Chatham County, North Carolina, Environmental Quality Department

2019-2020 Greenhouse Gas Inventory

Pollinator plant pilot project at closed county landfill.

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Introduction:

A greenhouse gas (GHG) inventory is a report consisting of GHG emission sources and the associated emissions quantified using standardized methods (1). This data can then be used by the community to understand and identify opportunities for action with the goal of reducing emissions. As the consequences of climate change begin to express themselves more frequently and the estimated "point of no return" looms in the not-so-distant future, GHG inventories have become a vital resource in the fight to lower emissions and stop the progression of climate change (2).

The Environmental Protection Agency publishes an annual report estimating the total national GHG emissions associated with human activities. According to this report the primary sources of GHG emissions in 2019 in the United States were transportation (29%), electricity production (25%), industry (23%), commercial and residential (13%), and agriculture (10%) (24).

This GHG inventory will focus on Chatham County, located in the middle of the state of North Carolina. This report was created by the county's Environmental Quality Department in order to inform local law makers and citizens about the GHG emissions being produced by their county. Two previous GHG inventories have been completed. A baseline GHG inventory was created in 2010 by Betsy McCorkle and Amanda Campbell with assistance from Duke University's Nicholas School of the Environment (3). An update to the baseline report was produced in 2015 by Lauren Joca and Carl Kolosna in conjunction with the PLAN 547 course: energy, transportation, and land use, at the University of North Carolina at Chapel Hill (4). This report will consist of updated methodology, data, and resources to create the most accurate representation of GHG emissions possible. Emissions produced by internal government, agriculture, waste, commercial, residential, industrial, and transportation activities will be represented.

It should be noted that unlike previous inventories, this report covers two calendar years of data. This project began in August of 2020 and was planned to cover only 2019 data, as the full 2020 data would not yet be available. Due to unforeseen circumstances, this project was put on hiatus from October 2020 – January 2021. It was decided that since the data would now be available for the 2020 calendar year, it would be beneficial to this report to include it as well. Readers should also be aware that any variances or noticeable inconsistencies with the data from the calendar year of 2020 could be the result of the COVID-19 pandemic which had global implications and fundamentally changed daily operations in all sectors of the county for much of the year.

Table One: 2019 and 2020 Distribution of CO_2E Emissions in Chatham County by Sector

Sector	2019 CO_2E (metric tons)	2019 Percent of Total	2020 CO_2E (metric tons)	2020 Percent of Total
Internal Government	5,467	1%	5,227	1%
Waste	28,021	3%	28,526	3%
Agriculture	43,916	5%	44,326	5%
Commercial	84,892	9%	80,629	9%
Residential	185,482	20%	179,036	19%
Industrial	199,496	22%	188,263	20%
Transportation	371,019	40%	392,403	43%
Total	918,293	100%	918,410	100%

Figure One: 2019 Distribution of CO_2E Emissions in Chatham County by Sector

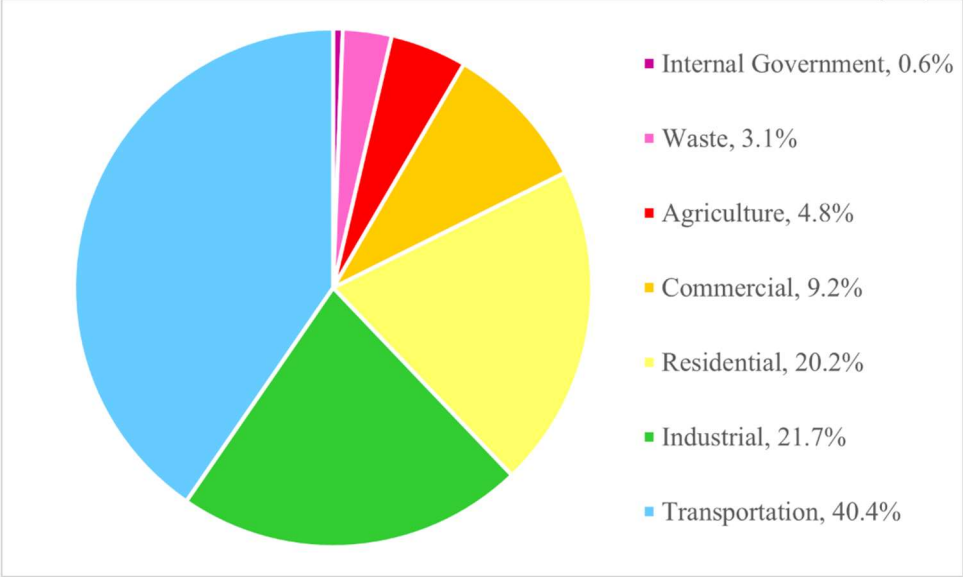

Figure One: The percentage of CO_2E emissions in Chatham County by sector for the year 2019.

Figure Two: 2020 Distribution of CO_2E Emissions in Chatham County by Sector

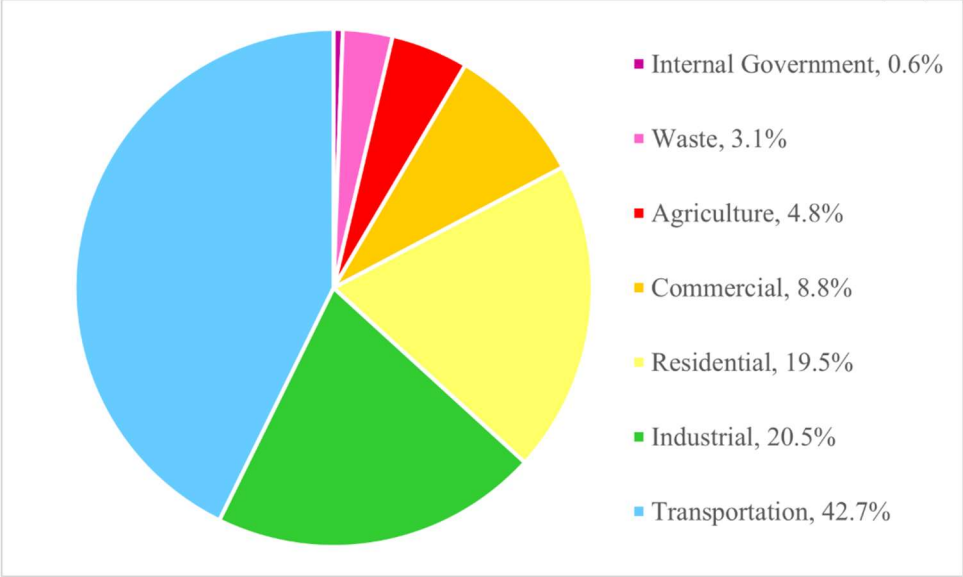

Figure Two: The percentage of CO_2E emissions in Chatham County by sector for the year 2020.

As shown in Figure One and Two, the emissions for 2019 and 2020 are very similarly distributed among the sectors in Chatham County. This is expected as the data displayed is for two consecutive years. A drastic change in emission would not be expected in such a short amount of time. The transportation sector is responsible for the most emission in both 2019 and 2020. The emissions for the transportation sector are nearly double the amount of the next largest sector, industrial. However, when looked at as one source, the commercial, residential, and industrial sectors exceed the emissions of the transportation sector.

Figure Three: Total CO_2E Emissions for Chatham County by Year

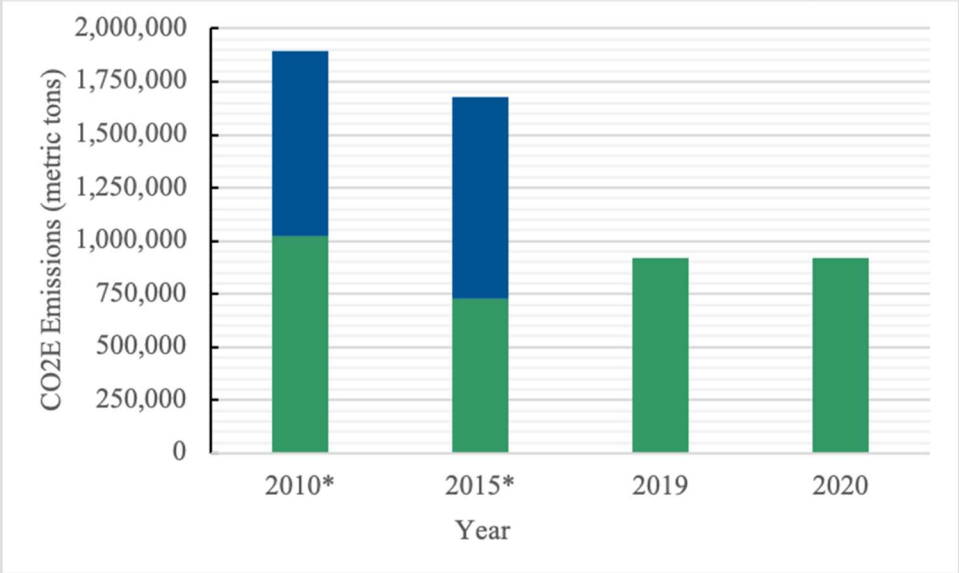

*Figure Three: The total CO_2E emissions in metric tons by year in Chatham County according to current and past GHG inventories. *This figure reports CO_2E emissions exactly as presented in previous GHG inventories. Sources for data differ between inventories. The blue section present on the first two bars represents the difference between the transportation emissions as calculated in the original reports and if it had been calculated using the data source used in this report.*

As shown in Figure Three, Chatham County has reduced its GHG emissions by over fifty percent in the last ten years. However, the data displayed in this figure should be viewed skeptically as the GHG inventories performed in 2010 and 2015 did not have access to as much data as was available while performing this inventory. This means that many of the data points used to create the total CO_2E emission for 2010 and 2015 had to be estimated or came from differing sources. However, using the transportation data source used in this report and subtracting it from the transportation emissions calculated in previous reports (the differences is represented by the blue sections on the graph), a more comparable set of data is produced.

Methodology:

The creation of this report required the collection of data from a multitude of sources including, governmental agencies, publicly available information, and privately owned businesses. The collection methods and other resources gathered will be described in greater detail in the individual sector's section below.

Once the information was gathered, the International Council for Local Environmental Initiatives' (ICLEI) ClearPath tool was used to convert the raw data into CO_2 equivalents (CO_2E). CO_2E use global warming potentials (GWP) to convert different GHG emissions into the equivalent amount of CO_2. GWP was created by the Intergovernmental Panel on Climate Change (IPCC) to determine the effect of different GHG emissions over a 100-year time span when compared to CO_2 emissions (5). For this report we used the GWP as recorded in the Fifth Assessment Report of the IPCC. Since CO_2 has a GWP = 1 all other GHG are converted into CO_2E for ease of conversion and comparison. An example of this process is the conversion of methane, GWP = 28, to CO_2E. Methane is a more potent GHG than CO_2, therefore it has a higher GWP (6).

$$1\ kg\ methane * \frac{28\ kg\ CO_2E}{1\ kg\ metha} = 28\ kg\ CO_2E$$

Once the data has been converted into CO_2E they can be easily combined and compared in order to create a GHG inventory.

It should be noted that this report uses the GWP established by the Fifth IPCC Assessment Report published in 2014, likely while the 2015 report was being written. The previous two reports likely used the GWP established in the Fourth IPCC Assessment Report published in 2007. This is an important distinction as the GWP potentials have been recalculated between the IPCC's fourth and fifth assessment. This recalculation has changed some of the GWPs, for example the GWP for methane in the fourth assessment report was 25 GWP, while in the fifth assessment report it was raised to 28 GWP. This will tend to elevate methane related emissions in this report compared to the 2010 and 2015 reports.

Greenhouse Gas Inventory

Using the business directory produced by the Chatham Chamber of Commerce, a list of companies involved in the production and/or distribution of electricity, gas, oil, propane, and natural gas were found. These companies were then contacted and asked to provide information on the amount of product they sold within Chatham County's borders between Jan. 1, 2019 – Dec. 31, 2020. Davenport Energy, Dominion Energy, Strick's LP Gas, and Randolph Electric Membership Corporation were all gracious enough to cooperate with the county and share the information necessary to complete this project. In order to collect data about the county from Duke Energy, a data request form had to be submitted and a $400 processing fee was paid. Hunter Oil and Propane, Inc, as well as Central Electric Membership Corporation declined to participate and were unwilling to provide information. However, Central Electric Membership Corporation did provide data for the 2015 report. The energy usage reported in 2015 was used in this report to avoid missing data. The companies who shared information self-defined and divided their data into sectors.

Internal Government:

The data used to calculate the internal government emissions came from three sources: Duke Energy, Davenport Energy, and from Chatham County itself. Duke Energy provided the name of each site to which it supplies energy for the government, allowing us to create the categories listed above (12). Davenport Energy provided both gasoline and propane (LPG) to the county which were assumed to be a part of the building facilities and therefore added under that category (13). The vehicle fleet data had to be gathered from two separate sources in order to create a comprehensive account of the fleet's emissions. The first of the two sources is the county's vehicle fuel garage where county vehicles are occasionally fueled using gasoline or diesel (14). The second source is the county's accounts payable department. When county vehicles are supplied with gasoline or diesel from a source other than the county garage, a receipt must be submitted to the accounts payable department who also keeps track of how many gallons of fuel were purchased (15). Using these two sources, we were able to calculate the CO_2E emissions for the county's vehicle fleet.

Table Two: 2019 and 2020 Internal Government Emissions of CO_2E

Government Activities	2019 CO_2E (metric tons)	2020 CO_2E (metric tons)
Building Facilities	2,522	2,268
Streetlights	4	2
Vehicle Fleet	2,040	2,077
Solid Waste	22	21
Water/Wastewater	879	859
Total	5,467	5,227

Figure Four: 2019 Internal Government CO_2E Emissions

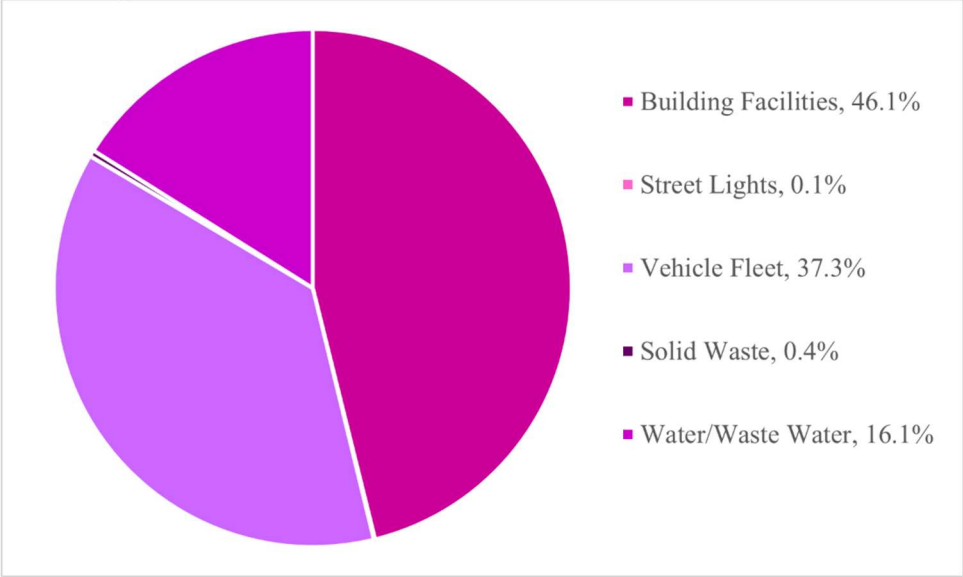

Figure Four: The percentage of CO_2E emissions in Chatham County from internal government activities for the year 2019.

Figure Five: 2020 Internal Government CO_2E Emissions

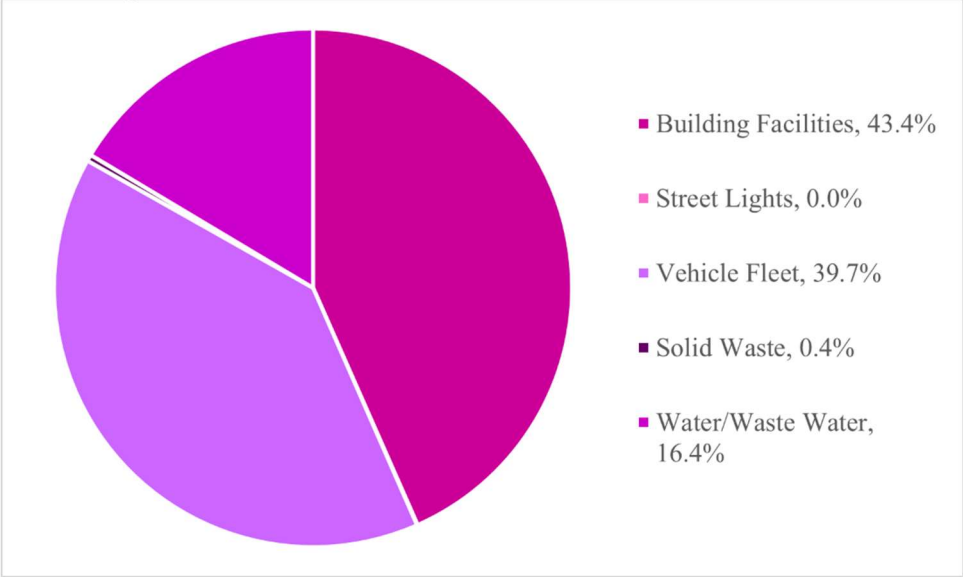

Figure Five: The percentage of CO_2E emissions in Chatham County from internal government activities for the year 2020.

Figure Six: Total Internal Government CO_2E Emissions by Year

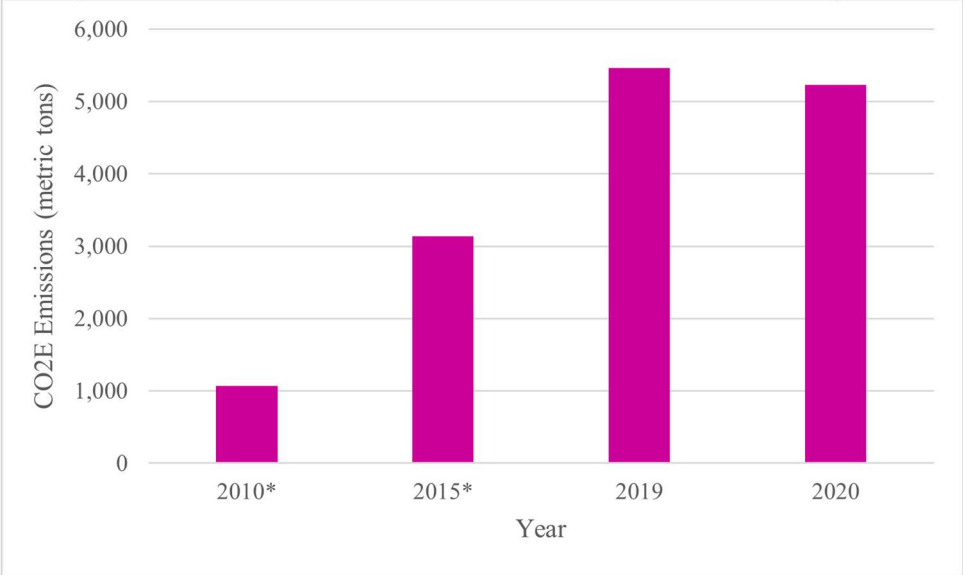

*Figure Six: The total internal government CO_2E emissions in metric tons by year in Chatham County according to current and past GHG inventories. *This figure reports CO_2E emissions exactly as presented in previous GHG inventories. Sources for data differ between inventories.*

Figure Six shows the comparison of internal government GHG emissions for current and previous years according to previous GHG inventories. There are many possible explanations as to why there are such significant increases in emissions from 2010 to 2015 to 2019 and 2020. However, when comparing the data, the most significant increase in emissions come from the building facilities and from the transit fleet. It is possible that these activities experienced a significant increase in use in four-to-five-year intervals. What is more likely to account for this

shift is the availability of information. The inventory in 2010 claimed only two resources were used when calculating the internal government emissions, electricity consumed in county buildings and the gasoline consumed by the county's vehicles. However, there are no sources listed for where this information was gathered. Therefore, it is difficult to explain exactly why there is such a difference besides missing information. Conversely, it appears that during the 2015 inventory the only data relating to internal government activities received was from Duke Energy. During the creation of this report, we were able to gather data from Duke Energy as well as Davenport Energy. It also appears that unlike in this report, the 2015 inventory did not account for the fuel collected by fleet vehicles from county fuel garage when calculating the emissions from the vehicle fleet.

Agriculture:

The North Carolina Department of Agriculture and Consumer Services agricultural statistics county estimates was used to determine the head of livestock recorded in Chatham County (9). Davenport Energy provided the amount of LPG and gasoline they sold that was used for agricultural practices (13).

Table Three: 2019 and 2020 Agricultural Emissions of CO_2E

Emission Source	2019 CO_2E (metric tons)	2020 CO_2E (metric tons)
Broilers	5,740	5,740
Beef Cows	34,496	34,496
Milk Cows	2,727	2,727
Hogs and Pigs	420	420
Layers (Dry)	118	118
Davenport – LPG (gal)	344	703
Davenport – Gasoline (gal)	71	122
Total	43,916	44,326

Figure Seven: 2019 Agricultural CO_2E Emissions

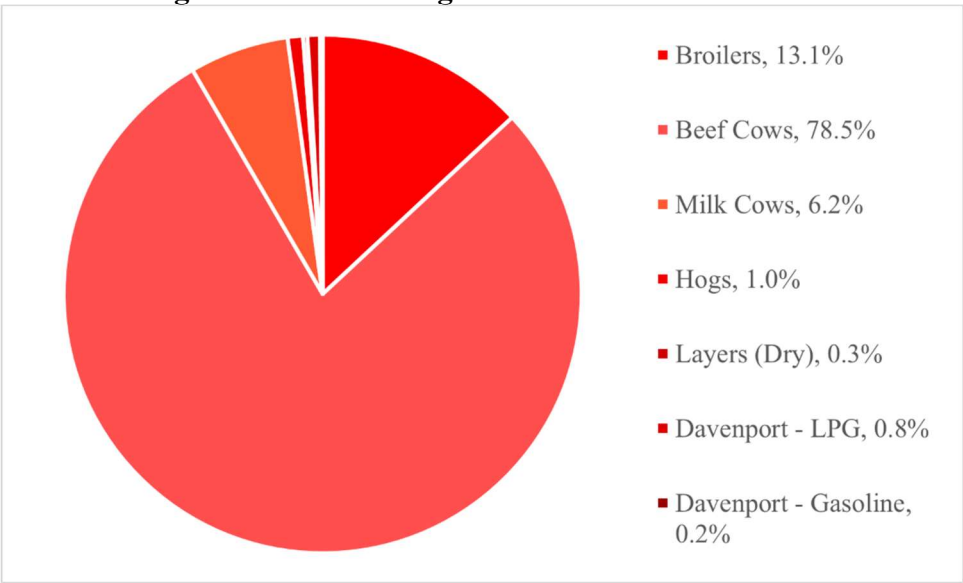

Figure Seven: The percentage of CO_2E emissions in Chatham County from agriculture for the year 2019.

Figure Eight: 2020 Agricultural CO_2E Emissions

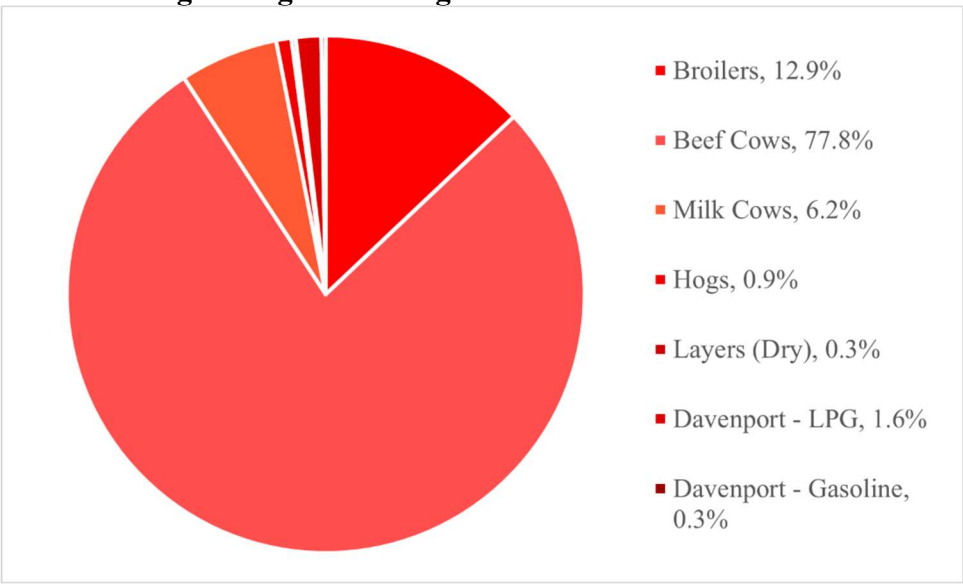

Figure Eight: The percentage of CO_2E emissions in Chatham County from agriculture for the year 2020.

Methane emissions for cattle and swine were calculated using the enteric fermentation method. Enteric fermentation occurs in the digestive systems of animals. Ruminant animals, such as cattle, have bacteria in their digestive systems which allow them to digest coarse plant material, such as grass. The microbial fermentation caused by these bacteria produces methane as a by-product. This methane is then exhaled or belched by the animal, releasing it as an emission. In order to determine how much methane is produced by the enteric fermentation process, emission factors established by the Environmental Protection Agency (EPA) are used. Using the formula below, the amount of methane emissions for cattle and swine can be calculated. (7)

$$EF = \frac{N * F}{2{,}000\ \frac{lb}{ton}}$$

EF = enteric fermentation (methane/year)

N = number of animals

F = emission factor

For example, dairy cows have an emission factor of 278.3 lbs. of methane/head/year and in 2019 there were 700 dairy cows in Chatham County.

$$EF = \frac{700\ head * 278.3\ lbs\ of\ methane/head/year}{2{,}000\ \frac{lbs.}{ton}}$$

$$EF = 97.405\ tons\ of\ methane/year$$

As stated above, enteric fermentation is helpful for determining the amount of methane produced by cattle and swine. However, this method cannot be used to calculate the emissions for other animals, such as poultry. Instead, the emissions associated with manure management of these animals can be calculated. This method uses the same formula as enteric fermentation with emission factors developed by the IPCC. In reference to poultry, the emissions vary based on how the manure is treated, poultry manure is usually treated in one of two ways. Dry layers refer to layer operations that manage dry manure and wet layers refer to layer operations that manage manure as a liquid, such as stored in an anaerobic lagoon (19). According to the NC DEQ, most, if not all, of the poultry operations in Chatham County use dry manure systems, thus only dry layers were included for this GHG calculations (20).

Table Four: 2019 and 2020 Heads and CO_2E Emissions of Livestock

Type of Livestock	Head of Livestock in 2019	2019 CO_2E (metric tons)	Head of Livestock in 2020	2020 CO_2E (metric tons)
Dairy Cows	700	2,727	700	2,727
Beef Cows	16,000	34,496	16,000	34,496
Swine	8,988*	420	8,988*	420
Layers (Dry)	280,000	118	280,000*	118
Broilers	20,500,000	5,740	20,500,000*	5,740
	Total	43,916	Total	44,326

In some cases, the NC Department of Agriculture and Consumer Services agriculture statistics did not provide the number of heads of livestock for 2019 and/or 2020. These instances are marked by asterisks in Table Three. In order to account for the livestock emissions, the head count for the most recent previous year records were used. The data for layers and broilers were last taken in 2019, therefore that data was used for both 2019 and 2020 calculations. The count for swine in Chatham County has been withheld for the last several years "to avoid disclosing data for individual farms." The last time this data was included in a NCDOA census was in 2012 when there was a total of twenty farms. In the following census, taken in 2017, there were nineteen total swine farms reported, however, this was when the number of swine began to be withheld (10).

Figure Nine: Total Agriculture CO_2E Emissions by Year

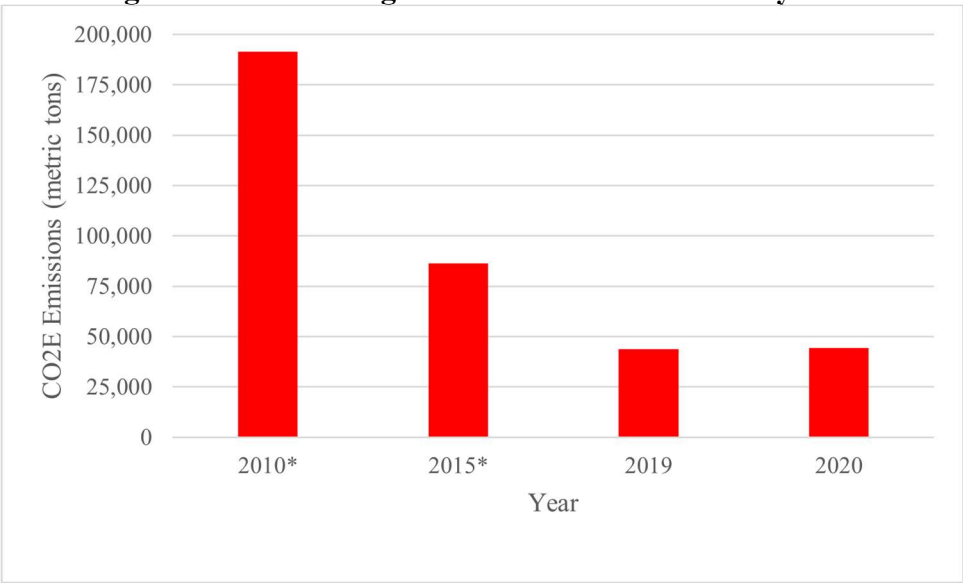

*Figure Nine: The total agriculture CO_2E emissions in metric tons by year in Chatham County according to current and past GHG inventories. *This figure assumes that the calculations done by the previous GHG inventories are correct and accurate.*

Waste:

Solid waste management reports for each county are created annually for the fiscal year by the North Carolina Department of Environmental Quality (NCDEQ) based on information contributed by each county transfer station and landfill. The reports calculate the amount of waste disposed by the county by combining the amount of solid waste landfilled in the county's name as well as the amount of solid waste sent outside the county that was subsequently landfilled. This data accounts for residential, non-residential, and waste from county municipalities (11). It is important to note that, unlike the rest of the data in this report, this information was only available by fiscal years and not calendar years.

Table Five: 2019 and 2020 Waste Emissions of CO_2E

Emission Source	FY 2018 – 2019 (tons)	FY 2018 – 2019 CO_2E (MT)	FY 2019 – 2020 (tons)	FY 2019 – 2020 CO_2E (MT)
Landfill Waste	42,899.25	28,021	43,672.12	28,526

Figure Ten: Total Waste CO_2E Emissions by Year

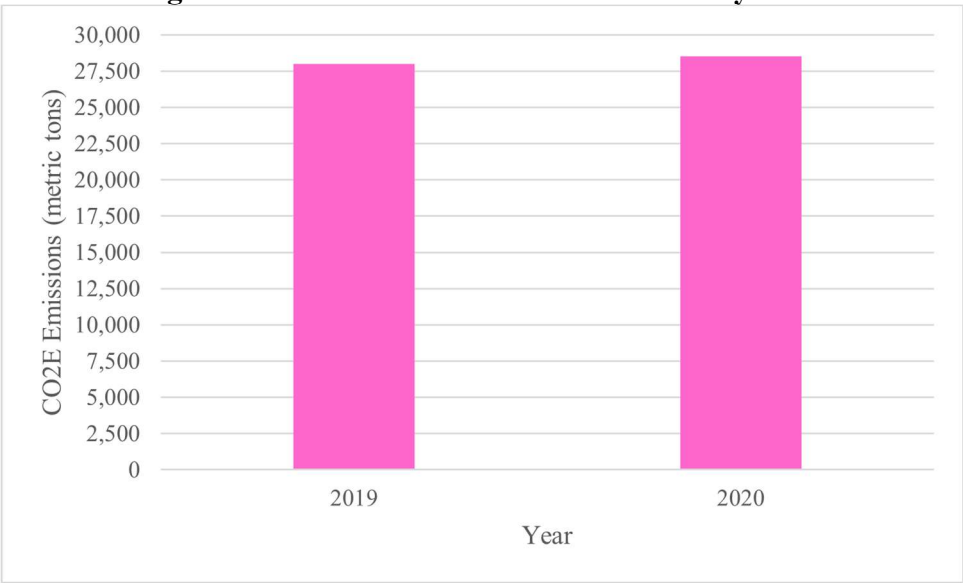

Figure Ten: The total waste CO_2E emissions in metric tons by year in Chatham County according to the current inventory. Previous inventories did not account for emissions created by waste.

In 1993, The Chatham County municipal solid waste landfill ceased all operations. Since then, all waste produced in Chatham County has been shipped elsewhere (21). Previous GHG inventories did not include waste emissions in their reports. While waste exported outside of the county does not produce internal emissions for the county, the county is still responsible for the creation of these emissions and therefore waste emissions are included in this report and will continue to be included in subsequent reports.

Commercial, Residential, and Industrial:

As stated above, we allowed the energy suppliers to self-define and divide their data into sectors. As you can see in the charts below, all the companies provided energy to the residential sector and most provided energy to the commercial sector. However, only two companies provided energy to the industrial sector.

Table Six: 2019 and 2020 Commercial Emissions of CO_2E

Emission Source	2019	2019 CO_2E (metric tons)	2020	2020 CO_2E (metric tons)
Duke (kWh)	168,258,535	61,378	161,706,200	58,988
Dominion – Natural Gas (Therms)	2,882,908	15,333	2,577,989	13,711
Davenport – LPG (gal)	84,705.3	495.41	101,043.3	590.97
Davenport – Kerosene (gal)	516.9	5.283	593.5	6.0659
Davenport – Gasoline (gal)	71,389.2	631.31	68,366.1	604.58
Davenport – DOF (gas)	200,785.7	2,050	169,417.5	1,729.8
Central Electric (kWh)	13,704,047	4,999	13,704,047	4,999
	Total	79,893	Total	75,630

Figure Eleven: 2019 Commercial CO_2E Emissions

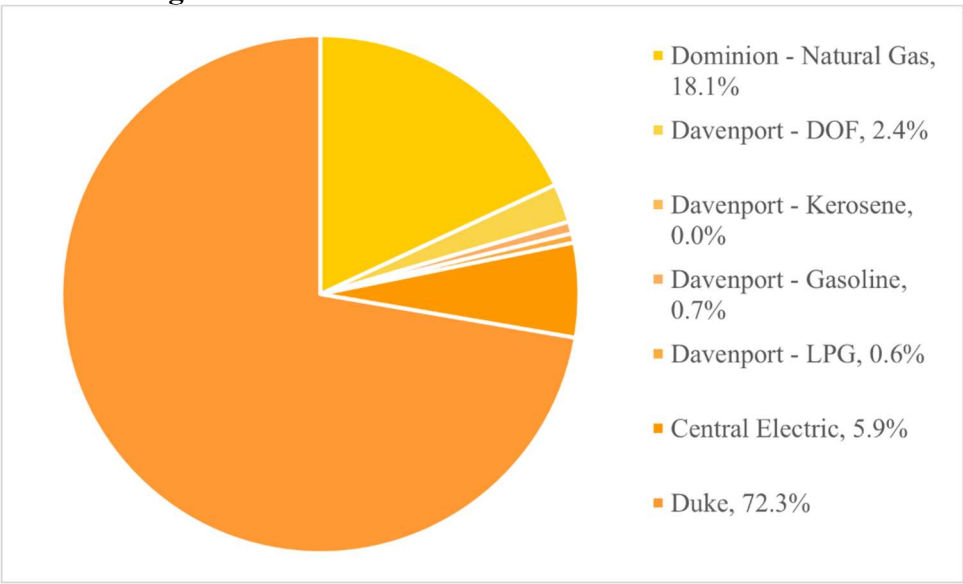

Figure Eleven: The percentage of CO_2E emissions in Chatham County from the commercial sector for the year 2019.

Figure Twelve: 2020 Commercial CO_2E Emissions

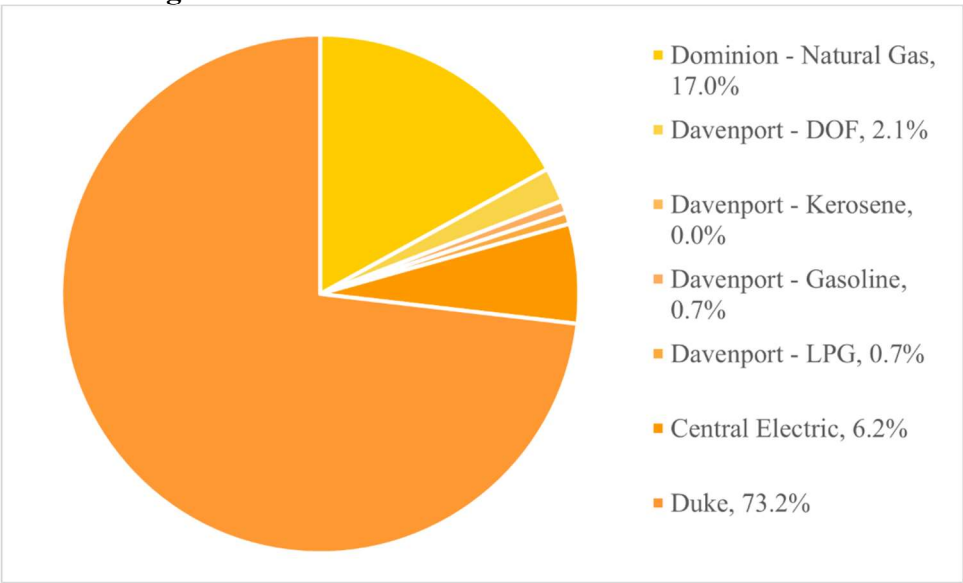

Figure Twelve: The percentage of CO_2E emissions in Chatham County from the commercial sector for the year 2020.

Table Seven: 2019 and 2020 Residential Emissions of CO_2E

Emission Source	2019	2019 CO_2E (metric tons)	2020	2020 CO_2E (metric tons)
Randolph (kWh)	20,974,532	7,651	20,253,131	7,388
Duke (kWh)	354,432,557	129,291	345,052,430	125,870
Dominion – Natural Gas (therms)	5,600,089	29,785	5,121,155	27,238
Stricks – Propane (gal)	58,000	339	22,000	124
Davenport – LPG (gal)	176,157	1,030	172,329	1,008
Davenport – Kerosene (gal)	3,141	32	2,880	29
Davenport – Gasoline (gal)	2,696	24	4,230	37
Davenport – DOF (gal)	7,640	78	8,819	90
Central Electric (kWh)	47,289,794	17,251	47,289,794	17,251
	Total	168,231	Total	161,785

Figure Thirteen: 2019 Residential CO_2E Emissions

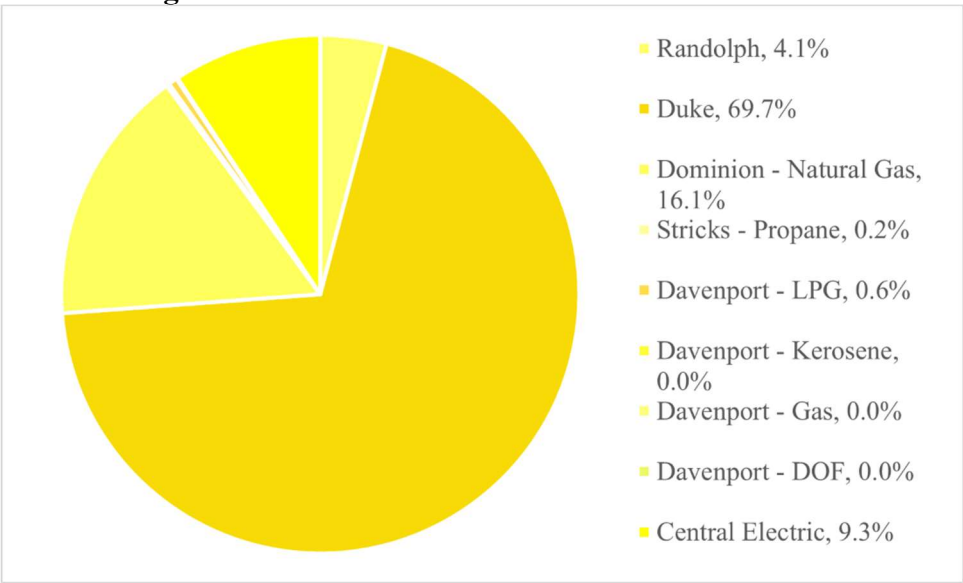

Figure Thirteen: The percentage of CO_2E emissions in Chatham County from the residential sector for the year 2019.

Figure Fourteen: 2020 Residential CO_2E Emissions

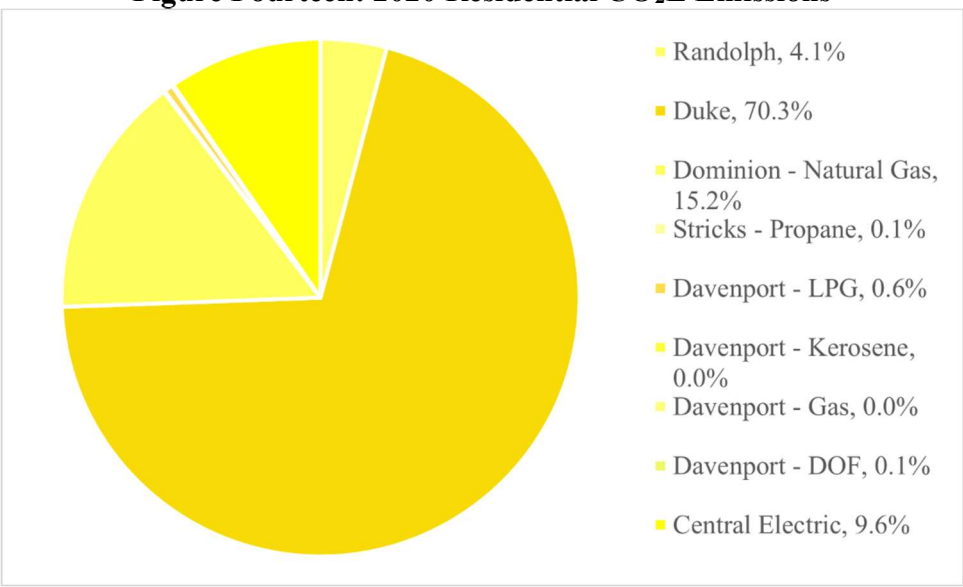

Figure Fourteen: The percentage of CO_2E emissions in Chatham County from the residential sector for the year 2020.

Table Eight: 2019 and 2020 Industrial Emissions of CO_2E

Emission Source	2019	2019 CO_2E (metric tons)	2020	2020 CO_2E (metric tons)
Duke (kWh)	327,859,672	119,598	315,160,082	114,965
Dominion – Natural Gas (Therms)	13,808,962	73,290	12,565,445	66,690
Central Electric (kWh)	18,115,200	6,608	18,115,200	6,608
	Total	192,888	Total	181,655

Figure Fifteen: 2019 Industrial CO_2E Emissions

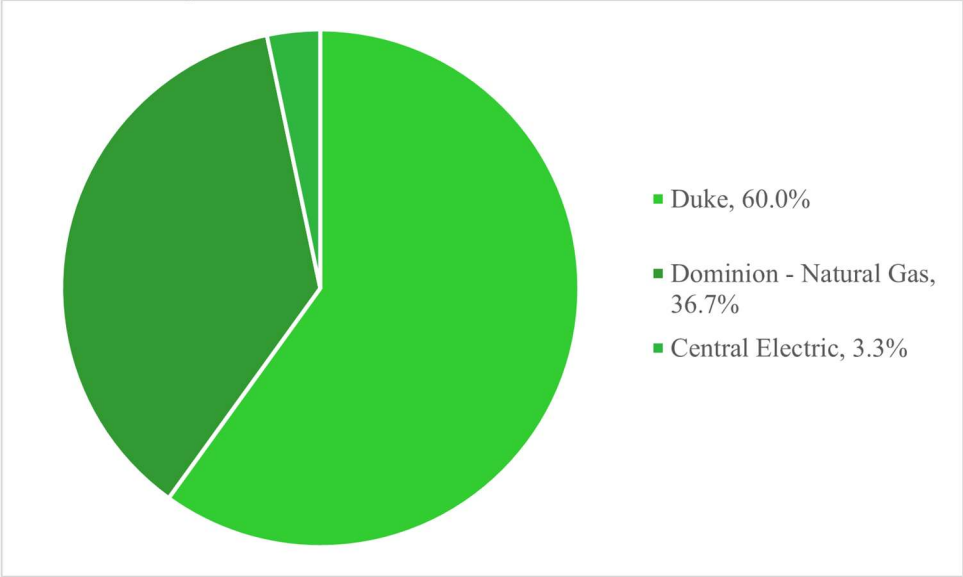

Figure Fifteen: The percentage of CO_2E emissions in Chatham County from the industrial sector for the year 2019.

Figure Sixteen: 2020 Industrial CO_2E Emissions

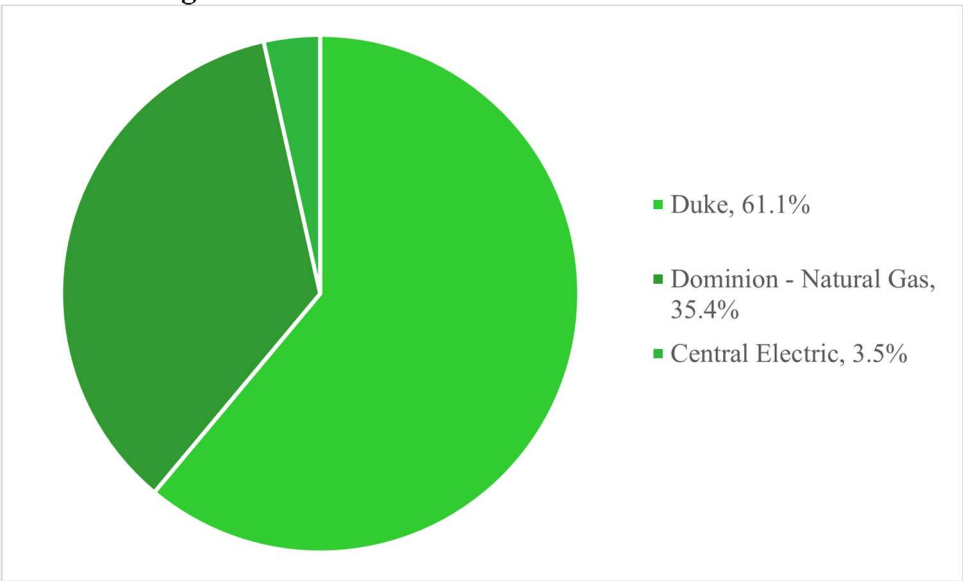

Figure Sixteen: The percentage of CO_2E emissions in Chatham County from the industrial sector for the year 2020.

Figure Seventeen: Total Commercial, Residential, and Industrial CO_2E Emissions by Year

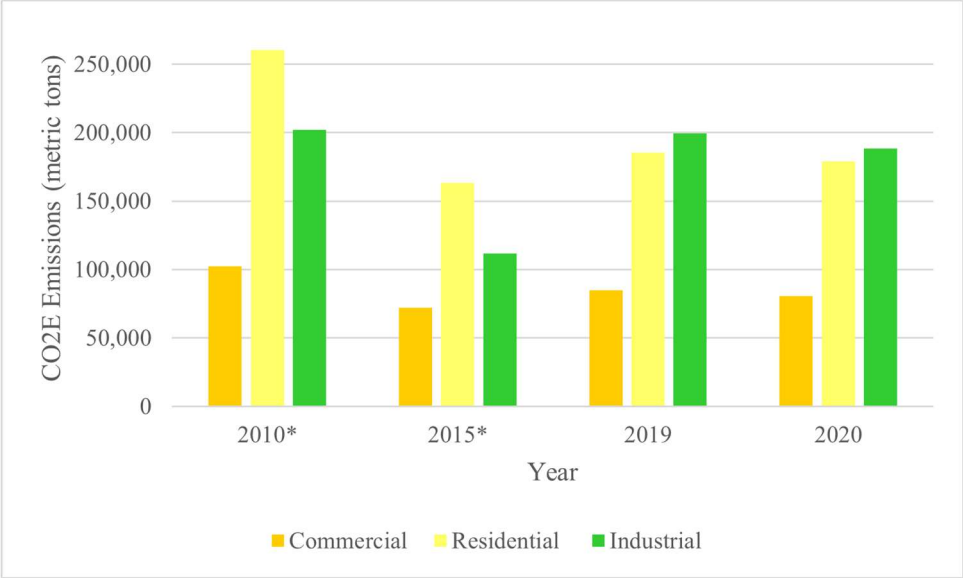

*Figure Seventeen: The total commercial, residential, and industrial CO_2E emissions in metric tons by year in Chatham County according to current and past GHG inventories. *This figure reports CO_2E emissions exactly as presented in previous GHG inventories. Sources for data differ between inventories.*

Once again, the drastic variation in emissions over the years most likely occurs from the lack of data availability in previous years. However, when comparing emissions between the most recent years, 2019 and 2020, there is a slight decrease in emissions. This could suggest that the commercial, residential, and industrial sectors in Chatham County are successfully working to reduce their GHG emissions. Another possible explanation is that the COVID-19 pandemic caused many commercial and industrial facilities to close, even for a brief period of time, resulting in the lowered emissions.

Transportation:

The transportation sector in Chatham County is responsible for the majority of emissions in the county by far. It is responsible for twice as much emissions as the next largest sector, industry. These calculations were made based on the North Carolina Department of Transportation (NCDOT) estimates of vehicle miles traveled (VMT) within the county's borders (16). It is important to note that the VMT are estimated and therefore do not take into account the impact the COVID-19 pandemic had. It is likely that the 2020 VMT estimate is around 30-50% higher than the actual number. However, it was decided to use the estimate in this report to track growth in this sector and in order to avoid underestimating its impact. It is also important to note that we have subtracted the county's vehicle fleet CO_2E emissions from the CO_2E emissions calculated for transportation to avoid double counting county vehicles on the road.

Table Nine: 2019 and 2020 Transportation Emissions of CO_2E

Emission Source	2019	2019 CO_2E (metric tons)	2020	2020 CO_2E (metric tons)
NCDOT VMT Data	1,028,035,000	373,059	1,087,805,000	394,480
Internal Government CO2E (subtract)		2,040		2,077
	Total	371,019	Total	392,403

Figure Eighteen: Total Transportation CO_2E Emissions by Year

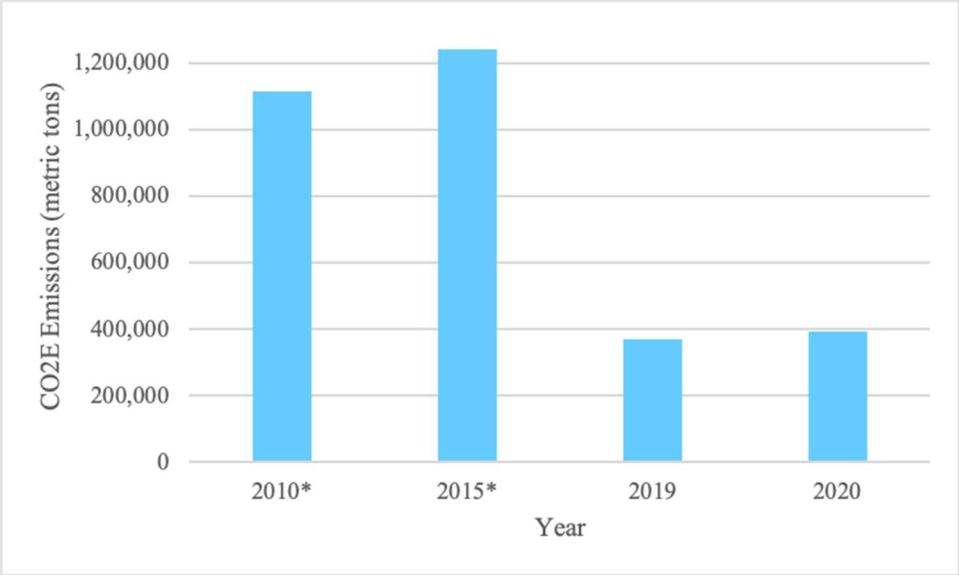

*Figure Eighteen: The total transportation CO_2E emissions in metric tons by year in Chatham County according to current and past GHG inventories. *This figure reports CO_2E emissions exactly as presented in previous GHG inventories. Sources for data differ between inventories.*

In previous reports, the source data used to calculate the emissions for the transportation sector differ drastically compared to the data used in this report. The emissions data for the 2010 report was gathered from the Transportation Planner for the City of Durham/DCHC

MPO. No more information on this source or how the data was calculated was given. The report in 2015 used the previous data from 2010 and performed a linear extrapolation to estimate the emissions for 2015. This is likely why the emissions for 2010 and 2015 are about three times more than the emissions calculated in this report. In 2010, the report estimated that there were 1.892 billion VMT in Chatham County and used this number to calculate CO_2E emissions. The 2015 report estimated that there were 1.910 billion VMT. However, the data provided by the NCDOT for the current report included data going back to the year 1987. If this information was used in previous reports, the estimated VMT for 2010 and 2015 would be 678,840,000 VMT and 800,668,000 VMT respectively. This is a drastic decrease from the estimates used in the previous reports.

Figure Nineteen: Total Transportation CO_2E Emissions by Year Using Current Data Source

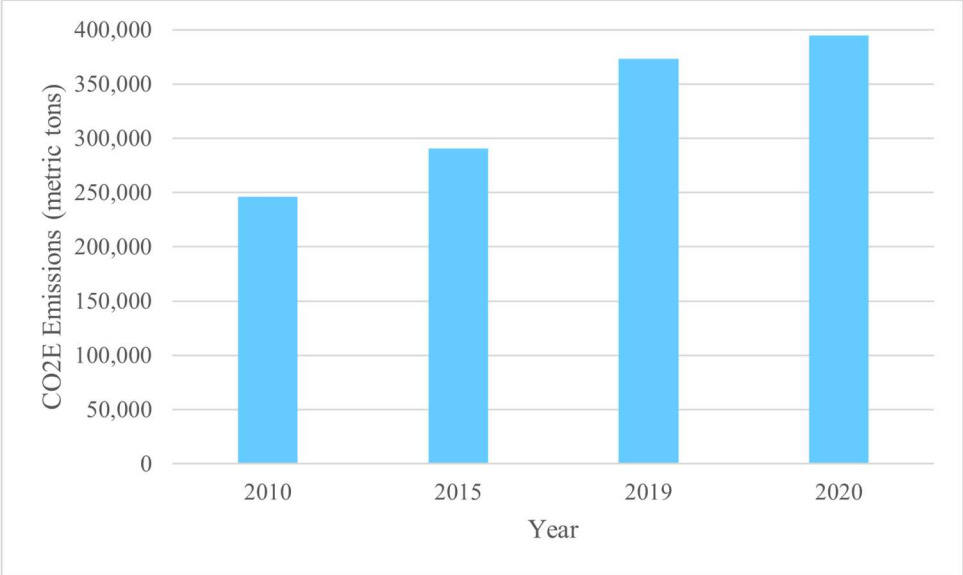

*Figure Nineteen: The total transportation CO_2E emissions in metric tons by year in Chatham County with emissions calculated using the NCDOT updated method. *This data does not account for VMT emissions created by the county fleet, thus total emissions for 2019 and 2020 will be higher than in previous figures.*

As shown in Figure Nineteen, if we do use the current data from the NCDOT for all four years, instead of seeing a decrease overtime, we see an increase. Figure Eighteen and Figure Nineteen show very different results based on the data used to calculate emissions. If Figure Eighteen had just been shown, the assumption could be made that there were changes made to the transportation sector between the years 2010 and 2020 resulting in a significant decrease in emissions. However, using the current data source, a steady increase in emissions can be seen which could prompt law makers to enact change to reduce these emissions.

Carbon Sinks:

Carbon sinks are an important factor to consider when creating a greenhouse gas inventory. Carbon sinks are forests, soil, oceans, or other natural environments that absorb more carbon than they release (22). To calculate carbon sinks already present in Chatham County the ICLEI Land Emissions and Removal Navigator (LEARN) tool was used. This tool used land use data as reported by the National Land Cover Database (23), reported most recently in 2016, to

approximate the annual GHG impacts over time. Chatham County consists of approximately 183,637 hectares (453,776 acres). Of this, roughly 65% is forest and an additional 17.3% is tree canopy on lands outside of forest areas. Between 2008 and 2016 forest disturbance from harvesting affected 7,611.5 hectares (18,808 acres) of land (25).

Table Ten: GHG Removals and Emissions between 2008 - 2016

	Removals (mT CO_2E/year)	Emissions (mT CO_2E/year)
Undisturbed Forest	-1,169,909	
Forest Disturbances		149,013
Non-Forest to Forest	-145,043	
Forest to Settlement		7,549
Forest to Grassland		102,312
Forest to other non-forest lands		5,107
Trees outside of forests	-110,745	10,086
Harvested Wood Products	0	
Total	-1,425,697	274,067
Net GHG Balance	-1,151,631	

Table Ten: The removals and emissions of CO_2E in mT between 2008-2016 due to changes in land usage.

Overall, the carbon sinks in Chatham County remove 1,151,631 metric tons of CO_2E per year. According to this number, Chatham County is carbon neutral by a significant amount. However, it is important to view these figures with healthy skepticism as they are estimates with significant uncertainties. Similar GHG inventories of forests report high uncertainties in net GHG balance. The LEARN tool summary report states that uncertainties of +/- 45% (with 95% confidence) are reported in GHG forest inventories using similar methodology. It should also be noted that the data used to calculate these figures are between five and thirteen years old. Land use can change drastically in that time frame (25).

A Note:

In 2020, Duke Energy and North Carolina environmental regulators reached an agreement on the issue of coal ash pits and ponds. These are sites where residue from coal-fired power plants are stored. These storage areas are often located near waterways and can cause significant damage when toxins seep into the water (17). As part of this agreement, Duke Energy will open a coal ash recycling unit, the Cape Fear Staged Turbulent Air Reactor or Cape Fear STAR facility, within Chatham County. This recycling process involves extracting excess carbon from coal ash in order to make the material suitable to be used in concrete (18). While the opening of the facility may provide many benefits in the way of reducing the effects of coal ash on North Carolina's waterways, it will be a new source of emission. According to the facility's application to the NC Division of Air Quality, the STAR Facility has the potential to emit an additional 156,869 tons (approximately 142,309 metric tons) of CO_2E per year, about 15% of the current 2019 and 2020 yearly emissions for the county (26). The emissions from this facility would significantly increase the amount of GHGs being produced within the county and should be reported in future inventories.

Going forward, this inventory lays out reliable data sources and methodology for future inventories which should make comparison simpler in future years.

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Appendix 1:

ICLEI ClearPath Settings: The ClearPath settings chosen to use for this report were based off of the best information available and informed estimations.

Factor sets are used to determine emissions for transportation, waste, and grid electricity inventories.

Transportation: The 2019 and 2020 transportation factor sets were based on ICLEI's 2019 and 2020 U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, Appendix D: Transportation and Other Mobile Emission and Activities and Sources, respectively.

Waste: The 2019 and 2020 waste factor sets required inputs for percentages of types of waste. For example, percentage of newspaper, percentage of food scraps, etc. Since this information was unavailable, 100% of mixed MSW was input for both years.

Electricity: The 2019 electricity factor set required inputs for lbs/MWh. These values were based on the EPA's State Output Emission Rates (eGrid2018 - updated 03/09/2020).

Most of the input options available in ClearPath were left blank as the information was not required in order to calculate the CO_2E values. Below is the addition information required to calculate certain values.

Community Track, Transportation and Mobile Sources: When calculating VMT, the percentage of types of vehicles, such as motorcycles, light trucks, etc., were required. As this information was unavailable 100% of passenger vehicles was used. This can be improved upon in future inventories if this information becomes available.

Community Track, Solid Waste: To calculate solid waste values, the following options were chosen after a conversation with Kevin Lindley, Environmental Quality Director of Chatham County's Environmental Quality Department.

Landfill Methane Collection Scenario: Typical
Landfill Moisture Content: National Average
Waste Type to Calculate Emissions for: All
Disposal Location: Outside the Jurisdiction