

# 2023-2024 GREENHOUSE GAS INVENTORY

Chatham County, North Carolina, Environmental Quality Department



*Jordan Lake, Photo by Courtney Bagans*

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## Introduction

Greenhouse gases (GHG) are a known cause of human-driven climate change across the globe due to their ability to trap heat within Earth's atmosphere<sup>1</sup>. These gases include carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (NO<sub>2</sub>), and fluorinated gases. Once emitted, GHGs can remain in the atmosphere for hundreds to thousands of years, warming the planet. Through comprehensive GHG inventories, regions can track GHG emissions by sector, which can support communities in gaining a deeper understanding of their current emissions footprint and trends over time. Moreover, a GHG inventory can help identify opportunities for climate action that reduce overall emissions and promote cleaner and healthier economic and governmental systems. This GHG inventory is a report for Chatham County, NC with a focus on emissions from the years 2023 and 2024.

Chatham County is uniquely positioned in the Piedmont region of NC, or the geographic center of the state. It includes five incorporated towns and an abundance of natural resources across 707 square miles<sup>2</sup>. Despite its proximity to the state's capital and largest county, Chatham County has retained over half (64.8%) of its forested lands since its founding in the late 18th century<sup>2,3</sup>. In 2017, the Chatham County Board of Commissioners adopted a Comprehensive Plan to guide the county's healthy growth and development strategies over the next 25 years<sup>4</sup>. A "Big Idea" from the Comprehensive Plan was for Chatham County to become a carbon neutral county, or a county where there is a balance between the amount of carbon dioxide (CO<sub>2</sub>) emitted into the atmosphere and the amount removed or stored by the natural landscape and land use practices. This GHG inventory was developed by Chatham County's Sustainability Division with the goal of updating local policy makers and community residents about the state of GHG emissions in the county.

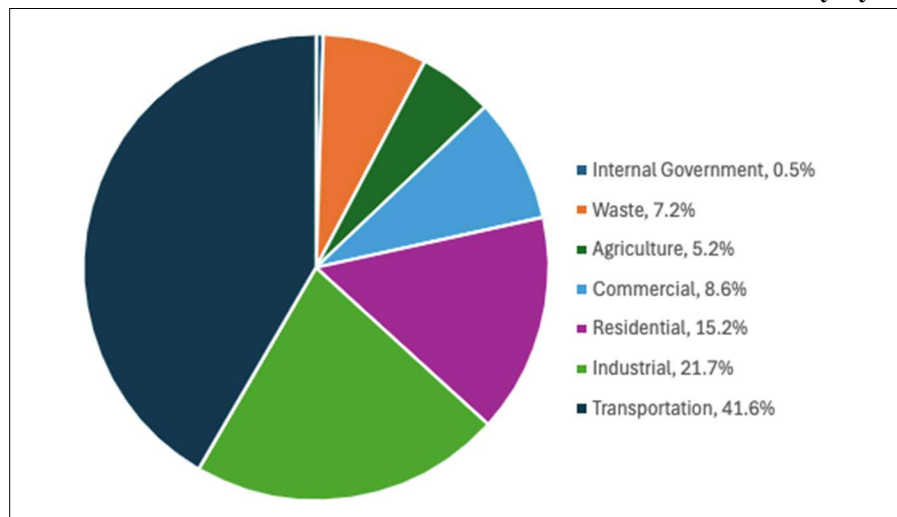
Chatham County has completed three previous GHG inventories. The first inventory (2010) has a good basic framework. However, when the second report was completed in 2015, that author could not find several of the data sets used in the first report. The author of the 2015 report was not able to find alternative third party data to use in lieu of the missing data sources from the previous report, so made the decision to extrapolate 2015 data from the 2010 report data. The third report covered the years 2019 and 2020 and standardized methodology for data collection, analysis, and reporting by searching out and using data sets for the emissions model that would be consistent for use in future reports. While this 2023-2024 GHG inventory attempts to use emissions data from all three previous reports to analyze emissions trends within the county, comparison to the 2010 and 2015 data needs to be done carefully since these two reports did not use the same data model. This report uses the same methodology, with minor exceptions noted throughout the report, established in the 2019-2020 GHG inventory to collect data from anthropogenic sources in internal government, agriculture, waste, commercial, residential, industrial, and transportation sectors, and convert data into total emissions.

**Table One: 2023 and 2024 Distribution of CO<sub>2</sub>E Emissions in Chatham County by Sector**

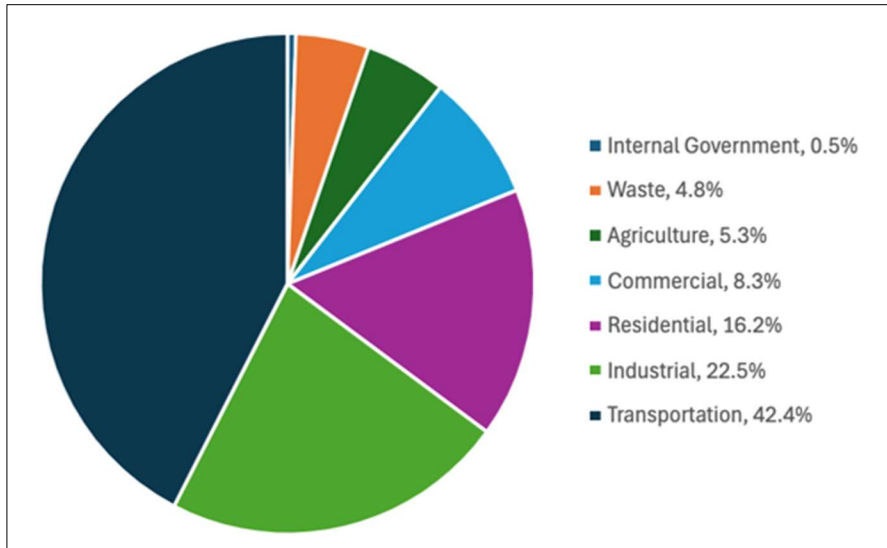
Sector	2023 CO <sub>2</sub> E (metric tons)	2023 Percent of Total	2024 CO <sub>2</sub> E (metric tons)	2024 Percent of Total
Internal Government	5,496	0.5%	5,683	0.5%
Waste	78,017	7.2%	50,601	4.8%
Agriculture	55,702	5.2%	55,911	5.3%
Commercial	92,993	8.6%	87,417	8.3%
Residential	163,626	15.2%	170,750	16.2%
Industrial	233,413	21.7%	237,885	22.5%
Transportation	447,905	41.6%	447,770	42.4%
Total	1,077,152	100%	1,056,017	100%

As shown in Figure One and Two, the emissions for 2023 and 2024 are very similarly distributed among the sectors, which is to be expected for two consecutive years of data. Transportation is the sector with the highest CO<sub>2</sub>E emissions at roughly 42% of total emissions. Similar to the previous inventory, Transportation emissions are nearly double the amount of the next largest sector (Industrial). In contrast, Internal Government is responsible for the least emissions in 2023 and 2024 (0.5%).

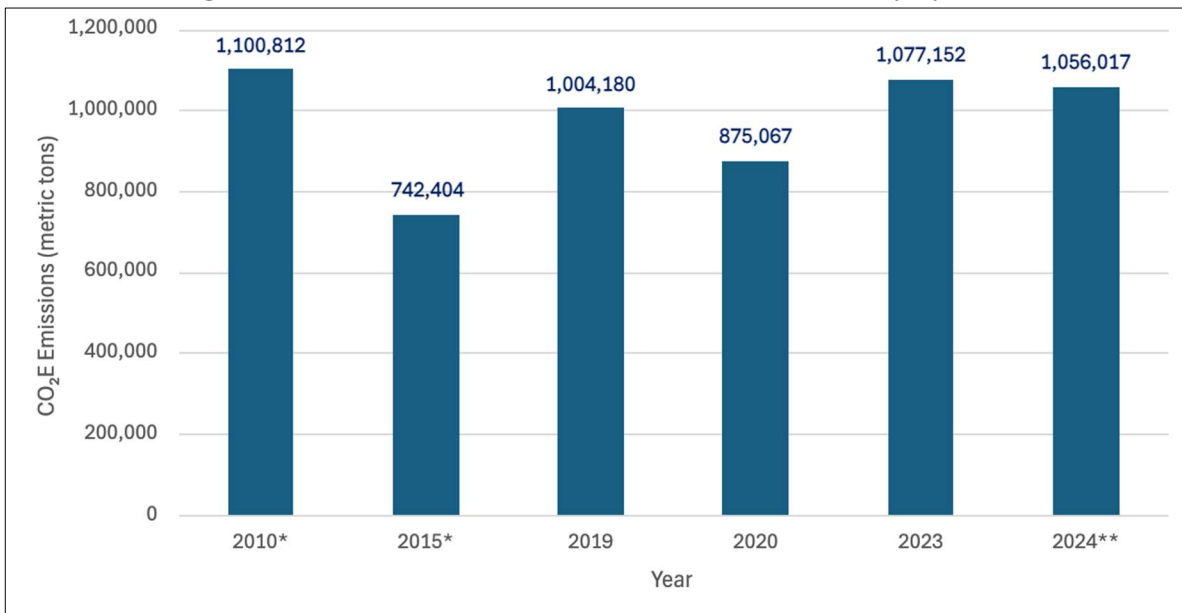
**Figure One: 2023 Distribution of CO<sub>2</sub>E Emissions in Chatham County by Sector**



**Figure Two: 2024 Distribution of CO<sub>2</sub>E Emissions in Chatham County by Sector**



**Figure Three: Total CO<sub>2</sub>E Emissions for Chatham County by Year**



*\*2010 and 2015 used different methodology and data sources to calculate emissions. \*\*2024 data is an estimate due to some data sources not being updated at the time this report was created.*

**Table Two: Per Capita GHG Emissions by Year**

Year	Population Estimates <sup>6</sup>	CO <sub>2</sub> E (metric tons)	Per Capita CO <sub>2</sub> e (metric tons) per person
2010	63,845	1,100,812	17.2
2015	68,307	742,404	10.9
2019	74,419	1,004,180	13.5
2020	75,748	875,067	11.6
2023	81,624	1,077,152	13.2
2024	83,874	1,056,017	12.6

**Table Three: Change in Chatham County GHG Emissions by Source Sector, 2019-2024**

Sector	2019 CO <sub>2</sub> E (metric tons)	2024 CO <sub>2</sub> E (metric tons)	Percent Change in GHG Emissions
Internal Government	5,463	5,683	4.0%
Waste	28,021	50,601	80.6%
Agriculture	50,576	55,911	10.5%
Commercial	82,841	87,417	5.5%
Residential	185,403	170,750	-8%
Industrial	199,496	237,885	19.2%
Transportation	452,380	447,770	-1%
Total	1,004,180	1,056,017	5.2%

Figure Three indicates the total estimate of GHG emissions in Chatham County for 2023 and 2024 at 1,077,152 metric tons (t) CO<sub>2</sub>E and 1,056,017 t CO<sub>2</sub>E, respectively. Overall, emissions have increased from the 2019-2020 inventory by about 5%, however, they have decreased since the 2010 baseline inventory. That said, the 2010 baseline data should be viewed with skepticism because the 2010 and 2015 inventories used different methodology and data sources to calculate emissions. While total emissions have increased over time, Table Two highlights that per capita GHG emissions from 2019 to 2024 have decreased from 13.5 t CO<sub>2</sub>E per person to 12.6 t CO<sub>2</sub>E per person, respectively. Additionally, Table Three presents the percent change of GHG emissions from 2019 to 2024. In both the Residential and Transportation sectors, emissions decreased by 8% and 1%, respectively. In all other sectors, emissions increased across the five-year period. The most notable increases in emissions are from the Waste and Industrial sectors, where emissions increased 80.6% and 19.2%, respectively.

After the previous inventory was released covering the years 2019 and 2020, significant new developments emerged within Chatham County. In early 2021, Duke Energy opened a coal ash recycling plant in Moncure<sup>5</sup>. This facility, called the Cape Fear “Staged Turbulent Air Reactor” (STAR) Plant, was designed to process 1.2 million tons of coal ash for use in the concrete industry. While designed to recycle polluting coal ash in the area, the facility is also responsible for a large amount of GHG emissions and energy usage within the Industrial sector. Additionally, other developments within the county to note include Chatham Park and Wolfspeed. As the county developed, the total population also increased over

the last five years. The county’s population estimate in 2023 was 81,624 individuals, and in 2024 it was 83,874 individuals<sup>6</sup>. In 2019, the population estimate was 74,419 individuals, meaning that from 2019 to 2024 the population increased roughly 13%<sup>6</sup>. New industrial facilities, residential and commercial developments, and population growth all contribute to direct and indirect GHG emissions captured within this inventory. In parallel with new development and growth, Chatham County has also seen increases in clean energy technologies, such as the use of solar energy and electric vehicles that help reduce and offset GHG emissions.

## Methodology

This inventory was completed between December 2023 and April 2024, and it follows methodology outlined within the 2019-2020 GHG inventory<sup>7</sup>. This inventory looks at direct and indirect GHG emissions from similar sources as the previous inventory and utilizes the International Council for Local Environmental Initiatives’ (ICLEI) ClearPath tool to calculate emissions by sector<sup>8</sup>. Data sources are from national, state, and local governmental agencies, as well as private enterprises. Some information was available through public websites (i.e. USDA, NCDEQ, and EPA), while other data was collected through phone and email communications with identified businesses. The main differences in data sources from the 2019-2020 GHG inventory include three new oil and gas suppliers (one of which resulted from a merger of a previous company, Davenport Energy, with Sharp Energy), and more reliable transportation data gathered through the Google Environmental Insights Explorer (EIE) tool, recommended by ICLEI<sup>9, 20</sup>. Specific data collection methods will be described in greater detail by each industry sector below.

To convert raw data from government agencies and businesses to GHG emissions data in metric tons, the ICLEI ClearPath tool was utilized. ClearPath is an emissions management tool used by more than 900 cities and counties in the U.S. to conduct GHG inventories and emissions forecasting<sup>8</sup>. It is a streamlined tool that uses pre-loaded emissions factors and integrated formulas to convert raw data from grid electricity usage and stationary fuel combustion, among other emissions processes, into the common unit of measure of CO<sub>2</sub> equivalents (CO<sub>2</sub>E). Converting all GHG emissions into this common unit of measure allows for the calculation of a comprehensive total of GHG emissions that support comparisons by sector. To convert specific GHG amounts to CO<sub>2</sub>E, ClearPath uses the Global Warming Potential (GWP) factor of each gas, determined by the Intergovernmental Panel on Climate Change (IPCC). A GWP is a measure of how much energy the emission of 1 ton of a gas will absorb over a given period of time, relative to the emission of 1 ton of carbon dioxide (CO<sub>2</sub>)<sup>10</sup>. For example, methane is a highly potent GHG with a GWP of 28<sup>12</sup>. The formula used to convert methane to CO<sub>2</sub>E is<sup>12</sup>:

$$1 \text{ kg methane} \cdot \frac{(28 \text{ kg CO}_2\text{E})}{1 \text{ kg methane}} = 28 \text{ kg CO}_2\text{E}$$

In addition to GWPs, ClearPath also uses specific settings for emissions factors for grid electricity, transportation, and waste data to account for variables dependent on the location and year when the GHG inventory was completed<sup>8</sup>. More information on specific settings for each sector can be found in Appendix I.

It is also important to note that this report uses the IPCC Sixth Assessment Report for 100-year GWP numbers, which was recommended by ICLEI<sup>12</sup>. This report was released in 2021, and therefore,

was not used in previous GHG inventories. To account for any updates to GWPs in previous GHG inventories, calculations from the previous inventory from 2019-2020 were updated to reflect changes in GWP values. Since changes to GWPs in the Sixth Assessment Report were minor, there were no significant changes in total emissions data from historical reports. Total GHG emissions by year are the same as noted in previous reports, unless otherwise mentioned.

## **Greenhouse Gas Inventory**

This report captures direct and indirect GHG emissions from eight unique sources which are involved in the production and/or distribution of energy (electricity, gas, oil, propane, and natural gas) within Chatham County's borders. This includes three electric companies: Duke Energy, Randolph Electric Membership Corporation, and Central Electric Membership Corporation; and five gas, propane, oil, and/or natural gas companies: Dominion Energy, Sharp Energy, Strick's LP Gas, Pico Propane, and Euliss Propane.

Reports and statistics from several federal and state government agencies were used to determine emissions from the various sectors. These agencies include the Environmental Protection Agency (EPA), United States Department of Agriculture (USDA), North Carolina Department of Environmental Quality (NCDEQ), and Chatham County. Emissions from Chatham County government operations are calculated separately, and include emissions from energy use and transportation. The Google EIE tool from ICLEI was used to develop the emissions inventory from the Transportation sector.

All entities in this report were identified from the previous 2019-2020 GHG inventory, apart from two new companies (i.e. Pico Propane and Euliss Propane) who were identified by a Google search for oil and gas suppliers in Chatham County. Hunter Oil & Propane declined to participate again this year. Campbell Oil & Gas, Jenkins Propane, LG Jordan Oil & Gas, and Ferrel were also identified and contacted during the data collection process; however, they did not participate.

If data was not publicly available from a source, businesses were contacted directly to provide information on the amount of product they sold or distributed within Chatham County's borders from January 1, 2023 to December 31, 2024. To receive data from Duke Energy, the county submitted a data request form and paid a \$400 processing fee. All companies who shared their information self-defined their data by sector and provided it as kilowatt-hours of energy used, or gallons of fuel sold.

## **Internal Government**

Data used to calculate emissions from Chatham County's internal government was gathered from Duke Energy, Dominion Energy, and Chatham County. Duke Energy and Dominion Energy data were extracted from Chatham County's energy usage software platform called Enpira<sup>13</sup>. Duke Energy data from Enpira was presented as kilowatt-hours (kWh) of energy usage from three different county departments: i) General Buildings and Facilities, ii) Solid Waste Facilities, and iii) Water and Wastewater Treatment Facilities. The same categories were also used to report Therms of natural gas supplied by Dominion Energy to the county<sup>14</sup>.

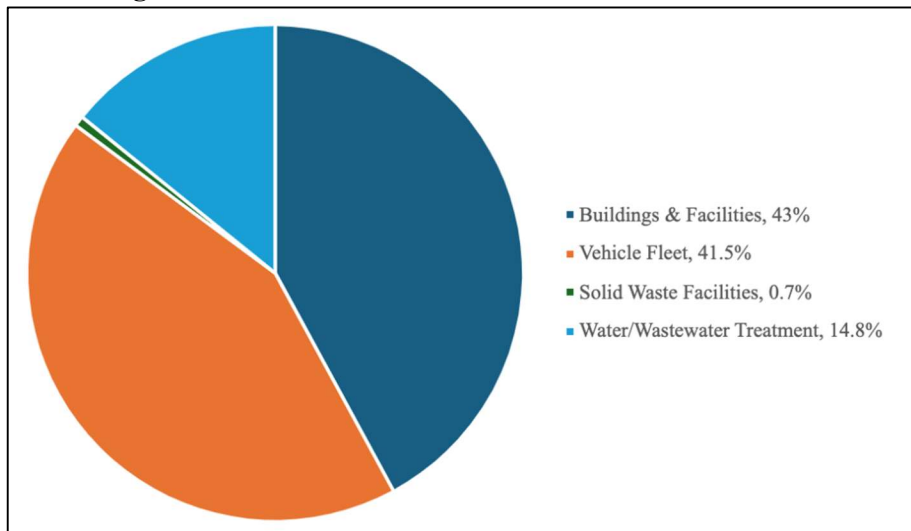
Vehicle fleet data for the county was collected from two different sources. Chatham County vehicles are fueled in one of two ways. There is a centrally located fueling facility that is owned by the Chatham County School System (CCSS) and shared with Chatham County government vehicles. All Chatham County vehicles also have the ability to fuel at public fueling stations using a WEX fleet fueling card. CCSS and WEX provide a monthly tally of the amount of fuel dispensed to county vehicles.<sup>15, 16</sup>

Combining the data from CCCS and WEX provided a comprehensive overview of the CO<sub>2</sub>E emissions for the county’s vehicle fleet.

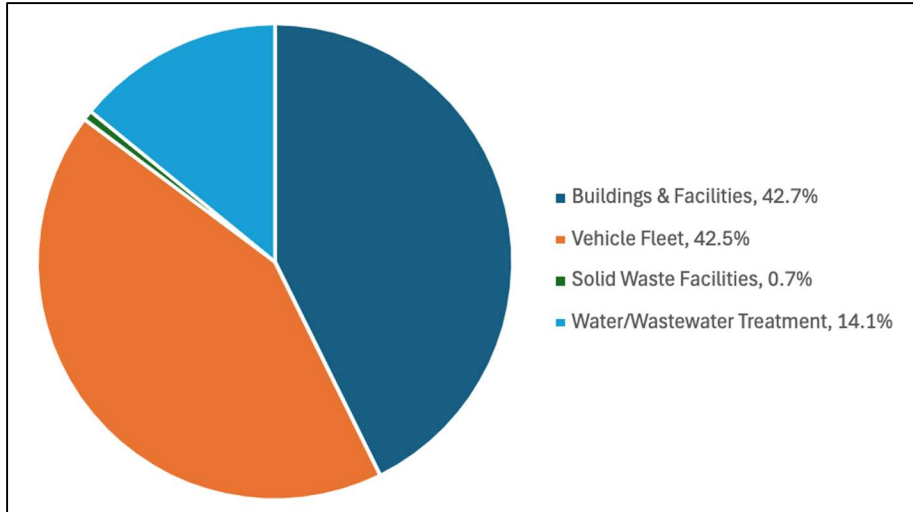
**Table Four: 2023 and 2024 Internal Government Emissions of CO<sub>2</sub>E**

Government Activities	2023 CO <sub>2</sub> E (metric tons)	2024 CO <sub>2</sub> E (metric tons)
Buildings & Facilities	2,365	2,427
Vehicle Fleet	2,281	2,416
Solid Waste Facilities	37	38
Water/Wastewater Treatment	813	802
Total	5,496	5,683

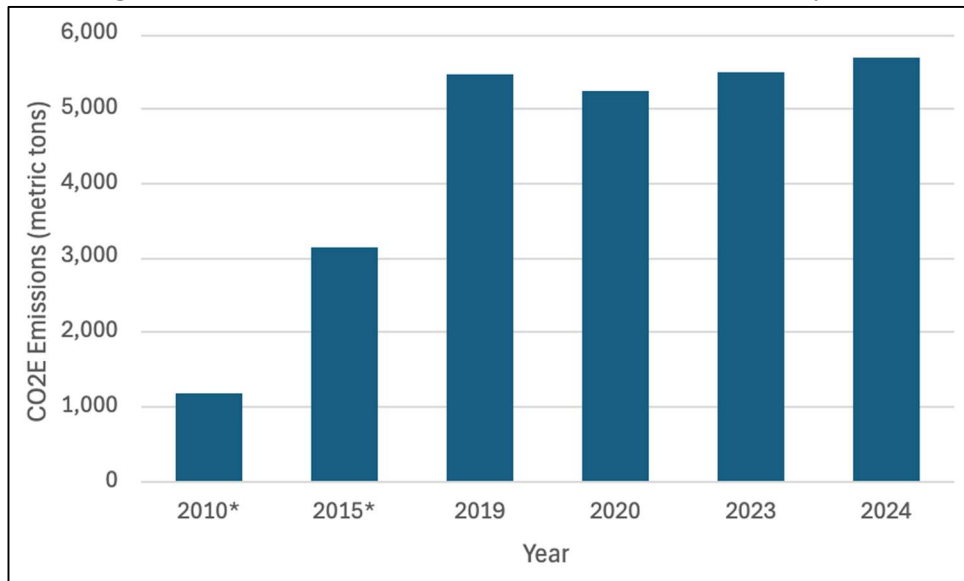
**Figure Four: 2023 Internal Government CO<sub>2</sub>E Emissions**



**Figure Five: 2024 Internal Government CO<sub>2</sub>E Emissions**



**Figure Six: Total Internal Government CO<sub>2</sub>E Emissions by Year**



*\*2010 and 2015 use different data sources and methodology to calculate internal government emissions, which can explain the large difference compared to later years.*

Chatham County’s internal government is responsible for a small percentage (0.5%) of total county emissions for 2023 and 2024. Figure Six shows that there has been a slight increase in Internal Government emissions over the last five years, which is seen in increased emissions from the county vehicle fleet and solid waste sources. Both vehicle fleet and buildings and facilities emissions make up the majority of Internal Government emissions at about 40% each for 2023 and 2024. The drop in

emissions in 2020 is most likely due to COVID-19 when government buildings and facilities were at low occupancy.

It is also important to note that Chatham County’s internal government has made significant commitments to sustainability over the last few years. In 2022, a 25-kilowatt solar system was installed on the Environmental Quality Building, and in 2023, a 154-kilowatt solar system was installed on the Chatham County Agriculture and Conference Center<sup>17</sup>. This has amounted to solar power generation of 168,843 kWh in 2023 and 227,904 kWh in 2024 that was used to power county facilities and systems<sup>13</sup>. While not part of Chatham County internal government emissions, it is also significant to note that in 2023, the Chatham County School’s administrative building was designed with a rooftop solar power system<sup>17</sup>. This investment in solar energy is a notable shift for Chatham County and will continue through the Sustainable Facilities Policy that ensures all new buildings are designed to achieve a Leadership in Energy and Environmental Design (LEED) Silver rating. Investing in energy efficient buildings and infrastructure, along with clean energy sources, helps offset GHG emissions from new development and expansion within Chatham County’s internal government.

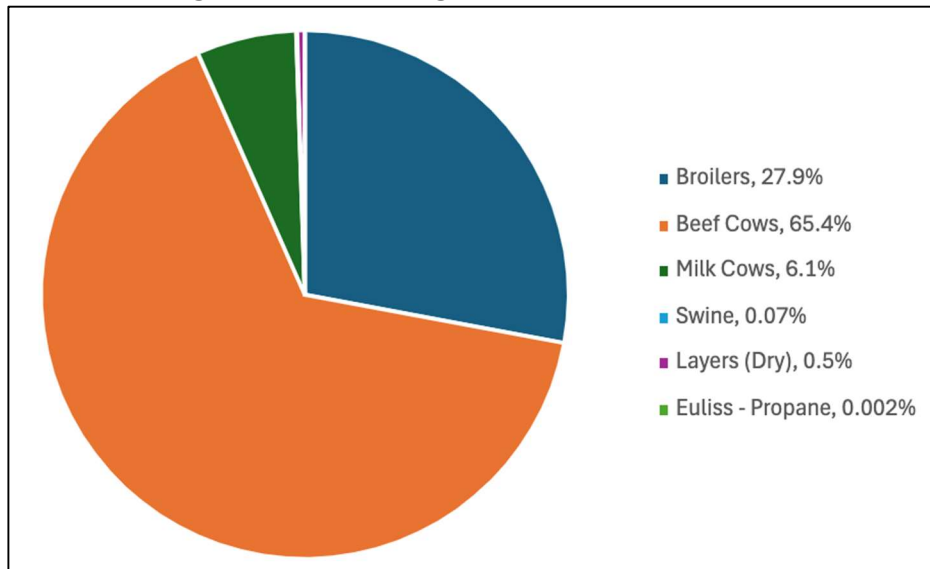
**Agriculture**

Data for the agriculture sector was extracted from publicly available information from the United States Department of Agriculture (USDA) website<sup>18</sup>. In cooperation with the NC Department of Agriculture and Consumer Services, the USDA develops National Agricultural Statistic Services reports that include a breakdown of livestock estimates by county within NC. This report includes estimates from 2023 and 2024 of broilers, cows (milk and beef), swine (hogs and pigs), and layers (manure management for poultry) in Chatham County. Additionally, Euliss Propane provided data on gallons of propane fuel sold for agricultural purposes within Chatham County’s borders which was also used for agricultural emissions calculations<sup>19</sup>. The 2019-2020 GHG inventory included agricultural data from Davenport Energy, however, since Davenport Energy merged with Sharp Energy in 2022, they will no longer be included in this sector<sup>20</sup>. Although Sharp Energy did provide data for 2023 and 2024, it did not include gallons of fuel sold for agricultural purposes, and therefore, will not be included in the agricultural emissions calculations.

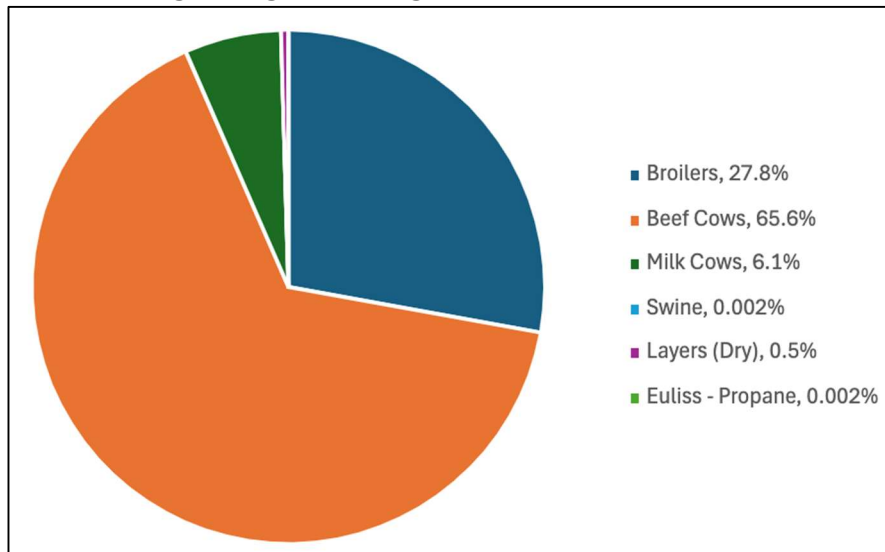
**Table Five: 2023 and 2024 Agricultural Emissions of CO<sub>2</sub>E**

Emissions Source	2023 CO <sub>2</sub> E (metric tons)	2024 CO <sub>2</sub> E (metric tons)
Broilers	15,558	15,558
Beef Cows	36,443	36,652
Milk Cows	3,407	3,407
Swine	41	41
Layers (Dry)	251	251
Euliss - Propane (gal)	< 1	< 1
Total	55,702	55,911

**Figure Seven: 2023 Agricultural CO<sub>2</sub>E Emissions**



**Figure Eight: 2024 Agricultural CO<sub>2</sub>E Emissions**



Similar to the 2019-2020 GHG inventory, emissions considered from livestock are methane (CH<sub>4</sub>) emissions. For cattle, swine, and broilers, methane emissions are calculated by looking at enteric fermentation processes, which occur within the digestive systems of animals when microbes in the stomach breakdown food. As a result of this fermentation process, methane is released into the atmosphere as it is exhaled and/or expelled by the animals. Methane emissions are calculated using the formula below<sup>42</sup>. Emissions factors are determined by the EPA for cattle and swine, and the IPCC for broilers<sup>12, 42</sup>.

Equation:

$$EF = \frac{(N \cdot F)}{2,000 \frac{lb}{ton}}$$

Key:

EF = enteric fermentation (methane/year)

N = number of animals

F = emissions factor

Additionally, emissions from layers are calculated by looking at manure management processes. Manure management is handled as either wet layers (i.e. stored in anaerobic lagoons) or dry layers<sup>21</sup>. In Chatham County, the majority of layers are dry, and therefore, only dry layers were included for emissions<sup>7</sup>. To calculate methane emissions from dry layers, the same enteric fermentation formula is used, however, emissions factors come from the IPCC. Once methane emissions are calculated from the enteric fermentation formula and input into ICLEI, they are converted to CO<sub>2</sub>E as seen in Table Six.

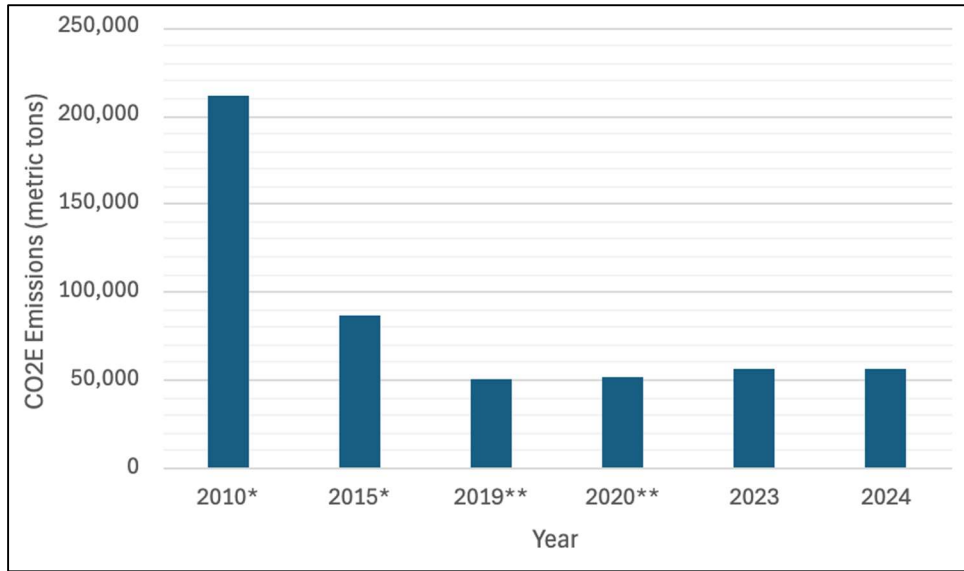
**Table Six: 2023 and 2024 Heads and CO<sub>2</sub>E Emissions of Livestock**

Type of Livestock	Head of Livestock in 2023	2023 CO <sub>2</sub> E (metric tons)	Head of Livestock in 2024	2024 CO <sub>2</sub> E (metric tons)
Milk Cows	900	3,407	900	3,407
Beef Cows	17,400	36,443	17,500	36,652
Swine	935*	41	935*	41
Layers (Dry)	280,000	251	280,000	251
Broilers	26,000,000	15,558	26,000,000	15,558
	Total	55,702	Total	55,911

*\*Swine estimates for 2023 and 2024 were withheld in the National Agricultural Statistic Services reports, and as such, were taken from the 2022 Census of Agriculture by the USDA, which was the most recent census. The 2022 census also notes that there were 28 farms with hogs and pigs in Chatham County.*

The Agriculture sector is responsible for 5.2% and 5.3% of total Chatham County emissions in 2023 and 2024, respectively. Agriculture has remained a small contributor to total greenhouse gas emissions over the inventory years within Chatham County. The slight increase in emissions from 2019 to 2024 can be attributed to increased livestock estimates for cows (milk and beef) and broilers within the county. Beef cows make up the majority (about 65%) of total county Agriculture emissions for 2023 and 2024.

**Figure Nine: Total Agriculture CO<sub>2</sub>E Emissions by Year**



\*2010 and 2015 inventories used different methodologies to calculate agricultural emissions, which can explain the large differences in emissions compared to later years.

\*\*The 2023-2024 GHG inventory updated broilers and layers emissions data for 2019 and 2020 because it did not account for conversions from kg•CH<sub>4</sub>/head-year to lb•CH<sub>4</sub>/head-year. This caused agricultural emissions to go up for 2019 and 2020 (from 5,740 metric tons of CO<sub>2</sub>E to 12,267 metric tons of CO<sub>2</sub>E for both years) as they were underestimated in the previous report.

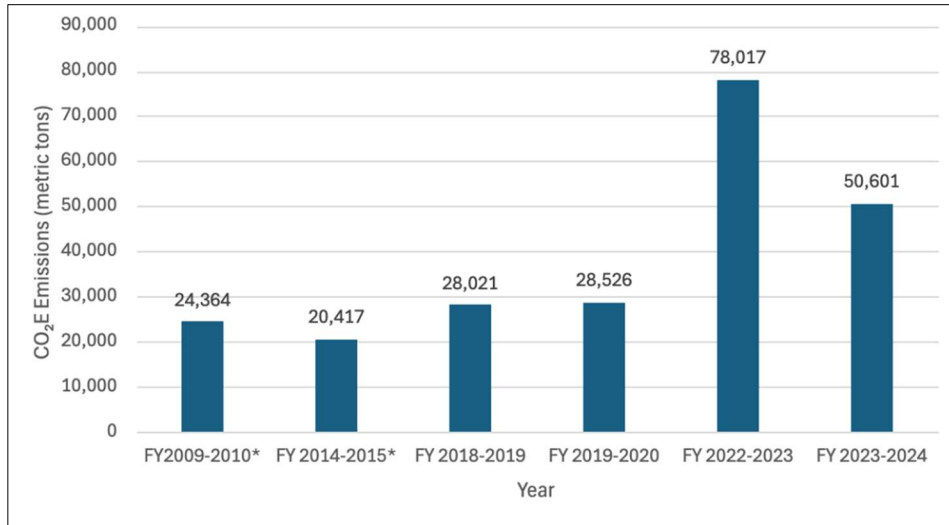
### **Solid Waste**

Data for the waste sector comes from the North Carolina Department of Environmental Quality’s (NCDEQ) Solid Waste Management Annual Reports<sup>22</sup>. The annual reports include information on the amount of waste disposed by county, which includes municipal solid waste and construction and demolition landfill waste within the county, as well as waste exported out of the county to other recycling facilities or transfer stations. Waste was assumed to be 100% mixed waste within ICLEI’s waste factor sets. Also, it’s important to note that unlike the rest of the inventory, the Solid Waste Management Annual Reports are based on Fiscal Years (FY). As such, data from FY 2022-2023 is utilized for inventory year 2023, and data from FY 2023-2024 is utilized for inventory year 2024.

**Table Seven: 2019 and 2020 Waste Emissions of CO<sub>2</sub>E**

Emission Source	FY 2022-2023 (tons)	FY 2022-2023 CO <sub>2</sub> E (metric tons)	FY 2023-2024 (tons)	FY 2023-2024 CO <sub>2</sub> E (metric tons)
Landfill Waste	199,658.29	-	126,433.11	-
Soil at Great Oak Landfill (subtract)	76,704	-	46,687	-
Total	122,954.29	78,017	79,746.11	50,601

**Figure Ten: Total Waste CO<sub>2</sub>E Emissions by Year**



\*2010 and 2015 inventories did not originally include waste emissions. Emissions were calculated for this report using historical FY data from NCDEQ provided in their Solid Waste Management Annual Reports.

For FY 2022-2023 and FY 2023-2024, Great Oak Landfill reported that 76,704 tons and 46,687 tons of contaminated soil were brought to the landfill from the Duke Energy STAR Plant in Moncure, respectively<sup>23</sup>. According to ICLEI, this soil waste from Greak Oak Landfill contains little to no biodegradable material that generates methane and contributes to total GHG emissions. Therefore, the tons of soil disposed of in FY 2022-2023 and FY 2023-2024 were removed from the total tonnage of municipal solid waste for Chatham County during emissions calculations, which is noted in Table Seven.

Waste accounts for 7.2% and 4.8% of 2023 and 2024 total GHG emissions in the county, respectively. Waste emissions have increased 80.6% from 2019 to 2024 which can be attributed to higher construction and demolition debris generated from large construction projects in the county (i.e. the Chatham Park Mixed Use Project and the new Wolfsped facility). Additionally, the number of North Carolinian’s that work from home has increased from about 6.7% in 2019 to 16.1% in 2023<sup>6</sup>. This has resulted in additional waste being generated in counties like Chatham, where many residents historically commuted to surrounding counties for work.

It’s also important to note that there are no landfills or waste transfer stations in Chatham County, as the Chatham County municipal solid waste landfill ceased operations in 1993<sup>24</sup>. All waste produced in Chatham County is transported to landfills outside of county borders. Since the county is still responsible for the waste and associated emissions, however, these waste emissions are included in Chatham County’s GHG inventories.

### **Commercial, Residential, and Industrial**

As a whole, the Commercial, Residential, and Industrial (CRI) sector is responsible for 45.5% and 47% of total GHG emissions in Chatham County in 2023 and 2024, respectively. All data used for CRI emissions was self-reported by the participating businesses listed in Tables Eight, Nine, and Ten. As mentioned earlier, data sources include two new propane suppliers: Euliss Propane and Pico Propane that contribute towards Commercial and Residential emissions<sup>19, 43</sup>. The CRI sector also includes data from Sharp Energy who merged with Davenport Energy from the 2019-2020 GHG inventory<sup>20</sup>. Additionally, point source emissions from Duke Energy’s Cape Fear STAR Plant are included in Industrial emissions,

which were extracted from the EPA’s publicly available data via the Facility Level Information on Greenhouse Gases (FLIGHT) tool<sup>25</sup>. The 3M Pittsboro industrial facility was also identified via the FLIGHT tool as a large GHG emitter in Chatham County. 3M Pittsboro point source emissions from the FLIGHT tool were not included in the report, however, because their primary energy source is natural gas, which is accounted for in Dominion Energy’s natural gas data.

**Table Eight: 2023 and 2024 Commercial Emissions of CO<sub>2</sub>E**

Emission Source	2023	2023 CO <sub>2</sub> E (metric tons)	2024	2024 CO <sub>2</sub> E (metric tons)
Duke Energy (kWh)	254,140,097.08	72,197	231,753,086.40	65,837
Central Electric Membership Corporation (kWh)	11,954,955	3,396	12,094,530	3,436
Randolph Electric Membership Corporation (kWh)	5,413,354	1,538	6,005,707	1,706
Dominion Energy – Natural Gas (Therms)	2,786,560	14,820	2,893,396	15,388
Euliss Propane (gal)	11,435	65	12,988	73
Sharp Energy (gal)	172,921.33*	977	172,921.33	977
	Total	92,993	Total	87,417

*\*Sharp Energy exclusively provided the total gallons of propane fuel sold for 2024, which was also used in 2023 emissions calculations.*

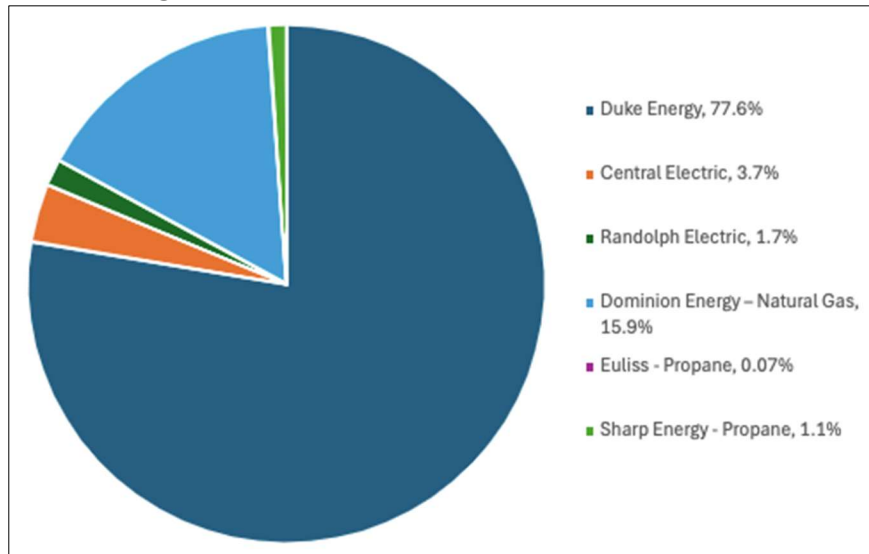
There are several details to note regarding emissions calculations from Dominion Energy, Duke Energy, Central Electric, and Sharp Energy within the CRI sector. Dominion Energy provided data in Therms of natural gas sold within Chatham County broken down by Commercial, Residential, and Industrial accounts<sup>14</sup>. The Commercial sector data included Therms of natural gas for all Chatham County accounts, which was already included in Internal Government emissions calculations. As such, Therms of natural gas from Chatham County’s accounts were subtracted from the Therms of natural gas Dominion Energy provided for the Commercial sector for 2023 and 2024. This ensures that there are no double calculations within final total emissions data for the Commercial sector. The same methodology was used for Duke Energy Commercial sector data as data from Chatham County accounts were included in Duke Energy’s Commercial sector data reports<sup>28</sup>.

Secondly, Central Electric provided a cumulative total of kWh of energy usage for both Commercial and Industrial sectors, as well as kWh for the Residential sector<sup>26</sup>. Therefore, to divide kWh between the Commercial and Industrial sectors, 2015 energy usage data from Central Electric was used to determine percentages of Commercial and Industrial kWh of energy usage. In 2015, 43% of combined Commercial and Industrial energy usage was from the Commercial sector, and the remaining 57% was from the Industrial sector. Given the combined Commercial and Industrial energy usage of 27,758,053

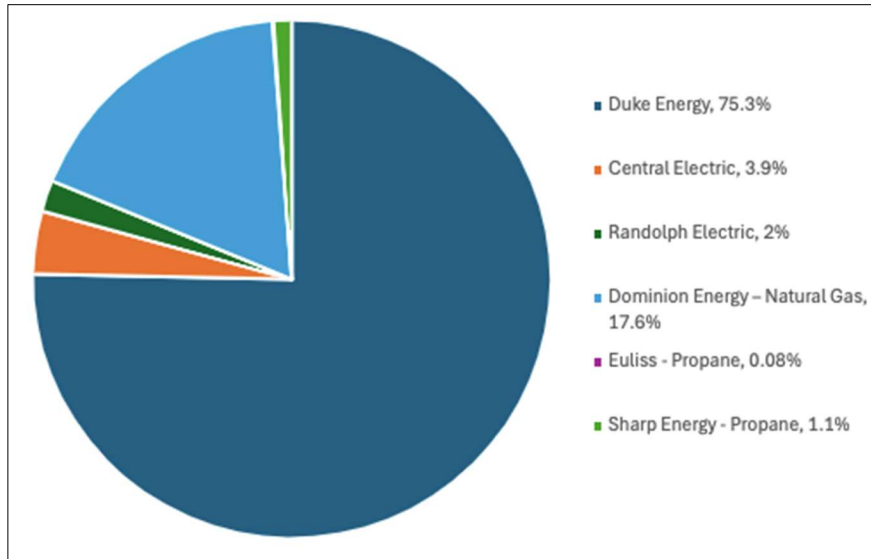
kWh in 2023, 43% was allocated to the Commercial sector (11,954,955 kWh) and 57% was allocated to the Industrial sector (15,803,098 kWh), which was then utilized to determine emissions by sector as seen in Table Eight and Ten. The same methodology was used for Central Electric 2024 emissions calculations.

Lastly, Sharp Energy provided a cumulative total of gallons of propane sold within Chatham County for all CRI sectors<sup>27</sup>. It was assumed that there was an even split in fuel sold to each sector within CRI. As such, the total amount of 518,764 gallons of propane provided by Sharp Energy was divided by three (172,921.33 gallons per sector) and distributed across each sector evenly to calculate CRI emissions.

**Figure Eleven: 2023 Commercial CO<sub>2</sub>E Emissions**



**Figure Twelve: 2024 Commercial CO<sub>2</sub>E Emissions**



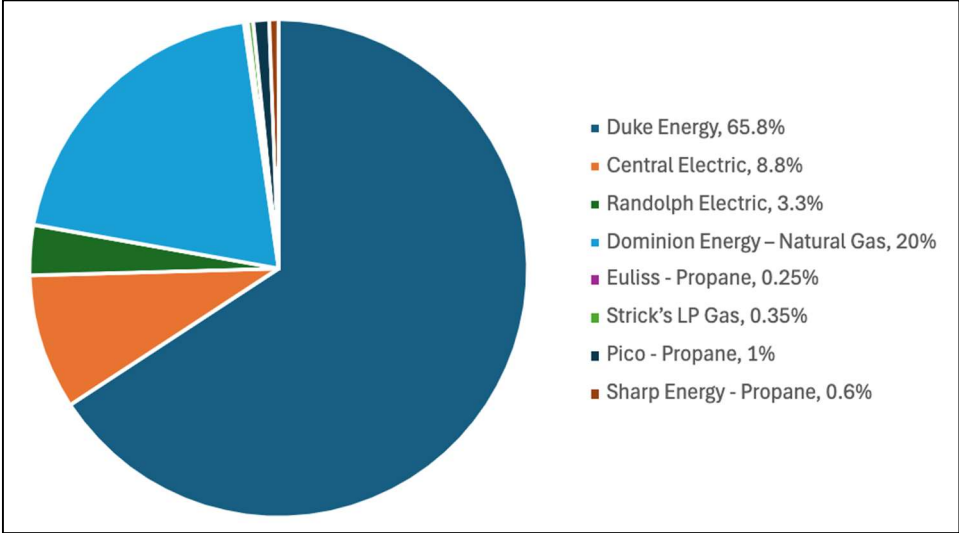
**Table Nine: 2023 and 2024 Residential Emissions of CO<sub>2</sub>E**

Emission Source	2023	2023 CO <sub>2</sub> E (metric tons)	2024	2024 CO <sub>2</sub> E (metric tons)
Duke Energy (kWh)	378,851,400.98	107,626	398,802,252	113,294
Central Electric Membership Corporation (kWh)	50,589,710	14,372	51,064,625	14,507
Randolph Electric Membership Corporation (kWh)	18,759,309	5,329	19,904,869	5,655
Dominion Energy – Natural Gas (Therms)	6,138,105	32,644	6,342,399	33,731
Euliss Propane (gal)	72,592	410	77,975	440
Strick’s LP Gas (gal)	101,600	574	80,000	452
Pico Propane (gal)	300,000*	1,694	300,000*	1,694
Sharp Energy (gal)	172,921.33**	977	172,921.33	977
	<b>Total</b>	<b>163,626</b>	<b>Total</b>	<b>170,750</b>

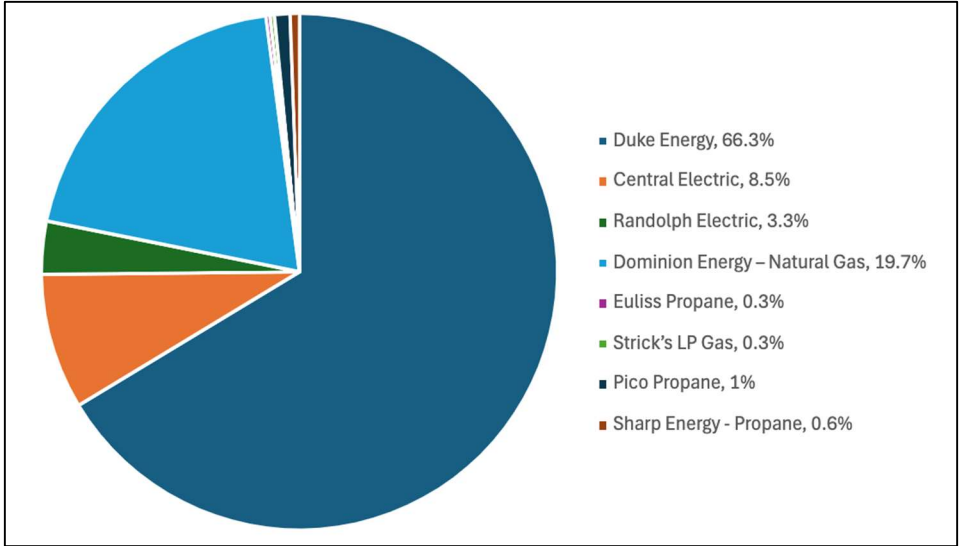
\*Pico Propane provided an estimate of gallons of fuel sold per year within Chatham County borders for 2023 and 2024.

\*\*Sharp Energy provided the total gallons of propane fuel sold for 2024, which was also used in 2023 emissions calculations.

**Figure Thirteen: 2023 Residential CO<sub>2</sub>E Emissions**



**Figure Fourteen: 2024 Residential CO<sub>2</sub>E Emissions**

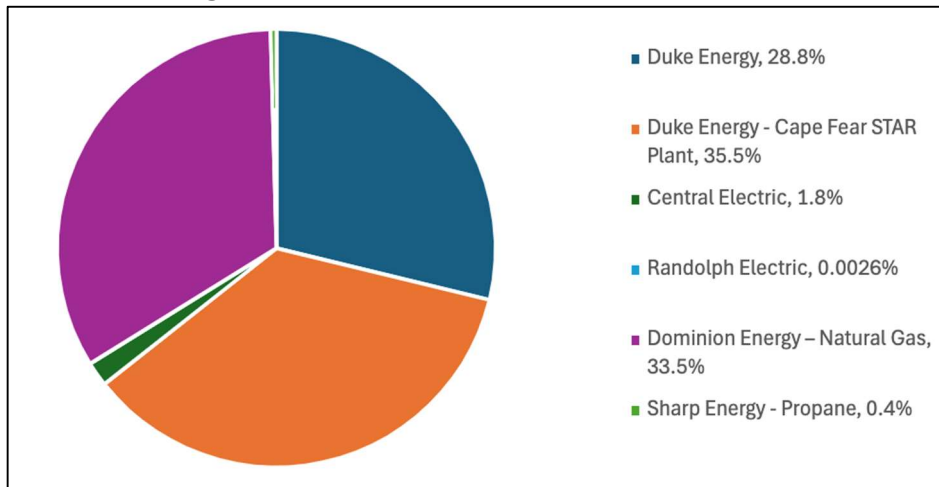


**Table Ten: 2023 and 2024 Industrial Emissions of CO<sub>2</sub>E**

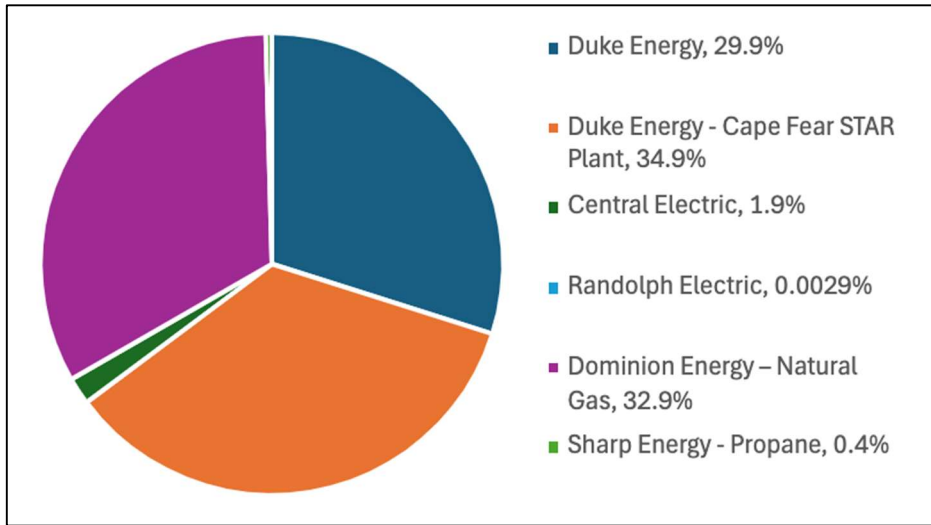
Emission Source	2023	2023 CO <sub>2</sub> E (metric tons)	2024	2024 CO <sub>2</sub> E (metric tons)
Duke Energy (kWh)	236,531,551	67,195	250,309,569.40	71,109
Duke Energy - Cape Fear STAR Plant	n/a	82,994	n/a	82,994*
Central Electric Membership Corporation (kWh)	15,803,098	4,251	15,987,601	4,542
Randolph Electric Membership Corporation (kWh)	22,192	6	25,409	7
Dominion Energy – Natural Gas (Therms)	14,695,212	77,994	14,745,223	78,260
Sharp Energy (gal)	172,921.33**	973	172,921.33	973
	Total	233,413		237,885

\*2024 data for the Cape Fear STAR Plant was not available at the time of report completion, so the 2023 data was used as an estimate. \*\*Sharp Energy provided the total gallons of propane fuel sold for 2024, which was also used in 2023 emissions calculations.

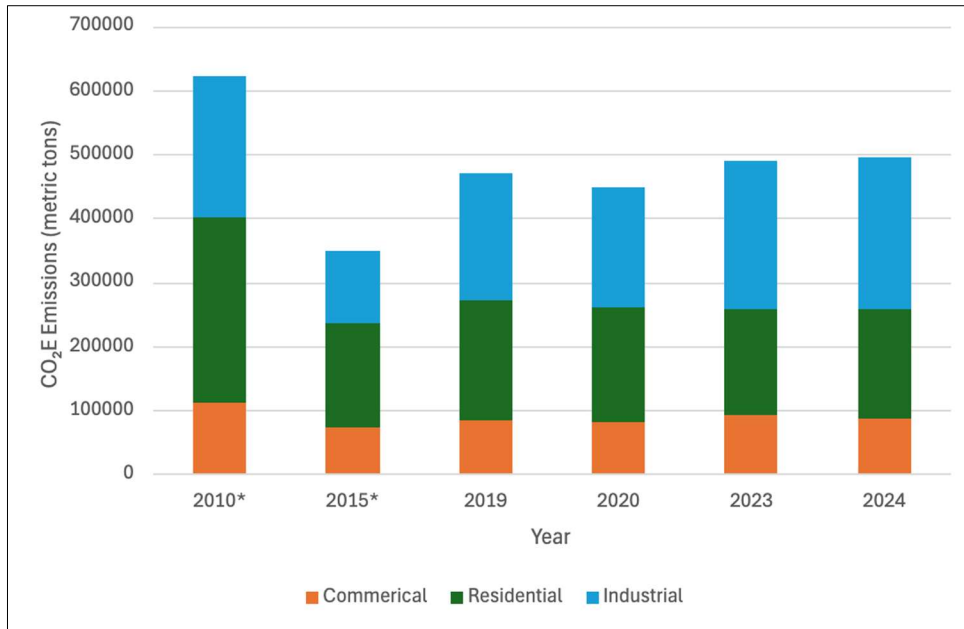
**Figure Fifteen: 2023 Industrial CO<sub>2</sub>E Emissions**



**Figure Sixteen: 2024 Industrial CO<sub>2</sub>E Emissions**

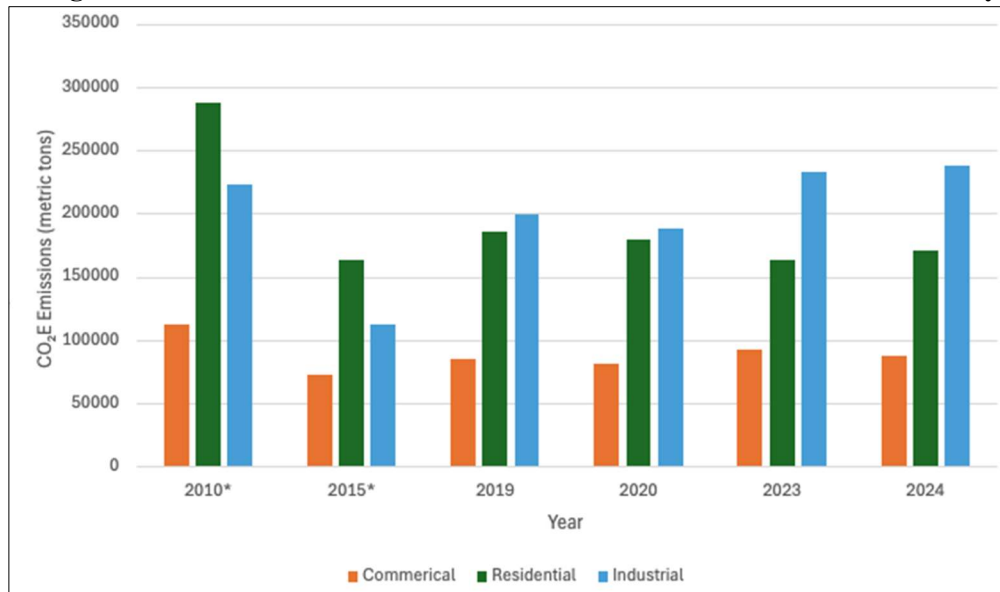


**Figure Seventeen: Total Commercial, Residential, and Industrial CO<sub>2</sub>E Emissions by Year**



*\*2010 and 2015 inventories use different data sources to calculate CRI emissions.*

**Figure Eighteen: Total Commercial, Residential, and Industrial CO<sub>2</sub>E Emissions by Year**



*\*2010 and 2015 inventories use different data sources and methodology to calculate CRI emissions.*

As mentioned earlier, the population in Chatham County has increased by roughly 13% between 2019 and 2024. Population growth, along with new developments in the area, could be large contributors to increased GHG emissions in the CRI sector. Additionally, the Duke Cape Fear STAR Plant is responsible for 82,994 metric tons of CO<sub>2</sub>E emissions, which make up 35.5% and 34.9% of Industrial sector emissions in 2023 and 2024, respectively. The plant is also responsible for nearly 8% of total county emissions. This is a significant contribution to Chatham County’s GHG emissions, although it is lower than the estimated 156,869 tons (approximately 142,309 t) of CO<sub>2</sub>E per year that was stated in their approved permit application to the NC Division of Air Quality<sup>29</sup>.

As seen in Figure Eighteen, Industrial emissions are the greatest within the CRI sector, followed by Residential and Commercial. While the Industrial sector emissions have increased in the last five years, Residential sector emissions have decreased by 8% from 2019 to 2024. Similarly, per capita CO<sub>2</sub>E emissions for the Residential sector have decreased from 2.3 t CO<sub>2</sub>E per person in 2019 to 2.0 t CO<sub>2</sub>E per person in 2024, which can be attributed to the adoption of clean energy and energy efficient technologies within this sector. Duke Energy is the largest energy provider across all three sectors. The energy provided by Duke Energy to the properties in these three sectors accounts for over 50% of all emissions across CRI sectors. In addition, the two electric cooperatives buy electricity from Duke Energy for their customers. Duke Energy’s published generation distribution for North Carolina is: nuclear (52.9%), natural gas (33.4%), coal (9.3%), hydro (1.3%), solar (1.9%), oil (< 1%) and other (< 1%)<sup>30</sup>. Natural gas, nuclear, and solar energy are all less polluting energy sources, and as energy demands increase due to increasing temperatures from climate change, they can help support the CRI sector in meeting carbon neutrality goals for Chatham County.

### Transportation

When calculating emissions in the Transportation sector, a few data sources were considered, including estimates of vehicle miles travelled (VMT) for Chatham County from the North Carolina Department of Transportation (NCDOT), the Durham-Chapel Hill-Carrboro Metropolitan Planning

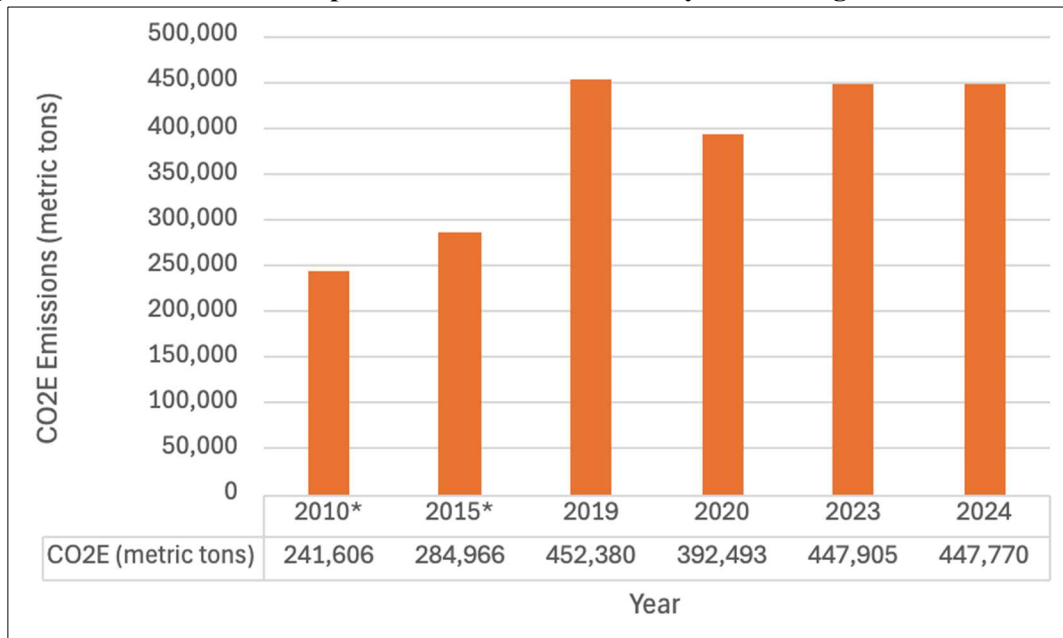
Organization (DCHC MPO), and Google EIE. The 2019-2020 GHG inventory used VMT from the NCDOT, however, this report uses updated methods from Google EIE data to capture VMT within county borders. Google EIE estimates VMT based on two measures: i) all trips on any road in Chatham County, and ii) an entire trip that starts or ends within the county boundary<sup>9</sup>. As noted in Table Eleven, to avoid double counting Transportation emissions, CO<sub>2</sub>E emissions from Chatham County’s vehicle fleet were subtracted from total Transportation emissions from VMT.

**Table Eleven: 2023 and 2024 Transportation Emissions of CO<sub>2</sub>E**

Emission Source	2023	2023 CO <sub>2</sub> E (metric tons)	2024	2024 CO <sub>2</sub> E (metric tons)
Google Environmental Insights Explorer VMT	1,264,887,704	450,186	1,264,887,704*	450,186
Internal Government CO <sub>2</sub> E (subtract)		2,281		2,416
	Total	447,905	Total	447,770

\*2024 VMT data from Google EIE was not available at the time of completing this report, so 2023 data was used here as an estimate.

**Figure Nineteen: Total Transportation CO<sub>2</sub>E Emissions by Year Using Current Data Source**



\*This assumes that updated 2010 and 2015 emissions data from the 2019-2020 GHG inventory is correct. Google EIE does not have data from 2010 or 2015.

The Transportation sector is responsible for roughly 42% of GHG emissions for 2023 and 2024, which is the largest emitting sector for Chatham County. Transportation is also the largest emitting sector for the State of North Carolina at 36% of total state GHGs in 2020<sup>31</sup>. Despite being the largest emitting sector, however, Transportation emissions have decreased by 1% overall from 2019 to 2024. The decrease in CO<sub>2</sub>E emissions during 2020 can be attributed to COVID-19 stay at home protocols. Chatham County has the highest electric vehicles (EVs) per capita among North Carolina counties, where there

were 1,518 registered EVs as of September 2024, and currently, there are 12 EV charging stations across the county<sup>32, 33</sup>. This is a notable 530% increase in registered EVs within the county when compared to 241 registered EVs in September of 2019<sup>33</sup>. As the number of EVs across the nation increases, companies and agencies are developing new methodologies to capture the number of EV miles travelled within regions. This methodology is not included in current Google EIE data, nor in this inventory. However, it should be considered for the next GHG inventory to calculate the most accurate Transportation emissions estimate possible.

## Carbon Sinks

Land use practices and natural environments, such as forests and soils, are capable of sequestering CO<sub>2</sub> from the atmosphere by acting like “carbon sinks.” Some land use practices emit carbon into the atmosphere, like harvesting trees and converting forest land to settlements, while undisturbed forests and tree canopies capture carbon during photosynthesis<sup>3</sup>. To calculate Chatham County’s net GHG balance from land use practices, the ICLEI Land Emissions and Removal Navigator (LEARN) tool was utilized<sup>3</sup>. The LEARN tool uses data from the National Land Cover Database (NLCD) that releases new data roughly every five years. The previous 2019-2020 inventory looked at emissions and removals from land use practices between 2008 and 2016, in sync with most recent NCLD data at that time. This current inventory looks at emissions and removals from land use practices between 2016 and 2021 since new data was released in 2021. According to this recent LEARN report, Chatham County consists of approximately 183,637 hectares (453,776 acres) of land. Of this, roughly 64.8% is forested, and an additional 16.5% is tree canopy on lands outside of forested areas.

**Table Twelve: GHG Removals and Emissions between 2016 - 2021**

	Removals (t CO <sub>2</sub> E/year)	Emissions (t CO <sub>2</sub> E /year)
Undisturbed Forest	-1,231,090	
Fire		0
Insect/Disease		0
Harvest/Other		234,615
Trees outside of forests		38,927
Forest to Grassland		132,943
Forest to Cropland		0
Forest to Wetland		460
Forest to Settlement		9,359
Forest to Other		1,726
Harvested Wood Products	0	
Trees outside of forests	-123,446	
Non-Forest to Forest	-102,911	
Total	-1,457,448	418,029
<b>Net GHG Balance</b>	<b>-1,039,419</b>	

The amount of CO<sub>2</sub>E removed from undisturbed forest per year was –1,289,604 t CO<sub>2</sub>E in the 2019-2020 inventory, while it is 4.5% lower at –1,231,090 t CO<sub>2</sub>E for the 2023-2024 inventory. Overall,

the net carbon removal in Chatham County from 2016 to 2021 is  $-1,039,419$  t CO<sub>2</sub>E per year. This is a 9.7% decline in carbon sequestration since the 2019-2020 inventory where the net GHG balance from land use practices was  $-1,151,631$  t of CO<sub>2</sub>E per year.

When comparing the net GHG balance from land use practices with total GHG emissions within Chatham County from 2024 ( $1,056,017$  t CO<sub>2</sub>E), the county is emitting a net positive of  $16,598$  t CO<sub>2</sub>E into the atmosphere. Net positive emissions is a shift from carbon neutral status indicated within the 2019-2020 inventory. It's important to note, however, that the LEARN tool is limited in scope when assessing land use changes and associated emissions and indicates that there are potential sources of error and uncertainty within the estimates. That being the case, LEARN also highlights that net GHG emissions for Chatham County across all sectors could be reduced if forest areas affected by disturbance were lessened and/or if losses of forests to other land uses or losses of trees outside forests were reduced.

## On the Horizon

Over the next several years, Chatham County is expected to see steady growth with new industries moving to the area influencing commercial and residential development. Wolfsped, a semiconductor maker for EVs, recently completed a facility in Siler City, which is expected to be fully operational in 2025 and bring 1,800 new jobs to the area<sup>34,35</sup>. VinFast, an EV manufacturer, also announced the development of a new facility in Moncure with expected development to begin in 2028<sup>36,37</sup>. In addition, a third corporation and manufacturer of high-temperature superconducting wire, MetOx International Inc., will also be building a major production facility in Chatham County in the coming years<sup>38</sup>. These new developments in Chatham County will engender growth in supporting businesses and residential and commercial construction. For example, Disney Asteria, a new residential development concept, is planned for development in Chatham County with home sales to begin in 2027<sup>39</sup>. Growth and development have significant economic and quality of life benefits for Chatham County residents, however, they will also likely impact GHG emissions. For example, the Cape Fear STAR Plant that went into operation in 2021 released  $82,994$  t CO<sub>2</sub>E of emissions in 2023, which is nearly 8% of total Chatham County emissions. New industrial developments can alter Chatham County's carbon neutrality, as witnessed with the Cape Fear STAR Plant. Mitigation strategies for significant new emission sources should be considered and balanced with carbon sequestration and carbon capture systems.

Moreover, there are also clean and efficient energy technologies being considered in Chatham County that can support carbon neutrality. Coming soon, an "Electrify the Triangle" program will bring public education initiatives for rebates and incentives for homeowners to take advantage of home energy efficiency improvements, such as insulation, air sealing, or upgrading an HVAC unit to run with fewer emissions<sup>40</sup>. As electricity demand keeps increasing, and rising temperatures from climate change exacerbate demand, home efficiency upgrades can help reduce such demand. In parallel with the Electrify the Triangle program, Duke Energy also remains committed to achieving a goal of net zero carbon emissions by 2050 and net-zero methane emissions by 2030<sup>41</sup>.

Looking ahead, Chatham County stands at a pivotal moment. As development continues and forested lands give way to urban expansion, the natural carbon sinks that help balance emissions will inevitably decline, and emissions across sectors will likely rise. However, by considering multi-pronged mitigation and adaptation strategies, Chatham County can achieve its carbon neutral goal and ensure a resilient, healthy, and sustainable future for years to come. This could entail prioritizing ecosystem conservation, integrating tree canopies into new developments, preserving farmland, promoting focused,

high-density, and sustainable growth, and embracing clean and efficient energy technologies. Chatham County has an opportunity to lead by example for the State of NC in building a low-carbon future that considers growth with environmental stewardship, community well-being, and climate resilience.

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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 2023 and 2024 transportation factor sets were based on ICLEI's 2023 U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, Appendix D: Transportation and Other Mobile Emission and Activities and Sources.

Waste: The 2023 and 2024 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 2023 and 2024 electricity factor set required inputs for lbs/MWh. These values were based on the EPA's State Output Emission Rates (eGrid2023 - updated 01/17/2025). Most of the input options available in ClearPath were left blank as the information was not required in order to calculate the CO2E 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