Technical Appendix

The greenhouse gas estimates for the Enhanced Green Communities Program were based off several proposed measures in the ARC Priority Climate Action Plan (PCAP). Those measures were scaled to the 29-county Metropolitan Statistical Area (MSA) while the Implementation Grant is focused on the core 11-counties of the ARC. This appendix will recap the methodologies and assumptions used to develop GHG estimates in the PCAP, and how they were downscaled from 29-counties to 11-counties.

Transition to Electric Vehicles and Increase EV Infrastructure

Transition to Electric Vehicles

An Excel-based CMAQ Calculator was used as a source to estimate emission rates for electrifying public fleet vehicles. The emission rates in this tool are derived from the EPA MOVES tool. It was assumed that a 3,000 fleet of half cars and half trucks could be transitioned during 2025-2030. This was a downscaling compared to an ambitious 60,412 for the entire 29-county MSA.

- 1,500 cars
- 1,500 trucks
- Gas car emission rate = 308.7 g/veh/mile
- Annual car mileage (both) = 25,000 miles
- Gas truck emission rate = 399.5 g/veh/mile
- Annual truck mileage = 40,000 miles
- EV vehicles = 0 g/veh/mile
- Replacement Rate/yr (cars & trucks) (2025-2029) = 250

Replacing the public fleets with this timeline gets the region to a 100% electric fleet by 2030. This analysis only considers the reduction in tailpipe emissions and compares it to a Business As Usual case of maintaining similarly emitted gas vehicles through 2050. Table 1 shows the results of placement schedule compared to a Business As Usual case, and the difference that makes the cumulative GHG reduction.

Table 1: Transitioning Fleets to EVs GHG Reductions

	2030	2050
Replacement Plan	88,870,575	88,870,575
No Replacements	213,289,379	924,253,978
GHG Reduction (MTCO2e)	124,419	835,383

Expand EV Charging Infrastructure

Expanding EV charging infrastructure was modeled using the Rocky Mountain Institute's (RMI's) Energy Policy Simulator (EPS), an "open-source model for estimating the environmental, economic, and human health impacts of hundreds of climate and energy policies." Environmental, economic, and human health impacts resulting from each measure's implementation were estimated for two periods: 2025-2030 and 2025-2050.

To model the measure in the EPS, a "business-as-usual" (BAU) and a "policy" scenario were developed, projecting out assumptions and key inputs related to the measure to 2050. The BAU scenario assumes no implementation of the reduction measure while the policy scenario assumes full implementation of the measure.

All assumptions and inputs to the EPS are listed in Appendix C of the ARC PCAP under "Expand EV Charging Infrastructure". Table 2 shows the GHG reductions from expanding EV charging infrastructure in the ARC region. Note that the + in the 2025-2050 column suggests that a GHG increase.

Table 2: GHG Reductions from Expanding EV Charging Infrastructure

	2025-2030	2025-2050
GHG Reduction (MTCO2e)	0	+3,156

It is assumed that there is no impact in the short-term by expanding infrastructure, but an increase in the long-term due to the factoring in manufacturing-related emissions. These estimates are for the 29-county MSA, but the full 3,156 MT CO2e were considered in the 2025-2050 calculations without any downscaling in case there are significant externalities to this measure and because the 11-county core will have the most need for EV chargers.

Shift Transportation Modes

Shifting transportation modes was modeled by the Rocky Mountain Institute's (RMI's) Energy Policy Simulator (EPS). Only passenger vehicles were considered, and mode shifting ramps up gradually to 26% in 2050. EPS models the entire state of Georgia, and its outputs were downscaled to the 11-county ARC by a population factor. ARC's population is 45.25% of the state's population as of the 2020 Census, so the ARC reduction is 45.25% of the State of Georgia estimate. Table 3 shows the results for 2025-2030 and 2025-2050.

Table 3: Transportation Mode Shift GHG Reductions

	State of Georgia	ARC 11-County
2025-2030 Cumulative Reductions (MTCO2e):	4,666,000	2,111,133
2025-2050 Cumulative Reductions (MTCO2e):	44,993,000	20,357,092

Protect and Increase Trees and Greenspace

Protecting and increasing trees and greenspaces as a GHG reduction measure was modeled by the Rocky Mountain Institute's (RMI's) Energy Policy Simulator (EPS). The following options under Agriculture, Land Use, and Forestry section were dialed up to 100% and the results exported.

- Afforestation and Reforestation
- Avoid Deforestation

- Grassland Restoration and Avoided Conversion
- Forest Set-Asides
- Cropland and Rice Measures
- Improved Soil Measures
- Improved Forest Management
- Livestock Measures

The results are for the entire State of Georgia and were downscaled to the 11-county ARC by a land area factor. ARC's land area is 5.6% of the state's land area, so the ARC reduction is 5.6% of the State of Georgia estimate. Table 4 shows the results for 2025-2030 and 2025-2050.

Table 4: Trees and Greenspace Reductions

	State of Georgia	ARC 11-County
2025-2030 Cumulative Reductions (MTCO2e)	10,311,000	573,293
2025-2050 Cumulative Reductions (MTCO2e)	120,557,000	6,702,984

Adopt More Efficient Energy Codes & Electrify Buildings

Energy Efficient Buildings
There is a detailed description of the assumptions, inputs, and outputs towards estimating the GHG reductions from increasing building energy efficiencies in Appendix C of the ARC PCAP under "Increase Energy Efficiency in Industrial and Commercial Buildings (including Multifamily)".

- Emissions data from 2022 for each county was gathered from Drawdown Georgia. The emissions were categorized into Residential, Commercial, and gas vs electric as a source. Only the 11 counties in the ARC were selected for this.

Table 5: Energy Efficiency GHG Reductions

	29-County MSA	11-County ARC
2025-2030 Cumulative Reductions (MTCO2e)	4,746,945	4,113,660
2025-2050 Cumulative Reductions (MTCO2e)	58,747,601	50,712,171

Electrify Buildings
There is a detailed description of the assumptions, inputs, and outputs towards estimating the GHG reductions from electrifying building in Appendix C of the ARC PCAP under "Electrify Buildings". These estimates are for the 29-county MSA and are downscaled to the 11-county ARC using a variety of adjustments.

- Emissions data from 2022 for each county was gathered from Drawdown Georgia. The emissions were categorized into Residential and Commercial. Only the 11 counties in the ARC were selected for this.

- Future projections of new residential and commercial space were based on City of Atlanta projections and scaled to the 11-county region by how much of each space type exist in Atlanta versus the rest of the region.
- Energy and emissions reductions were estimated by extrapolating off an earlier building study conducted in the City of Atlanta.

Table 6: Changes made to Electrifying Buildings Model

	29-County MSA	11-County ARC
Residential Emissions (MTCO2e)	17,070,700	13,875,500
Commercial Emissions (MTCO2e)	13,982,581	12,558,400
Residential floorspace in ATL to Residential floorspace reference area	6%	8%
Commercial floorspace in ATL to Commercial floorspace reference area	12%	16%

Table 7: Electrifying Buildings GHG Reductions

	29-County MSA	11-County ARC
2025-2030 Cumulative Reductions (MTCO2e)	1,526,961	1,244,402
2025-2050 Cumulative Reductions (MTCO2e)	20,983,721	17,431,966

Increase Renewable Energy Adoption

There is a detailed description of the assumptions, inputs, and outputs towards estimating the GHG reductions from increasing renewable energy adoption in Appendix C of the ARC PCAP under "Increase Use of Photovoltaics". Sources of data and tools include, but are not limited to, Google Project Sunroof, NREL Slope, Greenlink's ATHENIA model, and the US EIA.

Table 8 shows the maximum assumed reductions from adopting more renewable energy in the ARC region. These numbers are developed using a modest 5% adoption rate in the 29-county MSA, and are used for the 11-county region assuming a slightly more aggressive adoption rate in both the short- and long-term.

Table 8: Renewable Energy Adoption GHG Reductions

2025-2030 Cumulative Reductions (MTCO2e)	1,838,133
2025-2050 Cumulative Reductions (MTCO2e)	17,479,829

Divert Waste from Landfills

There is a detailed description of the assumptions, inputs, and outputs towards estimating the GHG reductions from diverting waste from landfills in Appendix C of the ARC PCAP under "Increase Diversion of Waste from Landfills". EPA's WARM model was a key tool for this exercise.

The methodology used in the PCAP assumes that data from the City of Atlanta can be extrapolated out to the full 29-county MSA. These assumptions are maintained, but only extrapolated out to the 11-county ARC geography based on a population factor.
City of Atlanta has 10% of the population of the 11-county ARC region. Table 9 shows the results for City of Atlanta, the rest of region, and the cumulative GHG reductions.

Table 9: Divert Waste from Landfills GHG Reductions

City of Atlanta	
Cumulative GHG Reductions by 2030 (MTCO2E)	735,880
Cumulative GHG Reductions by 2050 (MTCO2E)	8,621,810
Non-Atlanta	
Cumulative GHG Reductions by 2030 (MTCO2E)	5,887,037
Cumulative GHG Reductions by 2050 (MTCO2E)	79,061,761
Total for 11 Counties	
Cumulative GHG Reductions by 2030 (MTCO2E)	**6,622,916**
Cumulative GHG Reductions by 2050 (MTCO2E)	**87,683,571**

Final Calculations

Table 10 has the aggregate emission reductions from each measure for the 2025-2030 and 2025-2050 time periods.

Table 10: Aggregate Emissions from All Climate Measures

	2025-2030	**2025-2050**
Fleet Replacement & Charging Infrastructure	124,419	832,227
Mode Shift	2,111,133	20,357,092
Trees & Greenspace	573,293	6,702,984
Energy Efficiency	4,113,660	50,712,171
Building Electrification	1,244,402	17,431,966
Solar Power	1,838,133	17,479,829
Waste Diversion	6,622,916	87,683,571
Reduction (MTCO2e)	**16,627,956**	**201,199,839**

It is assumed that these full reductions may not occur due to low participation from eligible governments, difficulty implementing policies, or any number of external factors. As such, the reported numbers in this grant were further reduced from those in Table 10.

Table 11 shows the reported numbers where the 2025-2030 numbers are at 50% their maximum value, and the 2025-2050 numbers are at 80% their maximum value.

Table 11: Reported Aggregate Emissions from All Climate Measures

	2025-2030	2025-2050
Fleet Replacement & Charging Infrastructure	62,209	665,782
Mode Shift	1,055,566	16,285,674
Trees & Greenspace	286,646	5,362,387
Energy Efficiency	2,056,830	40,569,737
Building Electrification	622,201	13,945,572
Solar Power	919,067	13,983,863
Waste Diversion	3,311,458	70,146,857
Reduction (MTCO2e)	**8,313,978**	**160,959,871**