CHARLOTTESVILLE

Acting on Climate Together

charlottesville.gov/climate

6/8/2022 Senior Statesmen of Virginia

Susan Elliott

City of Charlottesville Climate Protection Program Manager

Climate Action Commitments

- 2006 – US Mayors Climate Protection Agreement
  - Comprehensive Plan (2007; 2013; 2018; 2021)
  - Charlottesville City Council Vision 2025: A Green City (2009)
- 2017 – Global Covenant of Mayors Commitment

PHASE	CLIMATE ACTION (GHG REDUCTIONS)	CLIMATE ADAPTATION
PHASE 1: Inventory	Measure city-wide GHG emissions	Identify climate hazards
PHASE 2: Target	Set a GHG reduction target	Assess climate vulnerabilities
PHASE 3: Plan	Develop climate action plans to deliver on target	Develop climate adaptation plan

City of Charlottesville's Climate Protection Program

Charlottesville's Greenhouse Gas (GHG) Emission Goals:

- **Reduce GHG emissions 45% by 2030**
- **Achieve carbon neutrality by 2050**

CHARLOTTESVILLE
Acting on Climate Together

Charlottesville's Greenhouse Gas Emissions are approximately:

RESIDENTIAL GHG	COMMERCIAL GHG	TRANSPORTATION GHG	WASTE GHG
30%	30%	30%	5%

charlottesville.gov/climate

Charlottesville's Greenhouse Gas Emissions are approximately:

95% Community

5% Municipal

RESIDENTIAL GHG

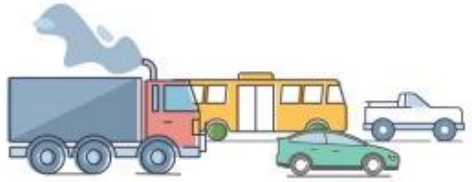
30%

COMMERCIAL GHG

30%

TRANSPORTATION GHG

30%



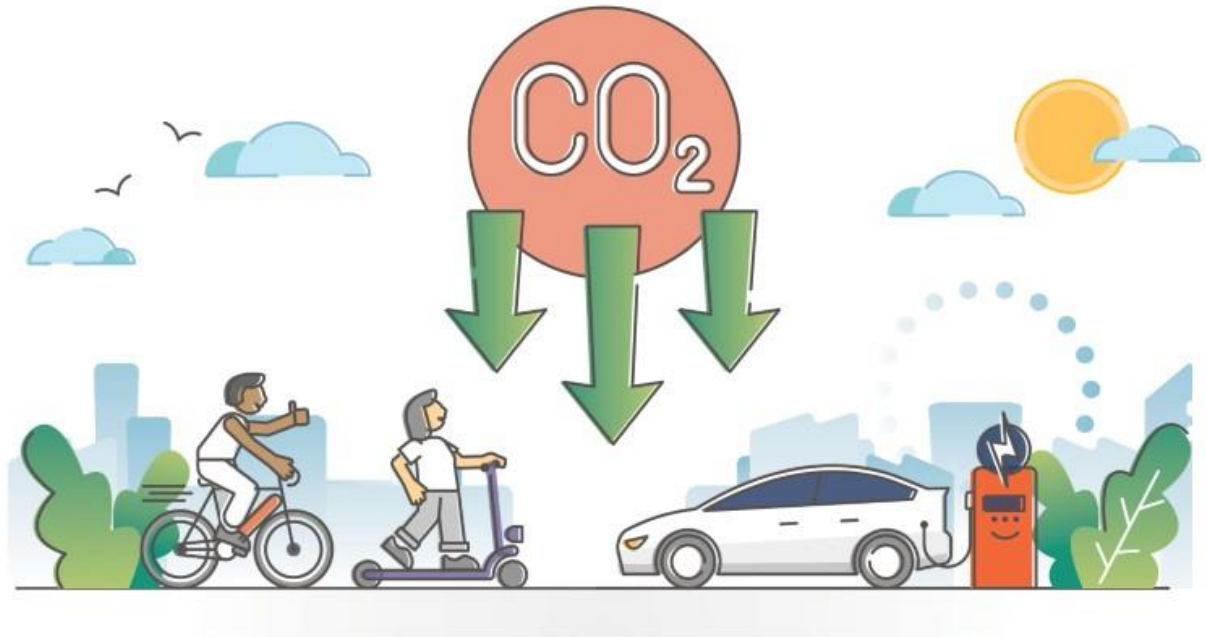
WASE GHG

5%

City of Charlottesville's Climate Protection Program

THE CITY'S CLIMATE PROGRAM INCLUDES:

- Planning for GHG emission reductions and climate adaptation
- Advancing energy improvements and renewable energy use in buildings throughout our community
- Encouraging use of fuel-efficient and carbon-free ways of getting around town
- Supporting public options for electric vehicle charging stations
- Reducing emissions from waste through composting and landfill diversion



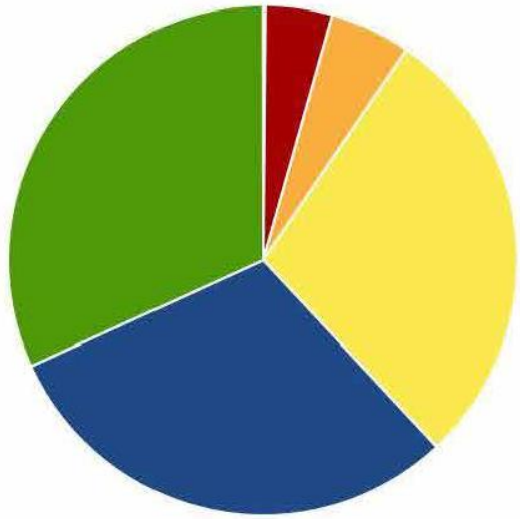
OUR COMMITMENT: By connecting our community with resources and programs that are available, accessible, and affordable, the City's Climate Program aims to support individual action to reduce the impacts of climate change and to help our community thrive.

charlottesville.gov/climate

Emissions Outcomes

Charlottesville Community GHG Emissions by Year					
	CO_2e (MT)				
Sector	**2011**	**2016**	**2017**	**2018**	**2019**
Transportation & Mobile Sources	128,835	92,648	92,218	90,938	91,205
Solid Waste	24,694	16,302	16,687	16,721	16,425
Water & Wastewater	-	271	271	271	271
Commercial Energy *	170,003	123,838	117,652	115,046	101,688
Industrial Energy	372	195	190	208	200
Residential Energy	135,405	108,393	100,986	107,699	96,389
Process & Fugitive Emissions	-	13,556	12,857	15,078	
Total	**459,309**	**355,203**	**340,861**	**345,961**	
% change from 2011		-23%	-26%	-25%	

** The Commerical Energy Sector includes Municipal and Non-Municipal Government energy consumpti*



30%
Reduction
Achieved

Charlottesville's Greenhouse Gas (GHG) Emission Goals:

- **Reduce GHG emissions 45% by 2030**
- **Achieve carbon neutrality by 2050**

GHG Emission Inventories

What are they? And, how are they done?

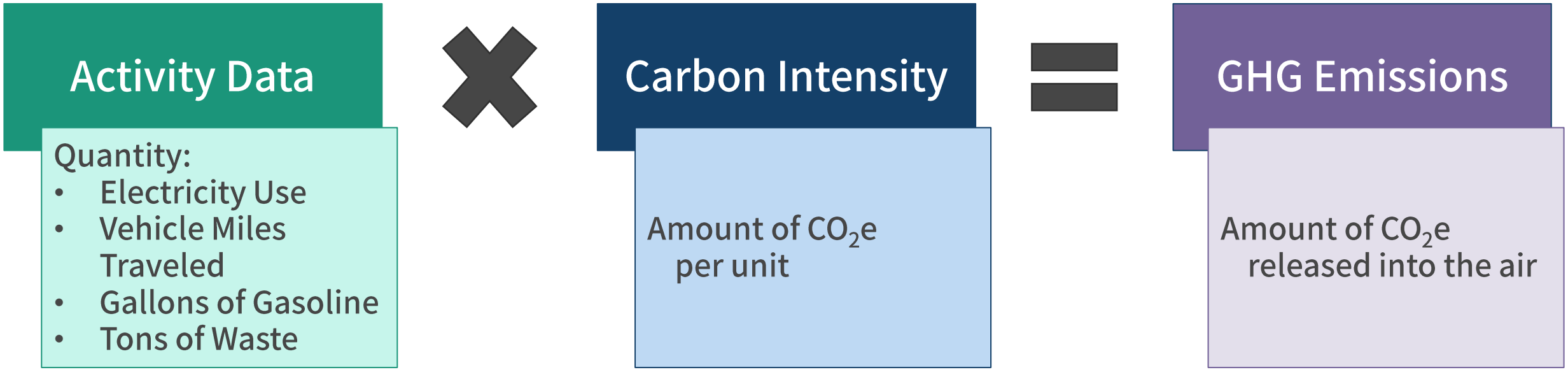
https://ghgprotocol.org

COMPANIES AND ORGANIZATIONS

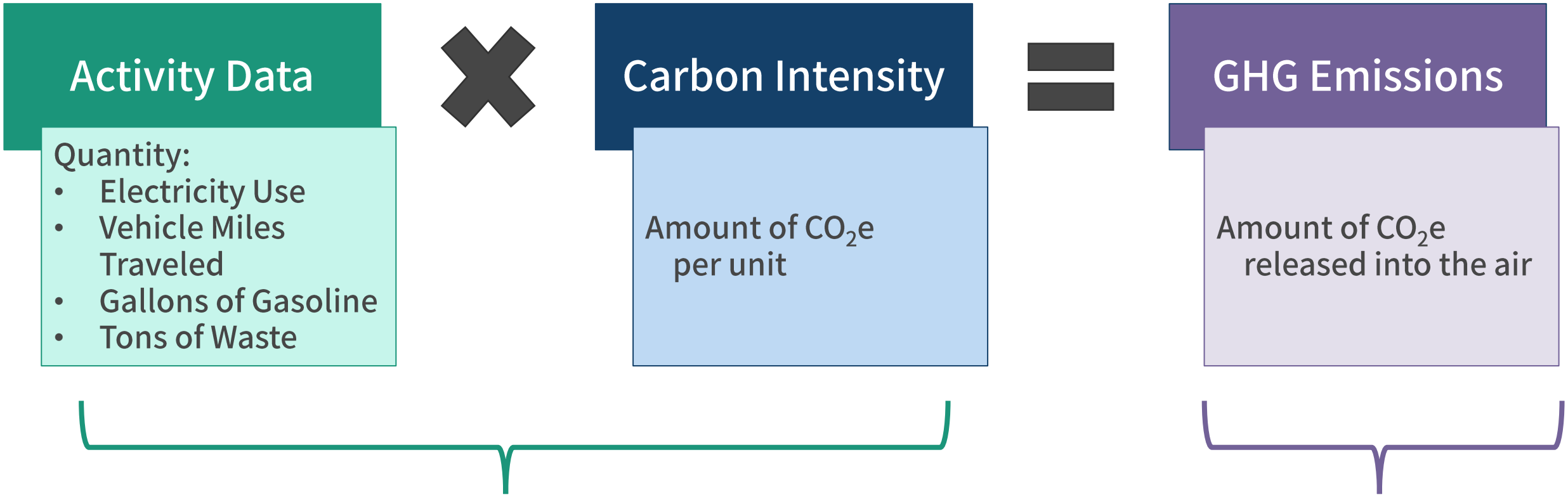
COUNTRIES AND CITIES

How GHG Emissions are Calculated

How GHG Emissions are Calculated



How GHG Emissions are Calculated



Reducing GHG Emissions

Activity Data × **Carbon Intensity** = **GHG Emissions**

Quantity:
- Electricity Use
- Vehicle Miles Traveled
- Gallons of Gasoline
- Tons of Waste

Amount of CO_2e per unit

Amount of CO_2e released into the air

Emission Reduction Actions

- Reduce Induced Demand
- Increase Equipment Efficiency
- Conservation Behaviors

- Switch to Lower Carbon Fuels
- Renewables

- Sequestration
- Carbon Farming
- Carbon Capture

Strategy Considerations for Buildings

- Current, Upcoming, and Potential Funding Routes
- New Housing & New Construction (emissions additions)
- Proactive retrofits vs. at point of Equipment Replacement
- Policy Priorities: ex. Small Number of Big Buildings, or Large Number of Small Buildings
- Split Incentive (between Property Owners and Renters)
- Lifetime Savings vs. Upfront Costs
- Resilience, Adaptation, Quality of Life benefits

Strategy Considerations for Transportation

- Land Use, Transportation, Natural Resources Planning
- New Construction and Housing
  - Street Network & Connections
  - Street Design
  - EV-Ready Standards
  - Parking Access (EVs and bikes)
- Lifetime Savings vs. Upfront Costs
- Split Incentive
- Resilience, Adaptation, Quality of Life benefits
- Policy Priorities:
  - ex. Looking ahead: EV market & current new housing, charging options
  - ex. Reliable & connected walkable/bikeable network
  - ex. Zoning density & transit ridership (current, future)
- Current, Upcoming, and Potential Funding Routes

Stay In Touch

CHARLOTTESVILLE
Acting on Climate Together

- **Climate Action News Flashes – Sign Up!**
  Subscribe to receive **emails or texts** when new content and events are added:
  charlottesville.gov/notifyme

- **Climate Planning webpage:**
  - Workshop recordings
  - Informational materials
  - Future events
  - Contact form
    charlottesville.gov/climateplan

Presentation for

Senior Statesmen of Virginia

Albemarle County Climate Protection Program

Gabe Dayley
Climate Protection Program Manager
gdayley2@albemarle.org
albemarle.org/climate | albemarle.org/stewardship

June 8, 2022

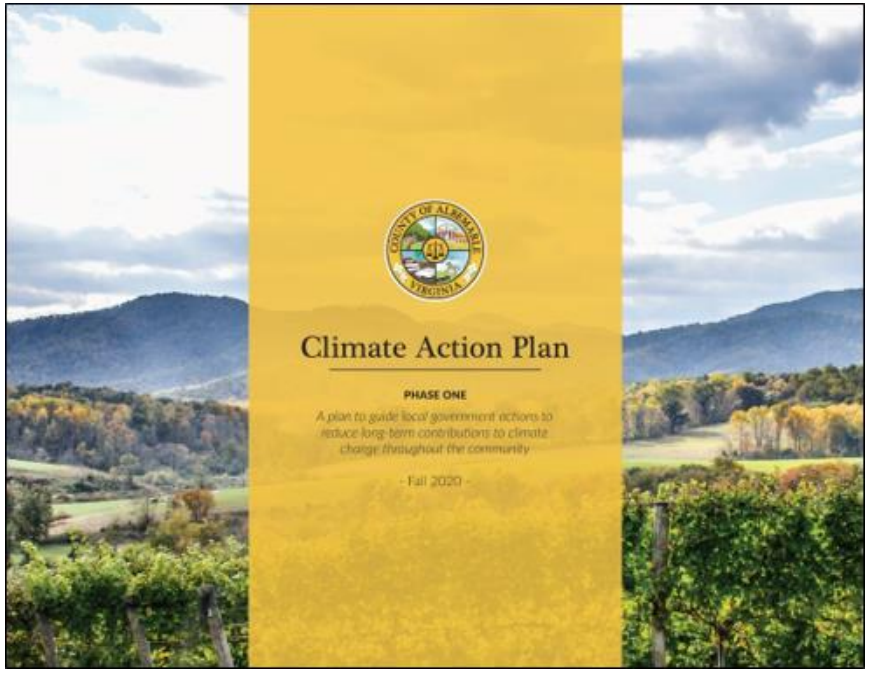
Agenda

- Climate Protection Program Overview
- Climate Action & Comprehensive Plan
- How You Can Get Involved

Climate Protection Program Overview

Climate Action Plan

- Adopted in 2020
- Key themes:
  - Health
  - Economy
  - Environment
  - Equity
- Targets:
  - Reduce emissions by 45% from 2008 levels by 2030
  - Achieve zero net emissions by 2050



Albemarle County Climate Action Plan (2020)

Climate Action Plan

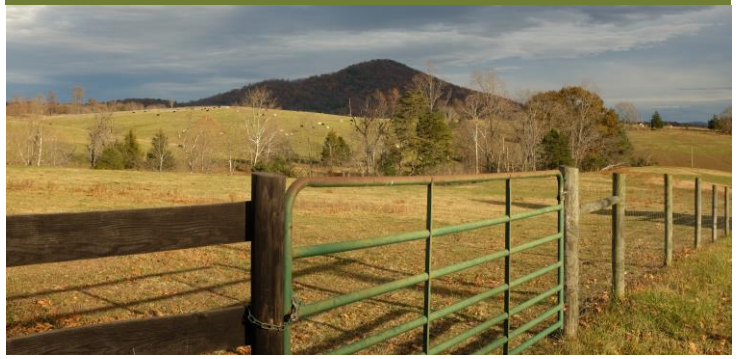
Transportation & Land Use

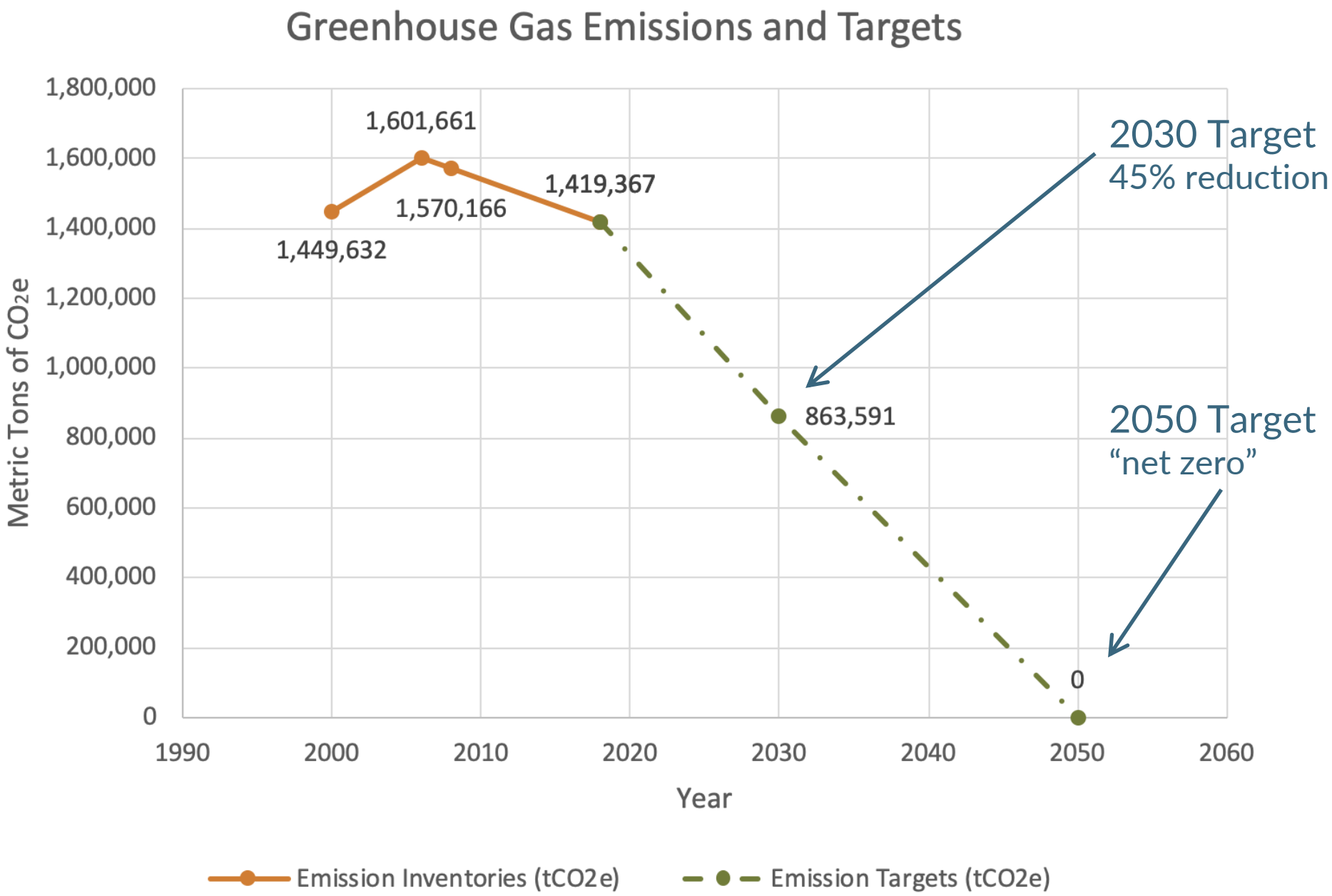
Building Energy Use

Sustainable Materials Management

Renewable Energy Sourcing

Landscape, Natural Resources, Ag




Greenhouse Gas Emissions and Targets
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Metric Tons of CO2e
1,449,632
1,601,661
1,570,166
1,419,367
863,591
0
2030 Target
45% reduction
2050 Target
"net zero"
1990
2000
2010
2020
2030
2040
2050
2060
Year
Emission Inventories (tCO2e)
Emission Targets (tCO2e)

Current Program Activities

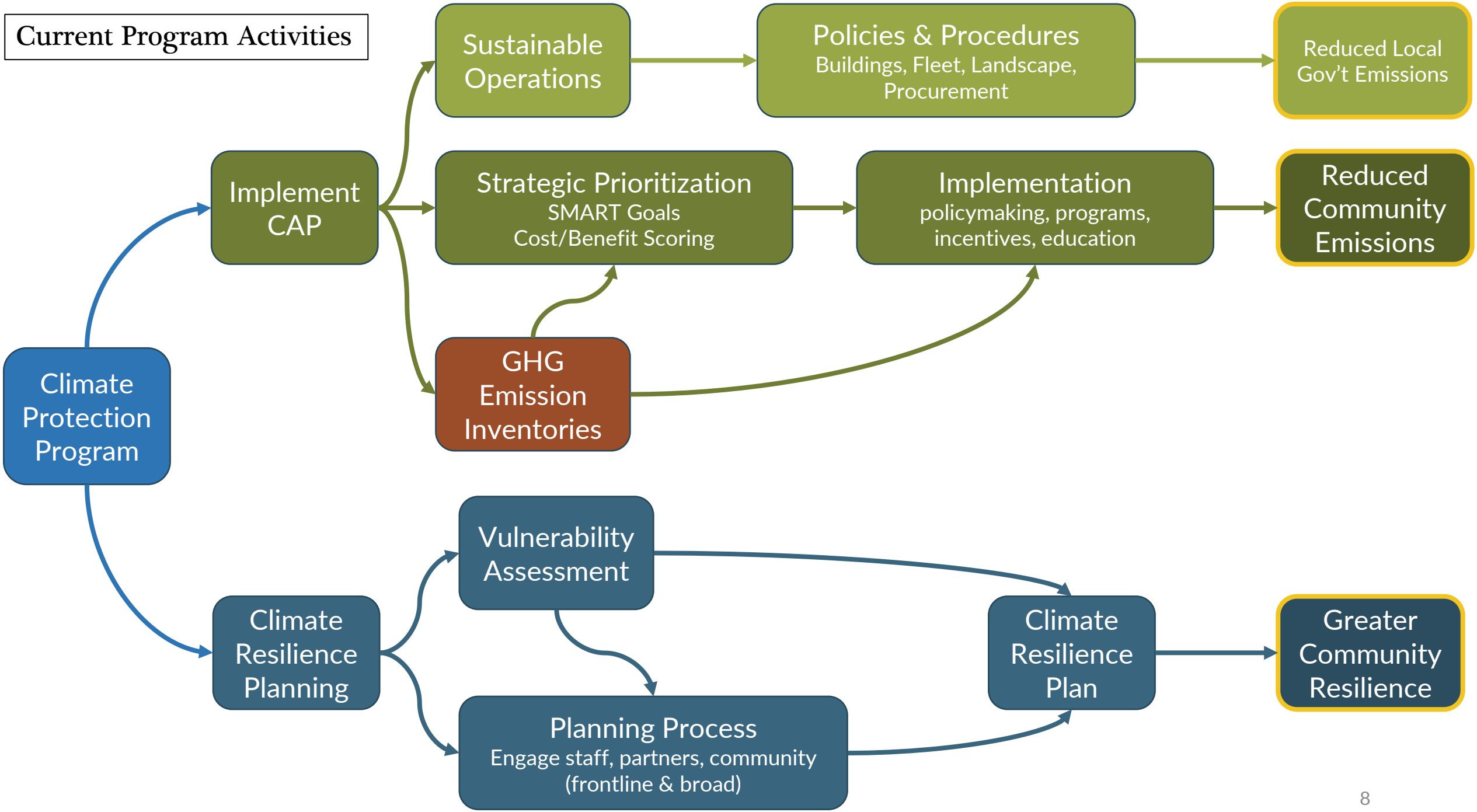
Climate Action Plan Implementation

- Prioritize community-oriented actions
- Local Government Sustainable Operations Policies
- 2020 Greenhouse Gas Emission Inventory

Climate Adaptation & Resilience Planning

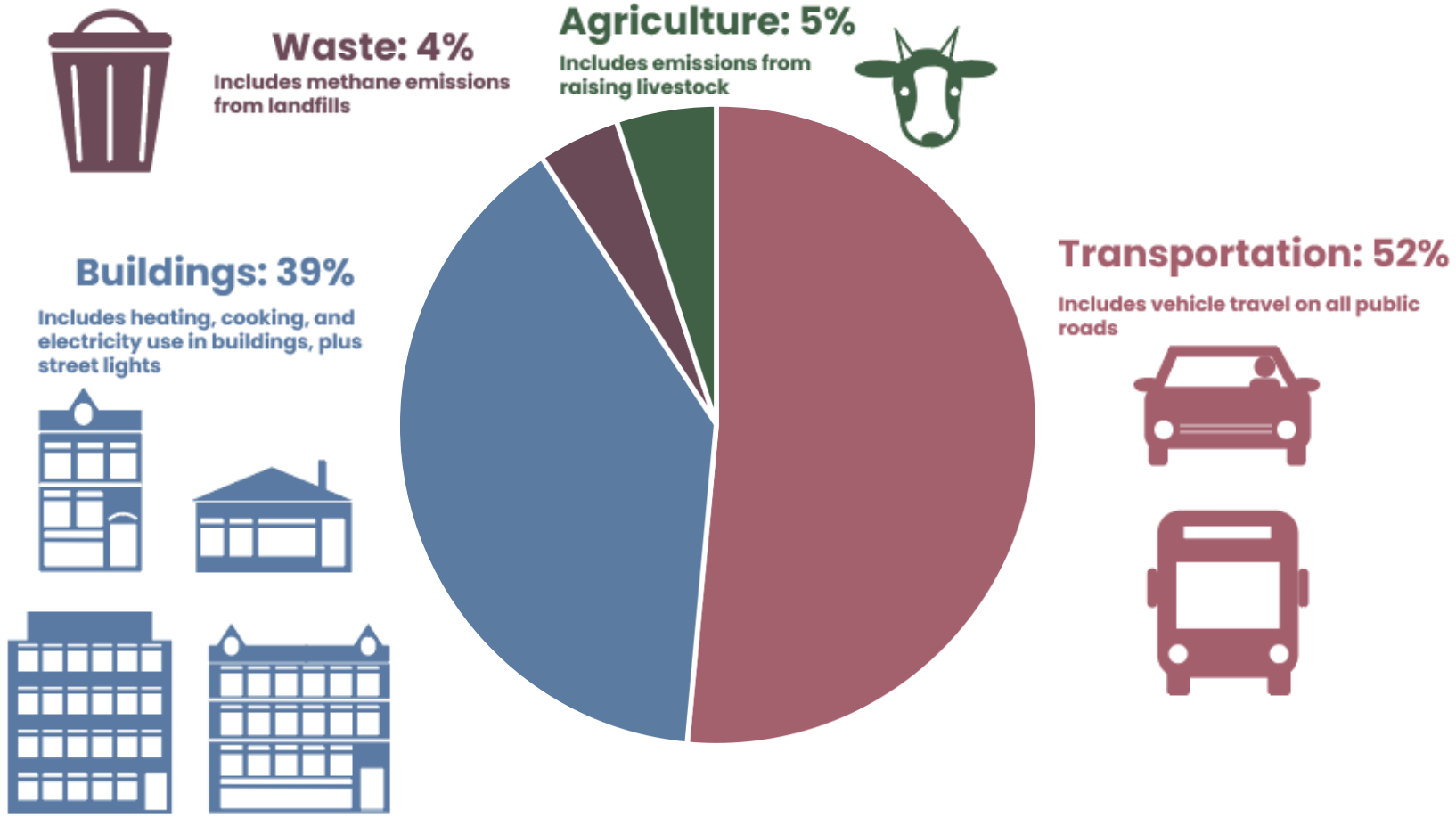
- Vulnerability & Risk Assessment
- Planning Process
- Topics:
  - Extreme Precipitation
  - Extreme Heat
  - Drought & Wildfire
  - Disease & Pestilence

Current Program Activities



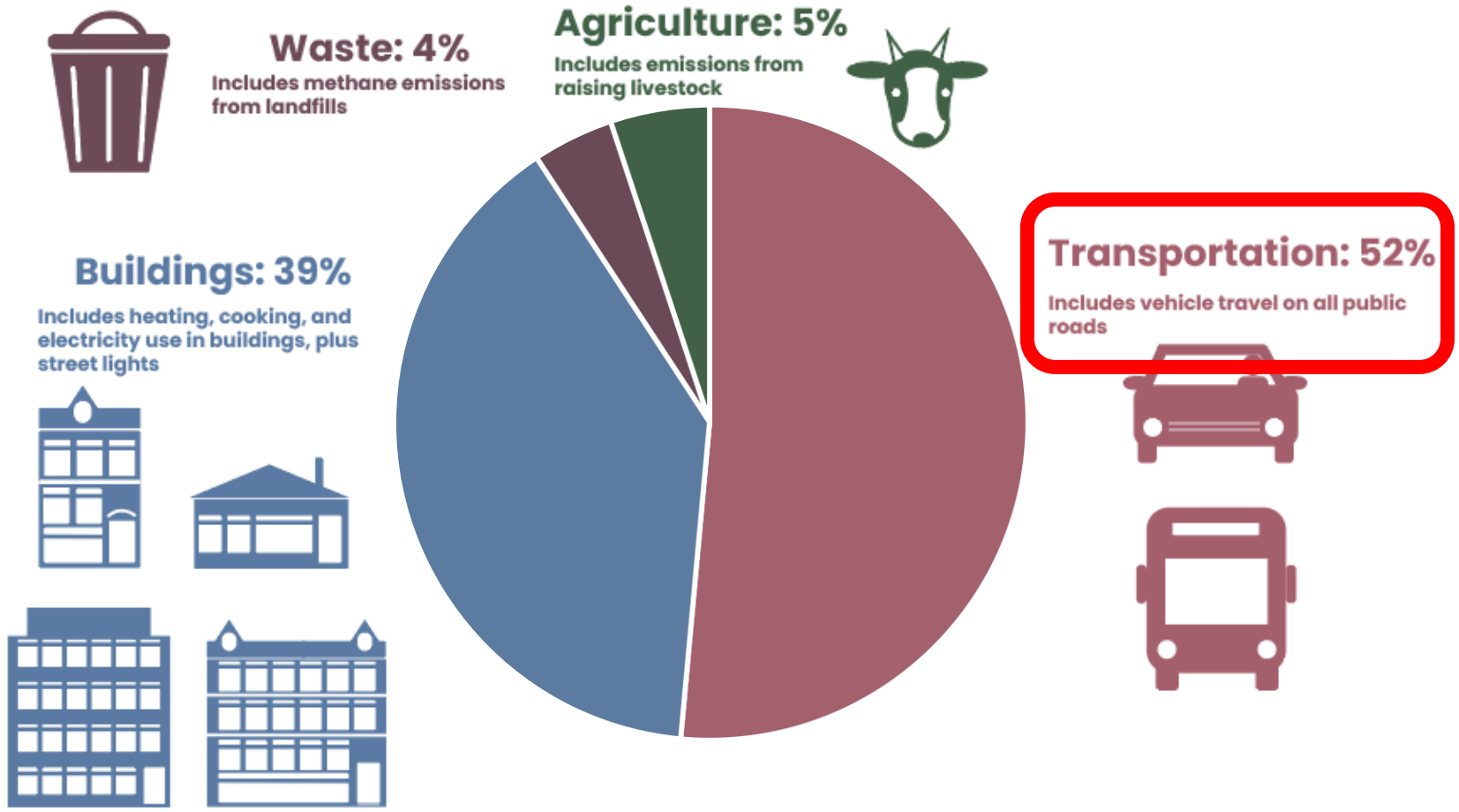
Climate Action and the Comprehensive Plan Update

Greenhouse Gas Emissions



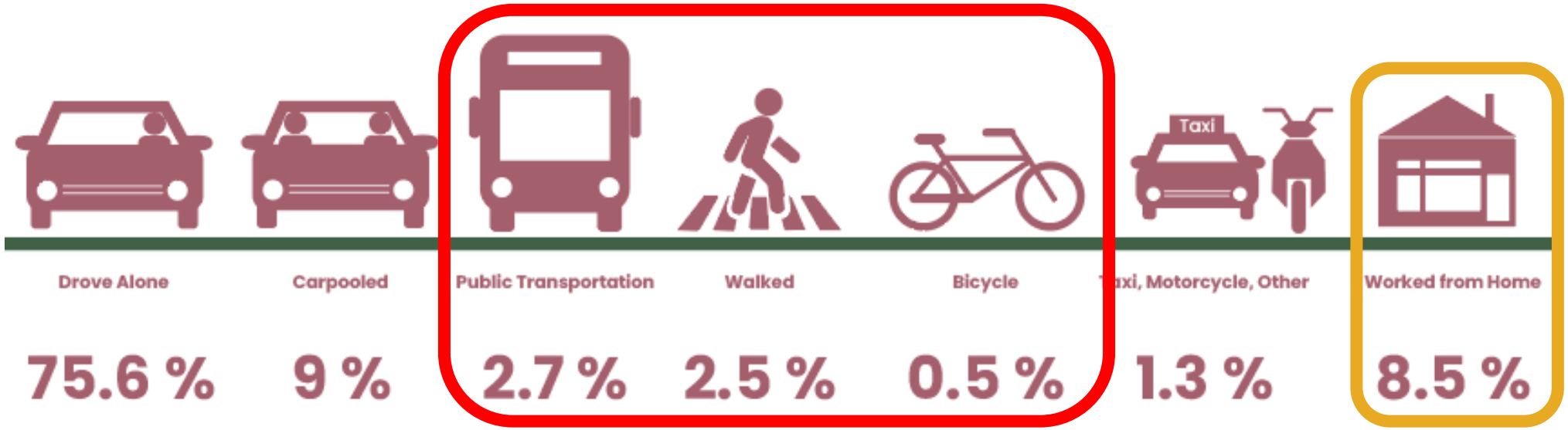
Estimated greenhouse gas emissions sources in Albemarle County in 2018. Source: Albemarle County 2018 Greenhouse Gas Emission Inventory Report.

Greenhouse Gas Emissions



Estimated greenhouse gas emissions sources in Albemarle County in 2018. Source: Albemarle County 2018 Greenhouse Gas Emission Inventory Report.

Transportation & Land Use



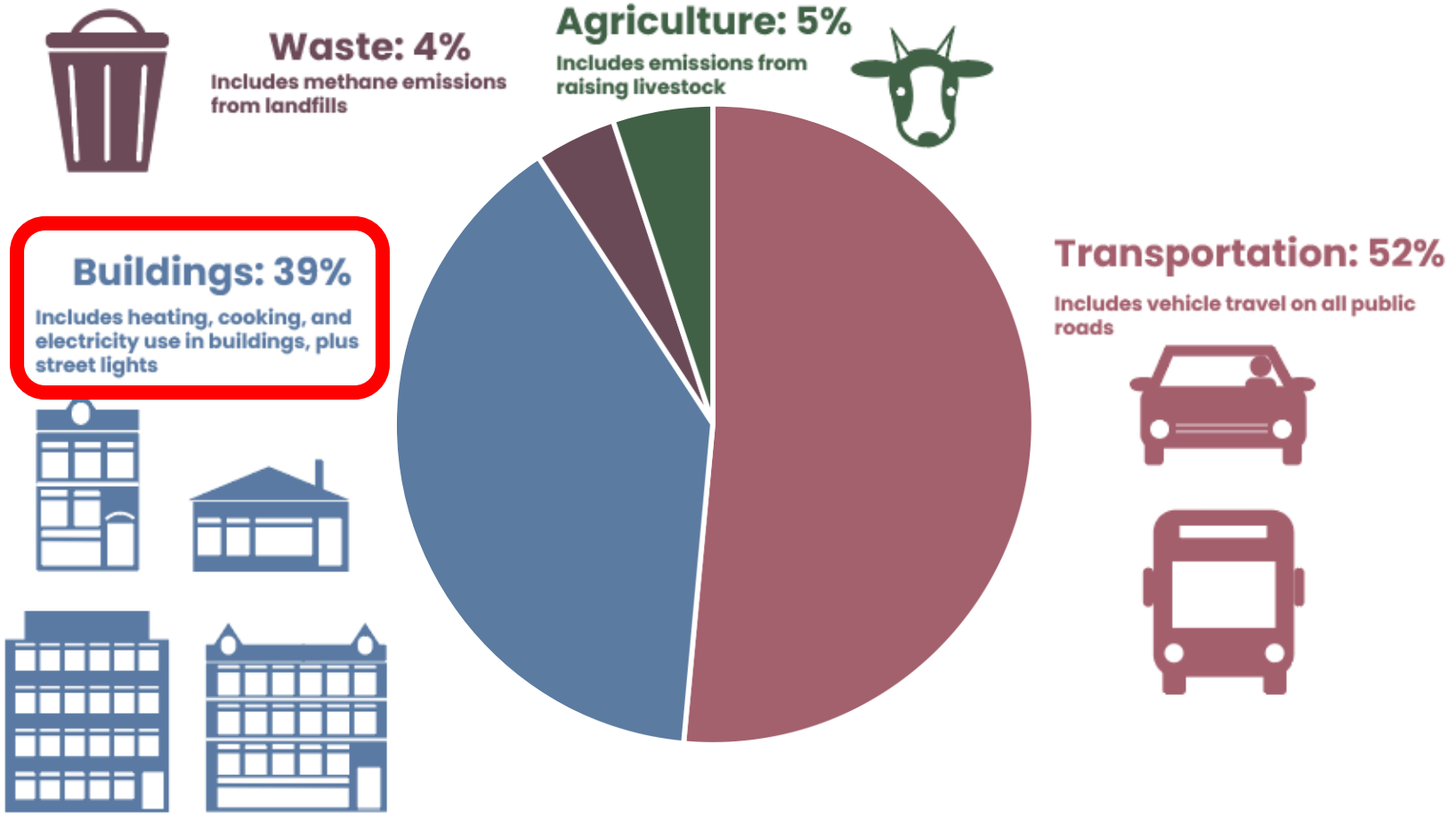
Means of transportation to work in Albemarle County. Source: U.S. Census, 2015-2019 ACS 5-year: Table S0801.

How can growth management and land use decisions help us increase the percentages of public transit, walking, and biking?

Transportation & Land Use

- ‘Complete streets’
- Dense, mixed-use development and affordable housing
- Infill development
- Less parking and more robust transit, bike, ped infrastructure

Greenhouse Gas Emissions



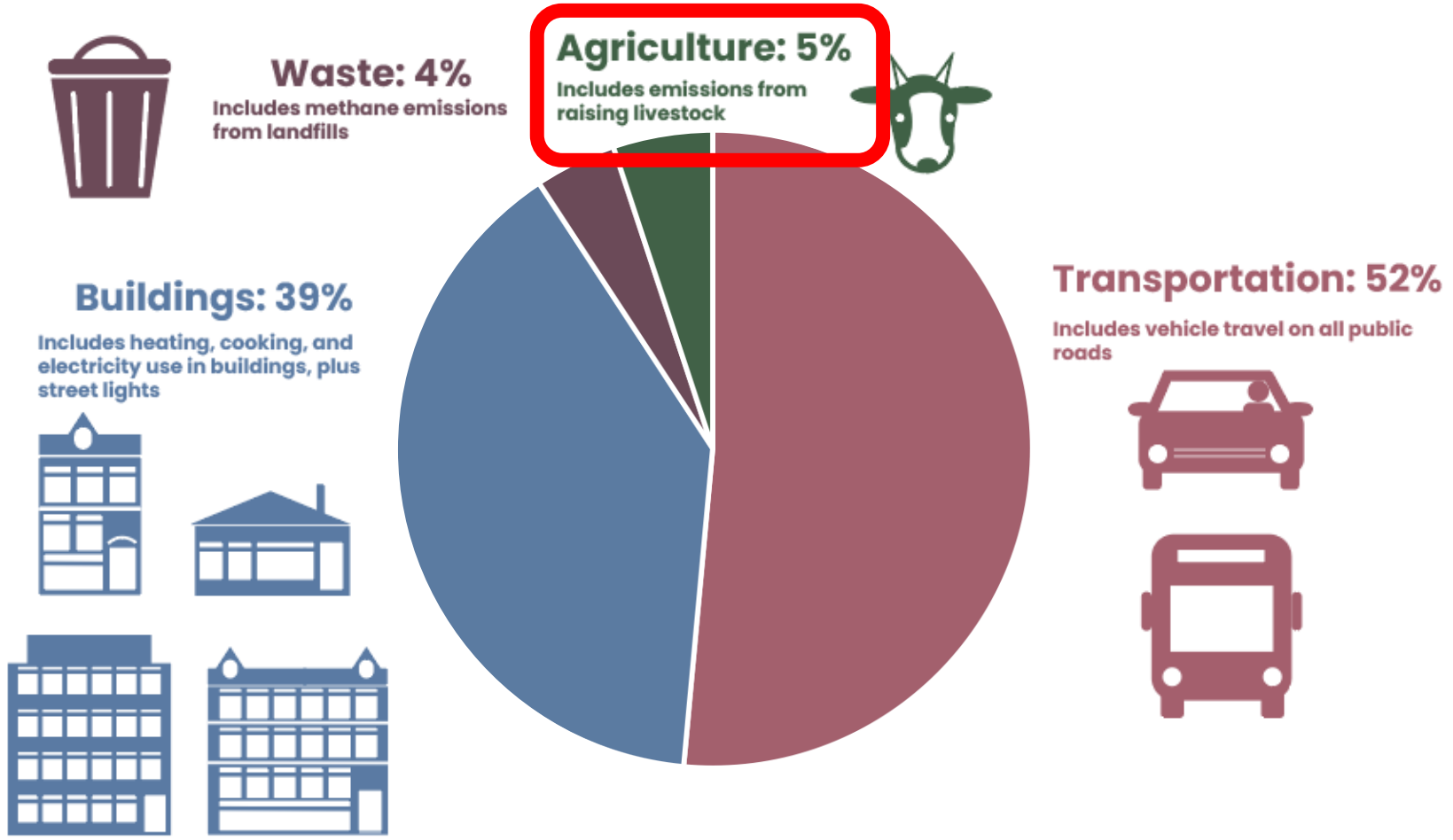
Estimated greenhouse gas emissions sources in Albemarle County in 2018. Source: Albemarle County 2018 Greenhouse Gas Emission Inventory Report.

Building Energy Use

How can the Comprehensive Plan promote:

- Electrification
- Solar energy systems
- Adaptive reuse of buildings

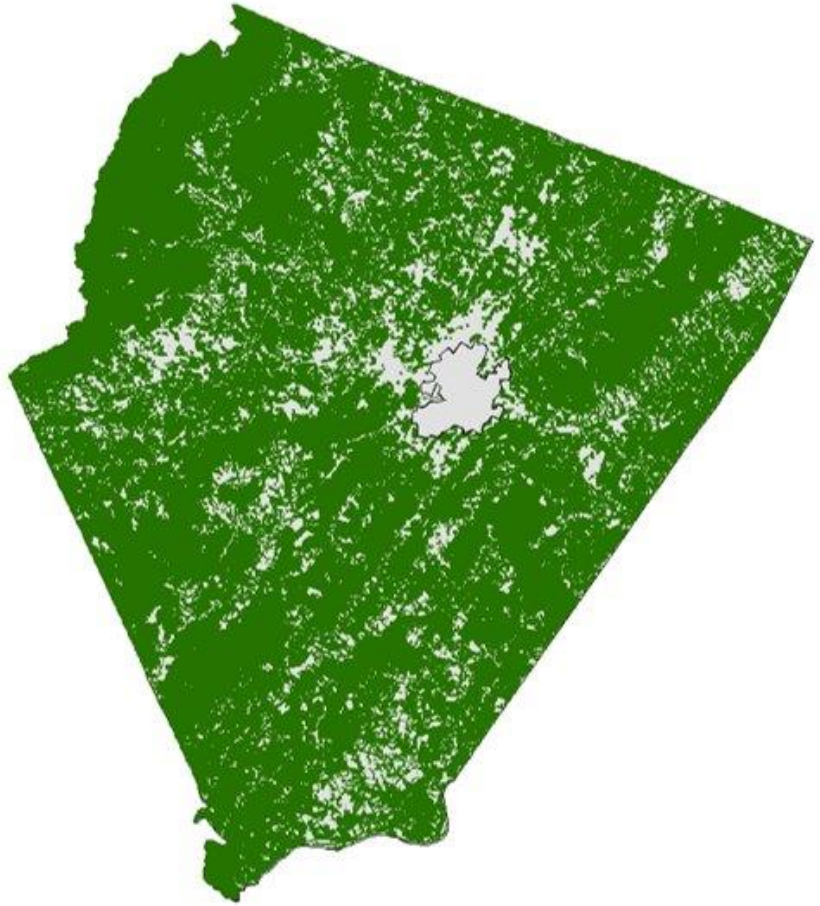
Greenhouse Gas Emissions



Estimated greenhouse gas emissions sources in Albemarle County in 2018. Source: Albemarle County 2018 Greenhouse Gas Emission Inventory Report.

Conservation & Sequestration

- The County's forests and natural areas are helping us—sequestering roughly 950,000 tCO_2e/year.
- How we manage growth can help us:
  - ensure this sequestration continues through conservation and stewardship; and
  - increase sequestration by adding tree canopy.



How You Can Get Involved

Environmental Stewardship Hub

Launched: Earth Day (April 22, 2022)

- Learn about County programs
  - Biodiversity
  - Climate Action
  - Clean Water
  - Reduce Waste

- Resources for community members to act
  - At Home
  - On Your Land
  - In Your Community

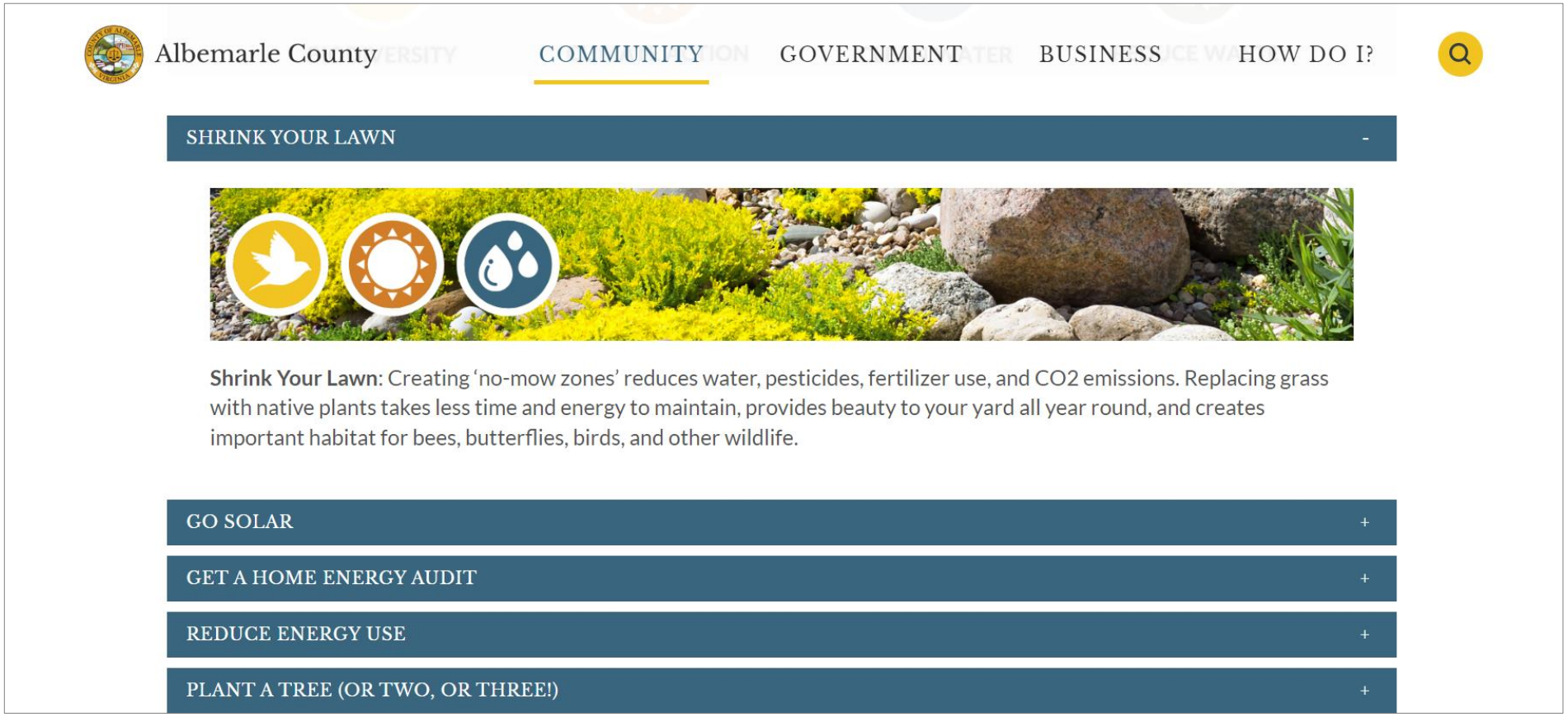
Environmental Stewardship Hub

Launched: Earth Day (April 22, 2022)

Link: [Environmental Stewardship Hub]

Environmental Stewardship Hub

Launched: Earth Day (April 22, 2022)



Link: Environmental Stewardship Hub

Climate Resilience Planning

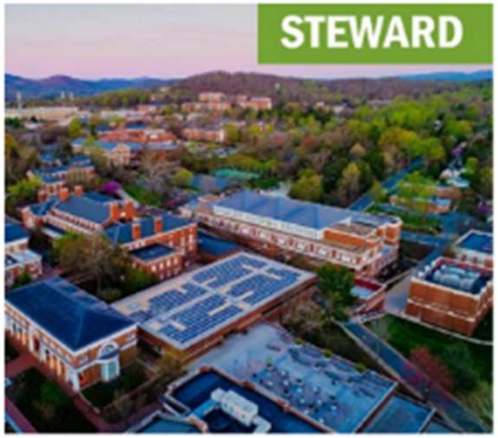
- Read the Climate Vulnerability & Risk Assessment
  - Examines the impacts of local hazards exacerbated by climate change on the people, natural environment, built environment, and economy specific to Albemarle County.
  - Albemarle.org/climate → “Quick Links”
- Participate in community process to draft a Climate Adaptation and Resilience Plan

Engage AC44

- Check out the AC44 website to learn about Planning for Growth.
- Read the Background Report to learn more about how growth management and climate action are connected.
- Complete the survey to share your thoughts on the current growth management policy and what should be prioritized in a policy update.
- Stay tuned for more opportunities to participate in June!


COUNTY OF ALBEMARLE
FOUNDED AD 1744
VIRGINIA

UVA SUSTAINABILITY FRAMEWORK



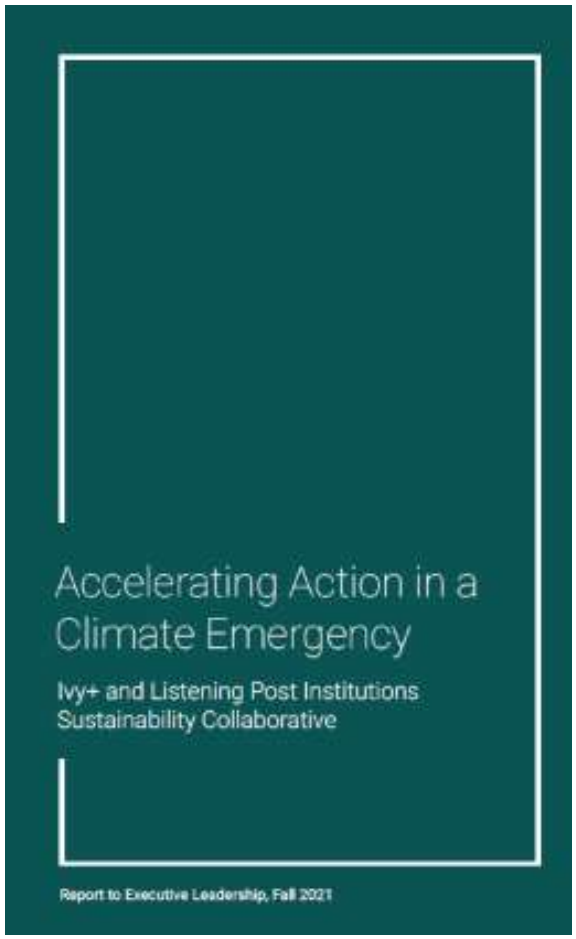
STEWARD our resources on Grounds and beyond by living our values through our actions and operations

ENGAGE in our community, serve our community, and build sustainability awareness

DISCOVER new solutions to global challenges through research, curriculum, and using the Grounds as a learning tool

2030 UVA SUSTAINABILITY PLAN GOALS

Context – Higher Education



Caltech
CHICAGO
Duke
EMORY
HARVARD
NYU
Penn
PRINCETON UNIVERSITY
USC
Tulane University
UNIVERSITY VIRGINIA
WAKE FOREST
WISCONSIN
Yale

20 CLIMATE ACTION 30 PARTNERSHIP
UNIVERSITY VIRGINIA
WILLIAM & MARY

The Washington Post

U-Va. and William & Mary team up to reduce carbon footprint

Two public universities in Virginia pledge to become 'carbon neutral' by 2030.

Background/History

UVA Sustainability Annual Reports

2020-2021 Annual Report

2019-2020 Annual Report

2018-2019 Annual Report

2017-2018 Annual Report

2016-2017 Annual Report

2015-2016 Annual Report

2014-2015 Annual Report

Quarterly Sustainability Updates

Sustainability Update June 2020

Sustainability Update June 2019

Sustainability Update March 2019

Sustainability Update December 2018

Sustainability Update June 2018

Sustainability Update March 2018

Sustainability Update December 2017

Sustainability Update June 2017

Sustainability Update March 2017

UVA Greenhouse Gas Reports

UVA Greenhouse Gas Report CY2020

UVA Greenhouse Gas Report CY2019

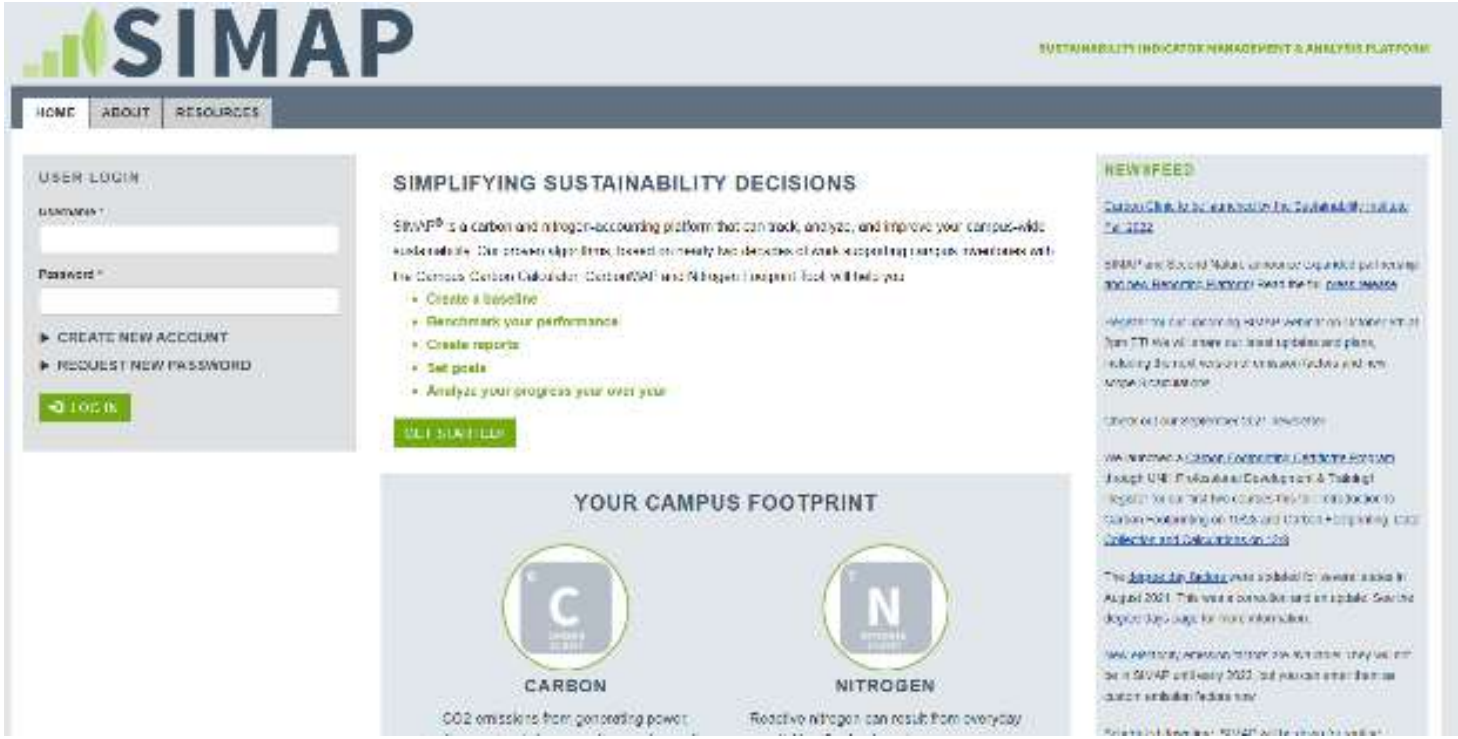
UVA Greenhouse Gas Report CY2018

UVA Greenhouse Gas Report CY2017

UVA Greenhouse Gas Report CY2016

UVA Greenhouse Gas Report CY2015

UVA Greenhouse Gas Report CY2014

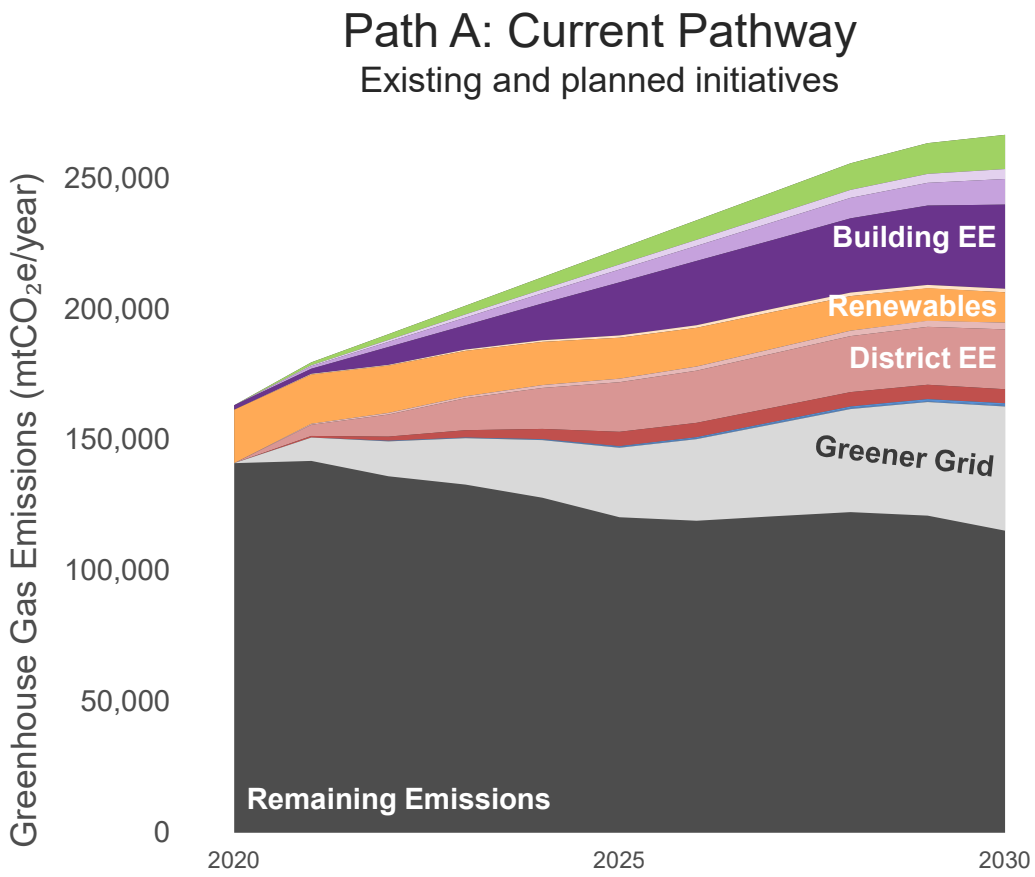


UVA's Carbon Footprint: Neutrality by 2030 - Progress

UVA 2020 Carbon Footprint

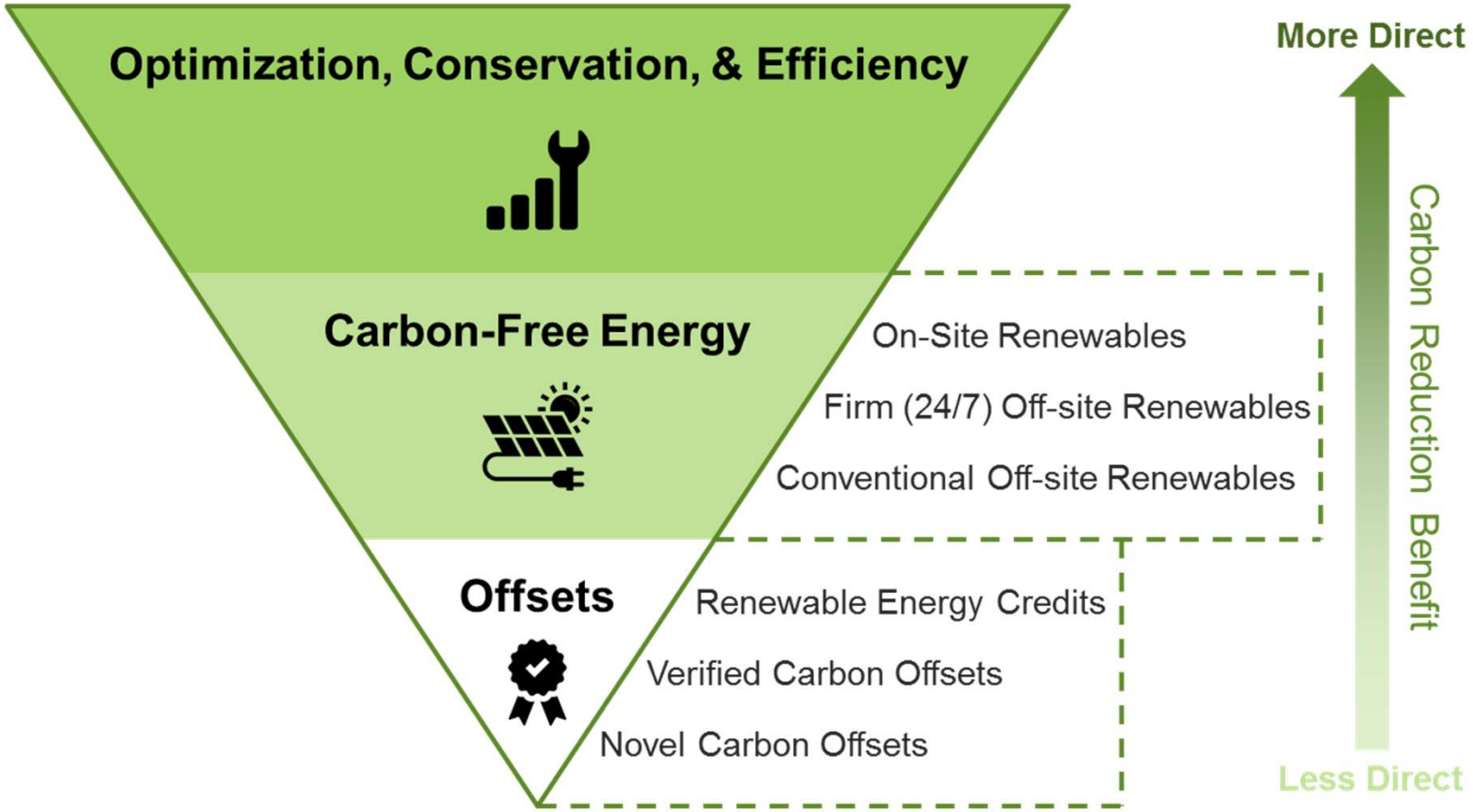
- Goal: Reduce emissions to 0 by 2030.
- In CY2010, the baseline year, UVA's footprint was 291,123 MTCDE.
- As of CY2020, UVA decreased its footprint to 163,327 MTCDE (a 43.9% reduction).
- Since 2010, UVA's population has increased 20.1% and square footage has increased 20.6%. Despite this, UVA has reduced its emissions in half per person and per square foot.

UVA's Carbon Footprint: Neutrality by 2030 - Progress

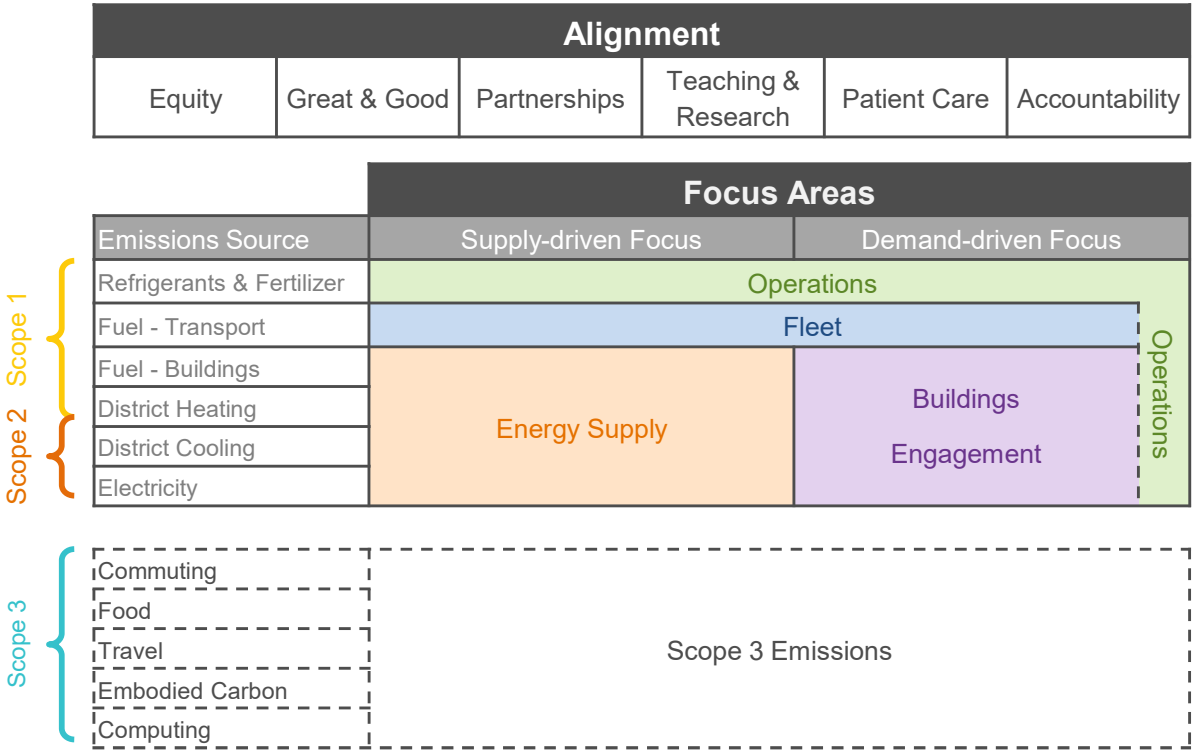


- **We anticipate continued growth in both square footage and population. The estimated footprint in 2030, if UVA were to stop all strategies, is 266,600 MTCDE**.
- This includes anticipated growth in emissions of 60,000-70,000 MTCDE (4 million square feet added).
- If we continue existing strategies, we could eliminate 56% of our projected 2030 emissions. This is not enough to counteract growth and not enough to continue the reductions required. Additional strategies are needed.

Approach


Optimization, Conservation, & Efficiency
Carbon-Free Energy
On-Site Renewables
Firm (24/7) Off-site Renewables
Conventional Off-site Renewables
Offsets
Renewable Energy Credits
Verified Carbon Offsets
Novel Carbon Offsets
More Direct
Carbon Reduction Benefit
Less Direct

UVA CLIMATE ACTION PLAN 2030



Existing Buildings: Deep Energy Retrofits, Smart Labs Program, Smart Clinics Program, Smart Buildings and Controls, Energy Efficient Procurement

New Buildings & Major Renovations: Low Energy Buildings, Zero Energy (or Carbon) Buildings, Building Electrification Space Utilization and Planning

Source Energy: On-site Renewable Energy, Off-Site Renewable Energy, Renewable Combustion Fuel (Biogas, Biomass, Hydrogen), Waste Heat Capture, Energy Storage, Emergency Power/Resiliency

District Energy: Chilled Water Optimization, Hot Water/Steam Optimization, Plant Energy Storage, Plant Waste Heat Capture, Heat Pump Systems/Geo-Exchange (ground source, air source), Deep Geothermal

Fleet: Electric Buses, Electric Vehicles, Electric Vehicle Charging Infrastructure, Hybrid Vehicles, Alternative Fuel Vehicles, Operational Optimization / Right-sizing, Centralized Fleet

Decarbonization Pathways

4 Separate Decarbonization pathways

- Path A – **Business as Usual**
  - Existing & planned initiatives
- Path B – **Building Efficiency**
  - Aggressive focus on building energy efficiency
- Path C – **Plant Efficiency & Electrification**
  - Building & heating plant electrification + optimization
- Path D – **Efficiency, Electrification, & Renewables**
  - "All of the above" strategy with 100% carbon-free energy procurement

Paths A, B, C would rely on RECs and offsets to drive total emissions to "zero" by 2030

	Baseline Demand Strategies	Aggressive Demand Strategies
Baseline Supply Strategies	**Path A** Business as Usual	**Path B** Building Efficiency
Aggressive Supply Strategies	**Path C** Electrification	**Path D** Efficiency, Electrification, & Renewables

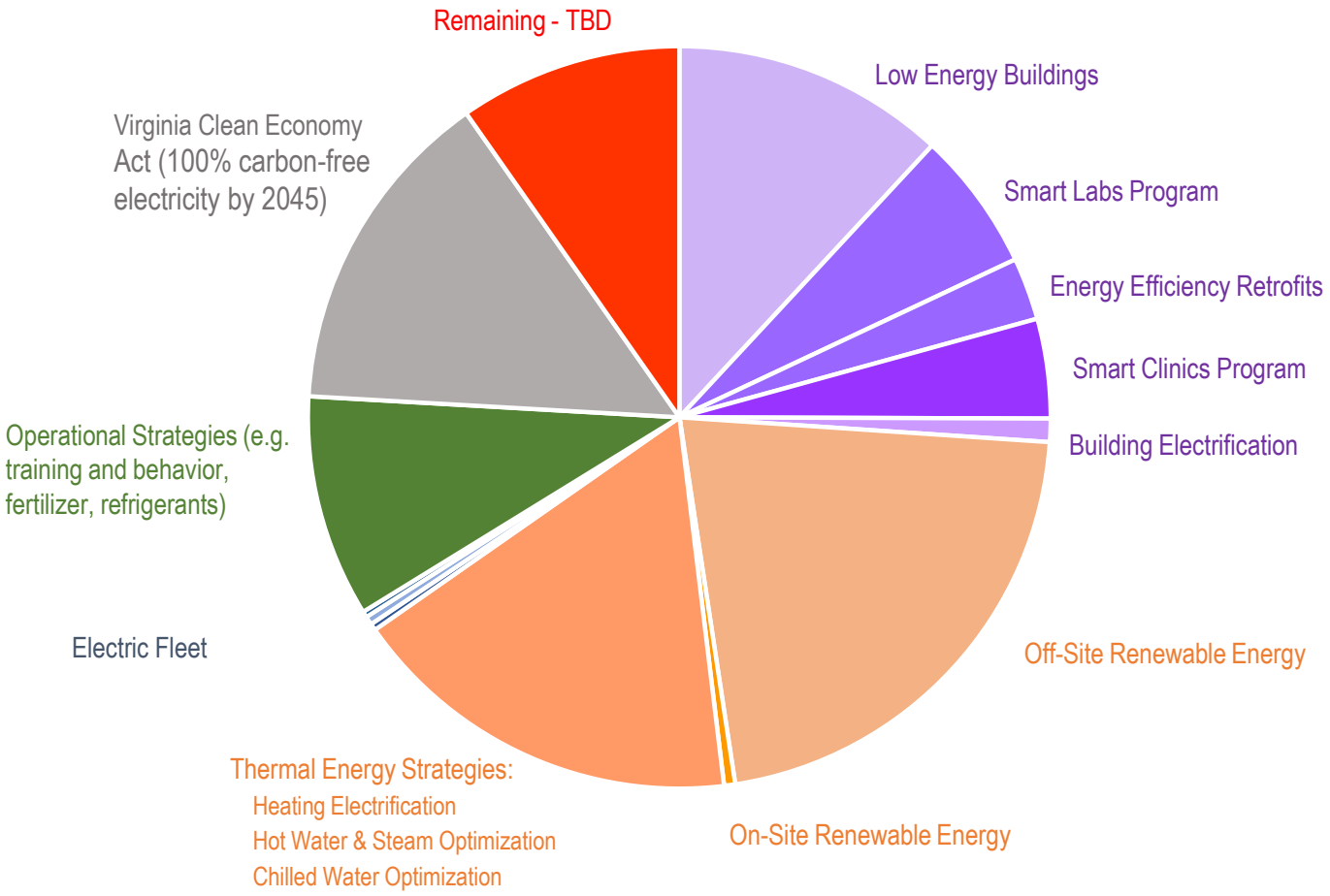
	Path A	Path B	Path C	Path D
Energy Efficiency Retrofits	Partial	Full	Partial	Full
Smart Labs Program	Partial	Full	Partial	Full
Smart Clinics Program	None	Partial	None	Full
Low Energy Buildings	Full	Full	Full	Full
Zero Energy Buildings	None	Full	None	Full
On-site Renewable Energy	Partial	Partial	Full	Full
Off-site Renewable Energy	None	None	None	Full
Chilled Water Optimization	Partial	Partial	Full	Full
Hot Water & Steam Optimization	Partial	Partial	Full	Full
Heating Electrification	Partial	Partial	Full	Full
Electric Buses	Partial	Partial	Full	Full
Electric Vehicles	Partial	Partial	Full	Full
Fleet Optimization	Partial	Partial	Full	Full
Combined Operations Strategies	Partial	Full	Partial	Full
Virginia Clean Economy Act	Full	Full	Full	Full

Climate Action Plan – Plan Strategies, Relationship to STES

POTENTIAL EMISSIONS REDUCTION STRATEGIES

Low Energy Buildings	Building Efficiency
Smart Labs Program	
Energy Efficiency Retrofits	
Smart Clinics Program	
Zero Energy Buildings	
Building Electrification	
Off-site Renewable Energy	Energy Supply: Strategic Thermal Energy Study
Thermal Energy Strategies: Heating Electrification Hot Water & Steam Optimization Chilled Water Optimization	
Chilled Water Optimization	
On-site Renewable Energy	
Electric Buses	Fleet
Electric Vehicles	
Fleet Optimization	
Combined Operations Strategies	Operations (e.g. fertilizer, refrigerants, behavior, training)
Virginia Clean Economy Act	Greener electric grid (100% carbon-free electricity by 2045)

Carbon Neutral by 2030: Recommended/Possible Reduction Strategies



- Chart represents UVA's total anticipated footprint (including growth): 266,600 MTCDE.
- Slices represent the estimated reductions possible for each strategy.
- Energy supply strategies (in orange) represent an estimated 40% of the emissions reductions. These are covered in the Strategic Thermal Energy Study and will be refined through the STES process.

Existing Buildings

Clark Hall's Energy-Savings Efforts Earn UVA Building National Recognition

Jan 18, 2019 | Lorenzo Perez / Senior Writer

Home to the University of Virginia's Department of Environmental Sciences and three floors of environmental research labs, Clark Hall served as an unsurprising candidate to lead UVA's energy conservation efforts by example.

UVA has >500 existing buildings

- UNESCO World Heritage Site
- R1 Research University
- Level 1 Trauma Center

UVA Building Efficiency Upgrade Program

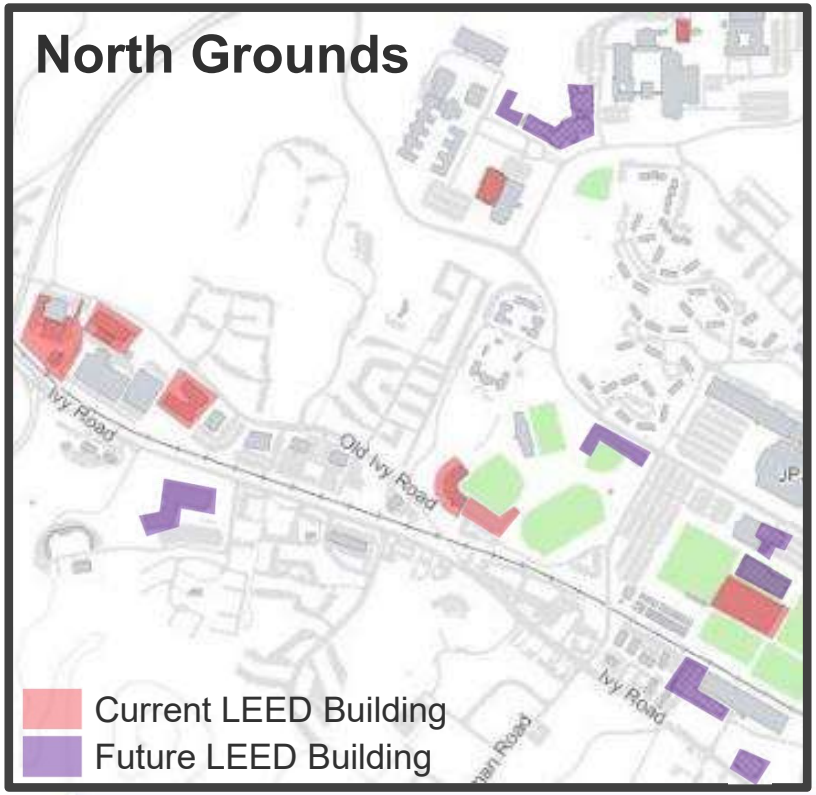
- 75 retrofits and counting
- $55M in energy savings, $21M invested
- 20,000 $MtCO_2e$/year savings
- **13% carbon footprint reduction**

New Construction

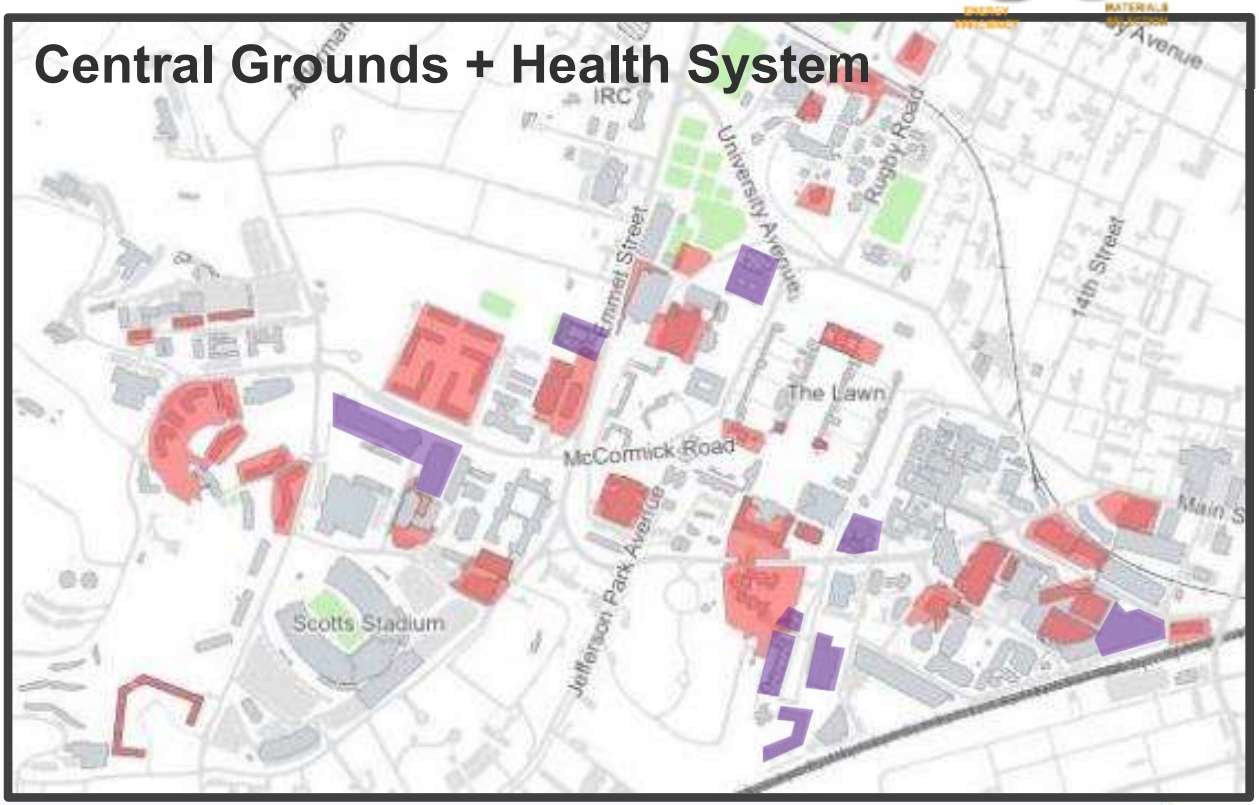
UVA Green Building Standards (low energy targets + fossil-fuel free + solar-ready construction, etc.) + LEED certification

74 LEED buildings at UVA, >4 million sf (80 football fields)

North Grounds



Central Grounds + Health System



Evaluating Performance

University-Wide

- Building metering
- Annual reporting
- Post occupancy survey report with building performance data and thermal comfort survey

APPENDIX H: Normalized Summary of Results - Rotunda

For this energy and water analysis, the Rotunda was benchmarked against buildings with similar primary uses, location and infrastructure. In 2018, the Rotunda performed below the average Energy Use Intensity (EUI) of the benchmarked buildings (93.3 kbtu per GSF) with approximately 77.3 kBtu per GSF. It also performed below its LEED modeled EUI.

Figure 1: Rotunda Energy Use Intensity (kBtu/GSF) with Benchmarks

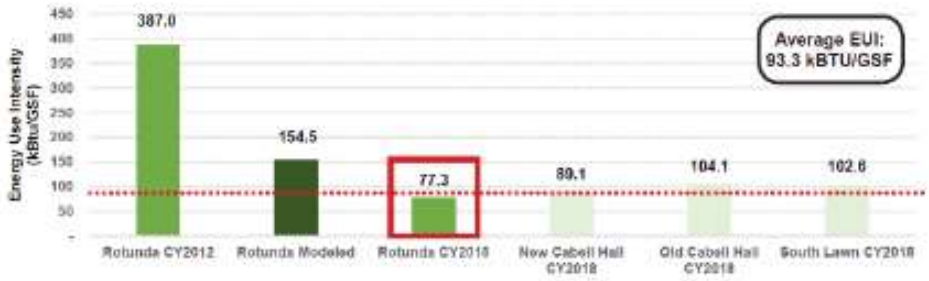
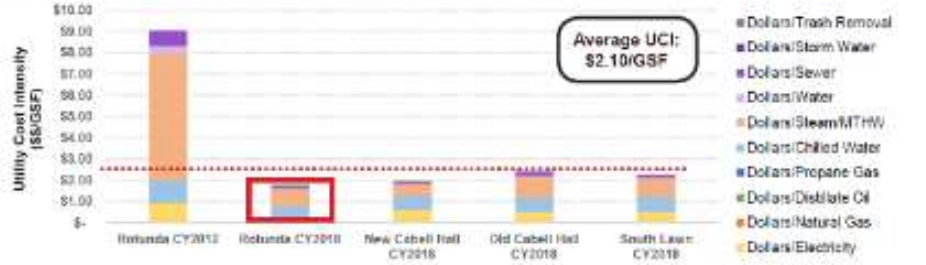


Figure 2: Rotunda Water Use Intensity (Gallons/GSF) with Benchmarks

In 2018, the Rotunda's total utility costs per GSF were smaller than the average of benchmarked buildings. Most notably, the Rotunda reported the smallest chilled water and electricity costs per GSF.

Figure 3: Rotunda Utility Costs by Square Foot ($/GSF) with Benchmarks



Renewable Energy

Four “Deliveries” of Solar at UVA

1. On Grounds – Roof Lease (364 kW peak capacity, 1589 panels)
2. On Grounds – Owned and Operated (271 kW peak capacity, 890 panels)
3. Off Grounds – Power Purchase Agreement (32 MW, 645,000 panels)
4. *Potential:* On Grounds – Power Purchase Agreement (max capacity apx. 3 MW)

UVAToday

VIDEOS

UNIVERSITY TRANSIT SERVICES BEGINNING TO GO ELECTRIC WITH NEW BUSES

Trending

Former UVA Athletes Reveal Mental Health Battles in Student-Produced Documentary

Dungeons & Dragons and Burgers: 'Really Bad Outcomes' When We Don't Group Practices

GREEN FLEET

The University of Virginia Facilities Management Fleet recently earned the Sustainable Fleet Accreditation, recognizing its efforts to build a fleet of cleaner and more sustainable vehicles.

UVA Facilities Management employees who assisted with the department earning the Sustainable Fleet Accreditation included, back row from left, Michael Duffy, Mark Stanco, Dan Slaughter, John Jordan, Mark Webb, Ken Rogers and Jesse Warren; and front row from left, Jamie Joyner, Cheryl Gomez, Emily Steil and Jess Wenger

The University of Virginia Facilities Management Fleet recently earned the Sustainable Fleet Accreditation, becoming the only active university fleet in Virginia to receive this designation.

"It is exciting to be recognized for our efforts to reduce the University of Virginia's carbon footprint and lower greenhouse gas emissions," said

Sustainability Advocates, Eco-Leaders, Zero Waste Ambassadors, Student Employees

Student Leadership

ABOUT THE DECARBONIZATION ACADEMY THE EXPERIENCE

The Teaching & Research Sub-Committee of the University Sustainability Committee, with support from the Environmental Resilience Institute (ERI), is pleased to announce the launch of the inaugural Summer Decarbonization Academy. The Academy will occur *June 13 to August 5, 2022 and provide* a hands-on learning experience for rising third-years, fourth-years, and graduate students currently enrolled in any UVA program interested in working towards UVA's goals of being and carbon-neutral by 2030 and fossil fuel-free by 2050. Student participants will receive $5000 for the summer.

Participants will engage with faculty and staff through the program's two signature components. First, participants will complete a hands-on, individual decarbonization learning experience ("project"). Second, participants will complete group-based shared learning activities to develop connections among the fellows and foster dissemination of cutting-edge content.

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