

TOWN OF CARRBORO

NORTH CAROLINA

TRANSMITTAL

PLANNING DEPARTMENT

DELIVERED VIA: ☒ *HAND* ☐ *MAIL* ☐ *FAX* ☒ *EMAIL*

To: David Andrews, Town Manager
Board of Aldermen

From: Laura Janway, Environmental Planner
Patricia McGuire, Planning Director

Date: March 19, 2019

Subject: Energy and Climate Protection Plan (2014) and Community Climate Action Plan (2017) Implementation Update

Summary

The purpose of this memo is to provide an update on progress since December 4, 2018 on the Energy and Climate Protection Plan, adopted May 28, 2014, and the Community Climate Action Plan (CCAP), adopted January 24, 2017. The Energy and Climate Protection Plan concentrates on lowering municipal greenhouse gas emissions and the CCAP establishes a 50% reduction goal in per capita greenhouse emissions by 2025. Town staff and residents are examining and pursuing several initiatives to reach the emissions reductions goals.

Town staff have scheduled the LED streetlight conversion project with Duke Energy. Project work will begin in May/June 2019 at a cost of \$35,395.00. Town staff are waiting for the Request for Proposals for the Volkswagen (VW) Emissions Mitigation Fund in order to begin writing a funding proposal for additional electric vehicle charging stations in Carrboro. Town staff have also completed 2018 reporting for the Bee City USA program, and have renewed Carrboro for participation in the program for 2019.

In February, staff and elected officials participated in a community discussion organized by a local resident at the Chapel Hill Public Library to discuss climate action, and have also worked to promote several proclamations and resolutions related to CCAP goals. Town staff have also re-initiated composting of coffee grounds at Town Hall and will attend the Climate Reality Leadership Corps training in Atlanta, Georgia with elected officials to learn leadership skills for community outreach related to climate action. Staff have been working with Chapel Hill, OWASA, and Chapel Hill-Carrboro City Schools (CHCCS) on a Mayors Water Conservation Challenge to promote water protection and conservation.

Public Works staff have installed an energy-efficient water fountain at Town Hall with a water bottle filling station to promote the use of reusable water bottles. In addition, Stormwater Utility

staff are working on an urban forestry public outreach project. The 2019 Comprehensive Bicycle Transportation Plan will also further the Town's efforts to achieve emissions reduction goals.

Planning Department staff have analyzed recommendations from the CCAP and have provided cost estimates and emissions savings for each recommendation, as well as a calculated cost-emissions savings ratio and a progress update on estimated total community emissions reduction to date.

Light-Emitting Diode (LED) Streetlight Conversion

- *Policy Connections:* Conversion of Town streetlights to LED lighting helps to fulfill Section 2A of the Energy and Climate Protection Plan (LED Outdoor Lighting). This section recommends conversion to LED streetlights as a high-priority action.

Public Works staff have been working with Duke Energy to implement the LED streetlight conversion. The project has been tentatively scheduled to begin in May/June 2019 and will take approximately 4 weeks to complete.

Summary Table

Total Transition Fee	\$35,395.60
Total Monthly Cost Savings	\$219.04
Estimated Town Emissions Reduction	10%

The streetlight fixtures will be changed while the poles will remain in place. The fixtures are American Electric Lighting Autobahn Series ATB2 and ATB0 and will be more amber in color than other LED lights, with a correlated color temperature of 3000K. They will be fully-shielded with no uplight and not more than 10% of the total lumens between 80-90 degrees. The 3000K temperature meets American Medical Association guidelines for lighting in outdoor installations and the streetlights also meet the requirements for the International Dark Sky Association's Fixture Seal of Approval Program.

Electric Vehicle Charging Stations

- *Policy Connections:* Installing additional EV charging stations helps to fulfill CCAP Transportation Recommendation #1: Reduce Greenhouse Gas Emissions from Motor Vehicle Use by 50% by 2025.

The VW Emissions Mitigation Fund Request for Proposals has not been released. The NC Department of Environmental Quality has provided the following information:

Phase 1 Timeline

- Plan submission to trustee (August 2018)
- Release request for proposals (Winter 2019)-RFP will be open for 90 days
- Proposal evaluations (Spring 2019)
- Phase 1 project selections (Summer 2019)
- Phase 2 planning (Fall 2019/Winter 2020)

Staff will proceed with a funding proposal when the Request for Proposals is released, per the Board's direction in the last update on December 4, 2018.

Bee City USA

- *Policy Connections:* Membership in the Bee City USA program helps to fulfill CCAP Ecosystem Recommendation #5: Improve Regulations and Community Capacity to Discourage Invasive Plants and Encourage Native Plants.

Town staff completed the 2018 report for Bee City USA and renewed the Town's membership for 2019. Accomplishments for 2018 included: public outreach at the Carrboro Farmers' Market, maintenance of the pollinator garden at the corner of West Main Street and Hillsborough Road, design of pollinator gardens in Martin Luther King, Jr. Park, reading of a proclamation from Mayor Lavelle on June 5th, 2018, a Father's Day movie at the Carrboro Century Center, planting of pollinator-friendly plant species on Town properties, and the installation of two bee boxes in Wilson Park and Anderson Park.

Community Climate Action Meeting

- *Policy Connections:* The Community Climate Action Meeting helps to fulfill CCAP Community Integration Recommendation #1: Create Grassroots Partnerships to Engage Community and CCAP Community Integration #5: Expand Capacity to Pursue Sustainability Initiatives.

Local resident Mary Perry organized a discussion at the Chapel Hill Public Library for the Sierra Club's *Our Climate Resolutions* initiative. At the meeting, local government officials, climate action groups, and community members discussed local initiatives to reduce greenhouse gas emissions. The discussion was positive and productive, and participants made connections to organize and collaborate for future action. Participants also shared contact information with the Town for future CCAP implementation outreach.

Proclamations and Resolutions

- *Policy Connections:* Proclamations and Resolutions help to fulfill CCAP Community Integration Recommendations to engage the community.
- Proclamation Supporting the Reduction of Single-Use Plastics, October 16, 2018
 - Designated March 2019 as "Skip the Straw Month" in Carrboro
- Proclamation Recognizing February 25th-March 3rd, 2019 as "Carrboro Invasive Species Awareness Week, February 19th, 2019

Climate Reality Leadership Corps

Alderman Randee Haven O'Donnell, Alderman Sammy Slade, Planning Director Trish McGuire, and Environmental Planner Laura Janway are scheduled to attend a Climate Reality Leadership Corps training in Atlanta, Georgia from March 14th-16th. At the training, staff and

Aldermen will discuss climate science and obtained skills to organize, and motivate communities to take climate action.

Composting at Town Hall

- *Policy Connections:* Reinitiating composting of coffee grounds at Town Hall helps to fulfill CCAP Ecosystem Recommendation #3: Accelerate/Expand Organic Waste Collection/Composting.

Staff purchased two composting buckets from Orange County Solid Waste Management, and are collecting coffee grounds in the Town Hall break room and Inspections Department for composting through the partnership between the Carrboro Farmers' Market and Orange County Solid Waste Management. Coffee grounds will be weighed weekly to determine emissions reductions.

Mayors Water Conservation Challenge

- *Policy Connections:* Participation in the Mayors Water Conservation Challenge reduces the community's carbon emissions through energy savings related to delivering and cleaning wastewater. As a social media outreach campaign and partnership between Carrboro, Chapel Hill, OWASA, the University of North Carolina, and CHCCS, this initiative helps to fulfill CCAP Community Integration Recommendation #2: Expand Public Partnerships to More Explicitly Consider Climate Action.

The Town of Chapel Hill invited staff from Carrboro, OWASA, the University of North Carolina, and CHCCS to participate in a challenge to save water. The group created a unique Mayors Challenge for Carrboro and Chapel Hill to promote OWASA's new "Agua Vista" Metering Initiative. Agua Vista promotes water conservation by allowing customers to track their daily water usage and providing leak detection alerts.

Chapel Hill and OWASA staff are in the process of creating an online form where residents can pledge to participate in activities related to water conservation and protection. The activities will provide estimated water and cost savings, and the Town with the highest percentage of residents who take the pledge will win. After completing the pledge, participants will be directed to the OWASA's Agua Vista website. Staff will calculate greenhouse gas emissions savings based on reductions in the quantity of water treated due to pledged water savings from the challenge.

The overall campaign has been designed to:

- Reduce costs for consumers
- Reduce infrastructure and operating costs for municipalities
- Promote drought resiliency
- Protect watersheds and ecosystems

Installation of Energy-Efficient Water Fountain

- *Policy Connections:* The installation of a new energy-efficient water fountain helps to fulfill CCAP Buildings Recommendation #1: Reduce Emissions Attributed to Carrboro Buildings by 50% by 2025.

A new water fountain with a water bottle filling station has been installed at Town Hall. This water fountain uses half of the energy as the previous water fountain by minimizing water refrigeration during nighttime hours. The fountain also provides a count of plastic water bottles avoided each time a reusable bottle is filled. The emissions savings related to this initiative, including energy savings and avoided plastic, will be reflected in the upcoming Town's 2019 municipal greenhouse gas emissions inventory.

Urban Forestry Intern Project

- *Policy Connections:* The Urban Forestry Intern Project helps to fulfill CCAP Ecosystem Recommendation #4: Tree Preservation, Protection, and Conservation.

Stormwater Utility staff are working with an intern on an educational outreach project. The project includes a tree inventory in Downtown Carrboro and on Town-owned properties, as well as educational and outreach activities at Town events. Trees will be given "Tree Value Tags" to highlight the benefits from urban forestry. After completion, the project will be submitted to the Arbor Day Foundation for Growth Award consideration.

Comprehensive Bicycle Transportation Plan Update

- *Policy Connections:* The 2019 Update to the Comprehensive Bicycle Transportation Plan helps to fulfill CCAP Transportation Recommendation #4: Further Promote Walking, Biking, Transit, and Transportation Recommendation #6: Improve Bicycle and Pedestrian Infrastructure.

The 2019 update to the Comprehensive Bicycle Transportation Plan is underway and should bring renewed attention to biking for transportation and recreation. Recommendations from the update on new and improved infrastructure and education should further the Town's efforts to achieve greenhouse gas emissions reduction goals. The Town Environmental Planner and Transportation Planner are working to incorporate the climate action message into promotion of Bike Month 2019.

Green Neighborhood Initiative

- *Policy Connections:* The Green Neighborhood Initiative helps to fulfill CCAP Community Integration Recommendation 3#: Create Green Neighborhood Program.

An update on the Green Neighborhood Initiative is outlined below in the CCAP Implementation Costs and Emissions Reduction Analysis.

Community Climate Action Plan (CCAP) Implementation Costs and Emissions Reduction Analysis

Community Integration Recommendation (CIR) #1: Create Grass Roots Partnerships to Engage Community

This recommendation will require staff time to identify partners, bring groups together, and promote and sustain efforts to reduce emissions.

CIR #2: Expand Public Partnerships to More Explicitly Consider Climate Action.

This recommendation will involve staff time to expand existing and new partnerships to support improved building energy efficiency, transportation, renewable energy, composting, and environmental community goals.

CIR #3: Create Green Neighborhood Program

Through a green neighborhoods program, the Town can enlist and engage neighborhoods in efforts to reduce greenhouse gas emissions. The Town could provide education regarding local emissions reduction opportunities, and teach neighborhood residents how to reduce their carbon footprints. Residents in neighborhoods can collaborate on projects, track their energy use and emissions savings, and compete to win awards for successful reductions.

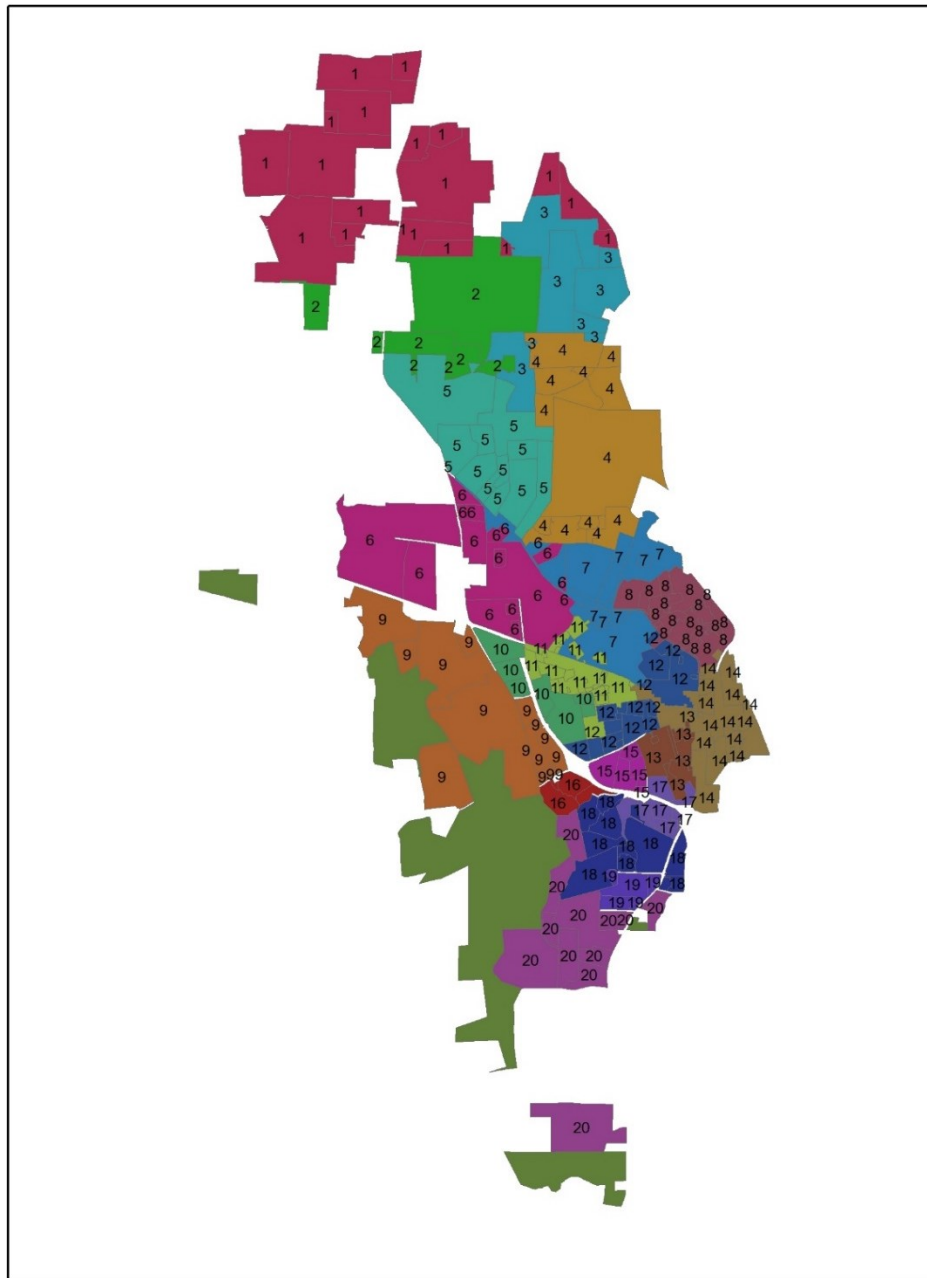
Program Cost

Carrboro could emulate the example set by the Town of Cary through the Cary Green Neighborhood Project (CGNP), which was initiated using a \$54,000 grant. This environmental stewardship project lasted for one year, ending in March 2017.

During this project, neighbors worked together over a twelve-month period to adopt green measures at their homes and throughout their neighborhoods. Initiatives focused on reducing an individual's environmental impact and restoring local ecosystems. Volunteers for the CGNP spent over 2,000 hours completing 37 community activities, including planting 200 live tree stakes for streambank stabilization. The project improved regional partnerships with the Town and neighborhoods and created a collaborative atmosphere for participants to address climate action.

In order to create neighborhood groupings for the Green Neighborhood Program, Town GIS staff divided the Town's jurisdiction into 20 subareas with roughly equal populations. Each subdivision/neighborhood was then assigned to the Green Neighborhood containing the center of the subdivision polygon. As proposed, each Green Neighborhood would contain approximately 1,077 residents.

Town of Carrboro Green Neighborhoods Map



TOWN OF CARRBORO

301 W. Main St.

Carrboro, NC 27510

Created on March 7, 2019

by Evan Crane

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CIR #4: Integrate Climate Action with Local Living Economy

CCAP recommendations include:

1) Include climate change mitigation in local living economy/locally owned marketing messaging 2) Encourage light manufacturing zone in Carrboro, 3) Set-up Property Assessed Clean Energy (PACE) financing program for commercial buildings to implement renewable energy.

CIR #5: Expand Capacity

Town staff will be bringing forward a Land Use Ordinance Text Amendment to modify the Environmental Advisory Board's title to more fully identify its role in CCAP implementation. Staff are also working to reactivate the interdepartmental Climate Action Committee, which will serve as a working group to pursue implementation of emissions-reducing strategies.

CIR #6: Facilitate Low Cost Financing for Energy Efficiency and Renewable Energy Projects

The main cost for this recommendation will be a debt burden for the Town. The CCAP recommends using Qualified Energy Conservation Bonds (QECB) to provide Carrboro and partners with access to low-cost financing for energy-efficiency projects. The second recommendation is to make this low-cost financing available for community projects using a revolving loan fund or PACE financing.

CIR #7: Integrate Climate Action and Social/Equity Initiatives

The CCAP includes recommendations on using federal grants, community programs, and Town initiatives/ordinances to make renewable energy more affordable for lower-income households to lower utility bills. Carrboro can use the example set by OWASA's Affordability Outreach Program, which uses six primary strategies to assist customers in management of OWASA bills through conservation and efficiency:

- Rates and Billing
- Information and Outreach
- Bill Assistance
- Water Efficiency Retrofits
- Leak Identification
- Partnership

Buildings Recommendation (BR) #1: Reduce Emissions from Buildings by 50%

Average costs and estimated emissions savings from the Carrboro Worthwhile Investments Save Energy (WISE) program were used to extrapolate the total cost and emissions savings for all Town buildings.

Estimated costs as determined by certified contractors that participated in the Chapel Hill- Carrboro Residential Retrofit program		
Retrofit Category	Type of Retrofits	Average Cost/Sq. Foot
Weatherization	Insulation, Caulking, Weather-stripping	\$4.95
Electric	CFL Lights, Thermostats	\$1.33
Replacements	Doors, Ducting, Appliances, Bath Fans, Windows, HVAC	\$11.33
Water Heaters	Solar, NG Tankless, Newer Model, Recirculating Pump, Hybrid	\$5.57
Crawlspace	Total Airsealing	\$5.70
Attic	Total Airsealing	\$5.26

Average Cost per square foot: **\$5.03**

Carrboro WISE Program Data: Average Energy and Cost Savings for Installed Measures			
Costs and Savings	Residential Average	Multi-family Average	Commercial Average
Retrofit Invoiced Cost	\$8,123.81	\$2,996.52	\$32,037.60
Annual Electricity Savings (kWh)	1,877.94	3,268.44	1,648.00
Annual % Electricity Savings (kWh)	13%	22%	15%
Annual Natural Gas Savings (Therms)	138.13	550	164.6
Annual % Natural Gas Savings	30%	89%	76%
Average Annual Cost Savings (\$)	\$363.12	\$361.24	\$359.15

Based on previous cost estimates and savings, performing the average retrofits from the WISE program on all buildings in Carrboro would not be enough to reach the entire community buildings emissions reduction goal. Additional retrofits must be completed in order to reduce building emissions by 50%.

To reach this goal, a total cost of \$706,000 is needed to retrofit all municipal buildings to reduce building emissions by 50%.

A total cost to residents of approximately \$122,390,000 is needed to reduce commercial and residential building emissions by 50%.

The average cost is \$3,365.29 per MTCDE in emissions reduction. Reducing emissions from buildings by 50% will reduce total community emissions by 33.7%.

To perform retrofits on commercial and residential buildings located within Carrboro, the estimated cost per person is \$2,098.65. To accomplish these goals and encourage energy-efficiency upgrades, the Town of Carrboro could coordinate and facilitate retrofits using a similar model to the WISE program.

Summary Table

Buildings	Total Estimated Costs (\$)	Emissions Savings (MTCDE)	\$/MTCDE	Emissions Savings Needed to Reach 50% Reduction Goal (MTCDE)	Additional Emissions Needed to Reach Goal (MTCDE)	Additional Cost to Reach Goal	Total Cost to Reach Goal
Commercial	\$2,350,860.53	5,962.15	\$394.30	13,418.00	7,455.85	\$2,939,822.63	\$5,290,683.17
Single-Family Residential (38% of total housing)	\$26,962,918.75	2,547.17	\$10,585.46	8,247.14	5,699.97	\$60,336,814.90	\$87,299,733.66
Multi-Family Residential (62% of total housing)	\$15,899,509.65	7,179.21	\$2,214.66	13,455.86	6,276.66	\$13,900,666.82	\$29,800,176.47
Town Buildings	\$387,348.35	1,452.13	\$266.74	2,648.50	1,196.37	\$319,125.66	\$706,474.01
Total	\$45,600,637.29	17,140.65		37,769.50	20,628.85	\$77,496,430.02	\$123,097,067.30

BR #2: Energy Audit/Performance Rating

In the Energy and Climate Protection Plan (2014), walk-through audits (ASHRAE Level I) are frequently priced at \$.02- \$.05 per square foot. Level II audits are frequently priced at \$.10-\$.15 per square foot. Investment grade audits (ASHRAE Level III) are frequently priced at \$.20-\$.30 per square foot. These estimates were adjusted to account for inflation.

Costs to Audit Town Buildings

Dept.	Current Existing Area (GSF)	ASHRAE Level I Audit	ASHRAE Level II Audit	ASHRAE Level III Audit
Total	77,026.00	\$2,911.58	\$10,398.51	\$20,797.02

Costs to Audit Residential Buildings

Building Type	Sq. Footage	ASHRAE Level I Audit	ASHRAE Level II Audit	ASHRAE Level III Audit
Single-Family Homes	7,500,000.00	\$283,500.00	\$1,012,500.00	\$2,025,000.00
Multi-Family Homes	4,800,000.00	\$181,440.00	\$648,000.00	\$1,296,000.00
Total	12,300,000.00	\$464,940.00	\$1,660,500.00	\$3,321,000.00

Costs to Audit Office and Retail Buildings

Source: CoStar. Provided to Town of Carrboro by Aspen Romeyn, TJCOG				
Building Type	2018 Sq. Footage	ASHRAE Level I Audit	ASHRAE Level II Audit	ASHRAE Level III Audit
Total	1,008,411	\$38,117.94	\$136,135.49	\$272,270.97

Total Cost to Audit all buildings in Carrboro

ASHRAE Level I Audit	ASHRAE Level II Audit	ASHRAE Level III Audit
\$505,969.52	\$1,807,034.00	\$3,614,067.99

Auditing is the first step to reducing energy emissions in Carrboro buildings, as it will provide direction for energy-efficiency retrofits. Duke Energy also offers to perform certain types of audits at no cost.

BR #3: Demonstrate/Pursue Energy Performance Beyond Minimum Requirements for New Development

This recommendation would require the Town to pursue statutory authority or voluntary compliance from developers/builders.

BR #4: Create Rental Property Task Force and Process, BR #5: Create Rental Property Registry/Certification

Mr. Jim Porto, former Carrboro mayor and founder of CommunityCAPS, Inc., submitted a Southeast Sustainable Communities Fund Grant through the Southeast Sustainability Directors Network (SESDN).

The grant's objective involved the development of a community-wide effort to remediate affordable rental units for energy efficiency without raising rents. This issue is known as the split incentive problem, as the financial structure of rental units does not create motivation for owners or renters to retrofit units for energy efficiency.

Item	Estimated Cost
Create Rental Property Task Force and Process	\$132,500
Create Rental Property Registry/Certification	\$112,500

Transportation Recommendation (TR) #1: 50% Challenge

Transportation-related emissions reductions can be calculated for specific projects. When submitting projects for federal Congestion Mitigation and Air Quality (CMAQ) funding, Town staff perform emissions reduction calculations.

Jones Creek Greenway Project

The greenway will be 650 feet in length and will create a 5,000 feet connection to neighborhoods such as Lake Hogan Farms and Fox Meadows, which contribute a significant component of the student population to Morris Grove Elementary. Estimates were made using walk and bike behavior from students at McDougale Elementary. After the greenway is complete, approximately 10% of students will be able walk or bike to school.

Estimated number of school-related greenway users per year: 6,480 trips per year

Vehicle miles avoided per year for school children: 32,400 miles

For this project, staff estimated 346.29 kg emissions reduced/year, or 0.35 MTCDE.

However, using the EPA's Greenhouse Gas Equivalencies Calculator, this avoided mileage is equal to 13.3 MTCDE in avoided emissions, or 0.02 MTCDE per foot of greenway constructed.

Example of Potential Project Cost

CMAQ costs (80% of project)	\$680,200
Cost to Carrboro (20% of project)	\$170,050
Cost per foot of greenway	\$1,308.08
Cost to Carrboro per foot of greenway	\$261.61
Total cost per yearly emissions reduction	\$63,928.57/MTCDE
Cost to Carrboro per yearly emissions reduction	\$12,785.71/MTCDE

Bicycle and pedestrian counts will be performed before and after construction of the greenway in order to confirm the accuracy of these estimates. This estimation method provides a framework to estimate emissions reductions from future greenways with school connections, as well as greenways connecting to other community destinations.

Electric Buses

Chapel Hill (CH) Transit is currently in the process of purchasing two electric buses through a grant from the Federal Transit Administration. Most of CH Transit's fleet uses diesel fuel. In the EPA's eGRID SERC Virginia/Carolina region, electric buses emit 67% less emissions than diesel buses.

The total transit emissions attributed to CH Transit in Carrboro in 2012 were 954 MTCDE. Operation of two electric buses will reduce this footprint by 1.56%. The cost for the buses is \$1.382 million, and the total cost per yearly MTCDE reduction for the project is \$93,001.35/MTCDE. However, CH Transit is using grant funding for this project, reducing the cost to solely staff time needed to writing the funding request and manage the project.

EV Charging Stations

A Level 2 charging station will cost approximately \$25,000, with an additional \$1,263.24/year in electricity costs. The Town Commons EV Charging station provides an emission reduction of 7.73 MTCDE in one year. The cost per yearly emissions reduction is \$3,397.57/MTCDE. However, staff will be pursuing funding to cover 100% of the costs of publicly-available EV Charging stations through the VW Mitigation Trust Fund, and this reduces the cost to solely staff time needed to writing the funding request and manage the project.

TR #2: Enhance Transit Service

In Chapel Hill Transit's FY17-18 Service Plan Update to the Transit Partners Committee, an estimate of \$200,000 is provided for a service expansion of 2,218 hours.

Greenhouse gas emissions for Carrboro's portion of Chapel Hill Transit ridership in the 2012 Capstone Report was calculated as 15%. Using this estimate and data from the 2005 Chapel Hill Mobility Report Card, there are approximately 880,800 rides taken by Carrboro residents each year, or 4.97 rides/hour.

Providing a service expansion of 2,218 hours would add approximately 11,023.46 rides in Carrboro. The total emissions attributed to CH Transit in the 2012 Capstone was 954 MTCDE, or 0.001 MTCDE per ride. Adding 2,218 hours of service would result in approximately 11.02 MTCDE in emissions reductions (0.005 MTCDE/hour of service).

At a cost of \$200,000 for 2,218 hours, the cost to add one hour of service is \$90.17, resulting in 0.005 MTCDE in emissions reductions. To reach 1 MTCDE of emissions reductions, it would cost approximately \$18,034.

TR #3: Improve Vanpool/Carpool Options

This initiative will require a partnership with GoTriangle and local businesses.

TR #4: Further Promote Walking, Biking, Transit

This recommendation involves staff time to promote Bike to Work Days, implement the Safe Routes to School Program, and promote other initiatives such as bike sharing and Open Streets events.

TR #5: Limit Idling in School Loading Zones*Idling Reduction Campaign*

According to the U.S. EPA, idling school buses for more than three minutes emits more particulate matter than restarting the engine. Emissions after a restart contain less carbon monoxide, nitrogen oxides, and other pollutants than if a school bus idled for ten minutes. Most of the costs related to initiating an Idling Reduction Campaign will be related to creating and printing public outreach materials and dedicated staff time in the Town of Carrboro and CHCCS.

Estimates

CHCCS operates 74 school buses for a minimum of 185 school days per year. If all buses reduce idling by 30 minutes per day, using estimates from the EPA, they will save 0.25 gallons of diesel fuel per bus per day.

School Bus Savings	
Gallons Gasoline saved/day	18.5
Gallons Gasoline saved/year	3,422.5
lbs CO2 saved/year	75,979.5
MTCDE saved/year total CHCCS	34.46
MTCDE saved/year Carrboro schools	10.68

Total CHCCS students	12,000
Bus riders	5,300
Driven to school*	4,467
Walk/Bike*	2,233

*Estimates using Safe Routes to School data.

Summary Table

Vehicle Type	Percentage	Fuel Economy (mi/gal)	Idling fuel use	# of vehicles	gal saved/car if reduce 10 min idling/car/day	Total Gal saved/day	Total Gal saved/school year	MTCDE saved/year
Passenger Vehicles	71.73%	23.3	0.0053 gal/min (or 0.32 gal/hr)	3204.18	0.05	169.82	31,416.98	276.46
Light Trucks	20.49%	17.1	0.0118 gal/min (or 0.71 gal/hr)	915.29	0.12	108.0	19,980.74	175.82

Totals	MTCDE Saved/Year
CHCCS	452.28
Carrboro Schools	140.16

Total MTCDE saved/year bus and cars	Estimated Outreach Cost	Estimated Staff Cost	Estimated Total Cost	\$/MTCDE Savings
150.89	\$4,740.67	\$5,000.00	\$9,740.67	\$64.55

Public Outreach

Source: Atkinson, et al., 2010

- Flyers
- Pledge cards
- Bumper stickers
- Keychains
- Posters

The EPA Idle-Free Schools Program recommends the following activities in the Idle Free Schools Toolkit.

- Pre-Campaign Observations
- Introduce Campaign, incorporate into classroom teachings
- Public outreach, distribute idling policies
- Pledge contest

- Driver Contact Event
- Mid- and Post-Campaign Observations

Ideas for continuing activities each year include periodic reminders, continued outreach, and continuing to teach air quality and pollution concepts in school.

TR #6: Improve Bicycle and Pedestrian Infrastructure

Estimates provided in a future update, including linear estimates of costs and greenhouse gas emissions reductions for sidewalks, bike lanes, and greenways.

Renewable Energy (RE) Recommendation #1: Pursue Community Solar Projects

Using the average yearly electricity production of the Carrboro Town Commons solar array, it would require 9,528 5 kWh solar arrays to produce 66,428,017 kWh/year, or half the yearly electricity used by Carrboro residents.

Estimated Cost of one 5 kWh system	\$22,688.00
Total Cost of 9,528 systems	\$216,171,264.00
Duke Energy Rebates (up to \$50,000)	\$216,121,264.00
Total Cost for Community Solar Arrays, Including 30% Tax Credit (through 12/31/19)	\$151,284,884.80

A 50% reduction in emissions from electricity is equal to 32,524.5 MTCDE.

The ratio of cost to MTCDE reduced is \$4,651.41/MTCDE. Reducing the electricity use of the community by 50% would reduce total community emissions by 29.02%

The Federal Solar Tax Credit will decrease to 26% of solar installations in 2020, and 22% in 2021, and will expire in 2022.

In a previous Community Climate Action Plan Memorandum to the Board of Aldermen, staff estimated that 3% of Carrboro may be suitable for solar installations from rooftops, open land, and parking lots. The Department of Energy has estimated that about 175k square meters of rooftop space is available in Carrboro, which is equivalent to about 34k MWh of potential annual generation, or a little more than 1/3 of the extrapolated area suitable for solar installations.

RE Recommendation #2: Pursue Downtown Geothermal Heating and Cooling

As of June 2016, Orange County has connected 6 buildings to geothermal systems at a cost of \$1.8 million. County buildings have experienced a 30-50% reduction in heating and cooling energy use and costs from this project. Town staff have researched this potential for Carrboro Town buildings, but have found that the logistics of the geothermal installation are prohibitive at this time.

RE Recommendation #3: Create Rental Property Task Force and Process

See BR #3 and BR #4.

Ecosystem Recommendation (ER) #1: Pursue Stormwater Utility

The Stormwater Utility is currently collecting ~\$800,000 in annual revenue from new stormwater fees, which is being used for both operational expenses and capital projects/revenues.

ER #2: Evaluate Extent to Which the Deer Population and Climate Change affect Native Plant Ecosystems

This recommendation will require a scientific study or UNC Capstone Project. It is a resiliency measure and will not result in easily-quantifiable emissions reduction.

ER #3: Accelerate/Expand Organic Waste Collection/Composting

In the December 4, 2018 Energy and Climate Protection Plan and Community Climate Action Plan Implementation Update, Town staff analyzed multiple composting scenarios using EPA's WARM model. Staff updated the WARM model by removing yard waste components to obtain additional estimates of emissions reduction from different composting scenarios. The average emissions reduction from a composting program was 236.89 MTCDE/year.

Town staff also updated cost estimates for composting scenarios. The average one-time cost for a composting program is \$199,647.24 to purchase curbside and kitchen composting bins. The average yearly cost of a composting and every-other-week garbage collection program is \$682,533.65. The average costs to emissions reduction ratio is \$5,706.20/MTCDE.

Pilot Program

A pilot program can be initiated in the Old Carrboro Neighborhood, Green Neighborhood #14. At approximately 1,077 people per Green Neighborhood, and an average of 2.34 persons per household, there will be approximately 460 households in the pilot program. Residents will receive outreach materials, a kitchen compost bin, a curbside compost bin, and a 6-month supply of compostable kitchen bin liners.

Item	Cost
Cost per 96-gallon bin	\$48.18
Cost to provide bins to 460 homes	\$22,162.80
Cost per kitchen bin	\$5.00
Cost to provide bins to 460 homes	\$2,300
Cost of 6-month supply of kitchen bin liners to each home	\$4,600
Outreach Materials	\$5,000
Total Cost	\$34,062

Outreach Materials

The City of Renton, Washington Pilot provided the following communications with participants in the pilot composting program:

- Initial notification letter
- Introductory postcard
- Composting instructional brochure
- Cart stickers, Problem tags
- Follow-up communication after completion of pilot

Monitoring Success

Resident feedback surveys, load weights, and visual audits can be used to measure success of the pilot program. According to McGowen and Nicoletto (2015), the Residential Composting Monitoring Program in Cambridge, Massachusetts used resident feedback surveys to obtain information on the following topics:

- Demographics
- Changes in generation of household waste
- Opinions on kitchen containers, compostable bags and green bins
- Cooking, food purchasing, leftovers and waste-related behaviors
- Odors, fruit flies and rodents

Cambridge staff also emailed participants on a monthly basis with updates on program performance, greenhouse gas emissions reductions, and composting tips.

During their pilot composting program, the City of Portland, Oregon measured participation and diversion rates by weighing haulers and performing visual audits on a selected sample of participants.

Additionally, the City of Renton, Washington monitored public health impacts of every-other-week garbage collection. To measure these impacts, a separate observer (staff member or consultant) joined route collection staff to perform visual monitoring. The observer also performed walk-around monitoring at selected locations.

ER #4: Tree Preservation, Protection and Conservation

The Town of Carrboro can pursue an Urban and Community Forestry Grant from the North Carolina Forest Service to perform a tree inventory and write a Street Tree Master Plan. Grants awarded to other cities in the state through the program in 2017 to complete a tree inventory and management plan average a cost of \$25,000-\$50,000.

ER #5: Improve Regulations and Community Capacity to Discourage Invasive Plants and Encourage Native Plants

This recommendation will involve updates to the Town's Land Use Ordinance and outreach. Using a \$30,000 grant, the Bolin Forest and Quarterpath Trace neighborhoods, with support from Green Roots Environmental Design from Raleigh, collaborated to pursue a neighborhood-driven forest stewardship campaign. The effort included invasive plant management, a community workshop at the Century Center, and preparation of an Urban Forest Stewardship Report. This

Recommendation action focuses more on resiliency than easily-quantifiable greenhouse gas emissions mitigation.

ER #6: Pursue Watershed Restoration Actions to Protect Local Streams from Changes in Rainfall Due to Climate Change

The Town of Carrboro was awarded a Section 319 NPS Pollution Control Grant for \$200,000 by the North Carolina Department of Environmental and Natural Resources (NC DENR) to support the continuation of watershed restoration efforts for Bolin Creek. The grant was a cooperative effort between the Town of Carrboro, North Carolina State University, CHCCS, and Friends of Bolin Creek. The Town of Carrboro provided an in-kind match of \$148,393.00, and the Friends of Bolin Creek provided a \$5,000.00 cash match. The Town pursued watershed restoration projects, planning, and monitoring using this funding. Watershed restoration focuses more on resiliency than easily-quantifiable greenhouse gas emissions mitigation.

Food Choice Recommendation (FCR) #1: 50% Challenge, FCR #2: Develop Local Dietary Consumption and Associated GHG Profile

FCR #2 must be completed in order to accurately track progress on FCR #1. Food choice emissions data was not included in the 2012 Greenhouse Gas Emission Inventory Capstone Project. In order to determine emissions from food choices, staff studied relevant research and utilized the CoolClimate Network's consumption-based greenhouse gas accounting. The CoolClimate Network is a University-Government-Business-NGO Partnership at the University of California (UC), Berkeley.

UC Berkeley CoolClimate Network Estimated Household Footprints for Carrboro Zip Codes		
Zip Code	Average Household Footprint (MTCDE)	Average Household food footprint (MTCDE)
27510	35.4	6
27516	49.5	7
Average of Zip Codes	42.45	6.5

According to U.S. Census Data, between 2013-2017, there were 8,991 households in Carrboro and an average of 2.34 persons per household. The estimated population for 2017 was 21,544.

Summary Table

CoolClimate Estimated Avg. Footprints	MTCDE
Avg. Estimated Total Footprint per person	18.14
Avg. Estimated Footprint per person – Food Consumption	2.78
Percentage of emissions related to food consumption per person ¹	15.3
Avg. Yearly Food Footprint Per Person	2.78
Total Yearly Town Food Footprint	59,892.32

¹This matches an estimate in a review of carbon calculators by Kim & Neff (2009) regarding the contribution of food to the average individual's carbon footprint.

Goals

	Avg. Yearly Food Footprint Per Person (MTCDE)	Total Yearly Town Food Footprint (MTCDE)	Food footprint from animal products (MTCDE)	50% Reduction Goal (MTCDE)	Goal Footprint from animal products (MTCDE)
2017 Population					
21544	2.78	59,892.32	26,951.54	13,475.78	46,416.55

Potential Emissions Reduction

Diet	Emissions Reduction	Decrease in per person footprint (MTCDE)	New Footprint Per Person (MTCDE)	Number of people	% of Population	New food-related footprint per person (MTCDE)
Meat partially replaced by plant-based food	7%	0.19	2.58	1,077	5%	2,782.25
Adopting Dietary Guidelines for Americans	12%	0.33	2.44	8,618	40%	21,063.92
Vegetarian	31%	0.86	1.92	6,463	30%	12,383.35
Vegan ¹	45%	1.25	1.53	3,878	18%	5,920.72
No change	0%	0.00	2.78	1,508	7%	4,192.46
Total			21,544			46,342.71

¹A publication by Aleksandrowicz et al., (2016) conducted a systematic examination of scientific literature measuring the environmental impacts of shifting current average dietary intake to a variety of more-sustainable diet options and found the median reduction in food-related emissions when shifting to a vegan diet was 45%. According to Weber & Matthews (2008), food production accounts for 83% of diet-related emissions, while food transport accounts for 11% of diet-related emissions.

Larger Context

Total Community Emissions	Town Emissions Including Food Footprint	Total Town Emissions with 50% Reduction from Food Emissions	Percentage of Emissions Reduction with 50% Reduction from Food Emissions
112,059	171,951.32	158,475.5	7.8%

If 5% of the population replaces a small amount of meat with plant-based food, 40% of the population adopts the Dietary Guidelines for Americans, published by the U.S. Department of Agriculture and U.S. Health and Human Services, 30% of the population becomes vegetarian, and 18% of the population becomes vegan, then Carrboro will reach its goal to reduce community-wide emissions from animal consumption by 50% by 2025. This will reduce total Town emissions approximately 8%.

Examples from Other Cities to Reduce Emissions from Food Consumption:

1. The City of Cincinnati, Ohio estimates a cost of \$25,000 for an outreach program to reduce meat consumption. The City recommended circular advertising, and providing handouts at events, grocery stores, fitness centers, and farmers' markets.

The City of Cincinnati also recommended an expansion of their Produce Perks/SNAP (Supplemental Nutrition Assistance Program) Plus Program. Produce Perks provides SNAP recipients an extra \$1.00 to spend on produce for each \$1.00 spent on other food, up to \$10.00/day. This allows SNAP recipients to purchase additional fruits and vegetables at no cost and will increase consumption of plant-based meals. The program also allows SNAP recipients to purchase produce at participating farmers markets and Community Supported Agriculture (CSA) programs, helping the local economy and incentivizing healthy foods at retailers. The cost estimate for the Produce Perks Program in Cincinnati was \$6,469.00.

2. The City of Eugene, Oregon recommends a "Buy climate-friendly first" food purchasing policy for public institutions including city and county governments, schools, and hospitals in its Community Climate and Energy Action Plan.

3. The City of Portland, Oregon partnered with the Portland Metro, the City of Portland Water Bureau, the Portland Bureau of Planning and Sustainability, and Energy Trust of Oregon to match Portland businesses and non-profits with a sustainability advisor through the Sustainability at Work Program. This program offers three levels of certification to recognize the positive impacts of businesses on the environment and community. Vegetarian and vegan meals are components of certification for restaurants.

4. The City of Durham, NC holds the Bull City Vegan Challenge (BCVC) each year. The BCVC is a 30-day contest where local chefs compete by adding a vegan entrée to their menus. Throughout the month, customers can visit the restaurants and vote for their favorite dishes. The BCVC is sponsored by The Durham Originals, the Triangle Vegetarian Society, Triangle VegFest, Fillaree, and Vegans for Peace. Additionally, local businesses donated prizes to the contest.

Estimated Cost to Promote Plant-Based Diets

Item	Cost
Outreach Program	\$25,000
Produce Perks Program	\$6,469
Community Survey	\$19,000
Restaurant Vegan Challenge	\$5,000
Part-time staff or staff time	\$20,000
Total	\$75,569

Reduction: 13,475.78 MTCDE

Ratio of Cost to MTCDE Reduced: \$5.61

Additionally, promoting local food could achieve 4-5% of additional emissions reduction (Weber & Matthews, 2008). The same reduction could also be made from an individual shifting less than 1 day/week from red meat and/or dairy to other protein sources or vegetable-based meals.

Town of Carrboro Community Emissions Reduction Estimates

Community Reductions 2012-2018	MTCDE Reduced
CHCCS Electricity Reductions, Solarize Carrboro & Pete St. Initiatives	1,000.45
WISE Program	89.7
CHCCS Nat Gas	490.89
CHCCS and Farmers' Market Composting	95.81
Town Reduction	353.9
EV Charging Station	9.02
Solid Waste	329.19
Projected Electricity Use with Current Population	13,268.43
Homestead Rd-Chapel Hill High School Multi-Use Path	16.02
Total Estimated Reduction	15,653.40

Total Community Emissions	MTCDE
2012	112,059
Estimated 2018	96,405.60

13.97% reduction in total community emissions

Per Capita Emissions	MTCDE
2012	5.50
Estimated 2018	4.47

18.73% reduction in total community emissions

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