Carbon Reduction Recommendations from the Town of Cary's Environmental Advisory Board

March 12, 2019

Executive Summary

The Environmental Advisory Board recommends that the Town of Cary set a goal to reduce town-wide carbon emissions* 25% by 2025 and 100% by 2040 compared to a 2018 baseline. These reductions should be guided by a Climate Action Plan/Community Energy Action Plan.

Based on our recent reading and discussion of Paul Hawken's *Drawdown*, combined with our collective expertise in climate and environmental issues, we recommend that carbon reductions are made in the following seven action areas, noting the first area establishes a baseline and metrics which will be used to measure progress in the following years:

1. Establishing a Carbon Baseline and Progress Metrics
2. Buildings, Renewable Energy, and Sites
3. Transportation
4. Green Infrastructure
5. Food Waste and Agriculture
6. Education and Coordination
7. Advocacy

The board encourages Town Council and management to see this as a call to action, given the expected health, environmental, and economic impacts of unabated climate change to the State of North Carolina, including the Town of Cary. Such a goal must be more than words and should yield an actionable plan. We believe that this plan should be an adaptive document that can be modified over time as new technology and policies allow for improving the approach.

*Carbon emissions, for the purposes of this document, is shorthand for a suite of greenhouse gases that contribute to the warming of the atmosphere. These include carbon dioxide, methane, and oxides of nitrogen, among other gases, and are measured in metric tons of carbon dioxide equivalent (MTCDE), which adjusts the magnitude of emissions to account for the potency of the greenhouse gas.

Vision for Town of Cary

The need to lessen the threats that climate change poses to our Town and our state has never been more urgent. This urgency is recognized by state and local officials, as evidenced by: Governor Cooper's recent executive order (#80) to reduce statewide greenhouse emissions 40% by 2025 compared to 2005 levels; the Triangle Regional Resilience Partnership's Resilience Assessment that reports on the increasingly severe impacts from climate change in the Triangle region; and Governor Cooper and NC Department of Environmental Quality's Natural and Working Lands group that is collaborating on actions to sequester carbon (also a part of US Climate Alliance).

We envision Cary as a municipal leader in carbon reduction, and a model that other cities in North Carolina could follow. In addition to providing leadership, the implementation of evidence-based carbon reduction actions will help build trust among the Town's citizens who have articulated that climate change is a topic of concern.

Cary's Environmental Advisory Board formulated these recommendations to guide the Town of Cary, its citizens, staff, and developers, in a process to reduce our carbon emissions. *We encourage Council to adopt these goals and act on these recommendations by working with staff and the Environmental Advisory Board (EAB) to further research, develop, and implement the recommendations to meet the carbon reduction goals.*

Background

Recent climate and national security reports provide ample evidence that significant measures must be taken in the very near term to slow down and eventually halt the rapidly changing climate. Our climate is changing due to carbon pollution in the atmosphere, including the release of carbon dioxide and other greenhouse gases from industry, transportation, food production, and other sectors. Impacts from climate change include negative effects on our food and agricultural production, water resources, air quality, health, and overall quality of life.

Cities are increasingly recognized as leaders in reducing carbon emissions and sequestering (storing) carbon to mitigate the effects of global climate change (Barber, Cool Cities, 2017; Plastrik and Cleveland, Life After Carbon**,** 2018). Strategies to reduce or sequester carbon have multiple benefits beyond limiting the effects of climate change, including energy cost savings, reducing heat stress, increasing stormwater infiltration, decreasing dependence on foreign energy sources, reducing landfill space, and improving health and well-being.

The Yale Climate Opinion Maps, 2018 showed that in Wake County 64% of people are worried about global warming and 61% think local officials should do more to address global warming.

Carbon Reduction Goals and Recommendations

Overall goal: Reduce the Town of Cary's carbon emissions town-wide 25% by 2025 and 100% by 2040 compared to 2018 (baseline).

Approach to derive goals and recommendations: In 2018, the Town of Cary's EAB read and jointly discussed the book *Drawdown* by Paul Hawken (2017) to formulate concrete recommendations that would be applicable, actionable, and impactful at the municipal level to

act on climate change. The group focused on quantitatively high-impact tactics in developing our recommendations, which are in seven major action areas.

Approach to implement recommendations: We recommend an adaptive implementation approach to reduce the Town of Cary's carbon emissions. Using 2018 as a baseline, we recommend re-measuring the Town's carbon emission levels at three to five-year increments and setting five-year step goals accordingly. In addition, we recommend using education and outreach materials to engage and educate the Town's citizens and developers, and employing incentives, certification programs, directives, and ordinances to encourage or require action, as appropriate.

Seven Major Recommended Action Areas:

1. Carbon Baseline and Progress Metrics

Vision: To ensure progress on town-wide carbon emission reductions, a baseline should be developed and refined at five-year intervals. Reports with status updates on tactics should be given at three- and five-year intervals. The five-year reports should be full quantitative reports with full updated emission inventories, while the three-year updates may be more qualitative in nature. The carbon baseline should include emissions as well as carbon uptake or sequestration.

1a. Determine the 2018 town-wide carbon footprint as a baseline measure.

1b. Measure progress using a variety of metrics. The EAB would like the opportunity to provide feedback to Town staff during the development and establishment of these metrics.

2. Buildings, Renewable Energy, and Sites

Vision: The Town of Cary should lead by example with Town buildings and facilities. Infill development and new development should contribute to carbon emission reductions through responsible building construction. These recommendations reflect the foresight expressed in the Imagine Cary Plan (Ch. 8, Serve; also known as the Cary Community Plan). Site planning should prioritize maintaining trees and limiting disturbance for new development and enhancing redevelopment to increase carbon storage and minimize emissions.

2a. New Buildings

New buildings in the Town should use a combination of energy efficiency, renewable energy generation (including being **solar ready**), energy storage, advanced automation, green building materials, and green stormwater infrastructure with the goal of having net zero energy consumption, with specific emphasis on:

- Rooftops – All new buildings in the Town should have rooftop solar panels, micro wind turbines, green roofs, or similar structures to generate clean energy, enhance cooling, and limit stormwater runoff.
- Net Zero Buildings – All new building construction should be done with the goal of creating Net Zero buildings. A Net Zero building produces as much energy as it uses in a year. Use of smart windows, green roofs, efficient HVAC and water systems, better insulation, radiant barriers, distributed energy and storage, and advanced building automation systems are all ways of achieving this goal.

2b. Renewable Energy

The Town should work to remove barriers to renewable energy implementation on Town buildings, as well as commercial and residential buildings.

2c. Site Plans

The Town should use the site planning process to encourage retention of stands of trees and high-value habitats, with an emphasis on contiguous tree canopy over preservation of solitary champion trees. Additionally, emphasis should be given to overall reduction in land impact caused by mass grading for large developments. For infill sites, the focus should be on adaptive reuse of buildings and existing structures as well as adding and enhancing green infrastructure and other ecologically sustainable practices. This would include addition of native vegetation to existing buffers, **daylighting** streams and wetlands buried under pavement, reduction of impervious areas by adding pervious pavement, and increasing root paths for trees planted in denser urban settings using modular suspended pavement systems (like **Silva Cells**).

3. Transportation

Vision: Cary should be a leading example of a walking, biking and Zero Emission Vehicle (ZEV) friendly community. These recommendations would provide a safe and healthy environment for Cary citizens and visitors due to significant carbon reductions, better air quality, and infrastructure designed for the user's needs. Some of these elements are reflected in the Imagine Cary Plan while others support North Carolina's Executive Order #80.

3a. Walkable and Bike Friendly Community

- Develop bike pathway infrastructure, invest in an efficient and robust mass transit system between walkable activity centers, and participate in a regional mass transit system.
- As areas are developed or redeveloped, co-locate a mix of affordable housing, retail and business, and open space (see Green Infrastructure section) to encourage walkable neighborhoods.
- Assure that the Town's walking and biking community goals are consistent with the Imagine Cary goals and if not, amend as needed.
- Explore the idea of "no car zones" to encourage safe pedestrian traffic.

3b. Zero Emission Vehicle (ZEV) Infrastructure

- Create incentives for ZEV use by building out infrastructure and increasing the number of charging stations throughout Cary. Identify opportunities for charging station locations and possibly develop ZEV infrastructure standards that can be used by other local municipalities.
- Encourage ride share opportunities and encourage new innovations in vehicle sharing that could allow the town to minimize the need for parking lots.
- Set an example in the community and reduce the Town's operations carbon emissions by increasing the ZEV and hybrid vehicle fleet and publicize progress.
- Explore the idea of electric vehicle only zones and priority parking to further encourage owning a ZEV.

3c. Last Mile Solutions

- Support creative and safe last mile solutions (pedestrian pathways, electric scooter/bike sharing), so that those who use public transit or other alternative modes of transportation (such as car sharing) can get from centralized drop-off points to their final destination.

4. Green Infrastructure

Vision: Cary has already started many efforts in this area, such as the stormwater stakeholder workgroups, restoration of floodplains, and a "cannot pipe our way out of this" attitude. Green infrastructure includes green rooftops (see above), open space, native vegetation, and increasing our tree canopy. Cary can continue to lead by example by increasing the use of green infrastructure, integrating the "treating at the source" ethic in Town operations and where possible, influencing private development. The Town of Cary should support green development by integrating green stormwater infrastructure into design standards for new development and infill sites. Treating stormwater at the source through practices that mimic natural landscapes with trees and native vegetation contribute to improvements in water quality and air quality.

4a. Sequester Carbon in Plants, Trees and Soil

- Tree Canopy – A tree can absorb as much as 48 pounds of carbon dioxide per year and can sequester 1 ton of carbon dioxide by the time it reaches 40 years old. By increasing the Town's tree canopy cover through urban forest protection, restoration, and afforestation, these and other benefits can be achieved.
- Open Space – As Cary continues to do infill development, open space will become more important. The designs for increased density will necessitate making open space a priority, to continue to increase our tree canopy, sequester carbon, cool the local environment, and provide recreation and improve the quality of life.
- Floodplain restoration – continue to improve and enhance floodplain preservation around streams (ephemeral and intermittent).
- Soils – Healthy soils are necessary for healthy trees and native vegetation. Degraded soils will require constant maintenance and replanting which is counterproductive and costly. Encourage developers to amend top soils with higher grade soil with adequate organic content since without this requirement modern development in our area often results in a thin layer of topsoil over heavy clay that does not support new plantings. Encourage Town to employ soil improvement in new Town-owned development as well as on existing sites where needed.

4b. Forest Protection

- The Town of Cary should protect and manage existing forests as a critical part of the town's infrastructure, as vital as the built environment. To that end, clear cutting should be prohibited in development projects, additional forested park land should be acquired for passive recreation, and a program of educational outreach should be established to inform residents of the importance of forest conservation and tree maintenance on private lands. Where appropriate, the use of conservation easements should be considered to prevent further fragmentation of currently forested land.

4c. Forest Restoration

- The Town should identify land areas that have been converted from forest (e.g., cleared for agricultural purposes) and develop private – public partnerships to plant native trees. When possible, trees with short life spans (e.g., Bradford pear) should be replaced with longer life species. Additional areas can be targeted for tree planting based on opportunities for green infrastructure benefits such as stormwater management and sediment and soil erosion control.

4d. Afforestation

- The Town should identify opportunities for creating new forested areas by planting trees or perennial biomass in areas that were not historically forested. Such areas can include degraded pasture lands, eroding slopes, industrial or abandoned lots, and highway and street medians.

4e. Green Stormwater Infrastructure

- The Town should support green development by integrating green stormwater infrastructure into design standards for new development and infill sites. Treating stormwater at the source through practices that mimic natural landscapes with trees and native vegetation increase tree coverage and contribute to improvements in water quality and air quality.

5. Food Waste and Agriculture

Vision: Food systems are integral to sustainable and healthy communities. We believe in reducing food miles by supporting local sustainable food systems and reducing organic waste going into landfills at all levels of the food supply chain. By educating about food waste and providing opportunities for citizens and businesses to compost, Cary can participate in a local circular economy.

5a. Support Local Agriculture

- Support local agriculture through farmers markets (e.g., Downtown Farmers Market and Western Wake Market) and farmer support (like the cooperative provided at Good Hope Farm).
- Encourage “victory gardens” and urban farming, even in place of lawns.

5b. Reduce Food Waste

- Divert food waste from restaurants, grocery stores, farms and other food providers by building a network of local resources and programs to reallocate unwanted food.
- Create partnerships and infrastructure for commercial and residential composting, turning waste into a resource in the form of rich soil.

5c. Integrate Regenerative Agriculture

- The Town’s Good Hope Farm could be a leader, innovator, and educator in regenerative agriculture by using these techniques, and being a demonstration project for other farmers. Partnering with academic institutions to demonstrate the carbon sequestration potential of healthy soils through regenerative agriculture

could help promote the practice in North Carolina. While this is not a major quantitative "win" for carbon reduction due to the overall small relative size of the farm, we believe that it is a good opportunity due to the unique nature of Good Hope Farm and would represent municipal innovation in the carbon sequestration space.

6. Education and Coordination

Vision: The citizens and businesses of Cary should actively join together to best implement these and future recommendations to reduce carbon emissions, sequester carbon, and meet our carbon reduction goals. The Town involves its citizens and stakeholders in all types of planning activities with public information. An educational campaign on carbon reduction and carbon sequestration will be needed to successfully reach our goals and engage our citizens.

6a. Educate Cary Citizens and Businesses About Actions to Reduce Carbon Emissions
- Provide public education, such as through existing town initiatives, partnerships with nonprofit organizations, and social media, on ways to reduce carbon emissions. This includes reducing food waste, composting, improving refrigeration, recycling, supporting alternative energy, saving water, and being more energy efficient.

7. Advocacy

Vision: The Town should work with other municipalities across the North Carolina to advocate at the state level for the ability to implement local ordinances aimed at carbon reductions.

7a. Advocate at State Level
- When municipal ability to make change is limited by state law, advocate for local rights to implement local carbon reduction measures through local ordinances.

DEFINITIONS

Advanced Building Automation Systems -- is a computer-based control system installed in buildings that controls and monitors the building's mechanical and electrical equipment such as ventilation, lighting, power systems, fire systems, and security systems. A BMS consists of software and hardware. (Wikipedia)

Block Leader Program –is a Town of Cary program that engages citizen volunteers to communicate about environmental topics with their neighbors. This program will be renamed and updated in 2019 to be called the Cary Green Neighborhood Program.

Carbon emissions -- Carbon dioxide (CO2) is a colourless, odourless and non-poisonous gas formed by combustion of carbon and in the respiration of living organisms and is considered a greenhouse gas. Emissions means the release of greenhouse gases and/or their precursors into the atmosphere over a specified area and period of time. (United Nations. United Nations Framework Convention on Climate Change (A/AC.237/18 (Part II)/Add.1 and Corr.1). Opened

for signature at Rio de Janeiro on 4 June 1992. (Section C)). Carbon emissions, for the purposes of this document, is shorthand for a suite of greenhouse gases that contribute to the warming of the atmosphere. These include carbon dioxide, methane, and oxides of nitrogen, among other gases, and are measured in metric tons of carbon dioxide equivalent (MTCDE), which adjusts the magnitude of emissions to account for the potency of the greenhouse gas.

Daylighting (streams)--In urban design and urban planning, daylighting is the redirection of a stream into an above-ground channel. Typically, the rationale behind daylighting is to revert a stream of water to a more natural state, for the purposes of runoff reduction, habitat creation for species in need of it, or for aesthetic purposes.(Wikipedia)

Ephemeral Streams -- An ephemeral stream has flowing water only during, and for a short duration after, precipitation events in a typical year. Ephemeral stream beds are located above the water table year-round. Groundwater is not a source of water for the stream. Runoff from rainfall is the primary source of water for stream flow. (US EPA Aquatic Resources Awareness Course)

Green Infrastructure -- is an approach to water management that protects, restores, or mimics the natural water cycle. Green infrastructure is effective, economical, and enhances community safety and quality of life. It means planting trees and restoring wetlands, rather than building a costly new water treatment plant. (American Rivers)

Intermittent Streams -- An intermittent stream has flowing water during certain times of the year, when groundwater provides water for stream flow. During dry periods, intermittent streams may not have flowing water. Runoff from rainfall is a supplemental source of water for stream flow. (US EPA Aquatic Resources Awareness Course)

Micro Wind Turbines -- A small wind turbine used for microgeneration, as opposed to large commercial wind turbines, such as those found in wind farms, with greater individual power output. (Wikipedia)

Regenerative agriculture -- is a system of farming principles and practices that increases biodiversity, enriches soils, improves watersheds, and enhances ecosystem services. Regenerative Agriculture aims to capture carbon in soil and aboveground biomass, reversing current global trends of atmospheric accumulation. (http://www.regenerativeagriculturedefinition.com/)

Silva Cells—A brand name for a suspended pavement system intended to allow healthy and mature tree growth underneath paved areas in denser urban areas.

REFERENCES

Barber, Benjamin. 2017. Cool Cities: Urban Sovereignty and the Fix for Global Warming. Yale University Press books, United States of America, pp. 207.

EO80-NC's. 2018. Executive Order No. 80: North Carolina's Commitment to Address Climate Change and Transition to a Clean Energy Economy. Available: https://governor.nc.gov/documents/executive-order-no-80-north-carolinas-commitment-address-climate-change-and-transition

Hawken, Paul. 2017. Drawdown: The most comprehensive plan ever proposed to reverse global warming. Penguin Publishing Group, pp. 256.

The Cary Community Plan, finalized on January 24, 2017. Also know as the Imagine Cary Plan. https://www.townofcary.org/projects-initiatives/cary-community-plan

Plastrik, Peter and Cleveland, John. 2018. Life After Carbon: The next global transformation of cities. Island Press, Washington DC, pp. 284.

Yale Climate Opinion Maps. 2018. Created by Jennifer Marlon, Peter Howe, Matto Mildenberger, Anthony Leiserowitz, and Xinran Wang. Available: http://climatecommunication.yale.edu/visualizations-data/ycom-us-2018/?est=happening&type=value&geo=county