Central Midlands Priority Climate Action Plan

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CLIMATE POLLUTION REDUCTION GRANTS
U.S. Environmental Protection Agency

CENTRAL MIDLANDS Council of Governments

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Acronyms and Abbreviations

Acronym or Abbreviation	Definition
AFOLU	Agriculture, Forestry, and Other Land Use
CO_2 / CO_2e	Carbon dioxide / Carbon dioxide equivalent (a metric used to report the combined impact of different greenhouse gases)
COG / CMCOG	Central Midlands Council of Governments
CPRG	Climate Pollution Reduction Grant Program
EE	energy efficiency
EPA	United States Environmental Protection Agency
EV	Electric Vehicle
GPC	Global Protocol for Community-Scale Greenhouse Gas Inventories
ICLEI	International Council for Local Environmental Initiatives
IPCC	Intergovernmental Panel on Climate Change
IRA	Inflation Reduction Act
GHG / GHGs	Greenhouse Gas(es)
GWP / GWPs	Global Warming Potential(s)
LIDAC(s)	Low-income and/or disadvantaged community (communities)
LCZ	Local climate zone (a type of land-use / land-cover classification scheme)
Midlands / Central Midlands	The seven counties underneath the Columbia-Newberry Combined Statistical Area: Richland, Lexington, Kershaw, Newberry, Fairfield, Saluda, and Calhoun counties
MSW	municipal solid waste
MT / MMT	metric tons / millions of metric tons (unit of mass)
NREL	National Renewable Energy Lab
USCP	U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions

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The Central Midlands Council of Governments is the recipient of EPA funding under the Climate Pollution Reduction Grant Program (CPRG) to conduct climate planning activities. The CMCOG has partnered with local jurisdictions to produce this priority climate action plan to support investment in policies, programs, and projects that reduce pollution (including greenhouse gas (GHG) emissions and other pollutants), create high-quality jobs, spur economic growth, and enhance the quality of life for all who reside here.

The measures contained herein should be construed as broadly available to any entity in the state of South Carolina eligible for receiving funding under the EPA's Climate Pollution Reduction Implementation Grants and other funding streams, as applicable.

Introduction

Central Midlands Geography

Under this Climate Pollution Reduction Grant (CPRG) program, analyses and planning will occur for the Columbia Metropolitan Statistical Area and the Newberry Micropolitan Statistical Area. This geography covers the seven counties of Richland, Lexington, Kershaw, Newberry, Fairfield, Saluda, and Calhoun (see Figure 1). This area will be referred to as the Central Midlands, or more simply, the Midlands.

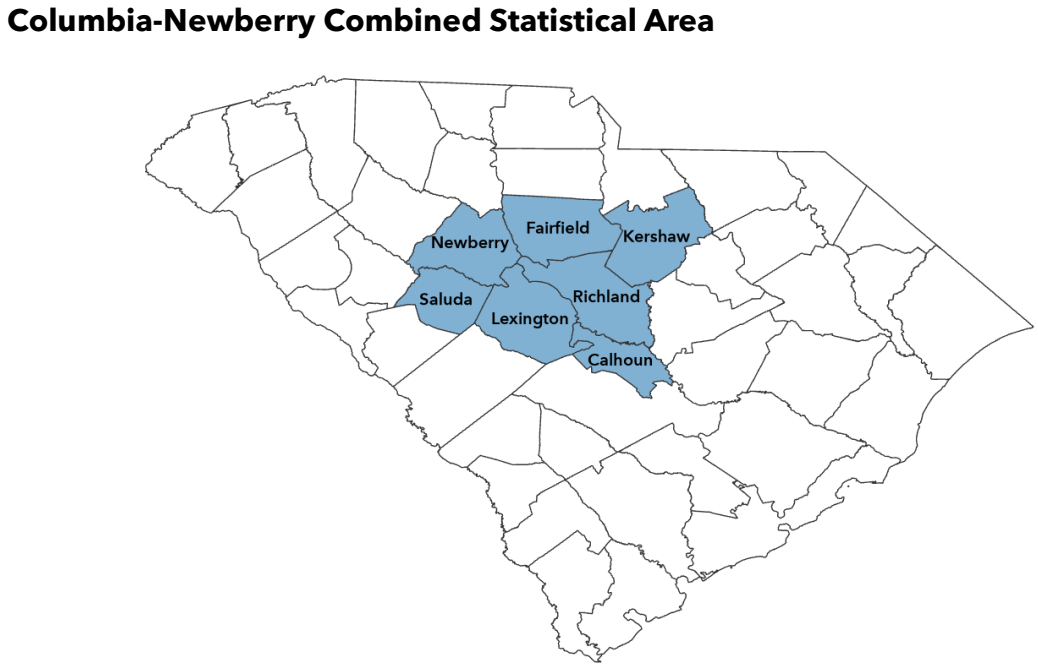


Figure 1: The seven counties of the planning geography under the CPRG program.

As of 2022 there are 869,831 people living in the Midlands according to the Census Bureau (16.9% of the state's population), representing 343,776 households with a median household income of $57,184 (see Appendix A).[1] In 2022 the combined Gross Domestic Product of the Midlands was $55.8 billion according to the U.S. Bureau of Economic Analysis (see Appendix A).[2] The Midlands is growing both economically and in number of residents; in the last decade the population grew by 7.7% (see Appendix A). Additional socio-economic details are shown below in Table 1.

County	Minority Population (%)	Education: at least a high school diploma (%)	Education: at least a bachelor's degree (%)	Unemployment Rate (%)	Population Below the Poverty Line (%)
Richland	57.6	92.2	40.2	6.8	16.8

[1] https://data.census.gov
[2] https://www.bea.gov/data/gdp/gdp-county-metro-and-other-areas

Lexington	25.0	91.3	32.6	4.4	11.6
Kershaw	31.3	88.9	21.3	4.7	14.4
Newberry	38.3	85.5	22.5	3.9	15.5
Fairfield	61.4	84.1	14.7	6.9	18.7
Saluda	39.1	83.2	19.2	3.3	17.9
Calhoun	44.2	86.5	19.1	7.3	18.7

Table 1: Selected socio-economic characteristics, by county. All data represent the year 2022 from the American Community Survey 5-year estimates.

Columbia is the largest of many municipalities within this area. According to the land-use classifications of local climate zones used in the National Climate Assessment, most urban areas in the Midlands are characterized as open low-rise, while the downtown core of Columbia is compact mid-rise in limited areas (see Figure 2). The Midlands also has a reasonably large amount of open land and rural areas outside of its municipalities.

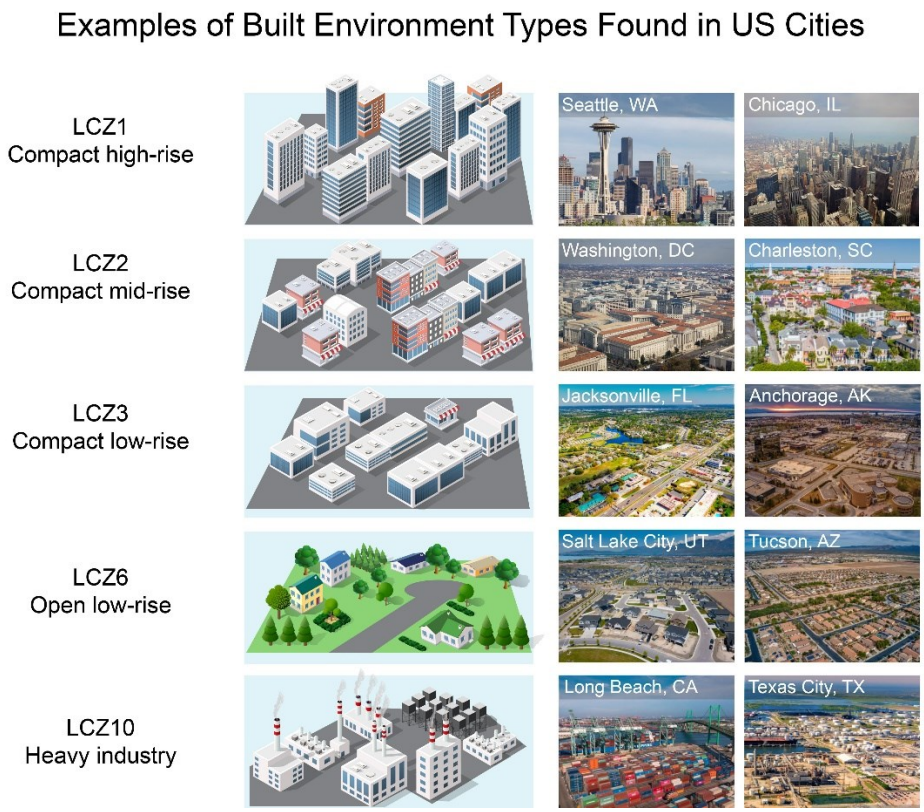


Figure 2: Illustrative land-use classifications of local climate zones (LCZs). Urban areas of the Midlands are most commonly LCZ6, with some exceptions including downtowns of certain Midlands municipalities. Figure copied from the National Climate Assessment, Chapter 12.[3]

Climate Change in the Midlands

Climate change is a growing focus in the Midlands for several key reasons.

1. Climate Impacts

While temperatures in South Carolina have risen more than 1 degree Fahrenheit since the beginning of the 20th century,[4] climate change is often felt in terms of extremes or damaging events.[5] According to the National Centers for Environmental Information, there have been over 50 "billion-dollar events" affecting South Carolina just since 2010 (most of which impacted Midlands communities to some degree).[6] South Carolina's strategic statewide resilience and risk reduction plan suggests that flooding (from both extreme precipitation and tropical storm systems) and heatwaves are two key climate impacts that will increasingly affect the Midlands as climate change continues.[7] One recent example of these impacts in the Midlands is the major flood event in October 2015, where some areas in the region

[3] https://nca2023.globalchange.gov/chapter/12#fig-12-3
[4] https://statesummaries.ncics.org/chapter/sc/
[5] https://nca2023.globalchange.gov/chapter/22/
[6] https://www.ncei.noaa.gov/access/billions/
[7] https://scor.sc.gov/resilience

exceeded 20 inches of rainfall in one week.[8] Climate impacts like flooding are predicted to worsen in severity and in impacts on communities (see Figure 3).[9] Local efforts like EJ Strong have highlighted flooding as a significant hazard posing risks to Lower Richland, and there is pre-existing vulnerable areas across the seven county planning area for climate impacts like flooding.

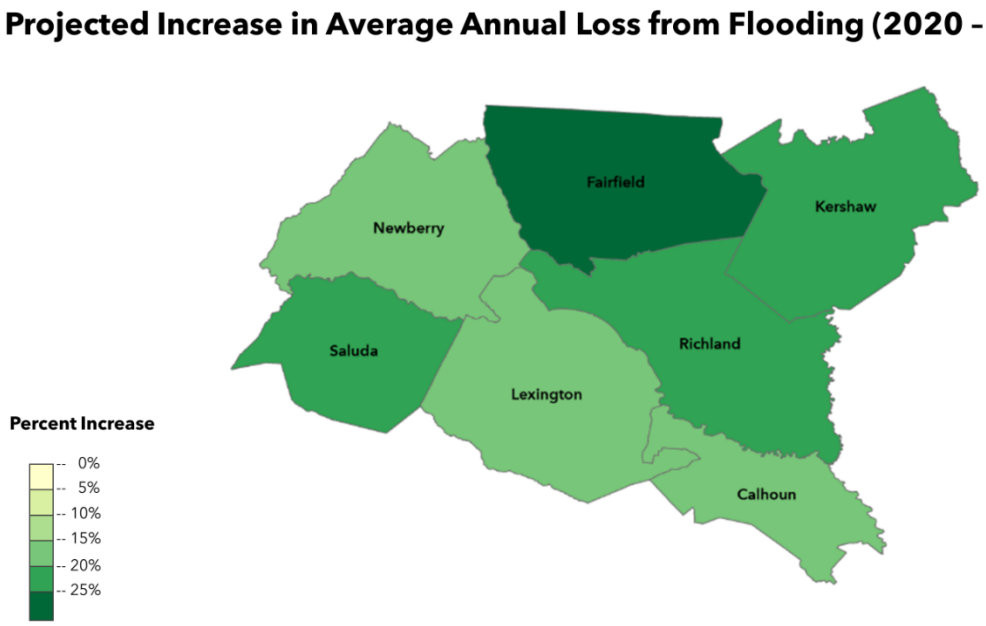


Figure 3: This map shows increasing average annual losses from flood events between 2020 and 2050 because of climate change. The combined increase in losses exceeds $2 million a year. Source: Wing et al. (2022).[10]

2. Economic Security

Severe weather events and other environmental impacts carry economic costs which affect the Midlands. Gradual changes like increasing temperatures also have an impact on residents. For example, over the past 50 years the number of cooling degree days has increased by about 90 per decade,[11] which directly increases residents' utility bills. This results in higher energy burdens which are disproportionately felt by lower income residents. In combination, gradual changes and extreme events associated with climate change combine to harm the economy and livelihoods of residents in the Midlands (see Figure 4). This economic trend is highlighted prominently in the most recent National Climate Assessment's review of the Southeast region of the country.[12] On the other hand, measures that reduce climate change are spawning new or accelerating existing businesses in South Carolina, especially in manufacturing of electric vehicles and chargers, renewable energy, energy efficient

[8] https://scor.sc.gov/resilience
[9] https://nca2023.globalchange.gov/chapter/22/
[10] https://www.nature.com/articles/s41558-021-01265-6
[11] https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/county/time-series/SC-079/cdd/12/1/1970-2023?trend=true&trend_base=10&begtrendyear=1973&endtrendyear=2023
[12] https://nca2023.globalchange.gov/chapter/22/

appliances, and others. According to one analysis, South Carolina has received the 2nd most large-scale manufacturing investment in these sectors under the Inflation Reduction Act.[13] The Midlands is also home to portions of this manufacturing investment, including the recently announced $2 billion electric vehicle plant from Scout Motors in Blythewood, SC.[14] This highlights that responding to climate change will form an increasingly important part of the Midlands economy in coming decades while climate impacts simultaneously increase costs and damages.

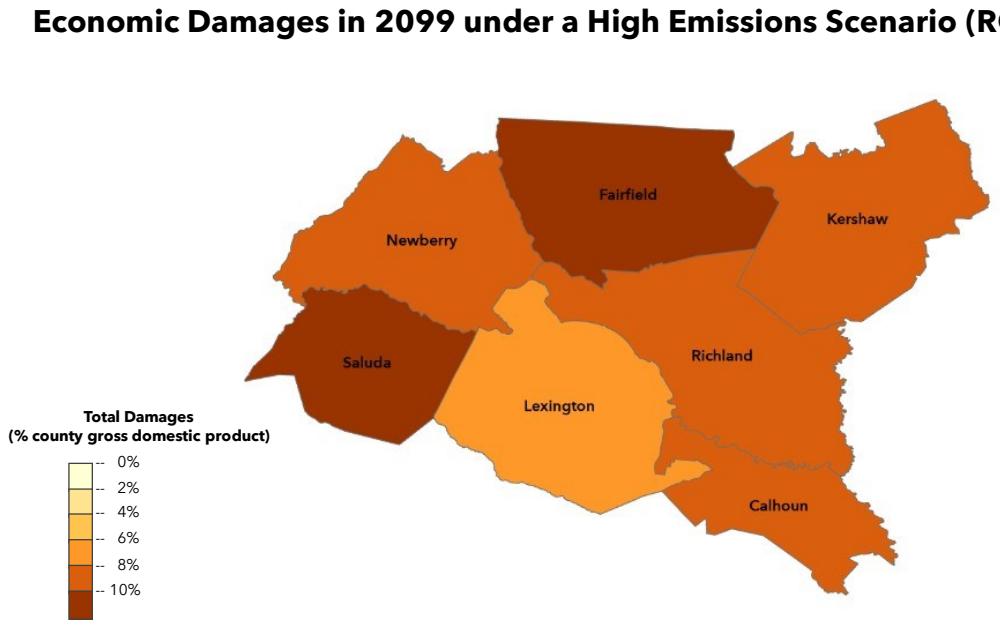


Figure 4: This map shows total economic damages resulting from unmitigated climate change in a high emissions scenario (RCP 8.5) by the end of the century. Economic damages are multi-sector and are expressed as a percentage of a county's total gross domestic product. Source: Hsiang et al. (2017).[15]

3. Community Climate Planning Actions

Climate change is increasingly becoming a priority across the Midlands, especially when it intersects with other community concerns such as economic development, rising energy burdens, or urban heat islands. The Climate Protection Action Committee, a citizen's advisory board, was organized by the City of Columbia in 2006 shortly after the city signed the U.S. Conference of Mayors Climate Protection Agreement and created a climate action plan.[16] Columbia has completed two prior greenhouse gas inventories focused on government operations, in 2007 and 2019 (discussed in a later section) and an urban heat island study in 2022.[17] First passed in 2017 and updated in 2023, the city created a Ready for

[13] https://www.ft.com/content/3b19c51d-462b-43fa-9e0e-3445640aabb5
[14] https://www.thestate.com/news/local/article272697530.html
[15] https://www.science.org/doi/full/10.1126/science.aal4369
[16] https://cpac.columbiasc.gov/about-cpac/
[17] https://columbiasc.gov/midlands-heat-island-mapping-report-released/

100 Resolution committing to energy efficiency and renewable energy goals by 2036[18] and joined the Smart Surfaces Coalition to address urban heat islands and flood control via infrastructure.[19] The EJ Strong Initiative is working in these areas and others to advance disaster preparedness and resilience in the Lower Richland Community and on a regional scale.[20]

Across the Midlands, counties and municipalities are beginning to incorporate climate and resilience planning into local comprehensive plans and hazard mitigation plans. The SC Disaster Relief and Resilience Act of 2020 mandates the creation of a distinct resiliency component within the comprehensive plan, focusing on addressing the impacts of flooding, high water, and natural hazards on various aspects including individuals, communities, infrastructure, and public health. This element must emphasize resilient planning and development, collaboration with neighboring jurisdictions and agencies, and integration with other plan components to ensure comprehensive and coordinated strategies.

Planning Process

Origin and Description of this Priority Climate Action Plan

The EPA's Climate Pollution Reduction Grant (CPRG) Program was funded under the Inflation Reduction Act to support climate planning and implementation. 46 states and multiple metropolitan statistical areas across the country received CPRG funding (see Figure 5). The Central Midlands Council of Governments (CMCOG) chose to participate in the CPRG program to better understand environmental pollution and change in our community and identify ways to respond and improve our social and economic future. Multiple government and community partners came together to express their support for the CMCOG's application for CPRG funding and form an ongoing partnership in its implementation.

[18] https://citycouncil.columbiasc.gov/download/resolution-no-r-2023-053/
[19] https://columbiasc.gov/as-heat-shatters-records-five-mayors-join-with-smart-surfaces-coalition-to-announce-major-new-infrastructure-initiative-to-cool-cities-and-advance-environmental-justice/
[20] https://scdhec.gov/environment/environmental-justice-ej/ej-strong

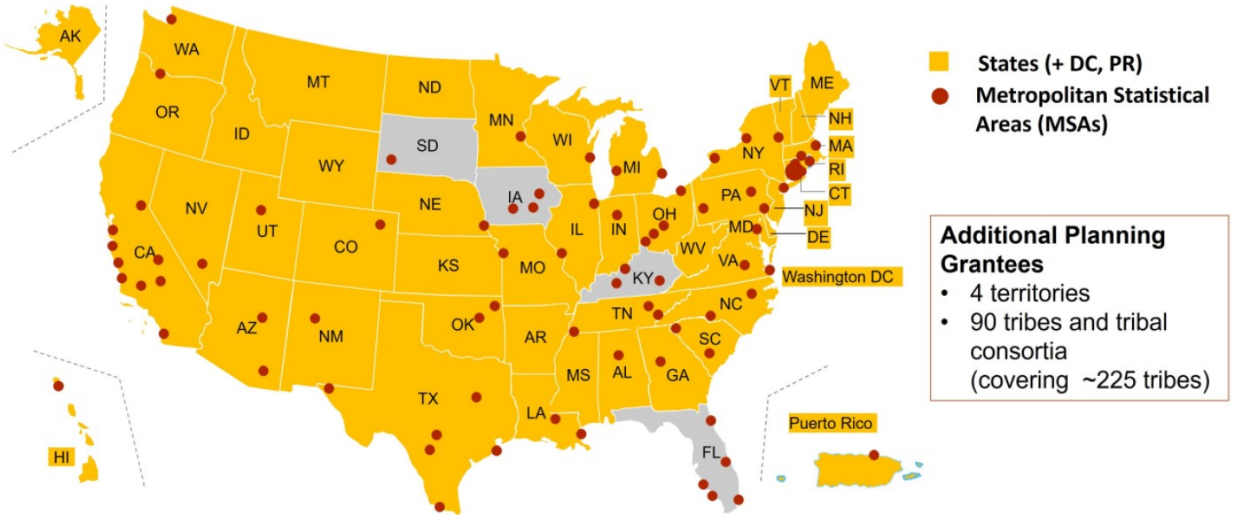


Figure 5: A map of CPRG participating government units. Source: EPA.[21]

The CMCOG's CPRG program is a three-year planning process (see Figure 6) that aims to better understand and respond to climate change in the Midlands. This priority climate action plan is the first deliverable to the EPA under the CPRG planning process and was created in less than 60 working days. This plan can be considered a preliminary draft of the comprehensive climate action plan. The comprehensive climate action plan in 2025 will build and greatly expand on the groundwork contained in this priority climate action plan. The status report in 2027 will evaluate both plans and look forward to future climate planning needs and challenges.

Figure 6: CPRG planning documents expected over the program duration at the CMCOG.

The core purpose of each document in the planning exercise is to:

1) Understand sources of greenhouse gas (GHG) emissions in the Midlands Area. Greenhouse gases are pollutants which result in climate change.
2) Map out a series of potential measures that reduce greenhouse gases and other pollutants, encompassing a variety of policies, programs, and projects within key economic sectors.
3) Analyze the community benefits that could be reasonably expected if these measures are implemented.

[21] https://www.epa.gov/inflation-reduction-act/about-cprg-planning-grant-information

There are multiple planning processes that are also relevant for a community responding to climate change that are not considered here. For example, communities may wish to know which climate impacts are most likely to affect them and potential options to increase their ability to prepare for, respond to, and recover from these impacts. These are important considerations included in other plans like comprehensive plans, emergency management plans, or adaptation and resilience plans. Communities can consult the National Climate Assessment[22] or the South Carolina Strategic Statewide Resilience and Risk Reduction Plan[23] for more information about these topics.

Stakeholder Coordination & Engagement

The CMCOG is taking a nested approach to governance of its implementation of the CPRG program (see Figure 7). The CMCOG program includes staff, interns, and possible future consultants currently working to implement it. The first layer of input comes from an Advisory Committee (see Acknowledgements for a list of current members). While currently under development, this committee played an important role in reviewing and editing this priority climate action plan. The second layer of input comes from the Intergovernmental Stakeholder Committee, comprised of partnering governments. This intergovernmental group initially applied to the EPA to receive CPRG funding and currently plays a role in reviewing work outputs, advising on decision making, and counseling CMCOG staff.

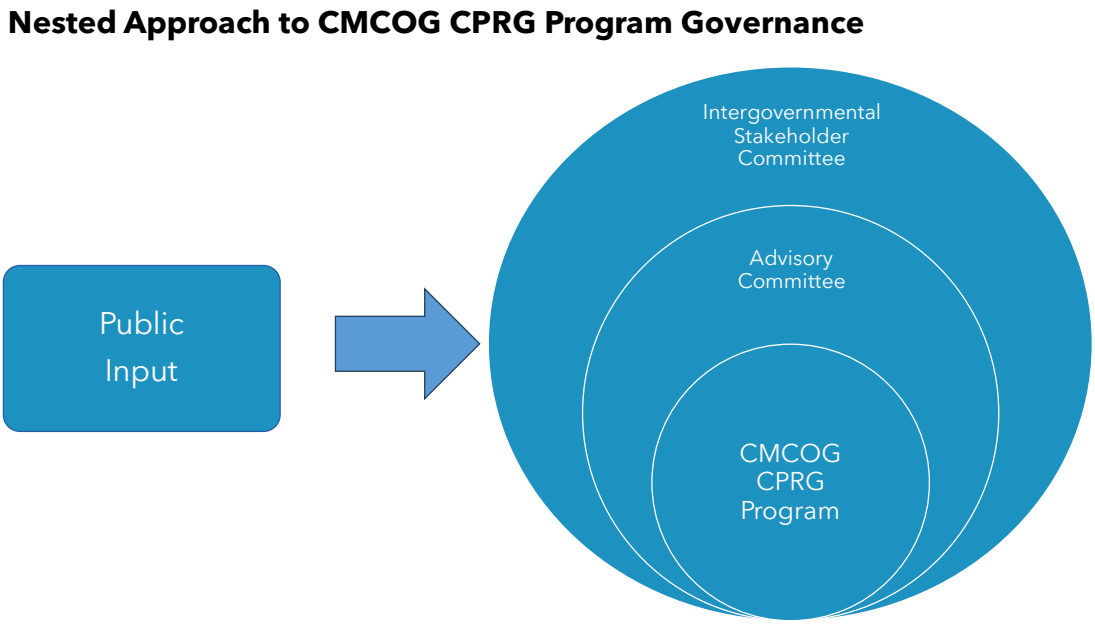


Figure 7: A diagram illustrating governance for this planning process.

A community engagement plan is currently under development for this planning process. The CMCOG's initial strategy for community engagement was to establish strong links among collaborating

[22] https://nca2023.globalchange.gov/chapter/22/
[23] https://scor.sc.gov/resilience

governments and to seek out community needs and priorities through existing networks and organizations. The CMCOG intends to collaborate with a consultant with expertise in community engagement as part of the comprehensive climate action plan process, and to facilitate a greater number of community meetings. The CMCOG is also working on developing ways for community members to provide input remotely and asynchronously via a website to host information and contact information about the comprehensive climate action plan. A list of meetings occurring under this priority climate action plan is available below (see Table 2 and Table 3).

Group	Number of Meetings	Type	LIDAC	Description
Central Midlands COG Board	1	Governing	Partial: some members represent LIDACs	The CMCOG board is composed of elected and appointed officials from across the Midlands.
CPRG Intergovernmental Stakeholder Committee	5	Governing	Partial: some members represent LIDACs	This committee assists in governing CMCOG's CPRG program (see Figure 7).
CPRG Government Coordination Meetings	10	Interagency	Partial: some members represent LIDACs	The CMCOG met with local governments to receive ideas for measures, including South Carolina CPRG Programs (State, Greenville-Spartanburg MSA, Charlotte MSA), Fairfield County, Richland County, Town of Winnsboro, City of Columbia, Newberry County, City of Newberry, Town of Batesburg-Leesville, Kershaw County, Saluda County, Town of Eastover.
CMCOG Environmental Planning Advisory Committee	1	Interagency	Partial: some members represent LIDACs	This committee advises the CMCOG in environmental planning and fosters collaboration in other areas. It is formed of governments, elected officials, and community organizations.
Congaree Biosphere Region Advisory Council	1	Community	Partial: some members	This council is hosted by CMCOG and collaborates in planning surrounding

			represent LIDACs	the Congaree Biosphere Region within the Midlands. It is formed of governments, community organizations, academics, and citizens.
Climate Protection Action Committee	4	Public Meeting	Partial: the City of Columbia includes LIDACs	This citizen's board advises the City of Columbia and constructs climate solutions at the local level. It is made up of representatives who are residents of the city, and all residents are invited to its public meetings.
City of Columbia Health, Social, and Environmental Affairs Committee	1	Interagency	Partial: some members represent LIDACs	City council committee comprised of elected officials, advising on planning priorities.
Calhoun County CDBG Needs Assessment	1	Public Meeting	Yes	Shared about the Climate Action Plan during a Community Development Block Grant Needs Assessment in St. Matthews

Table 2: Stakeholder meetings occurring related to this Priority Climate Action Plan. Engagements contributed to the planning process in a variety of ways, including providing data or measure ideas, establishing strategic and community priorities, reviewing portions of the plan, etc. The table also denotes whether engagement covers low-income and/or disadvantaged communities.

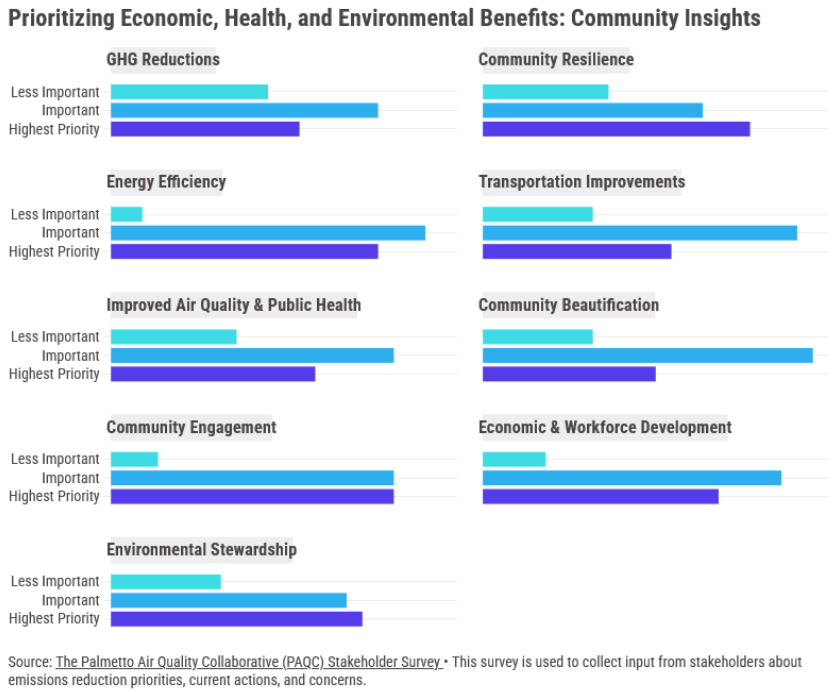
Group	Interactions	Type	LIDAC	Description
South Carolina Office of Resilience	Various	Government	Partial: SCOR partially represents LIDACs	Coordination on CPRG program implementation.
South Carolina Energy Office	Various	Government	Partial: the Energy Office partially represents LIDACs	Coordination on CPRG program implementation.
Appalachian Council of Governments	Various	Government	Partial: ACOG partially represents LIDACs	Coordination on CPRG program implementation.
Catawba Council of Governments	Various	Government	Partial: Catawba COG partially	Coordination on CPRG program implementation.

			represents LIDACs	
Dominion Energy South Carolina	2	Firm	No	Discussion on utility energy efficiency programs, renewable energy, and coordination.
Burnham	1	Firm	No	Discussion of wastewater treatment biogas utilization and waste to energy in Columbia Metro contexts.
Smart Surfaces Coalition	1	Non-profit	No	The City of Columbia is currently participating in the Smart Surfaces Coalition's Cities for Smart Surfaces Initiative alongside 9 other cities nationwide. Discussion of measures and other CPRG ideas.
Perpetual	1	Non-profit	No	Discussion of re-use and circular economy applicability to GHG reductions in city economies.
Congaree Land Trust	1	Community-based organization	Partial: engages with LIDACs on environmental topics	Discussion of intersections between land use and carbon storage in the Midlands.
Conservation Voters of South Carolina	1	Community-based organization	Partial: engages with LIDACs on environmental topics	Discussion of needs identified organizationally and via prior public interactions, including energy burden, energy efficiency, distributed and community-based solar, and electric vehicles.
Word of God Church / SC Interfaith Power & Light	1	Community-based organization	Yes: based in and represents LIDACs	Discussion of renewable energy and environmental justice in Lower Richland communities.
Sierra Club, Midlands Chapter	1	Community-based organization	Partial: engages with LIDACs on environmental topics	Discussion of energy efficiency needs across the Midlands, particularly in LIDAC and rental communities.

Midlands Local Food Collaborative	1	Community-based organization	Partial: engages with LIDACs on environmental topics	Discussion of incorporating climate into local food and commodities policies.
Citizens Climate Lobby, SC Chapter	1	Community-based organization	Partial: engages with LIDACs on environmental topics	Discussion of public engagement strategies and opportunities, emissions reductions in electrification, transport, and waste.

Table 3: Firms, community-based organizations, and other groups interviewed or engaged for this Priority Climate Action Plan. Engagements contributed to the planning process in a variety of ways, including providing data or measure ideas, establishing strategic and community priorities, reviewing portions of the plan, etc. The table also denotes whether engagement covers low-income and/or disadvantaged communities.

The CMCOG partnered with the South Carolina state-level CPRG program on a joint public survey to obtain feedback on measure ideas and community priorities. In addition to state agencies, CMCOG, and the City of Columbia, community organizations partnered in distributing this survey including the Environmental Justice Thriving Communities Technical Assistance Center, Southeast Sustainability Directors Network, SC Electric Transportation Network, Conservation Voters of South Carolina, Energy Justice Coalition, Southern Alliance for Clean Energy, Environmental Educators Association of SC, and Sustain SC. As of January 3rd, 39 Midlands responses from across Richland, Lexington, Newberry, and Calhoun counties were recorded (see Figure 8). Public comment concerns were incorporated into measure selection and/or prioritization.



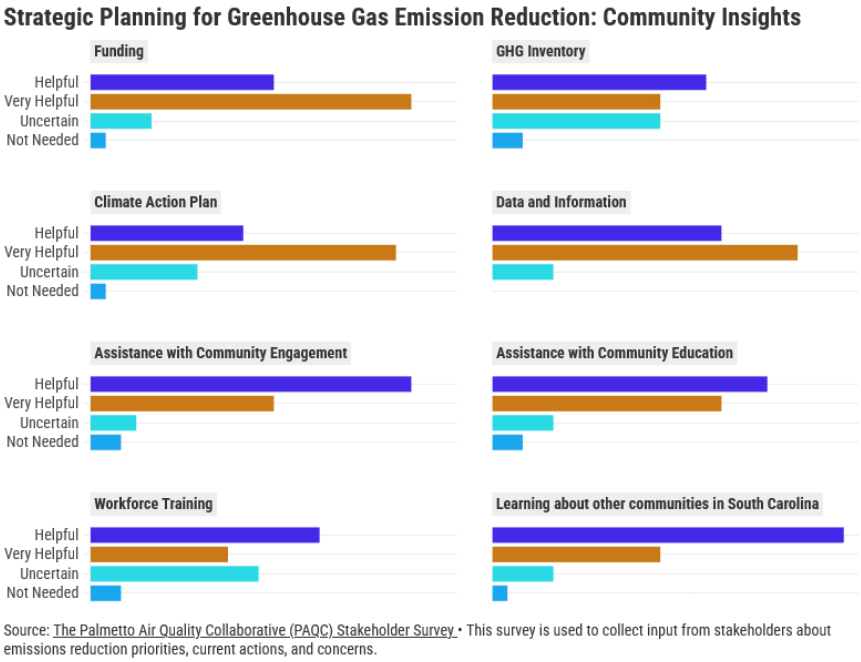


Figure 8: Top: Survey responses to the question "How does your community or organization prioritize the following economic, health, and environmental benefits?". Bottom: Survey responses to the question "What would help your community or organization plan and implement actions and strategies to reduce greenhouse gas emissions?".

The public was asked both about their priorities and what would be most helpful to them when it comes to reducing greenhouse gas emissions. A key prioritization survey question highlight is that over 81% of respondents consider economic health and environmental benefits to be of highest priority or important in at least one case. Community engagement is a primary concern among respondents, followed by community resilience and energy efficiency. In contrast, greenhouse gas reductions are deemed less critical, with community resilience and air quality following suit in terms of importance. When asked what would be most helpful to communities, it is evident that funding is deemed the most crucial factor, closely followed by the presence of a comprehensive climate action plan and access to relevant data and information. At the same time, all these presented issues are deemed helpful. Only a handful of respondents expressed that GHG inventory, assistance with community engagement, assistance with community education, and workforce training are unnecessary.

LIDAC Community Engagement

This priority action plan began to implement community engagement among low-income and/or disadvantaged communities (LIDAC) communities across the Midlands. This engagement is critical to the success of any planning effort because most Midlands' communities face one or more burdens that classify them as disadvantaged (see Figure 9). Local community-based organizations and governments that partially or fully represent LIDACs in the Midlands were engaged during the development of this plan alongside a limited number of public meetings (see Table 2 and Table 3). Community needs and priorities emerging from these discussions were used to select and evaluate the measures included in this plan. While the initial strategy for the priority climate action plan focused on ascertaining community priorities by engaging with local leaders and organizations, the comprehensive climate

action plan will include a greater number of public meetings and other types of engagement to facilitate further interactions with LIDACs. As a community engagement plan is developed for the comprehensive climate action plan, the CMCOG will aim to ensure that all communities are able to provide feedback and actively build their priorities into the planning process.

Low Income and/or Disadvantaged Communities (LIDAC) Benefits Analysis

LIDAC Geography

Low-income and/or disadvantaged communities (LIDACs) are an integral part of the Midlands economy and social fabric. LIDAC areas, sometimes also referred to as environmental justice communities, are defined by the EPA as either census tracts included in the Council on Environmental Quality's Climate and Economic Justice Screening Tool[24] or as census block groups meeting 90th percentile or above on any of the EPA's EJSCREEN supplemental indexes.[25] LIDACs represent 72.1% of the Midlands by area and 45.8% of people residing here (see Figure 9, Appendix A). LIDACs in the Midlands are not concentrated in a particular area but rather are geographically dispersed across all seven counties in the planning region. A full list of LIDAC census block groups is listed in Appendix B.

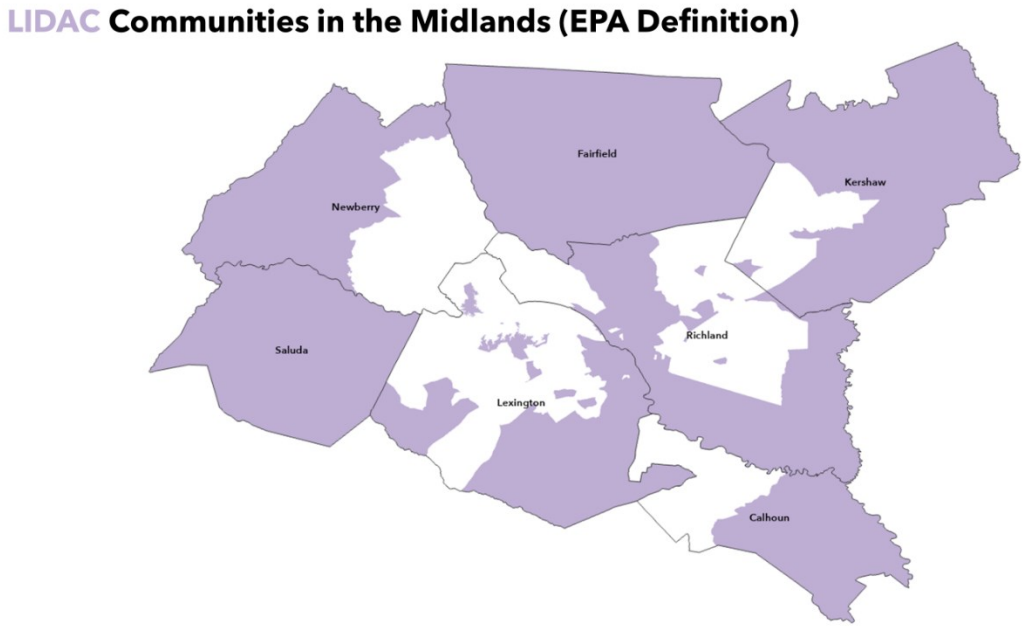


Figure 9: LIDACs (purple shaded areas) comprise a significant proportion of the Midlands by both geography and population. This map is at the census block group level and shows communities that meet either one or two of the following definitions: CJEST Tool Census Tract identified and/or EPA EJSCREEN supplemental indexes identified.[26]

[24] https://screeningtool.geoplatform.gov
[25] https://ejscreen.epa.gov/mapper/
[26] https://www.epa.gov/inflation-reduction-act/cprg-tools-and-technical-assistance-low-income-and-disadvantaged

Climate Risks & Potential Benefits of GHG Reduction Measures to LIDACs

Evaluating LIDAC benefits is important because climate change does not impact all residents of the Midlands equally. The climate impacts posing the greatest risk to LIDACs in the Midlands include extreme heat and the urban heat island effect, extreme rainfall leading to flooding, and drought (particularly in rural agricultural communities). Risks associated with these climate impacts are not evenly distributed,[27] while the impacts on communities can create a range of economic, social, and health burdens.[28] For example, social determinants of health can lead to health disparities over time if there are underlying inequalities affecting a subset of community members.[29] With a specific climate impact like extreme heat, this means that health outcomes and other economic or social burdens are not equally shared.[30] When Columbia did a major urban heat island study,[31] the results indicated that not all neighborhoods faced the same heat stress on a hot august day in 2022 (see Figure 10).

[27] https://nca2023.globalchange.gov/chapter/20/ & https://nca2023.globalchange.gov/chapter/22/
[28] https://www.epa.gov/cira/social-vulnerability-report
[29] https://nca2023.globalchange.gov/chapter/22/
[30] https://nca2023.globalchange.gov/chapter/22/
[31] https://cpac.columbiasc.gov/urban-heat-island-mapping-initiative/

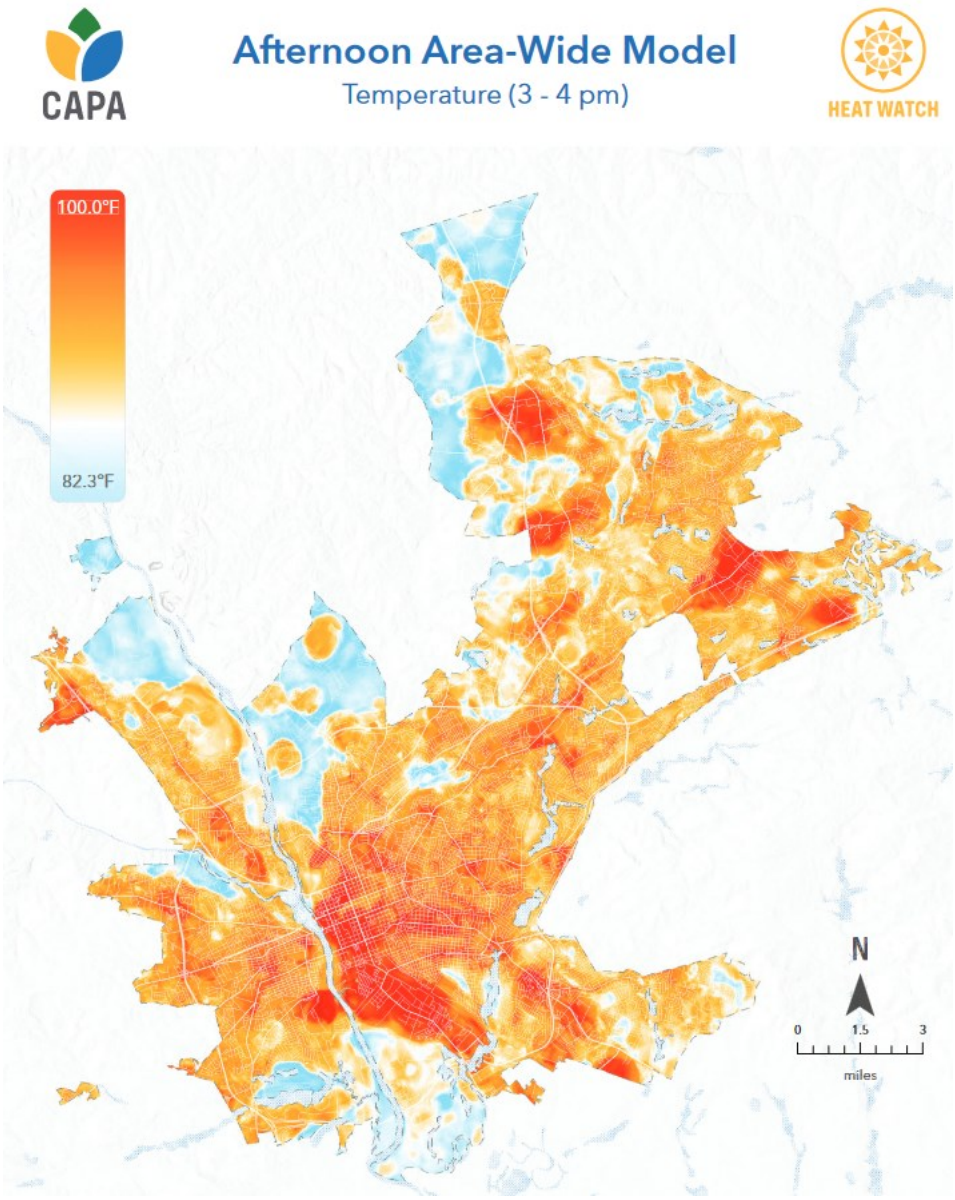


Figure 10: A heat map generated from the Columbia urban heat island study. Data from multiple sources, including citizen volunteers, resulted in this area-wide map. Figure copied from CAPA Strategies.[32]

While extreme heat can create urban heat islands and pose a risk to public health, slowly rising temperatures affects residents' utility bills. This can be seen in the number of cooling degree days, a measure where a higher number means more energy is needed to cool a building. This measure has been rising over the past 50 years in the Midlands (see Figure 11, left). Furthermore, lower-income households spend a greater percentage of their total income on energy: this is known as energy burden (see Figure 11, right). This means that slowly rising temperatures are being felt much more by lower-

[32] https://cpac.columbiasc.gov/urban-heat-island-mapping-initiative/

income households when it comes to paying their utility bills. This is just one example of how a climate impact can turn into an inequitable impact on Midlands LIDACs.

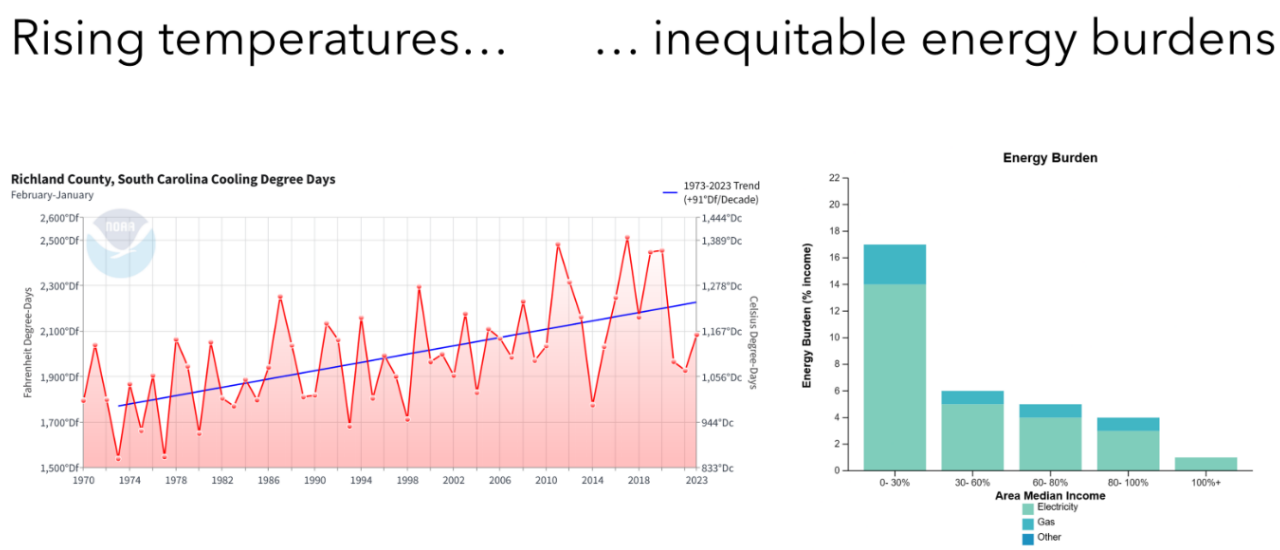


Figure 11: Left: A cooling degree day is a measure that reports a temperature relative to a standard temperature of 65 Fahrenheit. Thus a 95-degree day had 30 cooling degree days. A higher number means that air conditioners must work harder to cool a space, driving up energy costs. This graph shows the trend in cooling degree days over the past 50 years in Richland County. Figure copied from the National Centers for Environmental Information.[33] Right: Energy burden is a measure of the percentage of a household's income spent on energy (left-axis). The bars are grouped by area median income for Richland County. The graph shows that lower-income households spend far more of their household budget on energy and thus have significantly higher energy burdens. Figure copied from the Department of Energy.[34]

The priority greenhouse gas reduction measures in this plan are important to Midlands communities in several ways. Even though climate change is a global problem, local reductions in greenhouse gases reduce overall risk over time because it removes a fraction of the pollution which is driving the climate impacts.[35] Most, if not all, of the measures in this plan also carry direct and/or indirect benefits ranging from economic and social benefits to health benefits (often coming from reductions in co-pollutants that are harmful air toxics). Since LIDACs comprise such a high overall proportion of the Midlands area (see Figure 9) these communities are extremely likely to receive many of these benefits, especially if governments and community partners center their needs and voices during the implementation of these measures. Unless otherwise specified, it is assumed that all LIDAC geographies stand a reasonable chance to benefit from this plan's measures because each measure is planned to be implemented across the entire Midlands region (e.g., no measure is a specific facility designed to be placed in only a single geographic location). The benefits to LIDACs are discussed underneath each of the measures included in this plan.

[33] https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/county/time-series/SC-079/cdd/12/1/1970-2023?trend=true&trend_base=10&begtrendyear=1973&endtrendyear=2023
[34] https://www.energy.gov/scep/slsc/lead-tool
[35] https://nca2023.globalchange.gov/chapter/32/

Review of Authority to Implement

Each priority greenhouse gas reduction measure describes relevant authority to implement it. These are any legal or regulatory criteria governing who can act on a problem and in what ways those actions may be limited. Only measures in which local or regional entities have most or all the relevant implementation authority are considered in this plan. Other measures that can be considered may be found in the statewide climate action plan under development from the South Carolina Office of Resilience.

Greenhouse Gas Inventory

Overview

A greenhouse gas inventory's purpose is to identify sources of certain air pollutants across an organization or community geography. These pollutants drive global warming and are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and fluorinated gases (F-gases) including hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). There are several steps to create an inventory, shown in Figure 12.

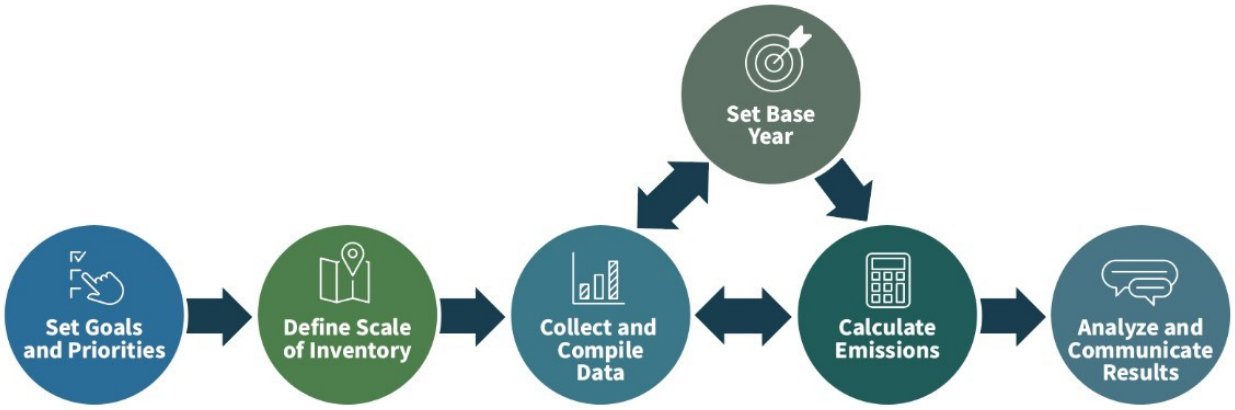


Figure 12: Overview of key steps of a GHG Inventory. Figure copied from EPA's User's Guide to Incorporating Existing GHG Inventories for the Priority Climate Action Plan (PCAP).[36]

[36] File downloaded from EPA Technical Assistance Forum December 2023.

Pre-Inventory Decisions and Actions

1. Generally, stakeholder engagement revealed that actions surrounding climate change are more important to communities than the greenhouse gas inventory itself. Greenhouse gases are also often considered alongside other forms of air pollution as being a general concern, with actions taken to reduce them having related co-benefits to other pollutants (especially in the transportation and industrial sectors). Existing inventories in the region such as the City of Columbia 2019 inventory are often seen as tools to prioritize future actions or ways to highlight the need for such actions. Further goals and targets for GHG reductions will be determined as part of the comprehensive climate action plan, where CMCOG anticipates setting science-based targets for greenhouse gas reductions.
2. The scale of this inventory is a community-wide inventory covering the Midlands geography, or the seven counties of the Columbia-Newberry Combined Statistical Area shown in Figure 2.
3. The year 2022 was selected as the base year, meaning the inventory attempts to document GHG emissions occurring over that period. This will allow for measures that attempt to reduce GHG emissions to be compared to a present understanding of air pollution in the community, and data are expected to be fully available for this base year by the time the comprehensive climate action plan is completed in 2025.

Sectors and GHG Protocols

This GHG inventory utilizes the International Council for Local Environmental Initiatives (ICLEI)'s ClearPath inventory tool to compile data and calculate emissions. It adopts a sector-based approach with the following source categories:

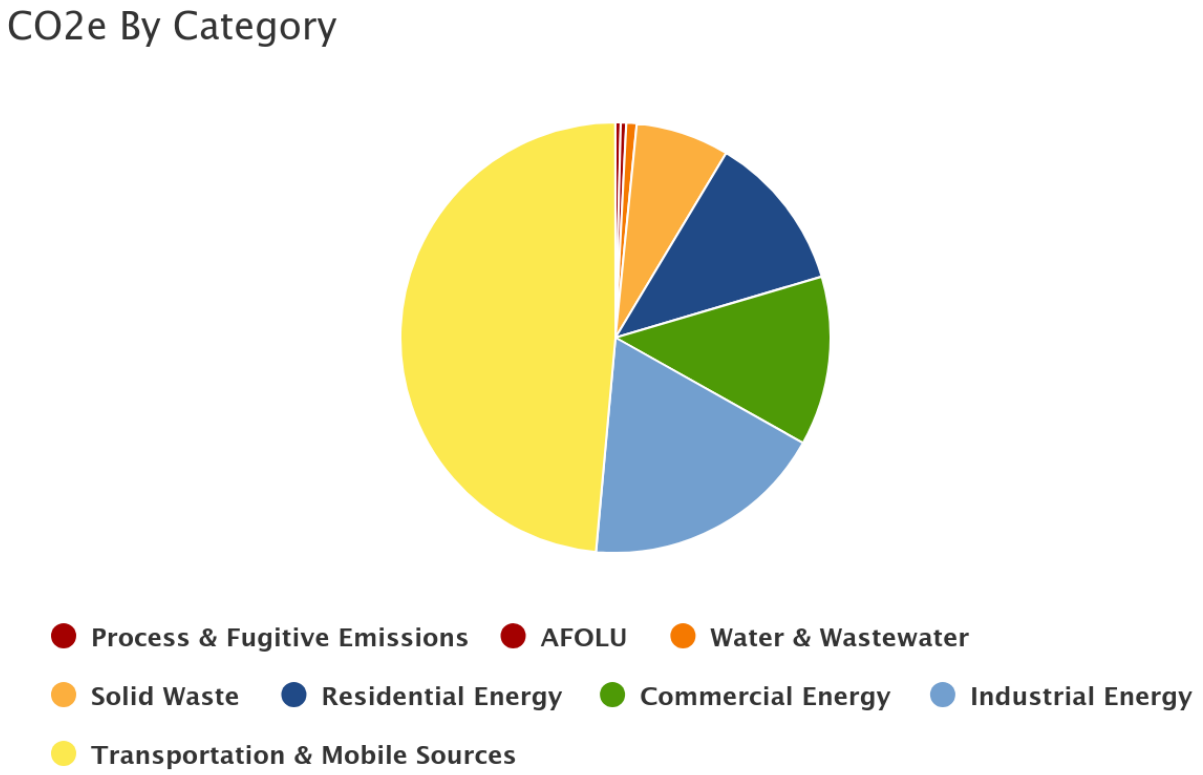
1. Transportation & Mobile Sources
2. Stationary Fuel & Grid Electricity (broken down into residential, commercial, and industrial energy use in buildings across the Midlands)
3. Solid Waste
4. Water and Wastewater
5. Agriculture, Forestry, and Other Land Use (AFOLU)
6. Other (all other sources, such as process & fugitive emissions)

This priority climate action plan presents a simplified greenhouse gas inventory that will be expanded as part of the comprehensive climate action plan. Similarly, compliance with commonly used protocols for GHG inventories such as the U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (USCP)[37] and/or the Global Protocol for Community-Scale Greenhouse Gas Inventories (GPC)[38] will be discussed in the comprehensive climate action plan. This preliminary inventory meets most reporting requirements under both protocols and includes major sources of greenhouse gas emissions in our region during the base year.

[37] https://icleiusa.org/us-community-protocol/
[38] https://ghgprotocol.org/ghg-protocol-cities

Results

The results are shown in Table 4, representing an estimate of gross emissions of greenhouse gases occurring over the Midlands seven county area in the year 2022. Transportation is the largest source of emissions at 5.99 MMT CO2e [39] (48.5%), followed closely by buildings (stationary fuel and grid electricity) at 5.29 MMT CO2e (42.8%). The transportation and solid waste sector results are based off activity data reported by the South Carolina Department of Transportation and South Carolina Department of Health & Environmental Control, respectively, and are thus likely to be more accurate than other source categories which use modeled data or a mix of activity and estimated data. In the Agriculture, Forestry, & Other Land Use (AFOLU) sector, only a portion of currently estimated agricultural emissions are reported in the main table due to data uncertainty, but AFOLU from land use gross additions were estimated at 3.08 MMT CO2e and a net removal of 6.47 MMT CO2e (the Midlands has approximately 58% of its land area as forest). Appendix A lists the methods and data sources used to complete this preliminary inventory, as well as proposed work plans for expanding this inventory as part of the comprehensive climate action plan. A key goal of the comprehensive inventory will be to switch from modeled to activity data for the residential, commercial, and industrial sector energy usage categories by collaborating with local utilities and incorporating fuels beyond electricity and natural gas.



Sector / Category	CO_2e (MT)	CO_2 (MT)	CH_4 (MT)	N_2O (MT)
Transportation & Mobile Sources	5,993,839	5,962,757	320	84
Industrial Energy	2,259,642	2,251,846	125	16

[39] million metric tons of carbon dioxide equivalent

Commercial Energy	1,569,050	1,561,551	131	15
Residential Energy	1,460,273	1,453,273	121	14
Solid Waste	867,204	0	30,913	6
Water & Wastewater	94,743	44,074	1,163	68
AFOLU	52,258	0	0	197
Process & Fugitive Emissions	48,191	18	1721	0

Table 4: Greenhouse gas inventory results, organized by sector and in order of descending magnitude. Results are reported in metric tons of carbon dioxide gas equivalents or by metric tons of individual greenhouse gas. Note that F-gases are not yet included, and these results represent a simplified inventory. See Appendix A for full details on datasets and which major sources and sinks are considered.

Prior Greenhouse Gas Inventories

The City of Columbia has previously completed two greenhouse gas inventories, one in 2007 and another in 2019. While both inventories use a local government operations approach and are not community-scale inventories, they show how the Midland's largest city can prioritize and focus on different operations to reduce air pollution in the future. The 2019 inventory analyzed sectors such as buildings, streetlights, water delivery, wastewater treatment, vehicle fleet, and employee commute. In 2019, notable emissions were observed from wastewater facilities and the vehicle fleet. The report details methodologies, results, baseline comparisons, and future applications to drive sustainable change and policy evaluation. The majority of city emissions stem from water treatment, delivery, wastewater treatment, and transportation sectors (see Figure 13). Notable reductions were observed between inventories in water distribution and wastewater treatment attributed to infrastructure upgrades and shifts towards cleaner energy sources. The inventory recommends the city regularly take stock of emissions, and generate implementation plans to bring emissions down over time.

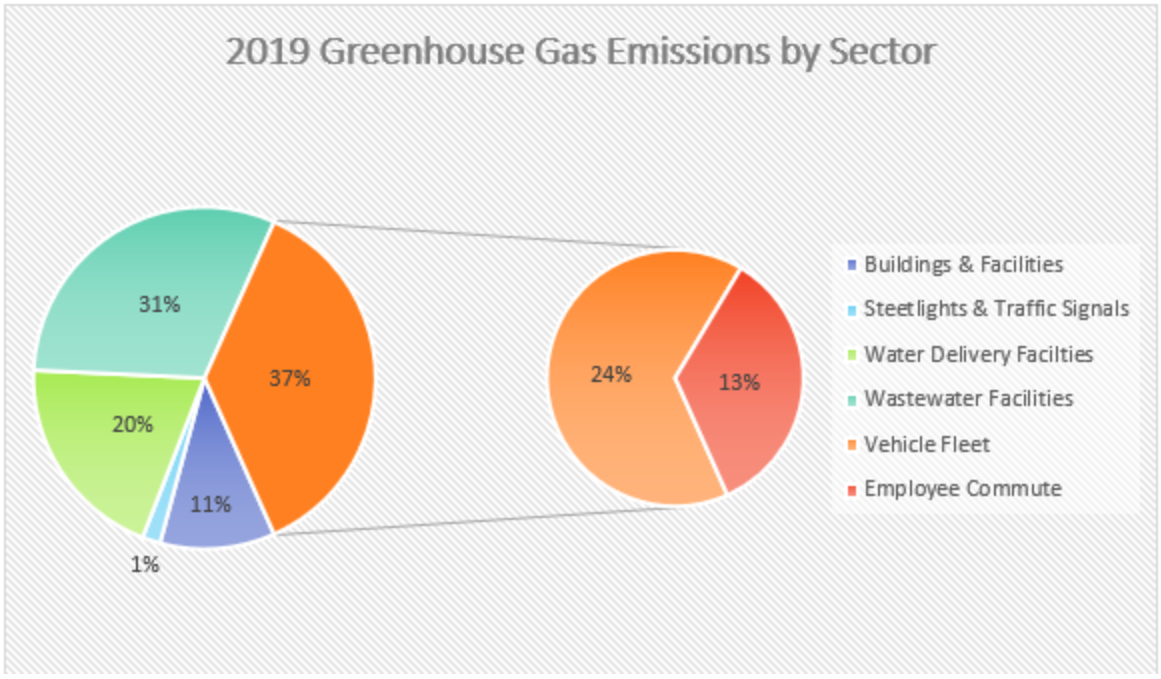


Figure 13: The main sources of emissions from the City of Columbia's local government inventory in 2019. Figure copied from the City of Columbia 2019 Emissions Inventory Report.

Greenhouse Gas Emissions Forecast

A business-as-usual forecast for greenhouse emissions through 2050 was created in ClearPath (see Figure 14). This forecast is based on the preliminary greenhouse gas inventory above and will be re-calculated as part of the comprehensive climate action plan. The comprehensive climate action plan will also set science-based targets for greenhouse gas reductions in consultation with ICLEI technical advisors. Population growth projected from current data was the main factor used to scale how emission quantities may increase in the future. Clean transportation standards from the U.S. Department of Transportation and projections of how the electricity grid will use different fuel sources from the National Renewable Energy Lab were the main factors used to scale how the carbon intensity of emissions may decrease in the future (see Appendix A for a complete description of how this forecast was generated).

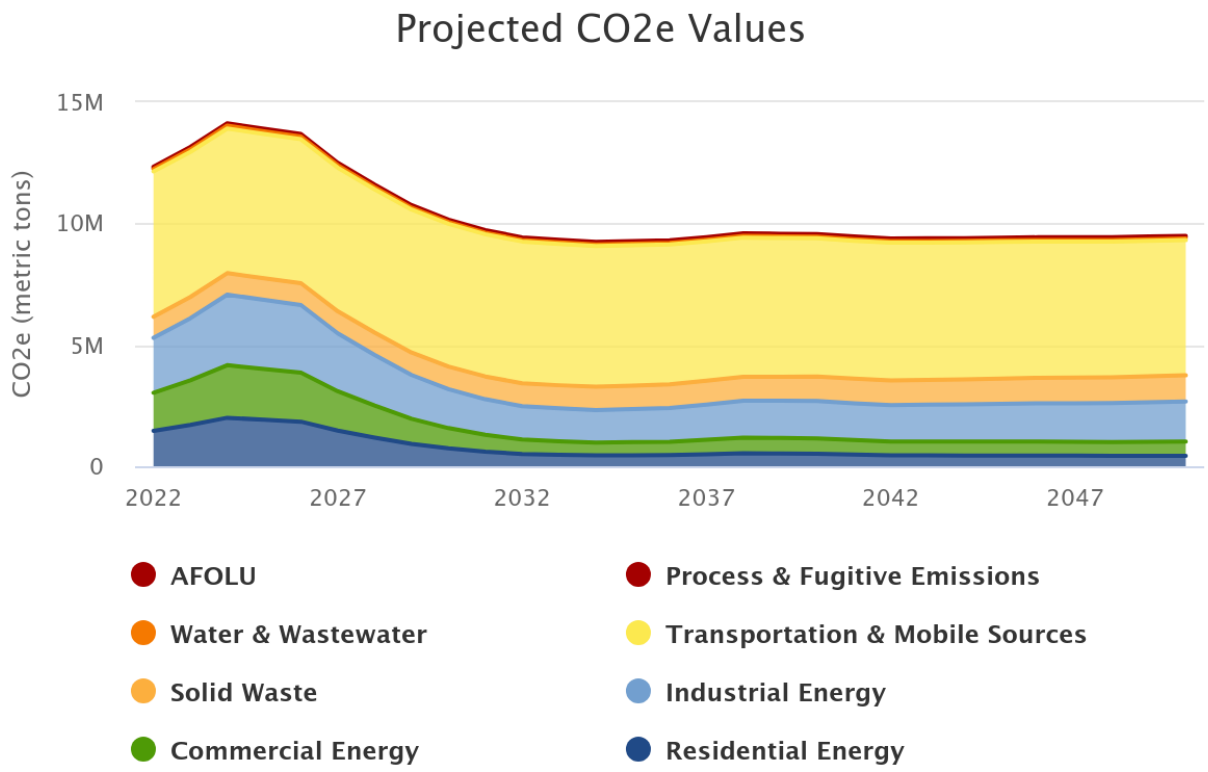


Figure 14: How greenhouse gas emissions from each inventory sector are projected to change between 2022 to 2050.

Broadly, the business-as-usual forecast shows that increasing renewable energy on the grid and cleaner vehicle standards will decrease greenhouse gas emissions across the largest emitting sectors. This results in a lower baseline level of emissions in future planning years. Transportation emissions will decrease less than emissions from buildings, resulting in this sector comprising a larger proportion over time. This forecast does not include any greenhouse gas measures that the Midlands may implement in the future to reduce pollution across the community over time. Table 5 below shows how the measures in this plan would decrease overall emissions in 2030 and 2050 in comparison to the business-as-usual forecast. The comprehensive climate action plan will set science-based targets for these benchmark years and will include a second forecast that shows how a larger suite of measures would reduce emissions.

Base Year Emissions (MT CO_2e)	**2030 Emissions (MT CO_2e)**			**2050 Emissions (MT CO_2e)**		
BAU	BAU	PCAP	Net Change	BAU	PCAP	Net Change
12,345,204	10,165,405	9,210,947	-9.39%	9,496,353	5,870,767	-38.12%

Table 5: A comparison that shows how the combined emissions reductions in this plan's priority measures reduces the business-as-usual (BAU) forecast. All values are reported in metric tons of carbon dioxide equivalent.

Priority Greenhouse Gas Reduction Measures

Introduction to Greenhouse Gas Reduction Measures

This section of the plan introduces individual measures that have a quantifiable reduction in greenhouse gas pollution over time. They are grouped by the sector of the greenhouse gas inventory they reduce emissions in. Each measure contains:

1. A brief introduction of why the measure is needed and prioritized by the community, including prior discussions and any relevant stakeholder engagement during this planning process.
2. A description of the measure and quantifications required by the EPA.
3. A review of potential benefits that would accrue to LIDACs in the Midlands.
4. A review of authority needed to implement the measure.

Stationary Fuel and Grid Electricity

Measure FG.1: LEAP into Energy Efficiency Across the Midlands for 15% of Residential Buildings by 2030 and 60% of Residential Buildings by 2050

Introduction & Community Needs

Energy efficiency is a large issue in the Midlands, with older and inefficient housing stock contributing to higher energy burdens among residents. Lower affordability of heating and cooling due to poor energy efficiency is a key contributor to energy insecurity in the Midlands.[40] In the absence of regulatory control or policy change at the state level, incentivizing energy efficiency measures to address their upfront cost barrier can be one of the best ways to reduce utility bills and generate emissions reductions when it comes to residential and commercial buildings. South Carolina's Energy Efficiency Roadmap[41] completed in 2020 represents diverse stakeholders and prominently highlights the need for energy efficiency improvements. Here in the Midlands, in 2022 Columbia SC applied for the Communities LEAP program from the Department of Energy's National Renewable Energy Lab (NREL). This program investigated energy burden for low-middle income residents, including renters.[42] This year-long effort concluded in December 2023 and brought together residents, community organizations, and government to analyze pathways to energy efficiency. Stakeholder engagement under the Communities LEAP program included a housing summit in November 2023 to discuss the results and plan for next steps and implementation options. Community-based organizations such as the Sierra Club are currently engaged in accelerating energy efficiency improvements, including among low-income communities and renters.

Measure Description

This priority action plan recommends the following actions identified via the Communities LEAP program to improve energy efficiency across the Midlands:

[40] https://nicholasinstitute.duke.edu/publications/stakeholder-recommendations-reducing-energy-insecurity-southeast-united-states & https://issuu.com/seealliance/docs/report_energyinsecurity_02_15_2021_v1
[41] https://energy.sc.gov/focus-area/energy-efficiency/energy-efficiency-roadmap
[42] https://www.energy.gov/communitiesLEAP/columbia-south-carolina

- NREL estimated over half of the buildings analyzed had below average building envelopes. Fund programs that help residents with air sealing, insulation, and other energy efficiency measures tied to the building envelope.
- NREL estimated that cost-effective energy efficiency measures also included heat pumps for air heating/cooling and water heating, in isolation and as a part of a whole home electrification. Fund programs that help residents with heat pumps and other appliance upgrades that reduce greenhouse gas emissions and save on energy bills.

Energy efficiency improvements in buildings can take a variety of forms. This measure assumes that stakeholders will adopt varying improvements over time in the number of buildings indicated by the targets above.

- *Estimate of the quantifiable GHG emissions reductions (through 2030 and 2050):* 131,340 MT CO_2e in 2030 and 525,358 MT CO_2e in 2050, with a cumulative reduction of 492,524 MT CO_2e between 2025 – 2030 and a cumulative reduction of 6,763,990 MT CO_2e between 2031 – 2050. (see Appendix A).
- *Implementing agency or agencies*: Incentive programs that aid in implementation can be run via governments at the state or local level, utilities, or other partnering entities.
- *Implementation schedule and milestones*: Implementation could begin immediately if funding is used to accelerate or improve an existing program, or within 1 year if a new incentive program is executed. Major milestones include the launch date of any new program, and future milestones would relate to the metrics described below over a program's duration.
- *Geographic location:* Across the Midlands.
- *Potential funding sources*: CPRG, IRA EE Home Rebate Program, IRA Tax Credits, Energy Efficiency and Conservation Block Grant Program, utility programs and incentives, local municipalities.
- *Metrics for tracking progress*: Number of households or buildings improved, type of improvement, and known or estimated energy savings. Dollars spent on program implementation.
- *Applicable sector:* Stationary Fuel and Grid Electricity.
- *Quantitative cost estimates*: Total of $6,652,890,662 for energy efficiency improvements, plus any needed programmatic costs (see Appendix A).

LIDAC Community Benefits

The need to support lower income households and renters with energy efficiency improvements was prominently highlighted by stakeholders in the engagement for this plan. Energy efficiency improvements typically offer immediate savings on monthly bills. NREL's modeling indicates low- to middle-income households can expect to see even greater utility bill savings and GHG emissions reductions (although cost to implement also rises). See Table 6 for estimated GHG emission reductions and utility bill savings. Utility bill savings are amplified because LIDACs can live in less energy efficient buildings. In addition to monetary savings, energy efficiency improvements can also improve indoor air quality and thermal comfort for residents. Energy efficiency improvements mean that less electricity needs to be generated, which may have direct or indirect air quality benefits to residents if that generation occurs within or upwind of the community. There is also a potential benefit that job creation

from an increase in contracting work (i.e. firms installing energy efficiency improvements) benefits businesses owned by or employing members of LIDACs.

EE Improvement	Average Cost	Average Annual Utility Bill Savings	Average GHG Emission Reduction (kg CO2e)	LMI Cost	LMI Annual Utility Bill Savings	LMI GHG Emissions Reduction (kg CO2e)
Enhanced enclosure (building envelope)	$6,307	$345	1,014	$9,534	$610	1,866
Minimum-efficiency heat pump using existing heat backup	$14,026	$276	926	$16,674	$424	1,451
High-efficiency heat pump with electric heat backup	$26,554	$625	1,846	$28,912	$949	2,986
Heat pump water heater	$3,129	$122	327	$3,121	$128	383
Whole home project (building envelope, water heater, and high efficiency heat pump)	$32,254	$900	2,547	$40,232	$1,395	4,108

Table 6: partial CLEAP energy efficiency modeling results for Columbia, SC. The average columns report a community-wide output of NREL's modeling, while the LMI columns refer specifically to the segment of 0 – 80% area median income households living in detached homes built between 1940 – 1979. This comparison shows that while implementation costs may rise in LMI households, so do community benefits and GHG reductions.

Authority to Implement

The Midlands still uses the 2009 International Energy Conservation Code according to the Energy Standards Act but this cannot be changed by municipalities, barring any future changes by the South Carolina Legislature.[43] Municipalities also do not have any control over utility power generation in South Carolina, as this is regulated at the state-level via the Public Service Commission. This leaves grant funding or other types of incentive programs, which municipalities or other partners have the authority to start and run. Utilities have the authority to implement new programs or change existing programs after approval by the Public Service Commission.

Measure FG.2: Energy Audits and Communicating about Energy Efficiency

Introduction & Community Needs

Energy efficiency improvements such as building envelope and weatherization enhancements, HVAC systems, or appliances can lower energy usage and improve energy burden across the Midlands. There can be a large variety of potential improvements while residents, businesses, and governments can be unaware of them or how to prioritize different types of improvements. South Carolina's Energy Efficiency Roadmap[44] recommended energy audits and other types of labeling programs to address this

[43] https://www.scstatehouse.gov/code/t06c010.php
[44] https://energy.sc.gov/focus-area/energy-efficiency/energy-efficiency-roadmap

issue, and it is also highlighted by the Department of Energy's main consumer savings website.[45] The City of Columbia under its Ready for 100 Resolution has a goal to conduct energy audits on 25% of city-owned investments and infrastructure by 2025, 50% by 2028 and 100% by 2033.[46] Stakeholder engagement with partner governments highlighted a need for energy audits to provide actionable insights to units of government and to residents for the buildings they live or work in. Stakeholder outreach under this planning process identified a possible underutilization of energy audits in the community. Existing audit programs, such as local demand side management programs run by local utilities currently have greater capacity and could serve more residents than they currently do each year. Finally, local community groups highlighted the importance of communication to both contractors and residents about new and upcoming sources of information in the energy efficiency space (whether that is facilitated as part of an energy audit or a public relations campaign).

Measure Description

This priority action plan recommends the following actions to increase awareness of energy efficiency savings across a variety of stakeholders in the community:

- Energy audits via certified contractors to assess or benchmark government-owned buildings and facilities.
- Increasing public awareness and utilization of home energy audit programs run by local utilities. One example is Dominion Energy's Home Energy Check Up Program.[47]
- Establishing new home energy audit programs, such as a local pilot of the state's implementation of the Home Energy Score Program.[48] This statewide program was recently highlighted by the Department of Energy and is set to begin in 2024.[49]
- Adopt local ordinances that recommend or require implementation of home energy labeling or another type of energy audits during residential construction and/or sales.
- Communication and outreach efforts to local contractors about energy efficient equipment and appliances such as heat pump HVAC upgrades.
- Communication and outreach efforts to residents about new tax credits, upcoming rebate programs, and other federal initiatives under the Inflation Reduction Act.
- Communication and outreach efforts to residents about current state and utility rebate or state tax incentive programs in South Carolina.

The first step towards energy efficiency improvements is often awareness of costs specific to an individual building and actionable information about how to reduce these costs. This measure assumes that those who receive energy audit information will act on that information over time and reduce their use of electricity or stationary fuels through energy efficient repairs or upgrades.

[45] https://www.energy.gov/save
[46] https://citycouncil.columbiasc.gov/download/resolution-no-r-2023-053/
[47] https://www.dominionenergy.com/south-carolina/save-energy/virtual-home-energy-check-up
[48] https://energy.sc.gov/focus-area/energy-efficiency/building-ee-homes/building-codes-and-labeling-recommendations
[49] "Residential Energy Dispatch" newsletter, October 2023 edition, highlighted the state's pioneering implementation efforts.

- *Estimate of the quantifiable GHG emissions reductions (through 2030 and 2050):* 14,062 MT CO_2e in 2030 and 18,230 MT CO_2e in 2050, with a cumulative reduction of 149,162 MT CO_2e between 2025 – 2030 and a cumulative reduction of 303,406 MT CO_2e between 2031 – 2050. (see Appendix A).
- *Implementing agency or agencies*: Communication and outreach efforts can be run by municipal, county, state agencies, or partnering entities. Utilities, private firms, or other partnering entities would conduct energy audits or home labeling programs.
- *Implementation schedule and milestones*: Implementation could begin immediately for some energy audit or labeling programs (such as existing utility energy efficiency programs). Others would require time for planning prior to implementation, up to one year. Municipalities seeking energy audits for government owned buildings could likely begin rapidly after deciding on purchasing or necessary procurement. Major milestones include the launch date of any new program, and future milestones would relate to the metrics described below over a program's duration.
- *Geographic location:* Across the Midlands.
- *Potential funding sources*: CPRG, IRA EE Home Rebate Program, IRA Tax Credits, Energy Efficiency and Conservation Block Grant Program, partnering or enabling firms and other entities, local municipalities.
- *Metrics for tracking progress*: Dollars spent on communication and outreach, number of households or buildings contacted, number of households or buildings participating in energy audit or labeling programs.
- *Applicable sector:* Stationary Fuel and Grid Electricity.
- *Quantitative cost estimates*: $150,000 a year plus any needed staffing cost for public outreach and engagement (based on prior CMCOG engagement in other programs). Additional costs are expected to pay for the energy audit, home energy label, etc. by contractors or other 3rd parties. These would likely be larger than outreach costs. A total estimate of $500,000 a year plus any needed staffing cost could enable a program to reach a reasonably sized population in the Midlands.

LIDAC Community Benefits

LIDACs can benefit more from some existing energy audit programs and be unaware of these benefits. For example, some local utilities run demand-side management programs where participation of low-income households is fully subsidized. Some local community-based organizations also prioritize energy efficiency and help LIDAC residents with information or access to small-scale energy efficiency improvements like LED light bulbs and door sweeps. Additional communication may increase their uptake in the community.

The Department of Energy's LEAD tool shows that energy burdens are higher for lower-income households in the Midlands,[50] but it can be difficult to know why for a particular residence without a formal or informal energy audit. It costs time and money to seek out an audit, a burden that differentially affects LIDAC residents and can be avoided by a program that actively supplies this information instead of it needing to be sought out or independently acquired. The primary benefit of

[50] https://www.energy.gov/scep/slsc/lead-tool

energy audits to LIDAC residents is actionable information which can lead to monetary savings on utility bills if that information is used in energy efficiency improvements. Secondary benefits include enhanced thermal comfort, possible indoor air quality improvements, and possible air quality improvements from avoided electricity generation nearby or upwind. There is also a potential benefit that job creation from an increase in contracting work (i.e. firms conducting energy audits) benefits businesses owned by or employing members of LIDACs.

Authority to Implement

Incentivizing, communicating about, or workforce development activities centered around energy audits (whether for existing or new programs) is within the current authority of city and county governments and local partners. Adoption of ordinances by city or county governments requiring energy audits or labels as part of property sales is possible, as it is not currently prohibited by a state provision.

Measure FG.3: Generate 500 MW of New Solar Projects in the Residential, Commercial, and Municipal Sectors by 2050

Introduction & Community Needs

The Midlands area receives plenty of sunlight and solar projects are expanding rapidly, but the currently installed capacity of residential, commercial and municipal solar relative to our region's potential is low (see Figure 15).[51] Although they are falling over time, the high up-front costs associated with solar projects means that residents, local businesses, and municipalities often defer or decline to invest in solar projects that could save significant amounts of money through avoided energy costs. Current programs to address this barrier include a federal tax credit of 30% and a state tax credit of 25%,[52] and a potential future Solar For All program through the South Carolina Office of Resilience which may address the currently limited access to community solar programs.

[51] https://scholarcommons.sc.edu/geog_facpub/231/
[52] https://programs.dsireusa.org/system/program/sc/solar

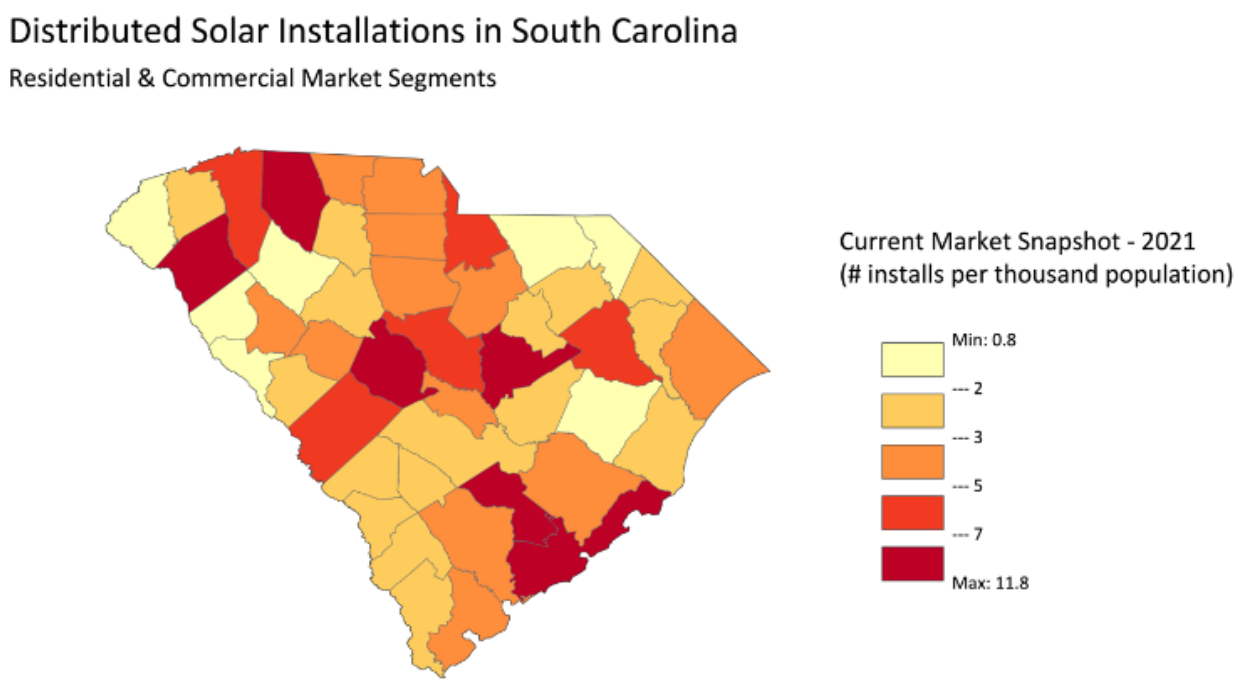


Figure 15: A map showing the per-capital installations of solar for all non-utility market segments. Figure copied from Fleming & Windsor, 2022.[53]

Measure Description

This priority action plan recommends the following actions to grow the volume of installed solar capacity among residents, local businesses, and governments:

- Encourage governments to utilize economic development departments to incentivize the installation of rooftop solar in large buildings and multi-unit housing developments.
- Incentivize government and non-profit entities to explore solar projects using the newly available direct pay provisions for federal solar tax credits.
- Fund programs that assist residents (both homeowners and renters) with accessing rooftop solar projects or community solar programs. Support initiatives that assist with navigating the complexity and cost/benefits of solar projects or community solar programs.
- Incentivize the use of solar as part of smart surfaces projects. [54] One example is solar canopies in parking lots to address urban heat islands and generate shade alongside clean power. According to one analysis parking lots represent 37% of downtown Columbia.[55]
- Encourage solar projects on unused, unusable, or less than desirable land where the power generated could have beneficial community impacts.

[53] https://scholarcommons.sc.edu/geog_facpub/231/
[54] Although this is a smart surfaces measure, it is listed here under measure FG.3 because greenhouse gas reductions would occur on the electricity grid and not in the AFOLU sector like other smart surface measures.
[55] https://www.postandcourier.com/columbia/parking-columbia-downtown-charleston-climate-development/article_da31b592-b09c-11ee-8f6d-67181ad34315.html

According to Google Project Sunroof, over 100,000 residential roofs in Richland County alone (representing 2,100 MW) are viable for rooftop solar.[56] While a 500 MW target across residential and non-residential sectors is well beneath the potential maximum across the Midlands, it represents a sizable greenhouse gas reduction and is comparable to other climate action plans when scaled to our population size.[57] Projects underneath this measure's target can set a positive example that further accelerates solar within the community or promote equity by focusing on stakeholders traditionally less likely to benefit from solar, such as low-income families or local municipalities with limited budgets.

- *Estimate of the quantifiable GHG emissions reductions (through 2030 and 2050):* 109,974 MT CO_2e in 2030 and 549,870 MT CO_2e in 2050, with a cumulative reduction of 329,922 MT CO_2e between 2025 – 2030 and a cumulative reduction of 6,818,388 MT CO_2e between 2031 – 2050. (see Appendix A).
- *Implementing agency or agencies*: Incentive programs that aid in implementation can be run via governments at the state or local level, utilities, or other partnering entities.
- *Implementation schedule and milestones*: Implementation could begin within 1 year if a new incentive program is executed. Major milestones include the launch date of any new program, and future milestones would relate to the metrics described below over a program's duration.
- *Geographic location:* Across the Midlands.
- *Potential funding sources*: CPRG, Federal Solar Tax Credit, SC State Solar Tax Credit, SC statewide Solar For All Program (if funding is awarded by EPA), Energy Efficiency and Conservation Block Grant Program, DOE Renew America's Nonprofits Program, utility programs and incentives, local municipalities.
- *Metrics for tracking progress*: Capacity of solar panels installed and known or estimated energy savings. Dollars spent on program implementation.
- *Applicable sector:* Stationary Fuel and Grid Electricity.
- *Quantitative cost estimates*: EnergySage lists a 5kW residential solar project in Midlands counties as costing between ~$12,000 and ~$17,000 before incentives.[58] Some very small solar projects at small businesses and municipalities will be similar in scale, although many will be larger in scale or complexity. Assuming an average on the upper end of the range, that gives a pre-incentive cost of $1.7 billion worth of small systems to scale up to a total of 500 MW if 100% of the projects are in the residential sector. A total cost of $2 - $2.5 billion includes a mix of larger commercial and municipal projects as a portion of the target.

LIDAC Community Benefits

LIDACs in the Midlands are less likely to directly benefit from the energy savings associated with rooftop solar because higher income households are more likely to be able to afford the up-front cost or have greater access to finance. The South Carolina Energy Freedom Act of 2019 encouraged access to community solar for low- and moderate-income utility customers,[59] but growth in community solar

[56] https://sunroof.withgoogle.com/data-explorer/place/ChIJOxu60MdK_4gRQqZb8Meu5LU/
[57] https://www.epa.gov/statelocalenergy/quantified-climate-action-measures-directory-local-directory
[58] https://www.energysage.com/solar-panels/sc/
[59] https://ors.sc.gov/consumers/electric-natural-gas/solar/south-carolina-energy-freedom-act

statewide is slow.[60] Whenever LIDAC residents have access to rooftop solar or community solar, direct monetary savings on utility bills are an expected benefit. Rooftop solar also has the additional benefit of increased property values in cases where the LIDAC resident is the homeowner. For solar in the community, there can be direct benefits for projects that are also a part of community infrastructure. One example is solar over a parking lot or other surface that reduces the urban heat island effect. Solar projects in non-residential sectors can benefit LIDACs if a portion of the revenues generated are re-directed. One example is a non-profit or municipality that uses the energy savings from solar to fund community initiatives. All solar projects can have air quality benefits if the increase in renewable energy generation decreases necessary generation from energy plants that release air pollutants. There is also a potential benefit that job creation (including for the installation or manufacture of solar panels) benefits businesses owned by or employing members of LIDACs.

Authority to Implement

Incentivizing, communicating about, or workforce development activities centered around solar projects (whether for existing or new programs) is within the current authority of city and county governments and local partners. While the adoption of ordinances requiring rooftop solar on new or existing buildings is not currently possible, this component of the measure could be incentivized by municipalities through economic development departments. The South Carolina Energy Freedom Act of 2019[61] expanded access to solar in the Midlands by implementing net metering tariffs, encouraging utilities to offer community solar, and updating rules around small power producers (relating to larger solar projects which send more power back onto the grid).

Transportation

Measure T.1: Increase the Share of Electric Vehicles in Passenger Transportation to 15% by 2030 and 60% by 2050 via Enhanced Public Charging Infrastructure

Introduction & Community Needs

Electric Vehicles (EVs) are an emerging segment of passenger transportation in the Midlands. Early data (see Table 7) suggests that EVs are at the beginning of an uptake in adoption as additional models become available in the state. This measure seeks to accelerate EV adoption to 15% by 2030 and 60% by 2050 by focusing on charging infrastructure in the community.

County	Market Penetration
Richland	3%
Lexington	3%
Kershaw	1%
Newberry	2%
Fairfield	2%
Saluda	1%
Calhoun	1%

[60] https://scholarcommons.sc.edu/geog_facpub/231/
[61] https://ors.sc.gov/consumers/electric-natural-gas/solar/south-carolina-energy-freedom-act

Table 7: EV Market Penetration by County, 2022. Source: U.S. Department of Energy.[62]

Access to charging for EVs is often a point of concern in deciding to switch from fossil fuel vehicles, and current data suggests that growth in charging stations lags EV registrations.[63] The Inflation Reduction Act's tax credits for the purchase of certain new and used EVs exceeds the likely capacity of a local incentive for vehicle purchases, and the South Carolina Legislature is exploring adding EV chargers to a state tax credit that would benefit the installation of chargers.[64] Community chargers (Level 2 chargers) complement the state's National Electric Vehicle Infrastructure (NEVI) program and the initiatives of private charging companies, which largely focus on DC Fast Chargers along major interstates and highways.

As of December 2023, there were 19 DC Fast and 52 Level 2 charging stations[65] in the Midlands according to the Department of Energy (see Figure 16).[66] Community chargers are geographically clustered in the City of Columbia, and many are co-located in parking garages. According to an analysis using the Department of Energy's Electric Vehicle Infrastructure Projection (EVI-Pro) Lite tool,[67] the Midlands region needs 3,075 shared private charging ports and 4,575 public level 2 charging ports by 2030 (given the target share of EV transportation, see Appendix A for additional information). Regional reports[68] and local major stakeholder initiatives[69] report the need for additional charging to meet growing demand, especially in underserved areas and for residents where access to home charging is currently limited (such as multi-unit housing developments). Stakeholder outreach under this planning process identified a need for community chargers for those who cannot charge at home. Many stakeholders see adoption of chargers in places of community importance or business activity as a pathway to economic development. For example, municipalities like the City of Newberry have installed EV chargers downtown to attract residents and out of town visitors to visit local businesses and recreational spaces.

[62] https://www.energy.gov/eere/vehicles/articles/fotw-1309-september-25-2023-there-were-four-counties-california-electric
[63] https://www.autosinnovate.org/posts/press-release/2023-q3-get-connected-press-release
[64] https://www.scstatehouse.gov/sess125_2023-2024/bills/3824.htm
[65] Note that charging stations can have multiple ports (i.e. cables) at a single station. There are 89 DC Fast ports and 98 Level 2 ports at these stations, respectively.
[66] https://afdc.energy.gov/fuels/electricity_locations.html
[67] https://afdc.energy.gov/evi-pro-lite
[68] https://cleanenergy.org/news-and-resources/transportation-electrification-in-the-southeast-fourth-edition/
[69] https://energy.sc.gov/focus-area/clean-transportation/electric-vehicles/electric-vehicle-stakeholder-initiative

Level 2 and DC Fast EV Charging Stations in the Midlands

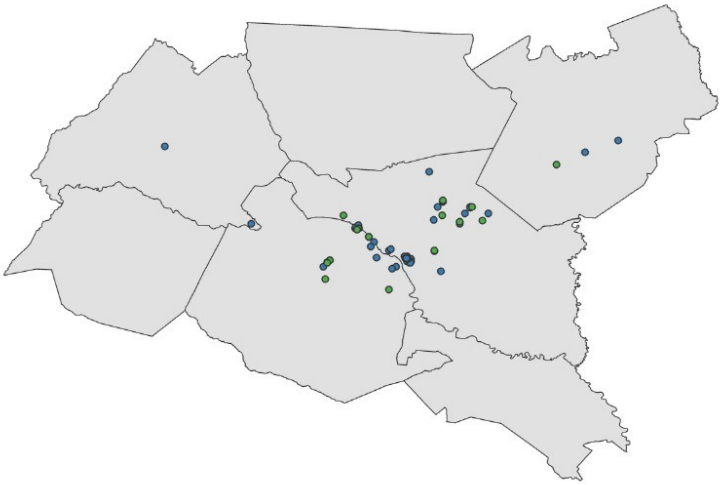


Figure 16: Locations of electric vehicle charging stations in the Midlands, as of December 2023. Note that charging stations can have multiple ports (i.e. cables).

Measure Description

This priority action plan recommends the following actions to enhance public charging infrastructure across the Midlands:

- Encourage counties and municipalities to utilize zoning codes to incentivize or require the installation of EV chargers in new parking lots or garages, especially in multi-unit housing developments and places of work. Fund planning or engineering analyses that help local governments assess the costs and benefits of zoning code changes related to EV chargers.
- Support the state-level legislative policy change currently under discussion to change the Alternative Fuels Tax Credit (state tax credit) to incorporate EV charger installation for both residential and non-residential entities.
- Incentivize installation of EV chargers in community corridors and common commercial hubs. Examples include (but are not limited to) downtown or cultural district meters and parking lots, convention centers and community meeting places, public parks, grocery stores, and places of work.
- Establish EV chargers in municipal and county parking lots and parking garages. Encourage municipalities to include them in plans for all new parking areas and in any development to retrofit existing parking areas.
- Establish a grant program to fund home EV charging, especially for low-income community members (where purchasers may not have access to financing/dealership bundles on purchase that include the installation of a home charger).
- Explore and utilize opportunities for public/private partnerships in EV charging.

EVs will become more affordable and attractive over time due to market forces. They already have lower annual costs to operate due to a combination of lower fuel and expected repair costs (leading to significant vehicle lifetime savings), and average upfront costs have begun falling.[70] More vehicles should begin qualifying for the Inflation Reduction Act's EV tax credits, and the supply of used EVs will increase over time as well. This measure thus assumes that access to widespread and convenient charging is a major incentive to switching to EVs in the Midlands that may not be adequately addressed by market forces in the absence of concerted planning.

- *Estimate of the quantifiable GHG emissions reductions (through 2030 and 2050):* 545,744 MT of CO_2e in 2030, 2,378,770 MT CO_2e in 2050, and a cumulative emissions reduction of 1,899,696 MT CO_2e between 2025 – 2030 and 30,161,653 MT CO_2e between 2031 - 2050. (see Appendix A).
- *Implementing agency or agencies*: Grant programs and incentives can be run by municipal, county, state agencies, or partnering entities. Local governments would be responsible for exploring and adopting any changes to zoning codes.
- *Implementation schedule and milestones*: Implementation could begin within months of funding availability, as multiple private firms offer community charging stations.
- *Geographic location:* Across the Midlands.
- *Potential funding sources*: CPRG, U.S. DOT Charging and Fueling Infrastructure Grant Program, Alternative Fuel Vehicle Refueling Property Credit (federal), Alternative Fuels Tax Credit (state tax credit, currently under discussion in the legislature to expand to include electricity as an alternative fuel), local firms, or municipalities.
- *Metrics for tracking progress*: Gap between current charging stations and number recommended by EVI-Pro to reach the 2030 target in this measure.
- *Applicable sector:* Transportation.
- *Quantitative cost estimates*: A recent South Carolina market assessment cited an average cost of $12,000 for a community level 2 charger.[71] The City of Columbia recently paid $3,000 plus installation costs (as part of larger construction) for level 2 chargers in municipal garages. Assuming $10,000 per charger, it would cost $45.75 million (plus additional programmatic costs) to build the recommended 4,575 public level 2 chargers.

LIDAC Community Benefits

Access to a charging station (either at home or in the community) is required for refueling an EV. Stakeholders in the Midlands also see Level 2 chargers in the community as ways to bring in people and money into different areas. Based on the current distribution of chargers in the Midlands, there is a danger of "charging deserts" developing over time, where some areas have few or no charging stations.[72] These charging deserts can be more likely to develop in LIDACs. Concerted planning efforts could instead use charging stations to fuel economic development in LIDACs. Access to charging stations nearby could be particularly important to LIDAC residents who are renters or live in apartments where installing a home charger may not be possible.

[70] https://www.consumerreports.org/hybrids-evs/evs-offer-big-savings-over-traditional-gas-powered-cars/
[71] https://scholarcommons.sc.edu/geog_facpub/231/
[72] https://www.canarymedia.com/articles/ev-charging/3-ways-to-help-ev-charging-bloom-in-charging-deserts

EVs carry more than just monthly cost savings to LIDAC residents. They emit no tailpipe air pollutants that have negative associated health outcomes such as asthma. They are also quieter, contributing to lower noise pollution levels in the area. There is also a potential benefit that job creation (including for the installation of chargers or manufacture of EVs) benefits businesses owned by or employing members of LIDACs.

Authority to Implement

Incentivizing, communicating about, or workforce development activities centered around electric vehicles and charging infrastructure (whether for existing or new programs) is within the current authority of city and county governments and local partners. Local governments control zoning requirements around parking lots and could add new requirements related to charging stations to these codes to predictably expand the number of chargers in certain locations (such as apartment complexes or community sites like grocery stores).

Transportation Measures to be Evaluated in the Comprehensive Plan

Several measures in the transportation sector were suggested but not able to be analyzed in time for this priority climate action plan. These measures will be explored further in the comprehensive climate action planning process.

- Government vehicle fleet conversions (both light-duty and heavy-duty vehicles).
- Regional transit authority vehicle upgrades (to either battery electric or hydrogen buses).
- Upgrading bicycle & pedestrian infrastructure and using local greenways to expand non-vehicle transportation options in the Midlands.
- Using traffic sensors and traffic light signal system coordination to increase traffic flows and reduce idling at intersections.
- Establishing new inter-city passenger rail links, such as to Charlotte NC.

Agriculture, Forestry and Other Land Use (AFOLU)

Measure AFOLU.1: Smart Surfaces Implementation

Introduction & Community Needs

The metropolitan area surrounding the City of Columbia recently conducted a heat mapping study in 2022, finding that urban heat islands are a problem in multiple areas.[73] Urban heat islands pose a health risk to members of the community by exacerbating extreme heat events, which are the leading cause of death and heat-related illness among natural disasters in the United States, Urban heat islands also limit recreation and economic activity, with disproportionate impacts in LIDAC neighborhoods. In response to the heat mapping study, in 2023 Columbia joined the Cities for Smart Surfaces project alongside 9 other

[73] https://cpac.columbiasc.gov/urban-heat-island-mapping-initiative/

cities nationwide (see Figure 17).[74]

Figure 17: A map of cities participating in the Cities for Smart Surfaces project, including Columbia SC. Figure copied from Smart Surfaces Coalition.[75]

Smart surfaces can include various land use measures like reflective roofs and pavement, porous and permeable pavement, green roofs, urban tree plantings, rain gardens & bioswales, urban meadows and other community green spaces, and more. These strategies have been discussed locally to mitigate climate change and address its impacts,[76] and in some cases municipalities are already acting on these measures. For example, tree planting is occurring in multiple areas across the Midlands for urban beautification, heat and flood control, reduced energy consumption, air quality improvement, and myriad other co-benefits. The Town of Winnsboro has been an Arbor Day Tree City for several decades and plans to continue with the program.[77] In addition, the City of Columbia has committed to planting over 800 trees annually and giving approximately 300 trees to community members in the coming five years.

Measure Description

[74] https://columbiasc.gov/as-heat-shatters-records-five-mayors-join-with-smart-surfaces-coalition-to-announce-major-new-infrastructure-initiative-to-cool-cities-and-advance-environmental-justice/
[75] https://smartsurfacescoalition.org/cities-for-smart-surfaces
[76] https://www.postandcourier.com/columbia/news/climate-change-energy-flooding-heat-carbon-emissions-recycling-waste-environment/article_59165412-9522-11ee-b248-2bb732336e17.html
[77] https://www.arborday.org/programs/treecityusa/#recognizedSection

This priority action plan recommends the following actions to continue and expand the implementation of smart surfaces across the Midlands:

- Encourage counties and municipalities to utilize ordinances, zoning codes, and other local policy instruments to incentivize or require the implementation of smart surfaces measures in new and existing construction and local infrastructure.
- Establish a green fund to provide financial support, and/or utilize incentives to prioritize smart surfaces implementation in buildings and community infrastructure.
- Lead by example by installing smart surfaces on or near municipal buildings, community parks, and local infrastructure.
- Continue working with the Smart Surfaces Coalition to adopt policies based on prior examples and other cities currently engaged in the coalition.

Smart surfaces often have multiple community co-benefits in addition to reductions in greenhouse gases and can address environmental justice at a local scale.[78] Adopting smart surface measures such as planting trees and bioswales and requiring reflective or green roofs can aid in the mitigation of urban heat islands in the Midlands.

- *Estimate of the quantifiable GHG emissions reductions (through 2030 and 2050):* 151,308 MT CO_2e annually, with a cumulative reduction of 907,848 MT CO_2e between 2025 – 2030 and a cumulative reduction of 3,026,160 MT CO_2e between 2031 – 2050. Note this is likely a conservative estimate because the source for this estimate is based on a smaller geographic area. This number will be revised as part of Columbia's participation in the Cities for Smart Surfaces project in 2024 (see Appendix A).
- *Implementing agency or agencies*: Incentive programs that aid in implementation can be run via governments at the state or local level, or in partnership with community-based organizations. Municipalities can adopt zoning changes or ordinances.
- *Implementation schedule and milestones*: Implementation will begin once initial metro area-wide analysis from the Smart Surfaces Coalition is available in summer 2024. That analysis will help identify priority smart surface interventions for the region based on net financial benefit, peak summer temperature impact, and CO_2e reductions. Certain smart surface implementation efforts will be a continuation and expansion of ongoing efforts in areas like increasing urban tree canopy. Other efforts may require policy changes and investments that could go into effect in 2025. Major milestones include the date of any policy changes or program launches, as well as achievement of targets based on the Smart Surface Coalition's analysis.
- *Geographic location:* Across the Midlands.
- *Potential funding sources*: CPRG, FEMA Building Resilience Infrastructure and Communities and Flood Mitigation Assistance programs, DOT RAISE, PROTECT and Reconnecting Communities programs, local municipalities, philanthropy and other grant programs.
- *Metrics for tracking progress*: Changes in policy implemented by municipalities, number/area of buildings/infrastructure adopting smart surfaces.
- *Applicable sector:* Stationary Fuel and Grid Electricity.

[78] https://smartsurfacescoalition.org/smart-surfaces

- *Quantitative cost estimates*: $1.4 billion (total, see Appendix A).

LIDAC Community Benefits

The implementation of smart surface projects city-wide and in LIDACs in the Midlands will provide myriad direct and indirect benefits to build climate resilience, improve health outcomes, and reduce risk. For example, adopting green infrastructure such as rain gardens, bioswales, and trees will help mitigate extreme flooding while also reducing extreme urban heat, which generally impacts LIDAC communities disproportionately. The adoption of cool roofs and pavements also help address the urban heat island effect as their reflective surfaces are designed to absorb less solar energy, lowering ambient temperatures in the city, and reducing energy consumption for cooling buildings.[79]

Municipalities that have adopted local smart surfaces measures have seen environmental justice benefits across social, economic, and public health areas. In addition, local community-based organizations are already implementing smart surfaces approaches in green infrastructure. For example, the Columbia Canopy Project is planting trees in in community areas across the city to help alleviate and address legacies of environmental injustice.[80] These prior examples are a major reason why the City of Columbia joined the Smart Surfaces Coalition in 2023.[81]

Authority to Implement

Incentivizing, communicating about, or workforce development activities centered around smart surface projects (whether for existing or new programs) is within the current authority of city and county governments and local partners. Municipalities also have the authority to adopt ordinances or zoning code changes that require the adoption of smart surfaces like cool roofs or green infrastructure around public properties or streets. In the case of paved roads, some are maintained by local municipalities while others are maintained by the state Department of Transportation (and are thus outside local control). Municipalities can only affect roads that they are responsible for maintaining, although local approaches to paved roads can influence the state's approach to future road maintenance.

AFOLU Measures to be Evaluated in the Comprehensive Plan

Several measures in the AFOLU sector were suggested but not able to be analyzed in time for this priority climate action plan. These measures will be explored further in the comprehensive climate action planning process.

- ❖ Expanding the percentage of plant-based meals at high-volume community cafeterias, such as schools and hospitals.
- ❖ Using land conservation and other tools to keep standing forests and farmland (both forestry and other crops) from being converted to developed lands in rural areas.
- ❖ Climate smart commodities and land management best practices in agriculture and forestry.

[79] https://smartsurfacescoalition.org/analysis/2022/8/9/smart-surfaces-guidebook
[80] https://www.historiccolumbia.org/research-portfolio/columbia-canopy-project
[81] https://columbiasc.gov/as-heat-shatters-records-five-mayors-join-with-smart-surfaces-coalition-to-announce-major-new-infrastructure-initiative-to-cool-cities-and-advance-environmental-justice/

Solid Waste and Wastewater

Solid Waste and Wastewater Measures to be Evaluated in the Comprehensive Plan

Several measures in the solid waste and wastewater sectors were suggested but not able to be analyzed in time for this priority climate action plan. These measures will be explored further in the comprehensive climate action planning process.

- Utilizing biogas at wastewater treatment plant anaerobic digesters, including the potential to also divert food waste from landfill.
- Utilizing solar dryers in wastewater treatment.
- Addressing high energy usage and energy inefficiency in pump station networks. Consolidation and elimination of outdated wastewater treatment plants.
- Diverting food waste from landfills to composting.
- Exploring a pay as you throw policy for municipal waste streams.

Appendix A: Methods and Technical Documentation

Introduction & Planning Process

Data on community geography were taken from the U.S. Census Bureau. GIS Files were used from the TIGER database.[82] The population of the community was obtained from the United States Census Bureau, using 5-year county estimates from the American Community Survey (Table Code B01003).[83] The number of households and median household income in the community was obtained from the same source (Table Code S1101 and B19013, respectively).[84] Median household income was averaged, while the others were summed in Excel. The Gross Domestic Product of the community was obtained from the U.S. Bureau of Economic Analysis, "CAGDP2 Gross domestic product (GDP) by county and metropolitan area 1" dataset and summed in Excel.[85] Population growth was calculated by comparing the 2010 and 2020 Census Data for the Midlands and the state (Census Table P1 PL_94-171), and the percentage of the state's population residing in the Midlands was calculated from the 2020 Census values.[86] Data from Table 1 comes from the American Community Survey, 2022 5-year estimates. Minority population is the % non-White population, Table Code B01001A. Educational attainment is from Table S1501. Unemployment rate is from Table S2301. Poverty data is from Table S1701.

ArcGIS was used to map the distribution of LIDACs in the Midlands, using EPA's definition.[87] ArcGIS was used to calculate the geometric area and population weightings of LIDAC vs. non-LIDAC geographies in the Midlands, using the 2020 Census data for population as this is more accurate at the block group level.[88]

Preliminary Greenhouse Gas Inventory

This inventory was completed using ICLEI's ClearPath tool. Further information about the tool is available at https://icleiusa.org/clearpath/. In this appendix, all datasets used are assumed to be from the inventory base year (2022) unless otherwise mentioned; data sources from other years list the alternative time period along with reasoning for inclusion. This appendix lists major calculation choices in ClearPath that allow for other users to replicate this inventory (e.g. in some cases, ClearPath defaults can be assumed to be left unchanged if not specified here).

Inventory Tool Pre-Selections

Per EPA's recommendations in CPRG Program Guidance, the Global Warming Potentials (GWPs) from the Intergovernmental Panel on Climate Change (IPCC) 5th Assessment Report were used (100 year

[82] https://www.census.gov/geographies/mapping-files/time-series/geo/cartographic-boundary.html
[83] https://data.census.gov/
[84] https://data.census.gov/
[85] https://www.bea.gov/data/gdp/gdp-county-metro-and-other-areas
[86] https://data.census.gov/
[87] https://gaftp.epa.gov/EPA_IRA_Public/
[88] https://data.census.gov/

GWPs). These GWPs are pre-built into the inventory tool. The population of the community was obtained from the United States Census Bureau, using 5-year county estimates from the American Community Survey (Table Code B01003).[89] The number of households in the community was obtained from the same source (Table Code S1101).[90] The Gross Domestic Product of the community was obtained from the U.S. Bureau of Economic Analysis, "CAGDP2 Gross domestic product (GDP) by county and metropolitan area 1" dataset.[91]

Stationary Fuel and Grid Electricity

Electricity and stationary fuel data for the residential, commercial, and industrial sectors were obtained from the Department of Energy State and Local Planning for Energy (SLOPE) dataset.[92] The data viewer was used to obtain modeled activity data in MMBTU for each county and sector for both electricity and stationary fuel (natural gas). The values were summed, and electricity was converted to kWh in Excel, and data were then entered into ClearPath. Emissions factors for eGrid 2021 (most recent available at time of inventory completion) were used for grid electricity, and stationary fuel uses standard emission factors built into ClearPath.

Comprehensive Climate Action Plan Workplan

- The SLOPE dataset is a modeled dataset. The future inventory will attempt to use activity data for electricity and natural gas usage from local utilities. Aggregated metered data will give a clearer picture of building emissions across sectors than is available from SLOPE. If outreach to utilities is unsuccessful, then statewide datasets from authoritative sources such as the Energy Information Agency may be downscaled to the Midlands to replace SLOPE data.
- For stationary fuels beyond natural gas, attempts may be made to obtain activity data from local suppliers of propane and other fuels used for home heating. If this is unsuccessful, then statewide datasets from authoritative sources such as the Energy Information Agency will be downscaled to the Midlands, or other potential approaches will be explored.
- For the industrial sector, additional detail may be attempted to be gathered on industrial emissions using datasets from authoritative sources like the EPA's Facility Level Information on Green House Gases Tool, which reports emissions from large industrial sources in the Midlands.

Transportation

For transportation of cars, trucks and other on-road motor vehicles, Vehicle Miles Traveled (VMT) data from the South Carolina Department of Transportation were used.[93] ICLEI's Transportation Template Excel Spreadsheet was used to apportion the total VMT into VMT by vehicle type and fuel (gasoline and

[89] https://data.census.gov/
[90] https://data.census.gov/
[91] https://www.bea.gov/data/gdp/gdp-county-metro-and-other-areas
[92] https://www.energy.gov/scep/slsc/state-and-local-planning-energy-slope-platform
[93] Data obtained via SC DHEC BAQ-Emissions Inventory Section.

diesel) based on a National Default Vehicle Mix for the year 2020 (the most recent available). The data were then entered into ClearPath. ClearPath's default emissions factor sets were used, which rely on nationwide averages of emissions by vehicle type for the year 2021 (the most recent available).

For off-road, aviation, rail, and water-based transportation, the EPA's National Emissions Inventory (NEI) was used for the year 2020 (the most recent available).[94] For off-road, rail, and water-based transportation, ICLEI's NEI Template Excel Sheet was used to sum a data export using the NEI data retrieval tool. This template aggregated and converted the NEI non-road equipment by fuel, locomotives by type, and watercraft by fuel. These data were then entered into ClearPath. For aviation, after consultation with ICLEI and EPA's Technical Assistance Forum, a data query by sector summary was performed on NEI data to obtain aviation transportation emissions by county for the Midlands. These were then summed in Excel, converted from short tons to metric tons, and entered into ClearPath. Across categories, default ClearPath emission factor sets were used.

Comprehensive Climate Action Plan Workplan

- The future inventory will further evaluate VMT activity data from the South Carolina Department of Transportation's statewide vehicle travel demand model in terms compliance with greenhouse gas inventory protocols.
- To better understand vehicle mix in the Midlands, vehicle registration data were requested from the South Carolina Department of Motor Vehicles. This will enable a better breakdown of VMT activity data by vehicle type for the Midlands. If outreach to the state is unsuccessful, any obtainable statewide average or an updated nationwide average may be used.
- For off-road, aviation, rail, and water-based transportation, attempts may be made to collect activity data from organizations. If this is unsuccessful, then the National Emissions Inventory will continue to be used. Potential scaling factors will be explored if transportation in these categories can be reasonably expected to have changed between 2020 and 2022.

Solid Waste

Solid waste data were collected from the South Carolina Department of Health and Environmental Control (DHEC)'s Solid Waste Management Annual Report for Fiscal Year 2022.[95] This report lists all class 1 – 3 landfills in the inventory boundary along with the disposal in tons. DHEC's report covers the last half of 2021 and the first half of 2022 (June-June) in their fiscal year. Outreach to landfill operators was not complete by the time of this preliminary inventory but based on communication with the South Carolina Department of Health and Environmental Control's Solid Waste Permitting and Monitoring Section, initial information about methane collection and waste characterization was estimated. A case "typical" scenario for landfill methane collection was selected alongside 90% mixed MSW for Class 3 landfills, which are the major landfills and destinations for MSW. No methane gas is collected for Class 1 or Class 2 Landfills. Class 1 Landfills were assumed to be 90% branches and 10% leaves, while Class 2

[94] https://www.epa.gov/air-emissions-inventories/2020-national-emissions-inventory-nei-data
[95] https://scdhec.gov/environment/recycling-waste-reduction/solid-waste-recycling-reports

Landfills were assumed to be 20% organic material, split evenly between branches, lumber, and cardboard. Annual precipitation was obtained from the National Centers for Environmental Information Climate Normals dataset.[96] Columbia, SC station ID USW00013883 was used as a representative weather station near the centroid of the inventory boundary. Average annual precipitation was found to be 45.24 inches, which categorizes all Midlands landfills as "wet" for landfill moisture content. Waste disposal in tons was summed in Excel and then entered into ClearPath's solid waste calculator alongside the decisions above.

Composting data were collected from the South Carolina Department of Health and Environmental Control (DHEC)'s Solid Waste Management Annual Report for Fiscal Year 2022.[97] From DHEC's report, almost the entirety of compost in the inventory boundary is yard waste and wood products. This report lists composting facilities in the inventory boundary along with the disposal in tons. This data was summed in Excel and entered in ClearPath, categorized as "green waste". DHEC's report covers the last half of 2021 and the first half of 2022 (June-June) in their fiscal year.

Comprehensive Climate Action Plan Workplan

- Continue outreach to landfills to better waste diversion across the inventory boundary. Attempt to obtain relevant methane handling and processing data from Class 3 landfills to update assumptions in this preliminary inventory and comply with ICLEI recommendations and protocol requirements.
- Consult with DHEC or Class 3 landfills to try and obtain better MSW waste characterization data to improve the emission factor set for solid waste in Class 3 landfills.
- Consider whether to align the fiscal year data to the inventory year once DHEC's Fiscal Year 2023 report is available.

Wastewater

Potable water and wastewater utility data was obtained from Columbia Water (City of Columbia) using an ICLEI data collection form, among the largest utilities in the Midlands region. This form has the necessary information for ClearPath to calculate the emissions associated with the supply of potable water, wastewater treatment energy use, and emissions associated with wastewater processing methods. Outreach was conducted with other utility districts, but their data was not available in time for this priority plan. The available data from the City of Columbia was used as a proxy for water supply and wastewater treatment across the Midlands region and scaled by population. The population of the community was obtained from the United States Census Bureau, using 5-year county estimates from the American Community Survey (Table Code B01003).[98] The CMCOG planning department made the following first order estimates: 85% of the community received potable water and 15% of the community relied on well water, AND 70% of the community was connected to wastewater systems and 30% relied on septic system. These were then combined with the City of Columbia data to generate a

[96] https://www.ncei.noaa.gov/products/land-based-station/us-climate-normals
[97] https://scdhec.gov/environment/recycling-waste-reduction/solid-waste-recycling-reports
[98] https://data.census.gov/

proxy estimate for the remainder of the Midlands population by scaling the City of Columbia data upwards by population.

Note that because electricity usage and natural gas usage for potable water supply were calculated here, these combined totals were then subtracted from the commercial sector totals from SLOPE under Stationary Fuel and Grid Electricity.

Comprehensive Climate Action Plan Workplan

- Continue outreach to water and wastewater utilities to decrease the percentage of the Midlands population where estimates are used. Utilize as much activity data as possible in the comprehensive plan's inventory to decrease the reliance on estimation.
- Consider approaches for refining the estimate of the number of residents using septic systems.

Agriculture, Forestry, and Other Land Use (AFOLU)

AFOLU data related to application of fertilizer was calculated using EPA's Local Greenhouse Gas Inventory Tool. The tool's technical appendix for agriculture and land management provides a methodology for downscaling state-level fertilizer data to a county level. This method was followed for the Midlands by using South Carolina's Priority Climate Action Plan inventory, where fertilizer application quantities were taken for fertilizer year 2020 (the most recent available). Data on total crop acreage from the USDA Census of Agriculture 2017 (the most recent available) was used as a ratio to downscale from the state level data to the 7-county Midlands geography. Downscaled fertilizer quantities were then converted into CO_2e estimates using the EPA Inventory Tool and these were copied into ClearPath. Data from other agricultural sources was not yet included because the USDA will soon release an update to the Census of Agriculture based on 2022 data, and the currently available data from 2017 are too far outdated for the base year.

AFOLU data related to land cover were collected from ICLEI's Land Emissions and Removals Navigator (LEARN) tool to understand emissions from forests and urban forests within the Midlands. A shapefile with the county boundaries shown in Figure 2 was used to define the inventory area. The years 2011 – 2018 were used for forest and land cover change, and the years 2011 – 2016 were used for trees outside forests (the most recent years available for Midlands). The LEARN tool calculates landcover change to help determine emissions and removals from forest land cover conversions, and from trees outside forests. For the emissions factors, LEARN has representative cities by region. The available city that was geographically closest with a similar climate was selected, which was Atlanta GA. Emissions values generated from LEARN were then entered into ClearPath. Note these emissions were not included in the preliminary inventory due to uncertainty around negative removals of carbon from forests. Forests cover 58% of the Midlands according to the LEARN tool.

- Explore additional datasets or methodologies for land cover and land use in addition to ICLEI's LEARN tool.
- Explore datasets or methodologies to evaluate emissions from agricultural activities in the Midlands such as the 2022 Census of Agriculture. Aim to include more sources of emissions in agriculture and/or forestry as relevant in the Midlands for the comprehensive inventory.

Greenhouse Gas Emissions Forecast

ClearPath's forecasting tool was used to model a business-as-usual (BAU) projection for greenhouse gas emissions through 2050 based on the preliminary greenhouse gas inventory detailed in the prior section. Certain growth rates and carbon intensity forecasts were used to generate this projection, following consultation and recommendations from ICLEI. These include:

- No Change: a growth rate assuming no change in activity between 2022 and 2050.
- Population Growth: a growth rate assuming that population change is highly correlated with the underlying activity. This rate was created by using the decadal Census population growth rate of 7.7112% between the 2010 and 2020 censuses for the Midlands.[99] This population growth rate was then applied on a decadal basis through 2050 starting from the 2020 census total.
- Total Job Growth: a growth rate assuming that job totals in all nonfarm sectors is highly correlated with the underlying activity. This rate was created by using historical jobs data from the Bureau of Labor Statistics (Seasonally Adjusted South Carolina Columbia, SC Total Nonfarm All Employees, In Thousands: SMS45179000000000001).[100] An average annual growth rate in job totals was calculated using data from 2010 – 2022, which was then applied on a yearly basis through 2050 starting from the 2022 total.
- Manufacturing Job Growth: a growth rate assuming that job totals in the manufacturing sector is highly correlated with the underlying activity. This rate was created by using historical jobs data from the Bureau of Labor Statistics (Not Seasonally Adjusted South Carolina Columbia, SC Manufacturing All Employees, In Thousands: SMU45179003000000001. *Seasonally adjusted was not available in the database).[101] An average annual growth rate in job totals was calculated using data from 2010 – 2022, which was then applied on a yearly basis through 2050 starting from the 2022 total.
- Carbon Intensity – CAFE Standards: This growth rate models the improvement in efficiency standards in the transportation sector set by the EPA and the U.S. Department of Transportation.[102] This is a default rate supplied by ICLEI in ClearPath.
- Carbon Intensity – NREL Electricity Grid Change: This growth rate models the decreasing carbon intensity of the electricity grid. ICLEI created this growth rate by using the Cambium model from the National Renewable Energy Lab[103] and extending it to 2050 via a log-linear model.

[99] https://data.census.gov/
[100] https://data.bls.gov
[101] https://data.bls.gov
[102] https://www.transportation.gov/mission/sustainability/corporate-average-fuel-economy-cafe-standards
[103] https://www.nrel.gov/analysis/cambium.html

The growth rates above were applied to inventory sectors as described below to generate the BAU forecast:

- Stationary Fuel and Grid Electricity: For residential energy, population growth was used as a growth rate and the NREL electricity grid change was applied to electricity energy equivalent. For commercial energy, total jobs was used as a growth rate and the NREL electricity grid change was applied to electricity energy equivalent. For industrial energy, manufacturing jobs was used as a growth rate and the NREL electricity grid change was applied to electricity energy equivalent.
- Transportation: Population growth was applied to waterborne energy, aviation, small and large utility vehicles, rail, and to on road vehicle miles traveled (both gasoline and diesel, respectively). CAFE standard carbon intensity reductions were applied to on road vehicle miles traveled for gasoline only.
- Solid Waste: Population growth was applied to both waste landfilled and waste composted.
- Wastewater: Population growth was applied to all emissions. The NREL electricity grid change was applied to electricity energy equivalent.
- AFOLU: No change was applied to fertilizer emissions.
- Process & Fugitive Emissions: Population growth was applied to natural gas released.

Priority Greenhouse Gas Reduction Measures

Measure FG.1: LEAP into Energy Efficiency Across the Midlands for 15% of Residential Buildings by 2030 and 60% of Residential Buildings by 2050

NREL provided data to the City of Columbia under the Communities LEAP program focused on the local residential housing stock.[104] The LEAP study concluded that a whole home project including the building envelope, heat pump water heater, and high efficiency heat pump would cost $32,254 and reduce GHG emissions by 2.547 MT on average. This average represents a whole community approach to the Columbia, SC housing stock, which is a mix of mostly detached single-family homes but also includes multi-family buildings. This plan assumes that this average is largely representative of the Midlands area. The number of housing units across the Midlands 7 counties (343,776) was collected from the Census Bureau (ACS 2022 5-year Table B25032).[105] This was multiplied by the LEAP GHG reduction average to estimate a community-wide reduction. All values were held constant through 2050. Although the number of housing units and relative GHG reductions saved from energy efficiency improvements can be reasonably expected to increase, this average from LEAP is also an upper-bound considering it combines multiple energy efficiency improvements (and some residents may only do one improvement at a time, e.g. only a building envelope improvement). Since these counter-act, this plan assumes that holding the values constant is a reasonable assumption to use in estimation. A final assumption is that an energy efficiency improvement would continue reducing emissions annually for 25 years. Some water heaters and HVACs may be replaced earlier than this, but not likely by a large margin (and are

[104] Liu, Lixi, Jes Brossman, and Yingli Lou. 2023. "ResStock Communities LEAP Pilot Residential Housing Analysis." NREL Data Catalog. Golden, CO: National Renewable Energy Laboratory. Last updated: December 12, 2023. DOI: 10.7799/2222487.

[105] https://data.census.gov/

furthermore likely to be replaced by similar energy efficient equipment). A linear model was used to calculate intermediate years between 2025-2030 and 2031-2050. This resulted in a GHG reduction of 131,340 MT CO_2e in 2030, 525,358 MT CO_2e in 2050, with a cumulative reduction of 492,524 MT CO_2e between 2025 – 2030 and a cumulative reduction of 6,763,990 MT CO_2e between 2031 – 2050. The cost of the 60% target was calculated using the average cost value above times that ratio of current housing units in the Midlands.

Measure FG.2: Energy Audits and Communicating about Energy Efficiency

The Energy Policy Simulator (v. 3.4.3) created by Rocky Mountain Institute and Energy Innovation was used to model the GHG reductions associated with this measure.[106] The simulator has a closely aligned policy measure "improved labeling" which reduces energy consumption from energy efficient home HVAC systems and appliances because of a labeling program. This policy was enabled, and all other settings were kept to the tool's defaults. Since the simulator's policy does not encompass the building envelope or other potential savings measures like most energy audits or the home energy score would, the output GHG reductions were doubled (this assumes that the building envelope and other energy efficiency measures have approximately equal impact on energy efficiency savings as HVAC and appliance improvements). Finally, the simulator outputs a model state-wide policy, so these reductions were then downscaled to the Midlands region by using the ratio of the Midlands 2020 Census population to the Statewide 2020 Census population, or 0.169425.[107] This resulted in a GHG reduction of 14,062 MT CO_2e in 2030 and 18,230 MT CO_2e in 2050, with a cumulative reduction of 149,162 MT CO_2e between 2025 – 2030 and a cumulative reduction of 303,406 MT CO_2e between 2031 – 2050.

Measure FG.3: Generate 500 MW of New Solar Projects in the Residential, Commercial, and Municipal Sectors by 2050

The EPA's AVERT Web Tool was used to model the GHG reductions associated with this measure by evaluating 500MW of distributed solar generation.[108] Distributed solar was selected because it is anticipated that most projects under this measure will be smaller-scale, behind the meter projects, due to the current low rates of community solar or other utility-scale project formats in the Midlands. Some municipal projects may be more like utility-scale projects if they are beyond a certain size threshold. Avert gave the following annual emissions changes to the grid from this change additional solar:

Pollutant	Original	Post Change	Change
SO_2 (lb)	27,538,900	27,231,300	-307,600
NO_X (lb)	65,389,140	64,893,830	-495,310
CO_2 (tons)	66,328,420	65,778,550	-549,870
$PM_{2.5}$ (lb)	9,704,520	9,608,230	-96,290
VOCs (lb)	3,349,510	3,298,790	-50,730

[106] https://energypolicy.solutions/home/southcarolina/en
[107] https://data.census.gov/
[108] https://www.epa.gov/avert/avert-web-edition

NH_3 (lb)	4,051,710	4,021,230	-30,490

The emissions reductions for CO_2 were then calculated in a linear equation assuming a starting point of zero in 2025 and reaching the target of 500 MW by 2050. This assumption assumes Avert's representation of the electricity grid in 2050 is equivalent to today's electricity grid, which is not the case. However, it is still a representative reduction, particularly when compared in time years closer to the present day. Additional options for calculating the GHG emissions reduction of this measure may be used in the comprehensive climate action plan. A final assumption is that solar panels will last at least 25 years, such that a panel in 2025 will still be generating in 2050, which is a reasonable assumption for many performance warranties today.[109] This current approach resulted in a GHG reduction of 109,974 MT CO_2e in 2030 and 549,870 MT CO_2e in 2050, with a cumulative reduction of 329,922 MT CO_2e between 2025 – 2030 and a cumulative reduction of 6,818,388 MT CO_2e between 2031 – 2050.

Measure T.1: Increase the Share of Electric Vehicles in Passenger Transportation to 15% by 2030 and 60% by 2050 via Enhanced Public Charging Infrastructure

The EPA's AVERT Web Tool was used to model the GHG reductions associated with this measure by evaluating a number of light-duty battery EVs that reached the targets of 15% and 60% of passenger transportation.[110] AVERT compared an entered vehicle count to the statewide % vehicles on the road in 2022, giving 710,000 vehicles for 15% and 2,835,000 vehicles for 60%. These were then scaled to 2030 and 2050 (respectively) using the decadal Census population growth rate for the Midlands of 7.7112%.[111] Finally, these projected vehicle counts were then downscaled to the Midlands region by using the ratio of the Midlands 2020 Census population to the Statewide 2020 Census population, or 0.169425.[112] This resulted in input EV counts of 129,568 (15%) and 600,224 (60%).

Using the input EV counts above, GHG emissions estimates were obtained from AVERT. Using the web version of the tool, the 2030 target was the input for light-duty battery EVs, and the vehicles were assumed to replace existing vehicles beginning in 2025, resulting in the following overall changes in annual emissions:

Pollutant	from Fossil Generation	from Vehicles	Net Change
SO_2 (lb)	132,700	-7,190	125,510
NO_X (lb)	208,810	-759,150	-550,340
CO_2 (tons)	220,700	-711,930	-491,230
$PM_{2.5}$ (lb)	39,130	-16,140	22,990
VOCs (lb)	21,510	-1,022,060	-1,000,560
NH_3 (lb)	12,560	-170,170	-157,610

[109] https://www.energysage.com/solar/solar-panel-warranties/
[110] https://www.epa.gov/avert/avert-web-edition
[111] https://data.census.gov/
[112] https://data.census.gov/

Using the web version of the tool, the 2050 target was the input for light-duty battery EVs, and the vehicles were assumed to be replace existing vehicles beginning in 2028 (the latest year in AVERT), resulting in the following overall changes in annual emissions:

Pollutant	from Fossil Generation	from Vehicles	Net Change
SO_2 (lb)	597,250	-31,520	565,730
NO_X (lb)	946,140	-2,260,180	-1,314,050
CO_2 (tons)	996,630	-3,120,460	-2,123,830
$PM_{2.5}$ (lb)	177,050	-68,670	108,390
VOCs (lb)	98,500	-3,770,110	-3,671,610
NH_3 (lb)	57,150	-699,510	-642,350

Tons of CO_2 were converted into metric tons by multiplying by the conversion factor of 0.9071847. AVERT reports annual emissions from the vehicle transition alone, and a net change resulting from increased electricity consumption using today's electricity grid. It is likely that emissions from the power grid will decrease in future years due to increasing renewables and retirement of coal power plants. For this plan's carbon emission reductions, an average of the net change and from vehicles change was used to account for this future change in the grid. This results in an emissions reduction of 545,744 MT of CO_2e in 2030 and 2,378,770 MT CO_2e in 2050. A linear equation was calculated using these two points and summed in Excel to give a cumulative emissions reduction of 1,899,696 MT CO_2e between 2025 – 2030 and 30,161,653 MT CO_2e between 2031 - 2050.

The Department of Energy's Electric Vehicle Infrastructure Projection (EVI-Pro) Lite tool was used to estimate the need for EV chargers in the Midlands. The EVI-Pro tool uses data from the Columbia MSA but excludes Newberry County. Using the 2030 target's EV count above and assumptions of full support for plug-in hybrids and the default 90% of drivers having access to home charging, EVI-Pro reports a need for 3,075 shared private charging ports and 4,575 public level 2 charging ports.

Measure AFOLU.1: Smart Surfaces Implementation

Greenhouse gas emissions reductions and cost data were taken from a comparable analysis for the City of Baltimore by the Smart Surfaces Coalition.[113] The data for avoided emissions from solar was not included here because solar is referenced as a separate measure. This report gave a total emissions reduction amount over a 30-year horizon, and this was converted into a yearly estimate. Columbia is currently working with the Smart Surfaces Coalition and expects to have a similar analysis and report completed in 2024. The comparative Baltimore data we are using here will be replaced with data specific to the Columbia, SC metro area in the final Comprehensive Climate Action Plan.

[113] https://smartsurfacescoalition.org/baltimore-report

Appendix B: List of LIDACs

This appendix presents a list of Census Block Group identifiers that the EPA has identified as low-income and/or disadvantaged communities. This list is also available as an Excel spreadsheet.

ID
450179502011
450179502022
450179502023
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