June 24, 2019

To: Chatham County Climate Change Advisory Committee

From: John Graybeal

Re: NC State Student Reports on Chatham County Climate Issues

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Several students at NC State University took a spring-semester 2019 course in the Department of Forestry and Environmental Resources. The professor was Jason Matney. Several of us on the Committee attended a session with the students early in the semester. The students interviewed us closely on various County environmental issues. We then supplied the students with our Greenhouse Gas Emissions Inventory, the Climate Action Plan and other materials. We had little or no contact with the students during the semester but on May 7, 2019, we attended a session at NC State where the students presented reports on five topics. We had not seen the reports in advance. As the session closed, we thanked Professor Matney for his work in organizing the student projects and we thanked the students for their efforts. On May 9, 2019, Professor Matney sent us via email the student reports.

The purpose of this document is to set out the main points in the student reports. I will first summarize by topic the main points of each report. For those wishing more detail, I will then set out all the notes I made while reviewing the reports. For anyone interested, the full student reports are available.

SUMMARY OF THE STUDENT REPORTS

(1) Most of the "Energy Efficiency and Expansion" report deals in useful detail with the recommendation that additional residential solar panels should be installed in the County. The students didn't consider wind, believing it wouldn't be a viable energy source in Chatham and they also didn't consider non-residential buildings since they thought that segment was already under consideration. The Committee should determine the status of non-residential solar panels.

The report determined that 50% of the residential rooftops in the County are "solar viable," although that may simply mean that they would hold at least four solar panels. It is not clear that the students made any determinations about the rooftop orientations or tree coverage that could interfere with solar panels. The report discusses financial incentives that may be available including an "NC Solar Rebate Program offered by Duke Energy," property tax exemptions for solar panel installations and federal tax credits.
Another part of the report emphasizes the desirability of upgrading existing residences, businesses and schools to comply with LEED standards. It

describes the various improvements that could be made to meet these standards.

(2) The transportation report acknowledges the importance of this segment, citing our Emissions Inventory, but doesn't offer a miracle fix. It notes the rural nature of the County; the absence of public transportation; that 11,500 residents commute to jobs outside the County; that the average commute time is almost 30 minutes; that almost 80% of commuters travel alone; and that less than 1% use public transportation.

The report recommends (1) that the County encourage citizens to use hybrid and electric cars; (2) that broadband be extended; (3) the development of "internet cafes;" and (4) that the number of charging stations be increased (it includes a map showing gas stations where charging stations could be located).

(3) "Agriculture and Forestry:" This report considers the extent of the loss of agricultural land in the County from 2011 to 2030 but, surprisingly, finds that the loss will be minimal. It concludes that forested land will decrease by 0.53%, pasture land by 0.55% and that the total loss of agricultural land will be 0.5%. It finds, however, that developed land will increase by 8.12%.

The report recommends that forested areas in the County be extended so as to increase CO2 sequestration. It recommends "intercropping" trees with other crops and identifies some varieties of trees that are better at sequestering, viz., hybrid poplar, red oak, black walnut, Norway spruce and white cedar. There may be a question as to whether these varieties are likely to be planted in the County.

The report recommends more use of "precision agriculture;" less use of chemical fertilizer; greater use of pesticides so as to reduce tillage; and greater use of legumes and "warm season grasses" in pastureland.

(4) Wetlands: Although the report urges that wetlands sequester carbon and that they should be protected and increased, the numbers given for sequestration suggest that their benefit is small. Noting the view of some that wetlands may not operate as an effective carbon sink until they have been in existence for 30 – 40 years, the report states that wetlands in the County by 2050 could sequester 35,905 metric tons of carbon annually. However, according to our Greenhouse Gas Emissions Inventory, that is only a little more than 2% of the 1,293,977 metric tons now sequestered by trees in the County. The report, however, notes that wetlands provide many other benefits, providing homes for plants, birds, fish and other water creatures and enabling hunting, fishing and other recreational activities.

(5) Community Engagement: This report concludes that Chatham citizens would probably be interested in assisting in emission reduction efforts. Over the course of 10 pages, it then discusses a Chatham Department of Environmental Quality website, "Sustainability," which I have not been able to locate. It has various

criticisms of that website (e.g., rates it low on "usability"), recommends that it should focus more on the transportation problem and believes that it should contain a carbon footprint calculator.

The following material consists of notes I made while reviewing the student reports.

1. Energy Efficiency and Expansion

The first part of this report recommends use of the LEED system to improve energy efficiency of existing school and other public buildings. (The focus seems to be on existing, rather than new, buildings.) Various efficiency improvements are discussed and recommended, e.g., adding insulation to pipes, windows and walls; using more efficient lighting systems (LED or compact fluorescent lighting) and motion-sensor lighting; "green landscaping" (including roofs); and metering systems. The report discusses costs and payback times (including LEED certification costs) and concludes that these are acceptable.

The next section discusses renewable energy generation, focusing on solar panels on residences. It does not discuss wind, indicating that there could be problems with wind generation in Chatham County; and it doesn't discuss solar panels for non-residential buildings, believing that the SolSmart program adopted by the County Commissioners is covering that issue. The section dealing with residential solar panels covers in great detail all of the relevant factors.

The report concludes that approximately 50% of the residential rooftops in the County are "solar viable," meaning, apparently, that they are large enough to hold at least four properly positioned solar panels. P. 14. The report discusses financial incentives for the installation of solar panels including the NC Solar Rebate Program offered by Duke Energy, property tax exemptions for solar panel installations and federal investment tax credits. Pp. 19 -- 25.

The recommendations contained in this report are summarized as follow

- ·Chatham County Climate Advisory Committee should conduct tours of a

LEED certified building, educating citizens about LEED and how they could implement LEED standards into residential homes.

- ·Residents, businesses, and schools in Chatham County should make changes to comply with LEED standards of energy efficiency through the following changes: Insulation on the piping and windows to better retain heating/cooling; more efficient heating and cooling ; replacing lights with CFL or LED lights ; automated lighting, faucets, HVAC ; "green" landscaping/roofing to aid in natural heating/cooling of the school; automated meters for accurate energy consumption data

- ·Chatham County municipalities should disseminate information regarding solar energy capacity and installation to residents, including the infographics of this report.

- ·The Chatham County Climate Advisory Committee should partner with Chatham CleanPath to hold information sessions/workshops about the growing affordability of residential solar energy. If residential solar is not an option for a Chatham County resident, they can request for a "retail choice" from an energy supplier, allowing them to support wind or solar without ever installing them personally.

- ·Chatham County municipalities should hold information sessions about the Duke Energy Solar Rebate and how to apply for rebates.

- ·Provide a community classes educating Chatham County residents about the tax forms, how to properly file them, and when to expect the refunds.

- ·Establish a website or sign-up email where Chatham County residents can easily access the solar forms.

2. "Green Transportation Program" (this is the title of the transportation report)

The report notes at the outset the rural nature of the County; that "transportation" is the largest source of County emissions; the fact that there is no public transportation system (although it describes the operations of Chatham Transit); that 11,500 resident commute

to jobs outside the County; that the average commute time is almost 30 minutes (the 15th largest County in the state); that almost 80% of auto commuters travel alone; and that less than1% of commuters use public transportation. Pp. 2-3.

The report focuses on individual transportation issues and makes several recommendations: (1) that the County urge citizens to consider hybrid and electric rather than regular gasoline vehicles; (2) that broadband coverage be expanded in the County so that the extent of commuting to work would be reduced; (3) the County encourage the development of "internet cafes" as another way of reducing commuting; and (4) that the number of charging stations be increased (the locations of gasoline stations where charging stations might be installed are identified).

3. Agriculture and Forestry

This report finds that the amount of agricultural/forested land in the County will decrease based on data for 2011 and projections for 2030. The report considers forested, pasture and crop land, and finds that the decrease in forested and pasture land will be very small and that the decrease in crop land will be minimal. The report states:

"Our results show that Chatham County is seeing an overall increase in developed land and decrease in forested and pasture land. Forested land will decrease by 0.53%, and pasture land by 0.55%. Developed land will increase by 8.12%. The total amount of agricultural land in Chatham county will decrease by 0.5% from 2011 to 2030. Table 1 outlines these changes as well. These are small changes, but when considered alongside the carbon stored in the land they point towards a net decrease in the agricultural sector's ability to sequester carbon." P. 13.

The report nevertheless recommends "intercropping" trees with certain crops, e.g., barley and it recommends certain varieties of trees that are better at sequestering carbon, i.e., hybrid poplar, red oak, black walnut, Norway spruce and white cedar. P. 21.

The report also recommends increasing the forested areas in the County, stating: "One solution would be to set aside more forestland, and to create plans to increase the forested land area for the future. If this is the solution, plans to conserve forestland need to be put into place immediately." P. 24.

The report seems to make the questionable assumption that some of the practices described in the Committee's Agricultural Study are actually in place, e.g., practices relating to the application of manure, increasing the digestibility of livestock feed and "composting of manure after anaerobic digestion." P. 18.

The report recommends several aspects of "precision agriculture" either to reduce emissions or improve sequestration. One suggestion is to use less fertilizer which would reduce the amount of nitrous oxide released. P. 19. Another recommendation is to increase the use of pesticides so as to reduce tillage thereby causing the soil to sequester more carbon. P. 20. Other suggestions include reducing tractor traffic generally and using hybrid powered robotic tractors with batteries charged by solar energy. P. 20.

The report recommends several steps to improve sequestration by pastures, including fertilization and the use of legumes and "warm season grasses." P. 21-22.

4. Wetlands

"[Wetlands] . . . serve not only as carbon sinks and flood protection, but also harbor diverse biodiversity threatened by invasive species." P. 2.

Japanese Stiltgrass is a particular invasive that impairs wetlands. It may be a threat to Jordan Lake in the future. P. 4.

Although there has been debate about it, the dominant view apparently is that wetlands are a net carbon sink. They do give off methane but they sequester carbon at 25 times the rate of methane release. P. 5 There are 38,000 acres of wetlands in Chatham County. The largest wetlands areas by far consist of freshwater ponds. P. 7 As for the debate whether wetlands are a carbon sink, some who claim they are also say a wetland may not become a carbon sink until it has existed for 30-40 years. P. 7 Once they become carbon sinks, the wetlands in Chatham County would sequester 22,163 metric tons of carbon each year. By 2050 Chatham wetlands could sequester 35,905 metric tons of carbon. P. 8

"It is necessary for the county to protect these wetlands, and to get the community to protect them, in order to achieve the goal of zero carbon emissions by 2050. The county

already has a large amount of wetland area, and these areas need to remain protected and be maintained properly in order to take advantage of the carbon sequestration potential." P. 9

"Using wetlands conservation as a venue of carbon sequestration provides a multitude of benefits that all of the Chatham County can take advantage. By enabling hunting, fishing, and other recreational activities in some of the wetland areas the communities overall happiness and health is increased." P. 15

The report contains a long list of plants, birds, fish and other water creatures that are at risk in Chatham County. P. 16

There are serious threats to wetlands in the County: human activity (conversion to crop land in the west and residential/commercial development in the east); sedimentation and invasive species. P. 19

Page 20 has a list of the most serious invasives in the County. Those most threatening to wetlands are Japanese Stiltgrass and Hydrilla.

Page 24 is a County map that shows the wetlands. Apparently almost all of them, except for Jordan Lake, are ponds.

The report encourages the County to sponsor increased number of wetlands and to encourage "pocket wetlands" and rain gardens. Pp. 22-26.

"Based on extensive research we believe that wetlands conservation should be at the forefront of Chatham County's actions to meet the goals for carbon neutrality. Wetlands provide not only carbon sequestration but also a multitude of other ecosystem services in public health, recreation, and pollution control. Chatham County can increase carbon sequestration by protecting these lands but also through management techniques that the entire community can participate in." p. 26.

5. Community Engagement

The goal of this paper was to focus on ways that citizens could become more actively involved in reducing carbon emissions. The team considered the use of more grass roots

efforts, a user-friendly website and other measures.

The team concluded that, based on a study done in Africa, citizens under 30 years of age were more likely to participate in activity to reduce emissions and that political orientation might also be a factor. Pp. 3-5. The study noted that the average age in Chatham is 47 and that Chatham tends to vote Democratic. P. 5. It concluded that many Chatham citizens would probably be willing to participate. P. 5.

The report notes that the Committee's Action Plan discusses the use of a website that citizens could use to learn ways they can reduce their carbon footprint. It notes that the Chatham Department of Environmental Quality has already developed a "Sustainability" website (p. 5) and it devotes 10 pages to a discussion of recommended ways the website could be improved. Pp. 10-20. For example, it points out that the website ranks low on "usability," that it has various content omissions and defects and that has no Spanish language material. P. 10. It emphasizes that the website should give more attention to the problem of emissions produced by "transportation," since that factor is the predominant source in the County. P. 16. Finally, it urges that a carbon footprint calculator either be added to this website or contained in a separate website so that citizens can calculate their carbon footprints. P. 20.

The report discusses "plogging" (combining jogging and "picking up") and #trashtag, both of which would involve citizens coming together to cleanup outdoor areas. Pp. 8-9.

This report concludes with discussion of the technical method of calculating CO2 sequestration by an individual tree or a forest. This method seems to be a different approach than the one used in our Emissions Report. We might be able to discuss this system with Prof. Mark Megalos of NCSU to determine whether it would be an improvement over the system that was used before.