduce food deserts</p> <p>GS5- Trees Carbon Sequestration - Quantification</p>	<ul style="list-style-type: none"> - Work with the City Department of Parks and Recreation and Planning and Community Development to Increase city parks land and green spaces - Continuing working with nonprofit organizations to maintain and increase Atlanta’s tree canopy. - Work with stakeholders to finance and increase the number of Agriculture/Vertical Farming practices - Work with stakeholders link local producers with food deserts - Coordinate a study to quantify the amount of carbon sequestered or avoided in Atlanta through its tree canopy and green spaces 		

Commercial & Industrial Buildings



Energy consumed in commercial buildings and industrial processes account for 45% of City of Atlanta’s total GHG emissions. Improving the efficiency of our commercial building stock, and reducing the energy intensity of the local industrial

sector will significantly contribute to achieving City of Atlanta’s greenhouse gas reduction target. This chapter focuses on opportunities to retrofit existing commercial and industrial buildings and to ensure that future activities in these sectors are compatible with our community’s climate protection goals.

Objectives	Reduction Potential
Reduce Energy Consumption by 20% in 2020 using 2009 Baseline	

Strategies	Actions	Supports Adaptation	Community/Government	Reduction Potential
CB 1 – Benchmark/Disclose and Retrofit existing commercial and industrial buildings	A. BM B. RCx C. EA, D. Subsidies E. Others	Y	Both	
CB 2 – Ensure new commercial and industrial construction is built to maximize energy efficiency	A. Code Compliance B. LEED compliance	Y	Both	

CB 1 – Benchmark/Disclose and Retrofit existing commercial and industrial buildings	
Benchmark/Disclose and Retrofit existing commercial and industrial buildings larger than 25,000 sqft to achieve a 20% reduction in energy and water use by 2020	

CB1-BM	Require Benchmarking and Disclosure of energy use in commercial and industrial buildings exceeding 25,000 gross square feet (10,000 gross square feet for City owned facilities) by 2020	Stage
<p>Benchmark means to input and submit the total energy and water consumed for a property located within the City of Atlanta, as well as other descriptive information for such property as required by the U.S. Environmental Protection Agency’s ENERGY STAR Portfolio Manager, or any additional information required by tools adopted by the Mayor’s Office of Sustainability.</p>		
<p>According to the Institute for Market Transformation, benchmarking is the first step towards boosting building energy efficiency. According to the Institute, benchmarking can cut costs because by just knowing how much energy a building consumes, managers can begin to reduce energy consumption and save money.</p> <p>Benchmarking and transparency data analysis can provide information to city officials to learn about their city’s buildings. Based on this information, city officials can be more strategic when setting their priorities and allocating resources, and they can make better, faster progress toward citywide sustainability goals.</p> <p>Benchmarking also support local economies because building owners may decide to upgrade their buildings, creating jobs for contractors, engineers, and other building professionals.</p>		

CB1-RXc	Retro-commissioning 50% of the existing buildings exceeding 25,000 gross square feet by 2020	Stage
<p>Retro-commissioning means a systematic process for optimizing the energy efficiency of existing base building systems through the identification and correction of deficiencies in such systems, including but not limited to repairs of defects, cleaning, adjustments of valves, sensors, controls or programmed settings, and/or changes in operational practices.</p>		
<p>Retro-commissioning professional means an individual authorized to certify retro-commissioning reports.</p> <p>A retro-commissioning report means a document which includes (but not limited to):</p> <ul style="list-style-type: none"> (a) Summary retro-commissioning report; (b) Benchmarking output; (c) Testing protocol, including a list of all equipment types tested, a list of the sample rates (percent of each type of equipment tested) for each equipment type tested, the testing methodology, including any diagnostic equipment used, and the test results, and a list of integrated system testing performed; and (d) Master list of findings, including for each, the name of the retro- commissioning measure, a brief description of the measure, recommended corrections, the benefits attained, estimated annual savings (energy and cost), the estimated implementation cost, the net present value, and the simple payback. 		

CB1-EA	Require Energy Audits for buildings exceeding 25,000 gross square feet by 2020	Stage
<p>Energy Audit or audit means a systematic process of identifying and developing modifications and improvements of the base building systems, including but not limited to alterations of such systems and the installation of new equipment, insulation or other generally recognized energy efficiency technologies to optimize energy use performance of the building and achieve energy savings, provided that such process shall be at least as stringent as or comparable to the Level II Energy Survey and Engineering Analysis of the most recent edition of Procedures for Commercial Building Energy Audits published by the American Society of Heating, Refrigerating and Air-conditioning Engineers Inc. (ASHRAE).</p>		
<p>Energy auditor means an individual possessing such certifications as determined by the Department to perform or directly supervise individuals performing energy audits and to certify audit reports. Until such time as there is a US Department of Energy (DOE)-recognized standard establishing qualifications for persons performing energy audits and such standard has been adopted by the Office of Sustainability, an energy auditor and any member(s) of the team that such auditor supervises shall have the certifications or qualifications as the Office of Sustainability deems to be appropriate.</p>		

CB1-Financing	Rebates/Tax credits or loans/ Subsidies, On-bill financing	Stage
<p>Rebates/ tax credits/low or no interest loans/ subsidized capital to kick-start early energy efficient efforts -</p>		
<p>Utilize an Energy Services Company (ESCO): ESCOs conduct a comprehensive energy audit for a facility and identifies improvements to save energy. In consultation with the Owner, the ESCO designs and constructs a project that meets Owner's needs and arranges the necessary funding. The ESCO guarantees that improvements will generate energy/utility cost savings sufficient to pay for the project over the term of the contract.</p>		
<p>The Property Assessment Clean Energy (PACE) is a municipal program funded via issuance of public bonds or private lenders. The bonds are secured by a property lien and repaid via special property taxes (also known as Environmental Upgrade Agreements "EUA")</p>		

CB1-Others	Other Strategies	Stage
<p>Cool Roofs: According to the EPA, cool roofs reduce energy use by transferring less heat to the building below, so the building stays cooler and uses less energy for air conditioning. Cool roofs reduce air pollution and greenhouse gas emissions by lowering energy use, and they improve human health and comfort by reducing air temperatures inside buildings with and without air conditioning, helping to prevent heat-related illnesses and deaths.</p>		

<p>Sub-metering: According to the National Science and Technology Council Committee on Technology, sub-metering of buildings enables the improved performance of new and existing buildings – sub-metering provides the operations and maintenance transparency necessary to enable more efficient management of energy. In addition, sub-metering can drive behavioral change related to energy conservation.</p>	
<p>Expand Voluntary Programs: The Atlanta Better Building Challenge (ABBC) is the major voluntary program in which building owners and managers, with the support of government and nonprofit organizations, pledge to save 20% of water and energy by 2020. This program has been extremely successful in Atlanta and should be expanded.</p>	
<p>Municipal BM/AU/RCx: The City of Atlanta is leading by example to reduce energy consumption and emissions through many initiatives such as submitting buildings to participate in the ABBC and the Advanced Commercial Buildings Initiative (ACBI) designed for small buildings (< 50,000 sqft). The City committed all of its fire stations and recreational centers to the project.</p>	

<p>CB 2 – Ensure new commercial and industrial construction is built to maximize energy efficiency</p>	
<p>Ensure new commercial and industrial construction is built to maximize energy efficiency and include energy efficiency measures available, such as sub-metering</p>	

<p>CB2-Code Compliance</p>	<p>Enhance building code enforcement and compliance (i.e., sub-metering) in new commercial buildings to achieve 100% compliance by 2020</p>	<p>Stage</p>
<p>According to the National Science and Technology Council Committee on Technology, sub-metering enables the improved performance of new buildings – sub-metering provides the operations and maintenance transparency necessary to enable more efficient management of energy. In addition, sub-metering can drive behavioral change related to energy conservation.</p>		

<p>CB2- LEED Compliance</p>	<p>Require new municipal buildings to meet LEED Silver requirements</p>	<p>Stage</p>
<p>Ordinance #03-0-1693, adopted in December 2003, requires all city-funded projects over 5,000 square feet, or over \$2 million, to meet a LEED Silver rating level or higher. Projects exempt from this policy are required to complete a LEED checklist to assess any sustainable design techniques.</p>		

Residential Buildings



Energy consumed in residential buildings accounts for 19% of City of Atlanta’s total GHG emissions. Improving the efficiency of our residential building stock will contribute significantly to achieving City of Atlanta’s greenhouse gas reduction target, while saving residents money on utility bills and reducing

the need for new infrastructure. This chapter focuses on opportunities to retrofit existing residential buildings, increase the quality of new construction, and to ensure that future activities in these sectors are compatible with our community’s climate protection goals.

Objectives	Reduction Potential
Reduce Energy Consumption by 20% in 2020 using 2009 Baseline	

Strategies	Actions	Supports Adaptation	Community/Government	Reduction Potential
RB 1 – Retrofit existing residential buildings and homes to achieve a 20% reduction in energy use by 2020	A. Subsidies/Rebates B. Utility programs C. HERS D. On-bill Financing	Y	Both	
RB 2 – Ensure new residential buildings and homes are built to maximize energy efficiency	Code Compliance	Y	Both	

RB 1 – Retrofit existing residential buildings and homes to achieve a 20% reduction in energy use by 2020	
Retrofit existing residential buildings and homes to achieve a 20% reduction in energy use by 2020	

RB 1 – Subsidies /Rebates	Offer financial incentives for residential energy retrofits	Stage
<p>Work with utilities to expand energy efficiency rebates program such as the Georgia Power Energy Efficiency Home Improvement Rebates that expired in 12/31/2012 – The program provided 50% of the cost of whole house improvements up to \$2,200 and for individual improvements up to \$700 (http://energy.gov/savings/georgia-power-energy-efficiency-home-improvement-rebates).</p> <p>Work with the State of Georgia to expand programs such as the Clean Energy Tax Credit for clean energy equipment installed and placed into service. For clean energy property installed for single-family residential purposes, the tax credit is equal to 35% of the cost of the system (including installation). The credit is subject to various ceilings depending on the type of system. A maximum of \$2,500 per residence for domestic solar water heating, a maximum of \$10,500 per residence for photovoltaic (PV), active space heating and wind energy systems, and a maximum of \$2,000 per installation for Energy Star-certified geothermal heat pumps (http://energy.gov/savings/clean-energy-tax-credit-personal).</p>		

RB 1- Utility Programs	Offer financial incentives for energy efficient appliances	Stage
<p>Continue working with utilities to provide economic incentives to replace inefficient appliances for efficient ones. As an example, Georgia Power Appliance program offers rebates for the replacement of room air conditioners, refrigerators, clothes washers, and freezers.</p>		

RB 1- HERS	Home Energy Rating System (HERS)	Stage
<p>The Home Energy Rating System (HERS) Index is the industry standard by which a home's energy efficiency is measured. It's also the nationally recognized system for inspecting and calculating a home's energy performance. Based on the results, an energy-rated home will receive a HERS Score. The HERS Index Score can be described as a sort of miles-per gallon sticker for houses. In addition to a HERS Index Score, a home energy rating also provides the homeowner an insight as to how the home ranks in terms of energy efficiency.</p>		

RB 1- Finances	On-bill Financing	Stage
<p>Utilize an Energy Services Company (ESCO): ESCOs conduct a comprehensive energy audit for a facility and identify improvements to save energy. In consultation with the owner, the ESCO designs and constructs a project that meets Owner’s needs and arranges the necessary funding. The ESCO guarantees that improvements will generate energy/utility cost savings sufficient to pay for the project over the term of the contract.</p>		
<p>The Property Assessment Clean Energy (PACE) is a municipal program funded via issuance of public bonds or private lenders. The bonds are secured by a property lien and repaid via special property taxes (also known as Environmental Upgrade Agreements “EUA”).</p>		

RB 2– New Homes	
<p>Ensure new residential constructions are built to maximize energy efficiency and include energy efficiency measures available such as sub-metering</p>	

RB 2- Code Compliance	Enhance residential building code enforcement and compliance in new residential buildings to achieve 100% compliance by 2020	Stage
<p>Effective January 1, 2011, Georgia’s residential energy code is the 2009 International Energy Conservation Code (IECC) with specific amendments to Georgia.</p> <p>Sub-metering: According to the National Science and Technology Council Committee on Technology, sub-metering of multifamily residences enables the improved performance of new buildings – sub-metering provides the operations and maintenance transparency necessary to enable more efficient management of energy. In addition, sub-metering can drive behavioral change related to energy conservation.</p>		

Energy Production



Broadly speaking, the use of fossil fuels for energy (including electricity, heating, transportation, and other uses) is the single largest contributor to greenhouse gas emissions. In the State of Georgia, burning fossil fuel supplies a considerable share of energy for electricity, heating, transportation, and other energy-producing uses. Emissions from fossil fuel combustion for energy, including transportation, represent 95 percent of the community’s total GHG emissions. Energy Production is a cross-cutting focus area in that nearly all activities that take place in the community require energy of some sort. While Georgia Power is working to increase the percentage of electricity generated through renewable sources, opportunities also exist for citizens and the city to produce small-scale renewable energy or fuels, offsetting the need for fossil fuels. This focus area is limited to energy production exclusively – objectives and strategies that focus on end-use energy efficiency are included in other focus areas. The programs and projects within this focus area are designed to spur local government and community investment in renewable energy sources including those that produce electricity, heat, and mobile fuels.

Building a Solar Atlanta

According to [Environment Georgia](#), Atlanta can meet 10 percent of its total electricity needs with solar power by 2030, including potential for solar hot water systems for 40,000 Atlantans¹.

According to the study, utilizing rooftop space with suitable sun exposure could technically produce nearly 1,400MW by 2030, which would increase solar generation up to 21 percent of the city’s total forecast electricity use in that year.

To achieve this goal, [Environment Georgia](#) proposes an increase of the solar market by an average of 38 percent per year. This rate has been demonstrated to be possible in other states such as in California (54 percent) and New Jersey (79 percent).

Combined rooftop solar and solar water heating installations can potentially save more than 712,000 mTCO₂e by 2030. Furthermore, the increasing solar power in Atlanta could make the city a leader in the region for the solar power industry, create jobs, and boost the economy.

¹ Environment Georgia. (2013). *A Bright Future: Building a Solar Atlanta*.

Objectives	Reduction Potential
Encouraging the production and use of clean local energy by 10% of the total 2009 Energy consumption by 2030	

Strategies	Supports Adaptation	Community/Government	Reduction Potential
EP 1 – Facilitate Renewable Energy Investment	Y	Both	
EP 2 – Supply 10% of City of Atlanta local government electricity demand via local renewable generation	Y	Government	

EP 1 – Facilitating Renewable Energy Investment	
Build local small-scale renewable energy systems and capacity	

EP-1A	Encourage community partners to finance and install renewable systems in private facilities	Status
<p>Provide incentives for the inclusion of clean/renewable energy in new community development plans or facilities.</p> <p>Engage with universities to perform resource and technical assessments to identify the best type and configuration of clean energy to install in various parts of the city. With resource assessment information available, local contractors and residents will have an important tool to support the installation of renewable energy sources (e.g., the Spatial Planning tool developed by the Geographic Information System at Georgia Tech).</p> <p>Educate/facilitate dialogue among contractors and private owners to increase renewable capacity.</p>		

EP-1B	Establish energy financing districts; offer renewable energy system financing to small commercial properties	Status
Build Financing Stakeholder Group (community local banks, buildings, finance, legal departments, utility experts); Identify financing vehicles, scope, appropriate funds/financing; Address legal barriers; Establish Program; Conduct Outreach		

EP 2 – Local Government Renewable Energy		
Supply 10% of City of Atlanta local government energy demand via renewable sources		

EP-2A	Install renewable energy systems on City of Atlanta-owned facilities such that 10% of total energy demand of local government buildings is met.	Status
Install renewable energy systems on City of Atlanta-owned facilities such that 10% of total energy demand of local government buildings is met		

Materials Management



City of Atlanta’s solid waste is disposed of outside of the city limits. Emissions from decaying putrescible material directly contribute 4% of City of Atlanta’s total GHG emissions and contribute to emissions in the Transportation sector via hauling of waste to and from facilities and operating. Additionally, embodied

energy within the items that we throw away might be harnessed through reuse and recycling of materials. It is in City of Atlanta’s long-term interest to expand recycling facilities and enable re-use of construction materials and other goods. This chapter focuses on opportunities to reduce waste, reuse materials, and recycle what cannot be reused.

Objectives	Reduction Potential
Increase diversion from landfill to 80% by 2020	

Strategies	Supporting Actions	Supports Adaptation	Community/Government	Reduction Potential
MM 1 – Building Materials Reuse	Promote the reuse of building materials and organizations whose main function is the collection of these materials for reuse	Y	Both	
MM 2 – Divert MSW from landfills (recycling program)	<p>A. Educate/Enforce Ordinance #130 – Multifamily recycling;</p> <p>B – Formally create a partnership between nonprofits (e.g., The Center for Hard to Recycle Materials – CHaRM, Keep Atlanta Beautiful – KAB, and the Lifecycle Building Center) and CarAtlanta to promote recycling education, curbside collection, and proper handling of nontraditional items.</p> <p>C- Pricing mechanisms: Pay-as-you-Throw program</p>	Y	Both	

MM 1 – Buildings Materials Reuse		
Promote the reuse of building materials and organizations whose main function is the collection of these materials for reuse		

MM-1A	Promote the use of the building materials reuse warehouses for community construction and demolition use	Status
In the City of Atlanta, there are some nonprofit organizations that collect and resale building materials for reuse from construction and demolition (e.g., The Lifecycle Building Center – www.lifecyclebuildingcenter.org). The objective of this strategy is to promote these organizations and educate residents and developers about the use of these centers.		

MM 2 – Divert MSW from landfills		
Divert from the landfill stream 80% of municipal and residential waste by 2020		

MM-2A	Educate/Enforce Ordinance #130 – Multifamily recycling	Status
City of Atlanta Ordinance #130 requires managers of multi-family units to provide their complex with commercial containers for the recyclables, including at the minimum the materials the City collects as part of its curbside recycling program. The location of these containers cannot in any way impede normal public right-of-ways.		

WR-2B	Support Center for Hard to Recycle Materials	Status
Formally create a partnership between nonprofits (e.g., The Center for Hard to Recycle Materials – CHaRM, Keep Atlanta Beautiful – KAB, and the Lifecycle Building Center) and CarAtlanta, to promote recycling education, curbside collection, and proper handling of nontraditional items that are hazardous, bulky, or other hard to recycle items.		

MM-2C	Pricing Solution (Pay-as-you-Throw)	Status
<p>In a pay-as-you-throw program, residents are charged for the collection of municipal solid waste—ordinary household trash—based on the amount they throw away. This creates a direct economic incentive to recycle more and to generate less waste.</p> <p>Traditionally, residents pay for waste collection through property taxes or a fixed fee, regardless of how much—or how little—trash they generate. Pay-As-You-Throw (PAYT) breaks with tradition by treating trash services just like electricity, gas, and other utilities. Households pay a variable rate depending on the amount of service they use.</p> <p>Most communities with PAYT charge residents a fee for each bag or can of waste they generate. In a small number of communities, residents are billed based on the weight of their trash. Either way, these programs are simple and fair. The less individuals throw away, the less they pay.</p>		

EPA supports PAYT because the program provides three benefits:

1. Environmental Sustainability - Communities with programs in place have reported significant increases in recycling and reductions in waste, due primarily to the waste reduction incentive created by PAYT. Less waste and more recycling mean that fewer natural resources need to be extracted. In addition, greenhouse gas emissions associated with the manufacture, distribution, use, and subsequent disposal of products are reduced as a result of the increased recycling and waste reduction PAYT encourages. In this way, PAYT helps slow the buildup of greenhouse gases in the Earth's atmosphere which leads to global climate change. For more information on the link between solid waste and global climate change, go to EPA's Climate Change Web site.

2. Economic Sustainability - PAYT is an effective tool for communities struggling to cope with soaring municipal solid waste management expenses. Well-designed programs generate the revenues communities need to cover their solid waste costs, including the costs of such complementary programs as recycling and composting. Residents benefit, too, because they have the opportunity to take control of their trash bills.

3. Equity - One of the most important advantages of a variable-rate program may be its inherent fairness. When the cost of managing trash is hidden in taxes or charged at a flat rate, residents who recycle and prevent waste subsidize their neighbors' wastefulness. Under PAYT, residents pay only for what they throw away.

Water & Wastewater Management



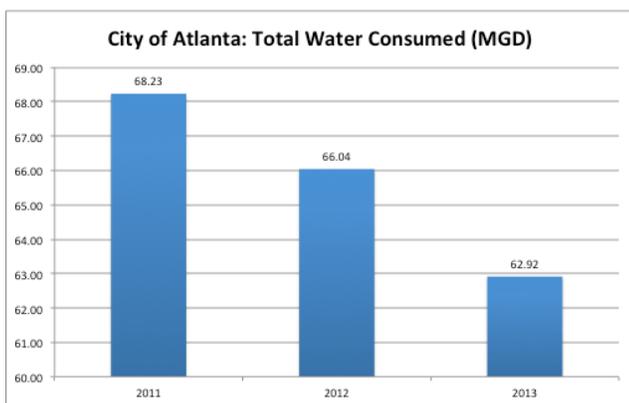
Water Supply

The water consumed in the City of Atlanta is taken entirely from the Chattahoochee River. The City of Atlanta Department of Watershed Management (DWM) operates the city’s water and wastewater collection, conveyance, and water treatment system.

The Georgia Environmental Protection Division licenses DWM to withdraw water from the river up to 180 million gallons per day (MGD). The average withdrawal from 2010 to 2013 was around 84 MGD.

drinking water. The rest of the water for the city is supplied by the Atlanta-Fulton County Water Treatment Plant, which also processes water from the Chattahoochee River.

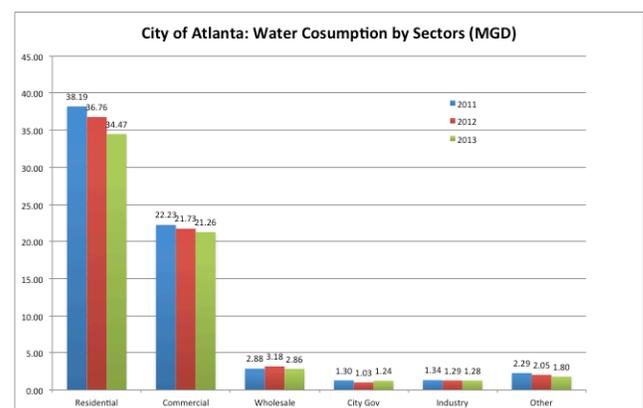
In 2013-2014, the Hemphill Water Treatment Plant was recognized by the EPA as a top finisher in the Atlanta Better Building Challenge. The plant was recognized for reducing its energy consumption by over 40%.



Total water consumed (2011-2013) source: City of Atlanta Department of Watershed Management

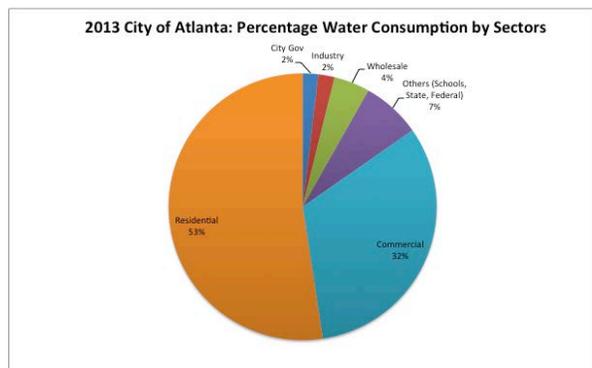
DWM operates three water treatment systems: The Chattahoochee Water Treatment Plant processes water directly from the Chattahoochee river. The Hemphill Water Treatment plant processes water from a reservoir that is filled from the river. Together these plants produce 75% of Atlanta’s

The Residential sector consumes more than half of the potable water consumed in the city, while the commercial sector consumes more than one-third.



Total water consumption by sectors (2011-2013) source: City of Atlanta Department of Watershed Management

The DWM Water Supply and Water Conservation Management Plan is being updated currently, with an expected 2016 release. The existing action items will be revised, and an emphasis on water efficiency for commercial and industrial water users is likely.



Percentage of water consumption by sectors (2011-2013) source: City of Atlanta Department of Watershed Management

Water-Energy Nexus

Distributing and treating water for the City of Atlanta is an energy intensive task. In 2013, 22 percent of city operation emissions were generated to treat and distribute water (116,187 mTCO₂e), only surpassed by buildings operations.

The link between water and energy is called the *Energy-Water Nexus*, in which water and energy are inextricably linked and mutually dependent with each affecting the other's availability. Water is needed for energy development and generation, and energy is required to supply, use, and treat drinking water and wastewater².

DWM is working intensively on two programs to reduce the city's water consumption:

- (1) Improving the water distribution system, and

- (2) Water conservation programs.

Water Distribution

The City of Atlanta water distribution system consists of 2,500 miles of distribution mains and approximately 25,000 hydrants. Improvements in the aging distribution system are taking place in 50 selected areas. The improvements consists of installing new fire hydrants within the existing rights-of-way and constructing more than 100,000 feet of new water mains ranging in diameter from 8 inches to 16 inches, as well as abandoning existing undersized water mains and hydrants. Some mains replaced were 80 years old.

From 2014 up-to-date, 477 main breaks, 360 meter leaks, and 713 hydrant leaks were repaired for an estimated of 520.2 million gallons of water saved per year.

Water Conservation

DWM has many programs in place to educate residents in water conservation issues.

Care & Conserve is a program to assist families and individuals in paying their water and sewer bill during times of financial hardship. The program also includes plumbing repairs and low-water fixtures installments at no cost to tenants. In 2014, the Care & Conserve program assisted 168 families.

The multi-family toilet rebates program consists of trading in old toilets for EPA WaterSense efficient models. In 2014, four multifamily properties participated in the program, and 49 toilets were replaced, \$4,900 in rebates applied, 1.2 tons of

² www.gao.gov
City of Atlanta Climate Action Plan

porcelain recycled and diverted from landfills, and 512,199 gallons of water of city water conserved.

Fix-A-Leak, a program sponsored by EPA WaterSense, consists of a series of campaigns in an effort to encourage Atlantans to repair leaking structures in their homes. DWS staff provides information on conserving water as well as demonstrations on installing low-flow water saving devices and preventing toilet leaks. The program also provides free water-saver kits complete with faucet aerators, showerheads, leak detection tablets, and other conservation-oriented materials. The kits are available to residents at all City of Atlanta fire stations.

The *Atlanta Better Building Challenges* is a US Department of Energy sponsored voluntary program in which participants compromise to reduce 20 percent of their energy and water consumption by 2020. By 2013, participants reduced the amount of water they consumed by 103 million gallons.

Water Reclamation and Treatment

DWM handles approximately 2,000 miles of sanitary and combined sewers, six combined sewers overflow treatment plants, four water reclamation centers, and sixteen pump stations. The water reclamation centers treat more than 170 million gallons of wastewater per day. The high quality water is discharged into the Chattahoochee River.

Clean Water Atlanta is a comprehensive, multi-program initiative to improve water quality in Atlanta through capital construction programs and enhanced operation of the City's drinking and wastewater systems. The City adopted an aggressive 10 year *City of Atlanta Climate Action Plan*

capital improvement program in 1993, spending more than 1 billion on wastewater and sewer improvements to the drinking water system.

Clean Water Atlanta expands this program to include all projects required to comply with two federal consent decrees and a state consent order, improve water quality throughout metro Atlanta, secure drinking water facilities in accordance with national homeland security guidelines and provide holistic management of the City's resource operation.

Through the programs associated with Clean Water Atlanta, the City of Atlanta will establish, operate and maintain state-of-the-art water resource and infrastructure systems. Clean Water Atlanta will also enable the City to meet water quality requirements in the near and distant future.

The City of Atlanta operates four Water Reclamation Centers (WRCs): R.M. Clayton, Utoy Creek, South River, and Intrenchment Creek. These facilities are primarily responsible for treating wastewater within the City.

Atlanta began a massive program of improvements to its WRCs in 1995, to comply with state regulations and legislative mandates. These improvements were designed to reduce phosphorus concentrations in the treated wastewater being discharged from the facilities and allow each WRC to fully treat wastewater from its own service area. The Consent Decree imposed additional treatment capacity and more stringent treatment limits on the City's WRCs. Supplementing compliance with these requirements will be the implementation of enhanced training and management procedures to operate these facilities

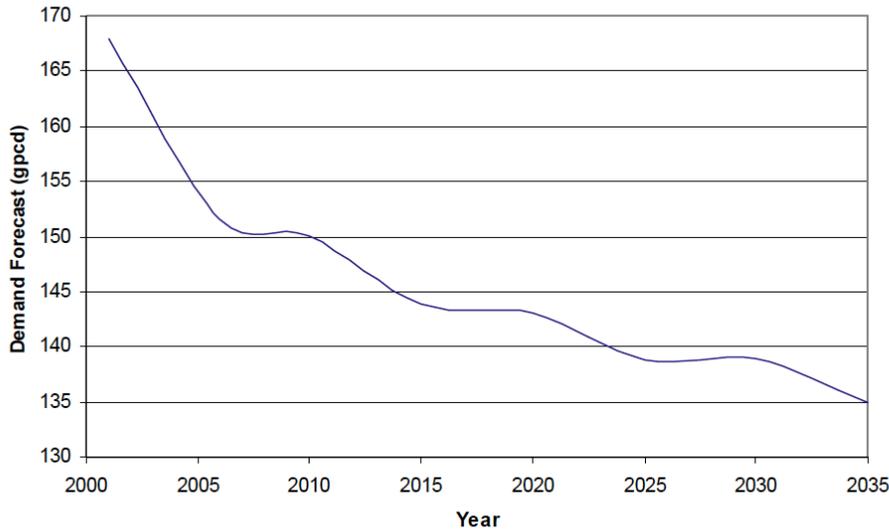
more effectively. These measures are intended to improve the water quality in downstream receiving water bodies, principally the Chattahoochee River, by improving the water quality of the effluent discharged from the WRC.

DWM has recently updated the Post-Development Stormwater Management Ordinance to promote the use of Green Infrastructure on new and redevelopment projects in the City. Green infrastructure uses natural hydrologic features to manage water and provide environmental and community benefits. On development sites, Green Infrastructure includes engineered practices that are designed to mimic natural hydrology by infiltrating

stormwater runoff into the ground, evapotranspiration (uptake of water by plants) in landscaped areas, or capturing and reusing the runoff through rainwater harvesting techniques.

The implementation of these measures has resulted in a decline in water consumption per capita as shown in the Figure below. Based on the trends shown, water consumption per capita between 2014 and 2020 is expected to be flat, representing savings of 10.62 million gallons per day (MGD) compared to 2009 consumption. These savings in water consumption imply indirect reductions in emissions in approximately 602,589 mTCO₂e.

Metro Water District Overall Per Capita* Water Use Trends (2001 – 2035)



* Overall per capita = total water demand supplied by public water systems in the Metro Water District divided by the Metro Water District's population.

Source: Water Supply and Water Conservation Management Plan – 2009 – Metropolitan North Georgia Water Planning District

Objectives	Reduction Potential
Increase efficiency in the use of water and wastewater treatment by 20% from 2009 baseline by 2020	

Strategies	Supporting Actions	Supports Adaptation	Community/Government	Reduction Potential
WW1 – Optimize water distribution systems	A. Remediate water pipe leaks by 50% to reduce pumping B. Upgrade the mechanical and electrical systems at water and wastewater facilities	Y	Both	
WW2 – Reduce water consumption per capita	Promote water conservation measures specified by the Water Supply and Water Conservation Management Plan	Y	Both	

WW 1 – Optimize water distribution systems	
<p>One of the priorities of the City of Atlanta Department of Watershed Management (DWM) is to improve operational efficiencies to deliver the highest level of service to customers in a sustainable and cost-effective manner. The Office of Linear Infrastructure Operations is responsible for the management, operations and maintenance of more than 2,500 miles of drinking water infrastructure, and more than 1,500 miles of sanitary and combined sewers.</p>	

WW-1A	Remediate water pipe leaks by 50% to reduce pumping	Status
<p>The City of Atlanta is committed to improving its aged drinking water infrastructure by finding leaks and repairing or replacing those pipes. The Mayor’s goal is to reduce system water loss from leakage by 50% (http://www.mydropcounts.org/index.php/whos-conserving/interactive-map/).</p>		

WW-1B	Upgrade the mechanical and electrical systems at water and wastewater facilities	Status
<p>Twenty-two percent of the electricity consumed by municipal operations is used for wastewater treatment. As such, the City of Atlanta Department of Watershed Management, in conjunction with the Mayor’s Office of Sustainability, retrofitted two water treatment plants and a water reclamation plant, replacing more than 4,300 inefficient fixtures with high-efficiency fluorescent and LED fixtures, saving the city more than \$400,000 annually in energy and maintenance costs. Additionally, the Hemphill water treatment plant was recognized as one of the nation’s most energy-efficient by reducing energy usage by 40% and preventing more than 11,000 metric tons of greenhouse gas emissions. Efforts at the Hemphill plant can be replicated in other facilities to reduce the amount of energy used to treat water facilities.</p> <p>http://www.atlantawatershed.org/newsroom/press-releases/watershed-management-to-celebrate-44th-annual-earth-day/</p>		

WW 2 – Reduce 20% of water consumption per capita by 2020		
<p>The City of Atlanta <i>Water Supply and Water Conservation Management Plan</i> is being updated currently with an expected release in 2016. The existing action items are being revised and most likely will include an emphasis on water efficiency for commercial and industrial water users.</p>		

WW-2A	Reduce Consumption	Status
<p>The City is also focused on reducing water demand in one of the largest consumer groups – Atlanta’s multifamily residential communities. This sector currently uses approximately 20% of Atlanta’s daily production. Through Atlanta’s new multifamily toilet rebate program older water wasting fixtures are being replaced by WaterSense toilets with the potential for saving up to 3 million gallons of water a day. The continuation of programs such as “Fix-A-Leak” is important to educate residents on water conservation issues.</p> <p>The second consumer group is the commercial sector. The new Buildings Energy Efficiency Ordinance requires benchmark of existing commercial and industrial buildings larger than 25,000 sqft to achieve a 20% reduction in water use by 2020.</p>		

Transportation



Emissions from transportation are evident to nearly everyone in the City of Atlanta. Besides emitting greenhouse gases, transportation that uses fossil fuels also produces a host of criteria air pollutants when combusted, reducing local air quality and affecting our health. Transportation accounts for 31% of City of Atlanta’s total GHG emissions. This chapter

focuses on programs and policies to reduce emissions from transportation and includes design-oriented approaches as well as expansion of alternate modes such as walking, biking, or public transportation to and from the most common destinations in the city.

Objectives	Reduction Potential
Reduce emissions from transportation by 20% from 2009 baseline by 2020	

Strategies	Supporting Actions	Supports Adaptation	Community/Government	Reduction Potential
TR1 -Reduce Emissions from VMT	<ul style="list-style-type: none"> A. Fuel Economy Standards B. Promote AFV purchasing C. Provide a reliable AFV infrastructure 	Y	Government	
TR-2 Reduce VMT	<ul style="list-style-type: none"> A. Parking Pricing B. Parking Cash-Out C. Transit Oriented Development D. Pedestrian Facilities E. Transit Investment F. Bicycle Support Strategy G. Telecommuting H. Compressed work weeks 	Y	Government	

TR 1 – Reduce Emissions from VMT		
Reduce emissions from vehicles traveling through the Atlanta area by following national and regional regulations on fuel economy standards and promoting the purchase and use of Alternative Fuel Vehicles (AFV) by providing economic incentives and an adequate infrastructure.		

TR 1-A	Fuel Economy Standards	
The Corporate Average Fuel Economy (CAFE) is a federal regulation enacted to improve the average fuel economy of cars and light trucks sold in the USA. CAFE standards will require an increase in the efficiency of vehicles of 25% by 2020.		

TR 1-B	Promote AFV purchasing	
Atlanta is one of the largest national markets for Electric Vehicles sales thanks to economic and transportation incentives provided previously by the State such as a \$5,000 tax credit for the purchase of a new Zero Emissions Vehicle and access to HOV lanes. State legislators terminated these incentives in 2015. The City of Atlanta is monitoring closely how this termination will affect the EV market and based on the results, it will initiate conversations with State legislators to reinstall these incentives to encourage more drivers to purchase and drive zero emission vehicles.		

TR 1-C	Provide a reliable AFV infrastructure	
The Georgia Environmental Finance Authority offers rebates up to \$40,000 to organizations interested in installing EV charging stations in the state. The city should continue the promotion of these types of incentives to ensure that users have adequate access to an AFV charging infrastructure.		

TR 2 – Reduce VMT Miles

VMT in Atlanta has been increasing during the past decade from 5,663 million VMT in 2010 to an expected 6,122 million VMT by 2015; however, an urbanization trend is emerging across the country as young educated professionals are moving back to urban centers that offer walkability, proximity to work, and cultural density (<http://www.thewire.com/national/2014/03/more-americans-moving-to-cities-reversing-the-suburban-exodus/359714/>; http://www.bizjournals.com/atlanta/real_talk/2014/10/martas-transit-oriented-development-program-can.html?page=all).

Achievable strategies to reduce VMT in Atlanta are classified in: parking management strategies (such as mandatory parking cash-out), land use (such as TOD), alternative modes (such as bicycle infrastructure), and other (such as telecommuting and compressed work weeks).

The Atlanta Regional Commission is currently doing a study on the emissions benefits of parking strategies with EPA. Results of the study will be available by September, 2015.



TR 2-A

Parking Pricing



Parking pricing includes increasing fees at municipal facilities or adding parking meters to previously free on-street spaces. Taxing private-parking operators can also raise the prices of parking in the region. Case studies have shown significant decrease in vehicles usage in the range of 26 to 81 percent (http://www.fhwa.dot.gov/environment/glob_c5.pdf)

TR 2-B

Parking Cash-Out



A mandatory parking cash-out policy would require employers who provide subsidized parking to also offer their employees the opt of receiving taxable income instead of parking. By having this alternative, employees may option to receive the taxable income instead of parking. Cash-out policies may result in significant reductions in VMT such as the case of Los Angeles Central Business District. A regional example of parking cash-out is taking place in Athens, GA:

<http://athensclarkecounty.com/2113/Parking-Cash-Out>

TR 2-C	Transit-Oriented Development (TOD)	
<p>TOD is a pedestrian-friendly, mixed-use community infrastructure that provides access to public transportation for residents and workers. TODs provide people with options so they can choose where to live, work, play, and socialize. The Atlanta Regional Commission (ARC), in partnership with MARTA, is working to promote TOD at each MARTA station to ensure that these transit stations will have the necessary infrastructure and land uses to support planned and future TODs.</p> <p>MARTA will be moving forward to partner with private developers to implement its 2015 Transit Oriented Development (TOD) strategy at Brookhaven, King Memorial, Avondale Estates and Oakland City stations.</p> <p>An important strategy to develop TOD projects is to alter zoning in the city, when it is necessary, to support more mixed land use (to improve jobs-housing balance and shorten trip distances).</p>		

TR 2-D	Pedestrian Facilities	
<p>Pedestrian-oriented measures can have an immediate effect in encouraging pedestrian activities and reducing VMT.</p> <p><i>Connect Atlanta</i>, the city's first Comprehensive Transportation Plan (CTP), includes guidelines for the location and design of sidewalks and other pedestrian amenities in new developments. There will also be guidelines for developed areas that reflect current land use and proximity to community facilities</p> <p>http://web.atlantaga.gov/connectatlanta/</p>		

TR 2-E	Transit Investment	
<p><i>Connect Atlanta</i> includes ninety-five (95) miles of rail transit and high-frequency bus transit. It also includes existing proposals to extend MARTA’s West rail line to I-285, to construct a Bus Rapid Transit line from the HE Holmes station to Fulton Industrial Boulevard, and to implement the planned BeltLine transit facility and the Peachtree Street Streetcar. In addition the study team is proposing high-frequency bus service, streetcar and light rail lines in several other major corridors in the city.</p> <p>http://web.atlantaga.gov/connectatlanta/</p>		

TR 2-F	Bicycle support strategies	
<p>Connect Atlanta, the city's first Comprehensive Transportation Plan (CTP), includes 200 miles of bicycle lanes. A core set of bicycle lanes is proposed that will link key travel corridors to activity centers; a secondary set of bike lanes will link neighborhoods. The bicycle network will be developed by restriping existing streets and by creating bike lanes as part of new construction and street widening.</p> <p>http://web.atlantaga.gov/connectatlanta/</p>		

TR 2-G	Telecommuting	
<p>Despite some countervailing effects, such as exacerbating trends toward increased geographical dispersion of residents, the US DOE suggests that the net benefits of telecommuting are positive. Some additional positive effects of telecommuting are employee effectiveness and productivity, higher morale and job satisfaction, decreased absenteeism and sick time, and decreased overhead costs such as office space.</p>		



This program allows individuals to work more hours per day and fewer days per week. For example, working 10 hours during 4 days a week. This program can be as effective as telecommuting because workers can reduce their emissions by reducing their round-trips to work.

Cross Reference Table between CAP Initiatives and ARC Transportation Study*

Objective	Supporting Strategies (CAP)	ARC Study: Recommended Goals	ARC Study: Recommended Actions
Reduce Emissions from VMT	- Fuel Economy Standards	Goal 3: Support the use of cleaner & more fuel-efficient vehicles and alternative fuels	<ul style="list-style-type: none"> - Support Federal and state investments in R&D to decarbonize transportation vehicles and fuels by 2050, not only in the U.S. but worldwide - Encourage conversion of public fleets into clean efficient vehicles - Continue to fund retrofits for cleaner diesel engines on buses, heavy-duty trucks, and locomotives - Outlaw and enforce unnecessary idling
	- Promote AFV purchasing		
	- Provide a reliable AFV infrastructure		
Reduce VMT	- Parking Pricing	Goal 2: Reduce VMT by supporting alternative modes and implementing transportation pricing measures	Adopt transportation pricing policies that discourage SOV travel (congestion pricing, parking pricing, mileage-based user fees, etc.)
	- Parking Cash-Out		
	- Transit Oriented Development		
	- Pedestrian Facilities	Goal 1: Promote sustainable development through integrated land use and transportation strategies	<ul style="list-style-type: none"> - Shift from sprawl to compact development - Continue LCI program - Increase involvement in ARC's Green Communities Program - Support development around transit stations - Promote infill development - Tie state and federal transportation funds to support sustainable development
	- Bicycle Support Strategy	Goal 2: Reduce VMT by supporting alternative modes and implementing transportation pricing measures	Target bike/pedestrian projects in areas that will reduce number of vehicle trips. Include improvements in sidewalks, crosswalks, bicycle lanes, and lighting.
	- Transit Investment		
	- Telecommuting		
- Compressed work weeks			
		<ul style="list-style-type: none"> - Increase safe, reliable public transportation, including higher occupancy of existing transit buses and rail vehicles. - Increase programs and incentives to maximize carpooling and vanpooling - Continue to encourage employers to adopt TDM strategies - Continue to encourage employers to adopt TDM strategies 	

Olivares, E. (2010). Taking the Temperature: Transportation Impacts on Greenhouse Gas Emissions in the Atlanta Region. Atlanta Regional Commission.

Urban Parks, Green Spaces & Food Security



Carbon Sequestration by Urban Trees and Green Spaces

Trees absorb carbon dioxide (CO₂) from the atmosphere through photosynthesis and store carbon as biomass. As such, trees in urban areas can become major carbon storage reservoirs through carbon sequestration. Urban trees and green spaces can also influence local climate by reducing the urban heat island effect and consequently reducing the use of electricity from air conditioning units.

The City of Atlanta, also called “The City in a Forest” for its abundance of trees, can benefit from carbon sequestration and reducing its heat island effect by increasing green spaces and tree canopy. Unfortunately, urban trees and forests ecosystem-services are just beginning to be understood and quantified by the scientific community.

As part of the Climate Action Plan, the Mayor’s Office of Sustainability will work with city experts, including the Nature Conservancy, Georgia Tech, and others, to quantify the amount of carbon sequestered or avoided in Atlanta through its tree canopy and green spaces. The results of this study will provide vital information to prioritize efforts related to carbon emissions reductions.

The Urban Heat Island Effect

Urban heat island effect is the increase in air temperature that results in part from the replacement of trees and other vegetation with buildings, roads and other heat-absorbing infrastructure³. This increase in temperature can affect the environment and the quality of life in communities for the following reasons⁴:

- Increases energy consumption by requiring more energy for cooling, adding stress to the electricity grid during peak periods of demand
- Elevates emissions of air pollutants and greenhouse gases emissions because it increases energy demand, which results in greater emissions of air pollutants and greenhouse gas emissions from power plants. Higher air temperatures also promote the formation of ground-level ozone

³ Berkeley Lab. (2015). *Cool Science: Urban Heat Island*. Retrieved 3 31, 2015, from Heat Island Group: <https://heatisland.lbl.gov/coolscience/cool-science-urban-heat-islands>

⁴ EPA. (2013, 8 29). *Basic Information*. Retrieved 3 31, 2015, from Heat Island Effect: <http://www.epa.gov/heatisland/about/index.htm>

- Produces a negative effect on human health and comfort because it warms days and nights and produces higher air pollution levels, which can contribute to general discomfort, respiratory difficulties, exhaustion, non-fatal heat stroke, and heat-related mortality
- Produces a negative effect on water quality because hot pavement and rooftop surfaces transfer their excess heat to stormwater, which then drains into storm sewers, raising water temperatures in other streams as the heated water is released in rivers, ponds, and lakes. Changes in the temperature of water streams can be stressful to aquatic ecosystems.

Physical interventions and policies related to the built environment can help to reduce urban temperatures, especially during periods of extremely hot weather, which are predicted to become more frequent with global climate change⁵. Vegetation, such as tree-canopies and community gardens, and green spaces such as urban parks, are the simplest and most effective ways to reduce the urban heat island effect. Trees and community gardens moderate higher temperatures produced by the heat island effect through shading and evapotranspiration. Urban parks and other green spaces enhance local wind patterns through the park breeze, mitigate local precipitation anomalies amplified by the urban heat island effect, and sequester carbon and other pollutants trapped by

⁵ Vargo, J. (2012, 11 12). Planning for the new urban climate: interactions of local environmental planning and regional extreme heat. Georgia Institute of Technology.

the urban heat island effect that may otherwise alter local and global atmospheric composition⁶.

The primary focus of the City of Atlanta is to reduce the heat island effect by increasing the tree canopy and impervious covers; these measures can produce statistically significant cooling in the area⁷.

Urban Parks and Green Spaces

According to the *2014 Park Score Index* published by *The Trust for Public Land*⁸, the City of Atlanta ranks 42nd among 60 cities in meeting the need for parks. Results of the study indicate that Atlanta is dedicating 5.8% of the city area to parks compared to the national median of 9.3%.

The city has taken significant measures to improve its green spaces. From 2010 to 2013, more than 330 acres of city land have been dedicated to city parks, and projects such as the Atlanta BeltLine and the Beltwood Quarry have been recognized as national examples of green urban development⁹.

Beyond the potential for GHG sequestration, parks and green spaces can reduce energy consumption by mitigating the heat island effect. Additionally, they may provide benefits to individual and communal health, transportation, water resource management¹⁰, and wildlife (by providing suitable habitats).

⁶ American Planning Association. (2015). Making Great Communities Happen. Retrieved 4 1, 2015, from How cities use parks for Climate Change Management: <https://www.planning.org/cityparks/briefingpapers/climatechange.htm>

⁷ Vargo, J. Planning for the Forest and the Trees. In H. Etienne, & B. Faga, Planning Atlanta. Chicago, IL: Planners Press.

⁸ The Trust for Public Land. (2014). *ParkScore Index*. Retrieved 3 23, 2015, from ParkScore Index: parkscore.tpl.org

⁹ Park Pride Org. (2015). Internal Communications.

¹⁰ *Quantifying the Greenhouse Gas Benefits of Urban Parks*. ICF International. San Francisco: The Trust for Public Land.

Tree Canopy

The City of Atlanta is also called “The City in a Forest” for its abundance of trees, and it is classified by the US Forest Service as one of the most forested urban areas in the country. In 2012, the City of Atlanta achieved the highest urban tree cover in the nation with 53.9% of its area covered¹¹. The City of Atlanta Department of Parks, in conjunction with Trees Atlanta and other community organizations, has planted more than 30,000 new native trees. The restoration of urban native botanical diversity enriches the habitat for wildlife and other native species, and has the potential of sequestering GHG emissions.

The City of Atlanta passed a tree protection ordinance in 2001, and in September of 2014 the City’s Arborist division submitted a revision of the original ordinance to the City Council to close loopholes. The City Council is still considering these revisions¹².

Urban Agriculture in Atlanta

Cities can benefit from urban agriculture economically, environmentally and socially. From an economic perspective, urban agriculture increases economic prosperity by creating jobs and developing new local industries; from an environmental perspective, urban agriculture improves the local

environment by removing vacant lots and returning a green landscape to the city’s neighborhoods; from a social perspective, urban agriculture improves the health and safety of residents by providing healthy food and greater access to well-maintained green spaces, and it nurtures a sense of community by building social capital and organizational capacity¹³.

An important consideration in the deployment of urban agriculture is related to the land being considered, which should be tested for soil contamination, particularly lead, and remediated first before planting begins¹³.

There are at least 85 active community and school gardens in the City of Atlanta and at least 10 urban farms. A diverse coalition of stakeholders works to build a more sustainable food system for Atlanta. These stakeholders include community organizations, nonprofits, universities, government agencies, individuals, and corporations. The Georgia Organics Organization holds bi-monthly meetings with approximately 30 to 40 stakeholders attending each meeting to build local food production and supply through comprehensive grower education and outreach programs. Georgia Organics also catalyzes demand on the consumer and business end by fostering market opportunities for local food.

Atlanta Food Deserts

Food deserts are parts of communities where residents have low access to healthy and affordable foods due to distance from supermarkets and grocery

Olivares, E. (2010)

¹¹ US Forest Service. (2012, February 23). *Nation's Urban Forest Losing Ground*. Retrieved March 23, 2015, from <http://www.nrs.fs.fed.us/news/release/urban-forests-lose-ground>

¹²[http://www.sandatlanta.org/Files/SAND/2014/AtlantaTreeOrdinanceRevisionsTableSummary\(shortversion\).pdf](http://www.sandatlanta.org/Files/SAND/2014/AtlantaTreeOrdinanceRevisionsTableSummary(shortversion).pdf)

¹³ Mogk, J. (2010). Promoting Urban Agriculture As An Alternative Land Use For Vacant Properties In The City Of Detroit: Benefits, Problems And Proposals For A Regulatory Framework For Successful Land Use Integration. Wayne State University Law School.

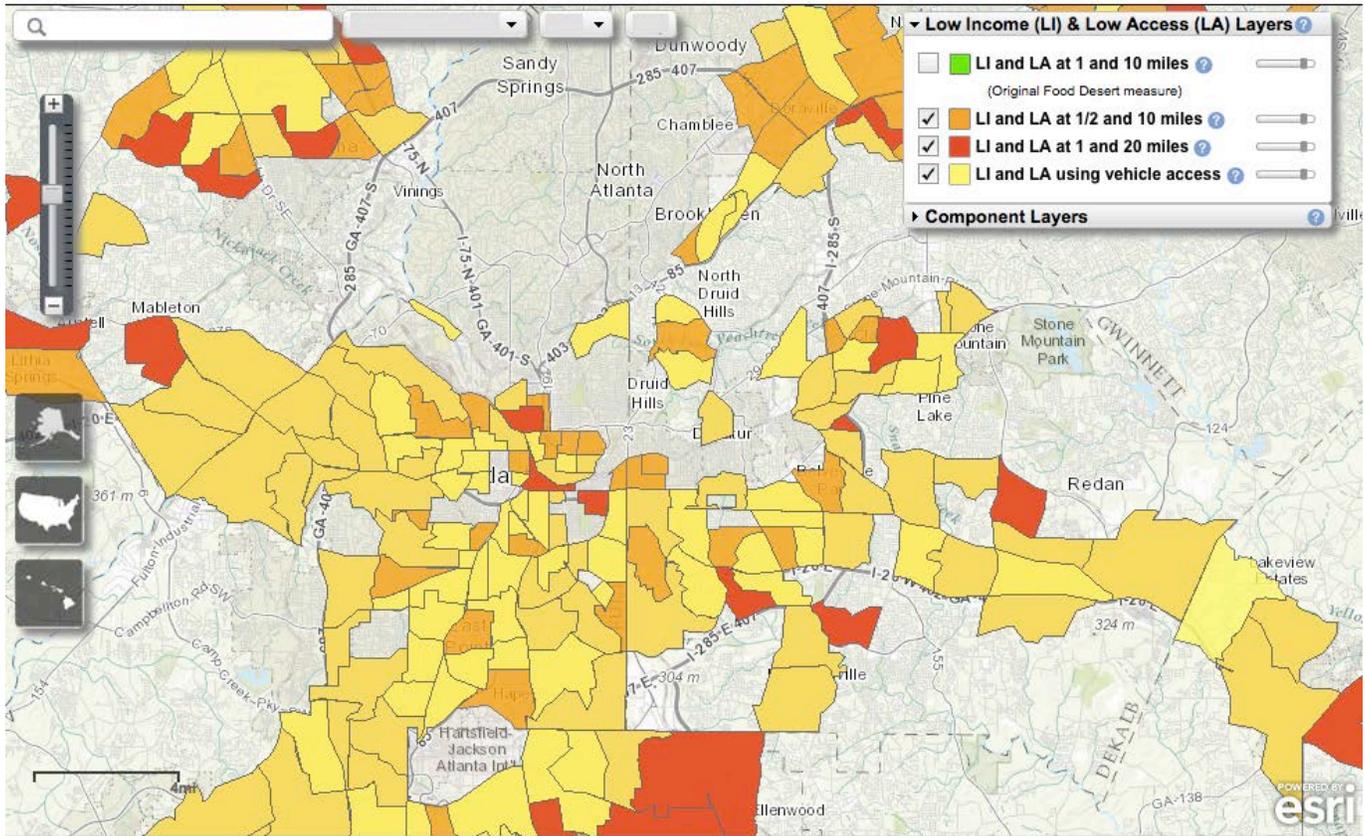
stores and low-income. According to the US Centers for Disease Control and Prevention, “limited access to nutritious food and easier access to less nutritious food may be linked to poor diets and, ultimately, to obesity and diet-related diseases.”

Using the Food Desert Locator, created as part of national campaign “Let’s Move”, Georgia Tech¹⁴ calculated 7,778 Atlanta residents living in a food desert (see diagram below) and 4,036 children and 705 seniors having difficulty obtaining healthy Food.

Food deserts can exacerbate GHG emissions because people living in these areas are required to travel long distances to obtain healthy and affordable food.

¹⁴ <http://arkfab.gatech.edu/content/atlanta%E2%80%99s-food-deserts>

Food Access Research Atlas



Last updated: Wednesday, March 11, 2015

Website- USDA-ERS Food Desert Locator: <http://www.ers.usda.gov/data-products/food-access-research-atlas/go-to-the-atlas.aspx>

Objectives	Reduction Potential
<p>Reduce emissions by increasing park land, green spaces, and tree canopy, and assuring local food security</p>	

Strategies	Activities	Supports Adaptation	Community/Government	Reduction Potential
GS1- Maintain and Increase park land to 7% by 2020 and 10% by 2025; increase accessibility to parks (within a half mile) to 40% of the population by 2020 and 45% by 2025	Work with the City Department of Parks and Recreation and Planning and Community Development to Increase city park land and green spaces	Y	Both	
GS2- Maintain/Increase Urban Canopy	Tree Protection Ordinance	Y	Both	
GS3- Increase Urban Agriculture/Vertical Farming practices	Urban Agr. Ordinance	Y	Both	
GS4 - Reduce Food Deserts	Mobile Markets	Y	Both	
GS5- Trees Carbon Sequestration- Quantification	Coordinate a study to quantify the amount of carbon sequestered or avoided in Atlanta through its tree canopy and green spaces	Y	Both	

GS 1– Maintain and Increase park land to 7% by 2020 and 10% by 2025; accessibility to parks (half mile) to 40% of the population by 2020 and 45% by 2025	
Work with the City Department of Parks and Recreation and Planning and Community Development to Increase city park land and green spaces	

GS 1-A	Power to Change – Land Use	Status
Develop land use policies and programs designed to protect green spaces and bring brownfields back to productive and enhance community livability.		

GS 2– Maintain/Increase Urban Canopy	
Maintain and increase the canopy of the City of Atlanta	

GS 2-A	Tree Protection Ordinance	Status
Work with the City’s Community Development/Human Resources committees to ensure that the city development is in accordance with the Tree Protection Ordinance to ensure that there is not net loss of tree canopy within the city limits		

GS 2-B	Work with Nonprofits / Education	Status
Work with nonprofit organizations (e.g., Trees Atlanta) and with educational institutions to promote and support the planning of new trees.		
GS 3– Increase Urban Agriculture/Vertical Farming Practices		
Work with stakeholders - including community organizations, nonprofits, universities, government agencies, individuals, and corporations - to promote urban agriculture practices and vertical farming		
GS 3-A	Power to Change – Community Health & Vitality	Status
Establish at least 40 new edible gardens by 2015 and increase this number by 20% each year after		
GS 3-B	Vertical Farming Events	Status
Program workshops in which the academic and business sectors collaborate to address Atlanta’s food security concerns using vertical farming alternatives		
GS 4– Reduce Food Deserts		
Develop projects to address the problem of Atlanta’s food deserts.		
GS 4-A	Power to Change: Mobile Markets	Status
Work with the public and private sectors to bring local healthy food within a ½ mile of 75% of all residents by 2020: http://news.medill.northwestern.edu/chicago/news.aspx?id=214221		
GS 5– Quantification Trees Carbon Sequestration		
Coordinate a study with city experts - including the Nature Conservancy, Georgia Tech, and others - to quantify the amount of carbon sequestered or avoided in Atlanta through its tree canopy and green spaces.		

Next Steps

While some of the actions within the City of Atlanta Climate Action Plan are well underway, over the coming months, the City of Atlanta will engage with community members, businesses, institutions, and other stakeholders through a Climate Action Planning Task Force to prepare for any prerequisites or additional actions needed to begin Plan implementation.

These prerequisite actions include:

- Creating citizen advisory groups for programs that require considerable community engagement.
- Gathering bids for contracted services and equipment.
- Making necessary changes to local policies or existing programs.

Immediate Steps

- Present CoA-CAP to City Council for adoption
- Develop a program for the implementation of strategies
- Hold stakeholder engagement meetings and provide CoA-CAP updates (e.g., Sustainable Atlanta Round Table – SART, presentations at local Universities, etc.)

Methodology

The framework selected for this Climate Action Plan (CAP) was based on the Statewide Energy Efficiency Collaborative (SEEC) template¹⁵. SEEC is an alliance to help cities reduce greenhouse gas emissions and save energy. SEEC is a collaboration effort among three nonprofit organizations and California's four Investor-Owned Utilities.

Atlanta follows ICLEI's Five Milestones for Climate Mitigation. This CAP document meets milestone three: Develop a local climate action plan.

For calculation of City of Atlanta's greenhouse gas emissions see *City of Atlanta Greenhouse Gas Emissions Inventory 2013* at:

<http://p2catl.com/publications/2013-greenhouse-gase-ghg-inventory/>

Projections for the City of Atlanta GHG Emissions were estimated using SEEC projections adjusted by emissions factors provided by the Forecasting Sustainable Energy and Environment (ForeSEE)¹⁶ tool. This tool is a spreadsheet cost-benefit model developed to inform policy dialogues regarding distributed energy policy options.

City of Atlanta GHG reduction targets were selected to be consistent with suggested national and international agencies, or proposed in federal legislation. Most local governments have a priority target of 15-25% below 2005

levels by 2020. Targets proposed via federal legislation have sought reductions of 17-20% below 2005 levels by 2020. Almost all sources recommend a reduction of 80% by 2050.

Estimated reductions for commercial and industrial buildings, and energy production, were calculated using ForeSEE.

Reductions for the residential sector were estimated using Georgia Tech's version of the National Energy Modeling System (GT-NEMS)¹⁷.

Waste and recycling reductions were estimated using projections of existing waste emissions and desired targets by 2020.

Water and wastewater reductions were estimated using existing consumption trends and projections in the "*Water Supply and Water Conservation Management Plan – 2009*" by the Metropolitan North Georgia Water Planning District.

Transportation reduction strategies followed guidelines by the Federal Highway Administration¹⁸. Reductions in VMT emissions were calculated using Atlanta Regional Commission (ARC) historical data and 2020 projections. Food security reductions were estimates using data from Georgia Organics¹⁹.

¹⁵ <http://californiaseec.org/>

¹⁶ Cox, W. (2014). Sustaining the City- Understanding the Role of Energy and Carbon Dioxide Emissions in Sustainable Development in Major Metropolitan Areas. Georgia Tech.

¹⁷ Brown, M., & Wang, Y. (2013). Estimating the Energy-Efficiency Potential in the Eastern Interconnection. Oak Ridge National Laboratory.

¹⁸ U.S. Department of Transportation. (1998). Transportation and Global Climate Change: A Review and Analysis of the Literature.

¹⁹ www.georgiaorganics.org

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