The Price of Biomass

How Pellet Mills and Biomass Power Generation Affect Health and Health Costs in the South

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Introduction

Industrial-scale renewable energy development of any sort has consequences for environmental and human health. Electric power generation from biomass has unavoidable negative impacts from the forests transformed into biomass farms, to the manufacturing plants where trees are transformed into wood pellets, and in the operation of power plants themselves. The harvest (logging), transport, manufacture, further transport, and eventual combustion of woody biomass can damage soil, destroy habitat, and pollute water and air, all of which can impact people, communities, and economies.

To examine, enumerate, and quantify these effects, we conducted mixed-methods research into two facilities in the biomass value chain. The first facility is the Enviva Biomass pellet mill in Northampton County, North Carolina. Enviva seeks to expand this facility, which would increase truck traffic, increase air emissions of volatile organic compounds (VOCs), particulate matter, noise, and other harmful pollutants, all while converting more of the forestland within the mill's sourcing area to ecologically simplified fiber farms. The second facility is Altamaha Green Energy's proposed plant in Wayne County, Georgia. This 70-megawatt combined-heat-and-power (CHP) facility would supply electric power to the grid and heat for a paper mill. Increased truck traffic, air pollution, and other impacts are expected from the facility.

Key Observations

- General health outcomes: producing wood pellets and other biomass to generate energy creates toxic air emissions that have been found to cause respiratory and cardiovascular problems and other neurological damage, which can lead to additional costs for medical care and lost workdays.
- Statistical analysis results indicate that the **presence of wood pellet mills and Combined Heat and Power (CHP) facilities, as well as specific socioeconomic and demographic characteristics, are significantly related to chronic obstructive pulmonary disease (COPD) among adults in North and South Carolina, Georgia, Alabama, and Mississippi**. Poverty, age, asthma, smoking, and the presence of wood pellet mills and CHP facilities are found to be positively related to COPD occurrence.
- Economic costs of biomass facilities include:
    - We find that **residents of the area around Enviva Northampton spent $78,000 to $148,000 annually on Emergency Department (ED) visits associated with COPD between 2022 and 2024**.
    - **The cost of work hours lost due to COPD in 2022 was $235,000.**
    - Facility expansion would likely increase medical costs and the costs of work hours lost.
- Analysis of fiscal impacts highlights that fiscal incentives have created an economic burden on taxpayers. **Counties have spent to attract facilities, but property taxes have increased accordingly to accommodate these incentives alongside a decrease in property values.** Property tax rates in Northampton County have increased since Enviva Northampton's first air permit application in 2011. The median value of owner-occupied housing units in the Census tract where Enviva Northampton is located declined 22% between 2010 and 2013, the year the facility began operating and has been substantially lower than Northampton County's since 2010.

If approved and when operations begin/expand, both of these facilities are likely to have adverse effects on human health, leading to increased health-related expenses (e.g., direct expenditure on medical care, lost wages due to illness). To the extent that owners of these facilities receive tax breaks or other subsidies to begin or sustain their operations, there would also be fiscal impacts for local governments and, therefore, taxpayers. Further, the use of forests as fiber farms rather than as places where diverse ecosystem services are produced

and the use of harvested biomass as fuel rather than as raw material for higher-valued forest products could dampen local and regional economic development.

This analysis focuses on health outcomes and costs of prolonged human exposure to air emissions from wood pellet manufacturing and CHP facilities on nearby residents in the southeastern U.S. First we describe biomass facility air emissions and their effects on human health. We then estimate the occurrence and costs of medical conditions (COPD, asthma, and cancer) in the areas around the Northampton Enviva and Atlamaha facilities. Statistical analysis is used to assess whether and to what extent the presence of a biomass facility is significantly statistically related to health outcomes associated with facility emissions. Finally we describe select fiscal impacts associated with biomass facility development and operation to consider what may be a double burden on residents of these areas. That is, their tax dollars support the development of industrial facilities that then increase healthcare costs.

Biomass Facility Emissions

Producing wood pellets and burning those pellets and other biomass to generate energy creates emissions, primarily nitrogen oxides (NO_x), carbon monoxide (CO), VOCs, sulfur dioxide (SO_2), particulate matter (PM), and hazardous air pollutants (HAPs) (Tran et al., 2023). HAPs are pollutants known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects (U.S. Environmental Protection Agency, 2024). Nitrogen dioxide, SO_2, CO, and PM (2.5 and 10) are pollutants known as criteria air pollutants with National Ambient Air Quality Standards set by the Environmental Protection Agency under the Clean Air Act. They have been found to cause respiratory and cardiovascular problems and other neurological damage, which can lead to additional costs for medical care and lost workdays. Table 1 outlines the known or suspected adverse effects of biomass facility emissions in exposed populations. Further details about the potential effects of air pollutants on human health and the populations most at risk follow that table.

Nitrous Oxides: Exposure to low levels of nitrogen oxides in the air can irritate eyes, nose, throat, and lungs, possibly causing coughing and shortness of breath, tiredness, and nausea. Exposure to low levels can also result in fluid buildup in the lungs. Breathing high levels of nitrogen oxides can cause rapid burning, spasms, and swelling of tissues in the throat and upper respiratory tract, reduced oxygenation of body tissues, a build-up of fluid in the lungs, and death (Centers for Disease Control and Prevention, Agency for Toxic Substances and Disease Registry, 2014a). People with asthma, children, and the elderly are generally at greater risk for the health effects of NO2 (U.S. Environmental Protection Agency, 2025a).

Carbon Monoxide: Exposure to lower levels of carbon monoxide can harm the heart, brain, and lungs. Breathing high levels of carbon monoxide can be fatal. Carbon monoxide can be more harmful to individuals with heart or lung disease (Centers for Disease Control and Prevention, Agency for Toxic Substances and Disease Registry, 2012).

VOCs: Breathing VOCs can irritate the eyes, nose and throat, cause difficulty breathing and nausea, and damage the central nervous system and other organs. Some VOCs can cause cancer. Acrolein, an aldehyde and VOC classified as a HAP, is emitted during wood pellet manufacturing and storage (Tran et al., 2023). It may influence the risk of developing diseases such as cancer and cardiovascular disease (Sinharoy et al., 2019).

Particulate Matter: PM consists of microscopic solids or liquid droplets so small that they can be inhaled and cause serious health problems, including COPD (Duan et al., 2020). Some particles less than 10 micrometers in diameter can get deep into the lungs and into the bloodstream. Particles less than 2.5 micrometers in diameter,

also known as fine particles or PM2.5, pose the greatest health risk (U.S. Environmental Protection Agency, 2025a).

People with heart or lung diseases, children, older adults, minority populations, and low-socioeconomic-status populations are most likely to be affected by particle pollution exposure, either because they are more sensitive or because they have higher exposures (U.S. Environmental Protection Agency, 2025a).

Table 1. Health Outcomes, Indicators, and Populations Most at Risk by Pollutant

Pollutant	Sources and Rates in Continental U.S. (total tons/year) (a)	Health Effects	Populations at Most Risk
CO	Pellet Mills 8,178 CHP 55,923	Harms heart, brain, lungs	People with heart or lung disease
SO2	Pellet Mills 851 CHP 37,679	Affects lungs, breathing issues	People with respiratory difficulties such as asthma, particularly children
NOx	Pellet Mills 6,617 CHP 50,639	Coughs, shortness of breath, fatigue, nausea, asthma	People with asthma, children, and the elderly
PM 2.5	Pellet Mills 7,178 CHP 9,755	Get into lungs and bloodstream causing inflammation	People with heart or lung diseases, children, older adults, minority, and low socioeconomic status
PM 10	Pellet Mills 7,444 CHP 13,824		
VOCs	Pellet Mills 10,613 CHP 5480	Difficulty breathing, nausea, damage to the nervous system	People with respiratory difficulties
HAPs	Pellet Mills 1,249 CHP 5,480	Cancer or other serious health effects	

Sources: Centers for Disease Control and Prevention (2024); Agency for Toxic Substances and Disease Registry (2012, 2014a, 2014b); Duan et al. (2020); Sinharoy et al. (2019); Tran et al. (2023); U.S. Environmental Protection Agency (2025a)
Note:

a. CHP emission rates apply to bioenergy facilities that generate electricity.

Sulfur Dioxides: Exposure to sulfur dioxide affects the lungs and, at high levels may result in burning of the nose and throat, breathing difficulties, and severe airway obstructions. Long-term exposure to persistent low levels of sulfur dioxide can affect lung function changes. People with respiratory difficulties such as asthma have been shown to be sensitive to the respiratory effects of low concentrations of sulfur dioxide (Centers for Disease Control and Prevention, Agency for Toxic Substances and Disease Registry, 2014b). People with asthma, particularly children, are sensitive to these effects of SO2 (U.S. Environmental Protection Agency, 2025a).

Wood Pellet Manufacturing

Typical emissions rates (pounds/oven-dried ton, or ODT) from wood pellet manufacturing and storage vary by facility production capacity (Tran et al., 2023). Emissions rates are lower for facilities with larger production capacities (typically those above 100,000 ODT/yr) because they must be equipped with emissions control devices to keep their emissions of criteria pollutants and HAPs below major source thresholds. NOx, VOC, and CO emission rates for facilities are highest for those producing more than 500,000 ODT/year, such as Enviva Northampton. For facilities producing 100,000 to 500,000 ODT per year, the highest emissions rates are for VOC, CO, and PM10. There are about 56 HAPs emitted by wood production manufacturing, with acetaldehyde, formaldehyde, methanol, acrolein, phenol, and propionaldehyde comprising up to 90% of total HAPs.

The Air Quality Permit for regulated pollutants (under the North Carolina Administrative Code) issued to Enviva Northampton by the North Carolina Department of Environmental Quality (NCDEQ) limits emissions of these pollutants. It also restricts visible emissions, state-enforced toxic air pollutants, and odor (North Carolina Department of Environmental Quality, 2021).

Combined Heat and Power

Biomass energy production facilities, such as Combined Heat and Power (CHP), use wood and wood residues, post-consumer wood and paper products, mill wastes, forestry residues, agricultural residues, food wastes, and other biomass-based elements of municipal solid waste streams (Tran et al., 2023). These facilities emit pollutants similar to those from wood pellet manufacturing, primarily CO, CO2, NOx, sulfur oxides (SOx), and PM (Department of Energy, 2013). The rates of emission depend on the quantities of fuel consumed, the type of fuel used, and the temperature of combustion (Department of Energy, 2013; Tran et al., 2023). For example, North Carolina Renewable Power, a biomass energy facility in Lumberton, North Carolina (now closed), burned wood and other fuels (e.g., poultry litter) (Department of Energy, 2013). The Air Quality Permit issued by the NCDEQ limited emissions of these pollutants, as well as sulfuric acid mist, mercury, and visible emissions (North Carolina Department of Environmental Quality, 2022).

Human Health and Economic Costs of Emissions

In this section we outline the data sources and methods employed to assess the occurrence of COPD, asthma, and cancer in residents of the area around Enviva Northampton and planned Altamaha Green Energy; prevalence of these health conditions and related health risk factors (such as heart disease); and resulting medical costs and productivity losses and costs. We find that residents of the area around Enviva Northampton spent a total of between $108,000 to $202,000 per year on Emergency Department (ED) visits associated with COPD and asthma between 2022 and 2024. (Additional spending for visits to urgent care facilities is not publicly available.) The cost of work hours lost due to COPD, asthma, and cancer in Northampton County in 2022 totaled $892,000.

As discussed above, short-term and extended exposure to air emissions of biomass facilities can result in respiratory conditions such as COPD and asthma, and cancer (Centers for Disease Control and Prevention, Agency for Toxic Substances and Disease Registry, 2014b; Sinharoy et al., 2019; U.S. Environmental Protection Agency, 2024). The effects of exposure may be reflected in the number of ED visits and prevalence of related

health conditions by residents near facilities. The cost of ED visits and work hours lost associated with these health conditions provides a measure of the economic losses that may be due to their presence and operation.

Illness and health conditions can result in employee absences from work and consequent productivity losses (in terms of time or money). Cancer and chronic lung disease (asthma, COPD, and bronchitis) are among the five most costly chronic conditions to employers (Rojanasarot et al., 2023); the others are pain, depression, and cardiometabolic disease. These losses are measured by the incremental work hours lost due to the medical condition and the degree of overall work impairment (from work productivity and impairment questionnaires, for example) (Rojanasarot et al., 2023).

We measure the occurrence of health effects associated with biomass facility air emissions by the number of hospital ED visits and the proportion of people with specific health outcomes. The number of ED visits attributed to COPD and asthma[1] in the area near Enviva Northampton and the planned Altamaha Green Energy are obtained from North Carolina's Asthma & COPD Dashboard (North Carolina Department of Health and Human Services and UNC School of Medicine, 2025) and Georgia's Online Analytical Statistical Information System (Georgia Department of Public Health, 2025). The smallest geographic area for which ED data are available is ZIP codes for North Carolina and Census tracts for Georgia. We define the area near each biomass facility as a two mile radius around the facility, consistent with recent studies on the distance within which people could be subject to adverse health impacts from facility emissions (North Carolina Department of Environmental Quality, 2019; Southern Environmental Law Center, 2024; Tran et al., 2023).

Total ED visit costs for COPD and asthma in each area are estimated using the county-level cost per encounter (Dieleman et al., 2025): number of visits × cost per visit. The county-level cost per encounter is reported in 2019 dollars and converted to 2024 dollars using the CPI-U for medical care in the southern region (U.S. Bureau of Labor Statistics, 2025b).

The proportion (%) of adults with COPD, asthma, and cancer, and related health/risk conditions, are obtained from the Centers for Disease Control and Prevention (Centers for Disease Control and Prevention, 2024) for Census tracts containing Enviva Northampton and planned Altamaha Green Energy. The related risk conditions include cigarette smoking, which has been linked to the development of both asthma and COPD (Bellou et al., 2022; Kotlyarov, 2023). In addition, the health effects of asthma and COPD are similar and approximately 20% of patients with COPD will have features of both conditions (Cukic et al., 2012; Knight, 2020).

Estimating the cost of lost work hours and productivity involves multiple steps. First, the number of adults in each Census tract aged 18 to 64 years with COPD, asthma, and cancer, respectively, is calculated by multiplying the percentage for each condition by the tract's adult population. Second, the number of adults with each condition is multiplied by the (median) number of work hours lost per year per full-time employee for COPD, asthma, and cancer (Rojanasarot et al., 2023), providing an estimate of the total number of work hours lost. Third, the total number of work hours lost is multiplied by the county's median hourly earnings (median annual earnings for the county (U.S. Census Bureau, 2025b) divided by 2080 work hours per year), resulting in the estimated cost of work hours lost due to COPD, asthma, and cancer.

[1] Identified based on ICD-10-CM diagnostic codes.

Occurrence of COPD, Asthma, and Cancer

Measures of the number of residents in the area around Enviva Northampton whose health may be adversely affected by the facility include ED visits related to COPD and asthma, the prevalence of these respiratory conditions, the prevalence of cancer, and overall health status. As described above, the cost of COPD, asthma, and cancer cases is estimated using the value of lost work hours. Estimates for the area around the planned Altamaha Green Energy are provided as baselines for future comparisons.

Table 2. COPD and Asthma Emergency Department Visits and Costs for the Area Around Enviva Northampton, North Carolina, 2022-2024

	Visits (a)			Cost (2024 dollars) (b)		
	2022	**2023**	**2024**	**2022**	**2023**	**2024**
Total ED visits	4,079	4,079	4,195			
COPD visits	242	128	158	$148,362	$78,472	$96,864
Percent of total	5.9%	3.1%	3.8%			
Asthma visits	141	79	107	$53,336	$29,883	$40,474
Percent of total	3.5%	1.9%	2.6%			
Total Costs				**$201,697**	**$108,355**	**$137,339**
Figures for all of Northampton County, NC, for comparison						
COPD (% of ED visits)	6.4%	4.2%	3.5%			
Asthma (% of ED visits)	3.5%	2.1%	2.7%			

Sources: Dieleman et al. (2025); North Carolina Department of Health and Human Services and UNC School of Medicine, (2025); U.S. Bureau of Labor Statistics (2025b)

Notes:

a. Emergency department visits are not available for Census Tracts, but for ZIP Codes. Reported here are visits by residents of ZIP codes 27831, 28762, and 27866, which contain a circle with a radius of two miles and centered on the Enviva Northampton facility. These ZIP Codes cover 58.3% of the Census Tracts for which the other data used in our analysis are available. The closest hospital reporting ED data is in Roanoke Rapids.

b. Costs estimated using county-level cost per encounter for all payers (Dieleman et al., 2025) in 2019 dollars converted to 2024 dollars using the CPI-U for medical care in the southern U.S. (U.S. Bureau of Labor Statistics, 2025b).

Enviva Northampton

The number of ED visits by residents of the Enviva Northampton area for COPD and asthma varied between 2022 and 2024 (as shown in Table 2). COPD accounted for 3.8% of total ED visits by residents of this (ZIP-Code-defined) area in 2024, compared with 3.5% in Northampton County (North Carolina Department of Health and Human Services and UNC School of Medicine, 2025). Asthma ED visits accounted for 2.6% of total visits, compared to 2.7% county-wide. The cost of COPD and asthma ED visits combined is estimated at $137,339 (2024$) in 2024 (Dieleman et al., 2025). This estimate reflects average spending by all payers, which varies widely. For example, in Northampton County average spending by all payers per encounter is $613 and ranges from $45 by Medicaid to $1,264 by private insurance in Northampton County. The majority of Northampton County residents have

private insurance alone, or in combination with other insurance (Dieleman et al., 2025; U.S. Census Bureau, 2025c).

COPD was more prevalent[2] (among adults) in the area around Enviva Northampton than it was among all Northampton County residents in 2022 (the most recent year for which data are available) (Table 3). Some indicators of health status or risk, such as frequent physical distress and cigarette smoking, are greater in the area around Enviva Northampton than in Northampton County (Centers for Disease Control and Prevention, 2024).

Table 3. Prevalence of Health Conditions and Risk Factors Among Adults in the Area Around Enviva Northampton and Northampton County, North Carolina, 2022

	Prevalence (%)	
	Enviva Northampton Census Tracts (a)	**Northampton County**
Health Condition		
Current asthma	12.4	10.9
Chronic obstructive pulmonary disease	13.9	11.8
Cancer	7.7	8.9
Health Status/Risk		
Coronary heart disease diagnosis	11.3	10.9
Stroke diagnosis	8.4	6.9
Cognitive disability	19.3	15.7
Frequent physical distress	20.5	17.3
Frequent mental distress	17.9	15.3
Current cigarette smoking among adults	22.6	17.9
Current lack of health insurance (b)	14.4	8.4

Source: Centers for Disease Control and Prevention (2024)
Notes:

a. Residents of Census tracts 37131920301, 37131920302, and 37131920401.
b. Lack of health insurance is among adults aged 18-64 years.

The cost of productivity losses in 2022 due to health conditions associated with pollutants from biomass manufacturing ranges from $209,284 for asthma to $447,760 for cancer in the area around Enviva Northampton, and totals about $892,276 million (Table 4).

[2] Prevalence is a model-based estimate generated using Behavioral Risk Factor Surveillance System 2022, Census 2020 population counts or census county population estimates of 2022, and ACS 2018-2022 (Centers for Disease Control and Prevention, 2024).

Table 4. Productivity Losses and Costs in the Census Tracts Within 2 miles of Enviva Northampton, North Carolina, 2022 (a)

Health Condition	Productivity Loss per Year (b)	
	Time (hours)	Cost (2024 dollars)
Asthma	9,045	$209,284
COPD	10,166	$235,232
Cancer	19,352	$447,760

Sources: Centers for Disease Control and Prevention (2024); Rojanasarot et al. (2023); U.S. Census Bureau (2025b)
Notes:

a. Residents of Census Tracts 37131920301, 37131920302, and 37131920401 aged 18-64.
b. The number of adults aged 18 to 64 years is used for productivity loss.

Altamaha Green Energy, Georgia

The number of ED visits by residents of the area around the planned Altamaha Green Energy for COPD and asthma varied substantially between 2015 and 2024. This area is defined as the 4 Census Tracts within 2 miles of the planned facility. Table 5 outlines prevalence, highlighting that between 2020 and 2024, visits with a COPD diagnosis composed 1.3% and asthma 1.0% of all ED visits respectively (Georgia Department of Public Health, 2025). The cost of these visits is estimated to total $350,671 (2024 dollars). This prevalence and ED data for residents near the planned Altamaha Green Energy in Jesup, Georgia may serve as a baseline for future studies of health outcomes after facility operation.

Table 5. COPD and Asthma Emergency Department Visits for Area Around Planned Altamaha Green Energy in Jesup, Georgia, 2015-2024 (a)

	Visits (a)		Cost (2024 dollars) (b)	
	2015-2019	2020-2024	2015-2019	2020-2024
Total ED visits	39,089	31,274		
COPD visits	487	396	$300,404	$244,974
Percent of total	1.2%	1.3%		
Asthma visits	470	298	$167,216	$105,697
Percent of total	1.2%	1.0%		
Total Costs			**$467,620**	**$350,671**
Comparison to All of Wayne and Long Counties				
COPD (% of ED visits)	1.2%	1.0%		
Asthma (% of ED visits)	1.1%	0.7%		

Sources: Dieleman et al. (2025); Georgia Department of Public Health (2025); U.S. Bureau of Labor Statistics (2025b)
Notes:

a. Total number of emergency department visits by interval for residents of Census Tracts 13183970102, 13183970201, 13305970202, and 13305970600

b. Costs estimated using county-level cost per encounter for all payers (Dieleman et al., 2025), converted from to 2024 dollars using the CPI-U for medical care in the southern region (U.S. Bureau of Labor Statistics, 2025b).

Table 6 outlines prevalence data in the area around the planned Altama Green facility, demonstrating that between 7% and 12% of adults within the Census Tract of the planned facility were diagnosed with COPD, asthma, or cancer in 2022.

Table 6. Prevalence of Health Conditions and Status Among Adults in the Area Around Planned Altamaha Green Energy in Jesup, Georgia, 2022 (a)

Health Conditions & Health Status/Risks	Prevalence (%)	
	Altamaha Green Energy Census Tracts (a)	Wayne and Long Counties
Health Condition		
Current asthma	11.5	11.1
Chronic obstructive pulmonary disease	10.4	9.2
Cancer	7.3	7.0
Health Status/Risk		
Coronary heart disease diagnosis	7.8	7.2
Stroke diagnosis	4.7	4.2
Cognitive disability	18.5	17.3
Frequent physical distress	19.4	15.7
Frequent mental distress	20.1	19.3
Current cigarette smoking among adults	21.15	19.7
Current lack of health insurance (b)	18.8	15.4

Source: Centers for Disease Control and Prevention (2024)
Notes:
a. Residents of Census Tracts 13183970102, 13183970201, 13305970202, and 13305970600.
b. Lack of health insurance is among adults aged 18-64 years.

Annual work hours lost due to cancer were the greatest at 48,013 (2022 data); hours attributed to asthma and COPD total 41,929 (Table 7). The cost of lost productivity ranges from $457,982 to $1.1 million (2024 dollars).

Table 7. Productivity Losses and Costs in the Census Tracts within 2 miles of the Area Around Planned Altamaha Green Energy in Jesup, Georgia, 2022 (a)

Health Condition	Productivity Loss per Year (b)	
	Time (hours)	Cost (2024 dollars)
Asthma	21,972	$504,220
COPD	19,957	$457,982
Cancer	48,013	$1,101,815

Sources: Centers for Disease Control and Prevention (2024); Rojanasarot et al. (2023); U.S. Bureau of Labor Statistics (2025b)
Notes:

a. Residents of Census Tracts 13305970600, 13183970102, 13183970201, and 13305970202 aged 18-64.
b. The number of adults aged 18 to 64 years is used for productivity loss.

Medical health effects and costs are not the only effects on surrounding communities. Other effects of biomass facilities on nearby communities include increased truck traffic, dust, and noise (Bell et al., 2024). Recent research found significantly higher sound levels in a community with wood pellet production compared to a nearby community without industrial activity, suggesting that wood pellet manufacturing can severely alter the soundscape of rural communities (Walker et al., 2024).

Estimating Health and Healthcare Cost of Biomass Facilities

This section describes the data and results of the statistical analysis we conducted to assess whether and to what extent the presence of a biomass facility is significantly associated with health outcomes correlated with facility emissions: COPD, asthma, and cancer. **Results indicate that the presence of wood pellet mills and CHP facilities, as well as specific socioeconomic and demographic characteristics, are significantly related to COPD among adults in North Carolina, South Carolina, Georgia, Alabama, and Mississippi.** While biomass facility presence is also associated with the prevalence of cancer, the relationship is not statistically significant with the data we have access to. Select socioeconomic and demographic characteristics are found to be significantly related to the prevalence of asthma; however, the presence of biomass facilities is not. Using the statistical results, we apply estimates of annual spending for COPD and the cost of work missed by people suffering ill health associated with Enviva Northampton pellet mill to deduce associated healthcare costs. Health outcomes and healthcare cost estimates for the planned Altamaha Green Energy CHP facility are presented for future research.

Epidemiological and Econometric Analysis

Data for the characteristics of people most at risk (see Table 1) were obtained from the 2022 Social Vulnerability Index, which uses 16 U.S. Census variables from the 2018-2022 5-year American Community Survey to characterize communities (Centers for Disease Control and Prevention, Agency for Toxic Substances and Disease Registry, 2022). These variables are grouped into four themes that cover four major areas of social vulnerability and then combined into a single measure of overall social vulnerability (Figure 1).

We employed multiple regression analysis, a statistical procedure to estimate the presence and strength of a relationship between the value of a response (dependent) variable and a set of predictor (independent) variables. The "dependent" or "explanatory" variables are all the Socioeconomic Status variables, Aged 65 & Older and Aged 17 & Younger from Household Characteristics, and Racial & Ethnic Minority Status (Figure 1). The study area comprises Census tracts in Alabama, Georgia, Mississippi, North Carolina, and South Carolina. Health condition data – adults currently with

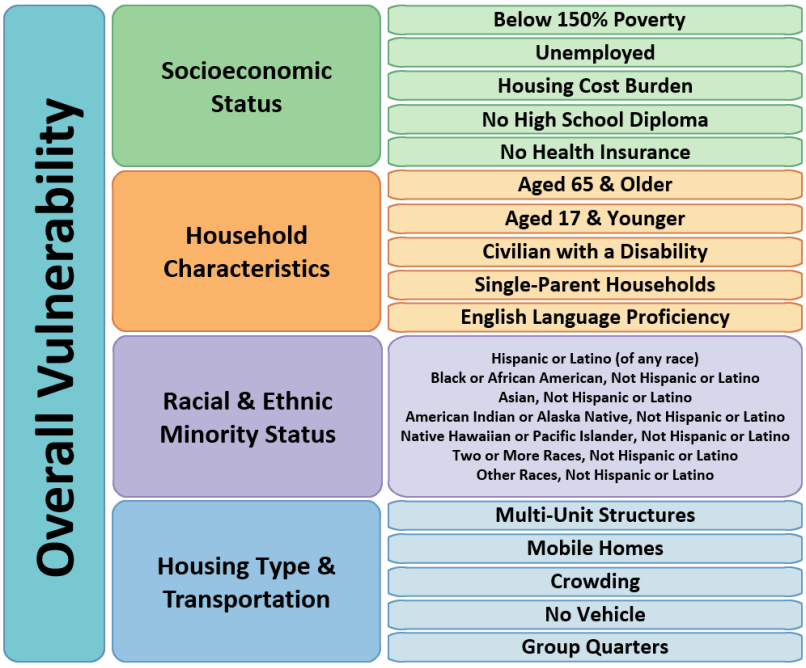


Figure 1. Social Vulnerability Index
Source: (Centers for Disease Control and Prevention, Agency for Toxic Substances and Disease Registry, 2022)

COPD, asthma, or cancer (independent variables) – are from the Centers for Disease Control and Prevention (Centers for Disease Control and Prevention, 2024).

We obtained the location and other attributes of wood pellet mills from the Southern Environmental Law Center (2025). We downloaded a list of CHP facilities from the Oak Ridge National Laboratory's Onsite Energy Installation Database (*Onsite Energy Installation Database*, 2025) and filtered the list to identify CHP installations where the fuel source was "wood' or "biomass". We georeferenced these data by searching for the installation using Google maps, verifying that the location found was an industrial site, and entering the latitude and longitude coordinates for the installation to the downloaded data.

For both facility types, we identified the Census Tracts with any part within two miles of the facility and marked those as the Tracts as being near a biomass energy facility. A total of 34 wood pellet mills are located within the study region, and 103 Census Tracts are within 2 miles of those mills. There are 109 Census Tracts within two miles of the 29 CHP facilities located within the study region. (See Figure 2, below.) For the econometric analysis, our data set also includes the remaining Census Tracts in the same county or counties as the Tracts containing that two-mile-radius circle around the facilities. Thus, the full data set comprises all Census Tracts in all counties that contain any portion of a two-mile-radius circle around a wood pellet mill or CHP, with Census Tracts assigned to the case group if the Tract contains any portion of the circle. Other Tracts are assigned to the control group.

A stepwise regression procedure was used to identify the best subset of explanatory variables related to health conditions. Stepwise regression constructs a regression model by iteratively adding or removing independent variables, facilitating the selection of the most important variables.

HC = *f*(FAC, POV150, UE, HCB, NHSD, NHI, AGE65O, AGE 17Y, MIN, SMOKE)

where:

HC = Health Condition, number of adults diagnosed with current COPD, asthma, or cancer

FAC = Facility, presence or absence of a wood pellet mill (WPM) or CHP
A dummy variable taking the value of 1 for Census tracts with any area of overlap with a two-mile-radius circle around a WPM or CHP (i.e, the Tract is a case), or a value of 0 (zero) otherwise (i.e., the Tract is a control).

POV150 = Poverty, number of people with income levels below 150% of poverty level

UE = Unemployment, number civilians aged 16 and older unemployed

HCB = Housing Cost Burden, defined as the number of occupied housing units with annual income less than $75,000 and 30% or more of income spent on housing costs

NHSD = No High School Diploma, number of people aged 25 and older with no high school diploma

NHI = No Health Insurance, number of uninsured people in civilian noninstitutionalized population

AGE65O = Number of people aged 65 and older

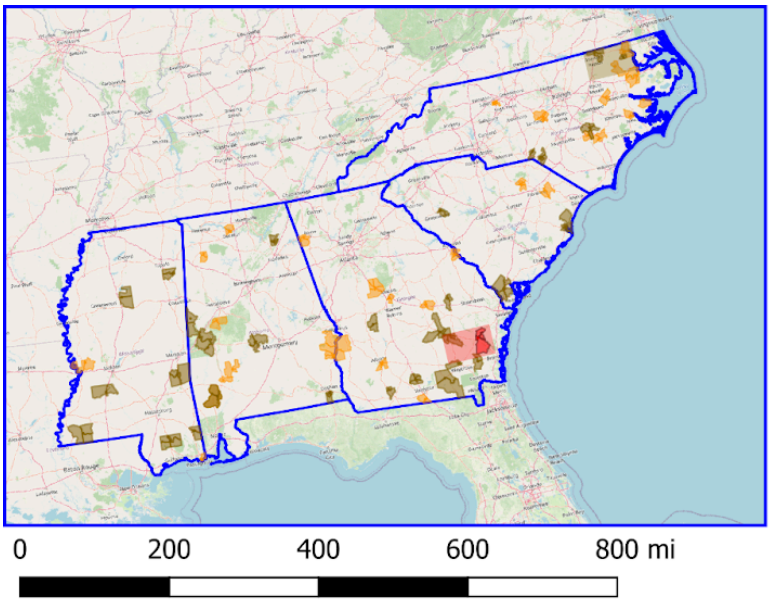
AGE17Y = Number of people aged 17 and younger

MIN = Number of minority people

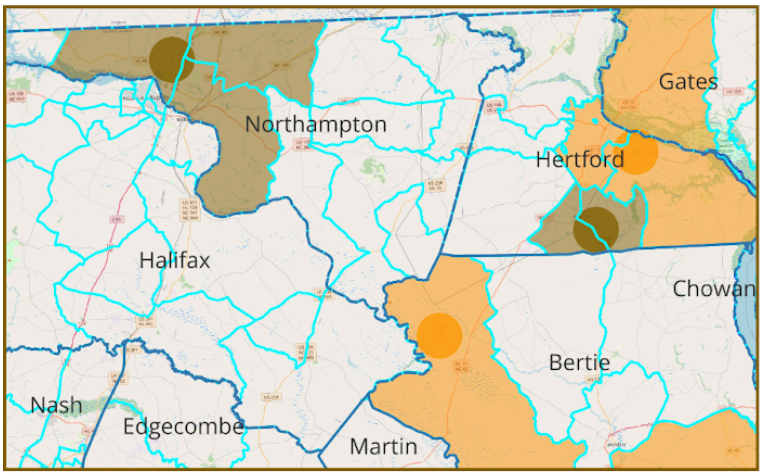
SMOKE = Number of adults who report having smoked ≥ 100 cigarettes in lifetime and currently smoke every day or some days

Also, the number of adults with current asthma was tested as an explanatory variable in the regression model for COPD.

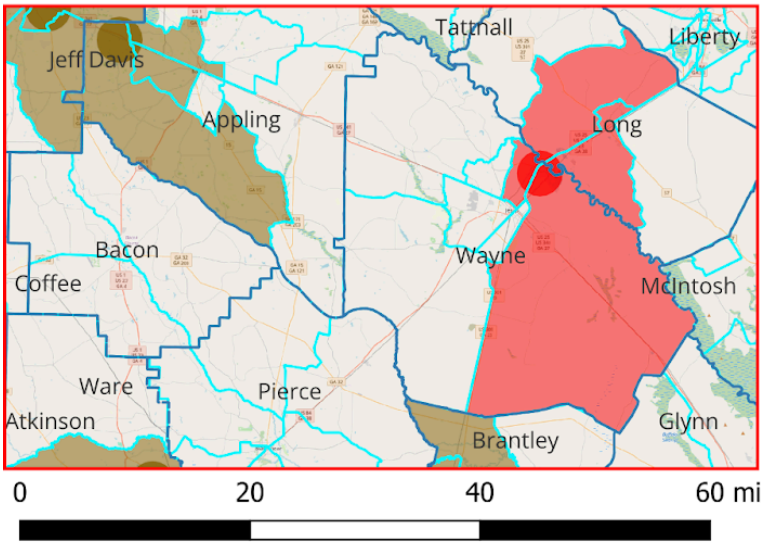
Figure 2. Study Region, Wood Pellet Manufacturing and Combined Heat and Power Facilities

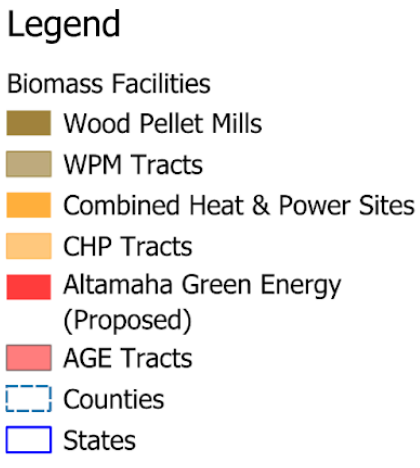


Across the five-state study region, there are 34 wood pellet mills (WPMs) and 29 Combined Heat & Power Facilities (CHPs) with biomass as a fuel source. For the statistical analysis, Census tracts with any portion of their area within 2 miles of these faciltiies (that is, the 103 "WPM Tracts" and 109 "CHP Tracts") were compared to the remaining tracts in the same county or counties as the WPM or CHP Tracts.



The Enviva Northampton WPM, two CHPs and a second WPM, along with their respective Census Tracts, appear in the map at left. The map at the bottom left shows the site of the proposed Altamaha Green Energy facility in Wayne County, Georgia along with what would become its CHP Tracts. Census Tracts associated with four WPMs are also visible.





Regression Results

Analyses indicate that the presence of wood pellet mills and CHP facilities, as well as specific socioeconomic and demographic characteristics, are significantly related to COPD among adults in the study area. While biomass facility presence was also related to cancer, it was found not statistically significant using data we currently have access to. This may be partly due to the fact that Census tract level data is available for all types of cancer combined, not for individual types of cancer associated with harmful air emissions, e.g., tracheal, bronchus, and lung cancer. The prevalence of asthma is found to be significantly related to age (17 and younger and 65 and older), housing cost burden, and smoking, but not the presence of biomass facilities in our data. This suggests that in our study region, and with the data we have access to, socioeconomic and other factors linked to asthma development (including COPD) are of greater influence than facility emissions.

Results of regression analyses appear in Tables 8 and 9. The coefficients represent the estimated amount of change in the dependent variable for a one-unit change in the independent variable. The overall quality of the models and the power of the independent (or explanatory) variables in explaining variation in the independent variable (i.e., the number of COPD cases in a given Census Tract) are indicated by five statistics provided in the tables. These are:

- Adjusted R-square (or Adjusted R^2) tells us the proportion of the overall variation in the independent variable (COPD) that is explained by the model. For both WPMs and CHPs, our models explain 99 percent of the variation in the number of COPD cases.
- The F statistic indicates the overall explanatory power of the regression model. It tells us whether the particular collection of explanatory variables in the model does a better job of explaining the variance in the dependent variable (i.e., COPD) than a model without any of those explanatory variables.
- The related statistic, p(F), is the probability that the collection of explanatory variables has no effect on the dependent variable — that is, that the variation in the number of COPD cases is completely random.
- The higher the F statistic, and the lower the p-value for the F-test, the better the mode. The models here have high F statistics with low p(F), meaning the models, overall, are highly effective as explanations of variation of COPD cases across Census Tracts.
- Finally, each independent/explanatory variable has its own P-value. It is the probability that the actual (as opposed to the estimated) value of the coefficient on the independent/explanatory variable is zero — that is, that the explanatory variable actually does not explain anything.

When the P-value is small (generally <0.05), one can say that the independent/explanatory variable is "significant" as a predictor of variation in the dependent variable, or that the effect of the explanatory variable has a "significant" effect on the dependent variable.

Tables 8 and 9 display the explanatory variables, estimated COPD cases, and actual COPD cases for the Census Tracts that contain a two-mile-radius circles around the Enviva Northampton WPM facility and the proposed Altamaha Green Energy facility, respectively. As an example, estimated cases of COPD for Census Tract 37131920401 (Table 8) is calculated as follows:

Estimated COPD Cases = (0.020 x POV) + (0.201 x ASTHMA) + (0.376 x SMOKE) + (8.212 x WPM)
= (0.020 x 1,392) + (0.201 x 355) + (0.376 x 645) + (8.212 x 1)
= 350

The coefficient on the variable WPM indicates that the presence of a WPM is associated with 8 more or excess COPD cases per Census Tract, when compared to Tracts without WPMs nearby. There are three Tracts that contain the two-mile-radius circle around the Enviva Northampton WPM. In those Tracts, there are an estimated 710 COPD cases, of which 24.6 (3 Tracts x 8.212 excess cases per Tract), or 4%, can be attributed to the Enviva facility.

Table 8. Regression Results Wood Pellet Mills (361 Observations), with Estimated COPD Cases for Census Tracts near the Enviva Northampton Wood Pellet Mill

Dependent Variable:	**Independent/Explanatory Variables:**				**Estimated Cases**	***Actual Cases***
COPD	**POV**	**ASTHMA**	**SMOKE**	**WPM**		
Coefficients & P-values	0.020	0.201	0.376	8.212		
	< 0.001	< 0.001	<0.001	0.018		
Independent (explanatory) Variable Values and Estimated COPD cases for the three Census Tracts within 2 miles of Enviva Northampton (Tract IDs are in the first column.)						
37131920301	903	193	372	1	205	*233*
37131920302	593	159	273	1	155	*171*
37131920401	1,392	355	645	1	350	*384*
Total Cases					**710**	***788***
Regression Statistics: Adjusted R-square 99%; F Statistic = 8,314; p(F) < 0.0001						

The coefficient on the variable CHP (Table 9) indicates that a little more than 5 of the estimated cases in each Census Tract could be attributed to the presence of the planned Altamaha Green Energy facility after operation commences. Since there are 4 tracts, the number of excess cases would be 21 (5.283 x 4), 2% of the total estimated cases.

Table 9. Regression Results for CHP Facilities (811 Observations)

Dependent Variable:	**Independent/Explanatory Variables:**				**Estimated Cases**	***Actual Cases***
COPD	**POV**	**AGE65O**	**SMOKE**	**CHP**		
Coefficients & P-values	0.013	0.076	0.398	5.283		
	< 0.001	< 0.001	< 0.001	0.056		
Independent (explanatory) Variable Values and Estimated COPD cases for the three Census Tracts within 2 miles of Enviva Northampton (Tract IDs are in the first column.)						
13183970102	2,143	301	799	1	374	*300*
13183970201	1,153	317	320	1	172	*159*
13305970202	2,113	652	779	1	392	*402*
13305970600	1,040	697	706	1	353	*393*

Dependent Variable:	Independent/Explanatory Variables:				Estimated Cases	*Actual Cases*
COPD	**POV**	**AGE65O**	**SMOKE**	**CHP**		
Total Cases					**1,291**	***1,254***
Regression Statistics: Adjusted R-square 99%; F Statistic = 20,678; p(F) < 0.0001						

Results of the statistical analyses indicate that the presence of wood pellet mills and CHP facilities, as well as select socioeconomic and demographic characteristics, are significantly related to COPD among adults in the study area. COPD is found to be significantly related to poverty, asthma, smoking, and wood pellet mills; 8 cases in each tract within 2 miles can be associated with WPM operations. Poverty, age (65 and older), smoking, and CHP are significantly related to COPD cases; 5 cases in each tract within 2 miles can be associated with CHP operations. Approximately 4% (25) of the COPD cases in the Enviva Northampton area are estimated to be associated with the mill's operation.

Health Cost Estimates for Selected Locations

Working from the statistical results above, we estimate annual patient spending for COPD and the cost of work missed by people suffering ill health in Census tracts within 2 miles of the Enviva Northampton pellet mill. Estimates for the area around the planned Altamaha Green Energy CHP facility are provided for future research. Annual spending for COPD by all payors is calculated as $218 per patient (2024 dollars) on average, $154,847 total near Enviva Northampton. The cost of work hours lost associated with the facility is estimated at $209,890 annually for COPD.

Patient Spending

Annual spending for COPD is estimated at $2.5 million in Northampton County, North Carolina, $3.2 million in Wayne County, and $880,000 million in Long County, Georgia (2024 dollars) (Dieleman et al., 2025). Spending is available by payee and county, based on 2010-2019 data (Dieleman et al., 2025). It includes all types of care: ambulatory, inpatient, prescriptions, nursing facility, dental, emergency, and home health. The percentage by payee is calculated by dividing spending for each payee by total spending (Table 10). Annual spending for COPD in Census tracts within 2 miles of the with Enviva Northampton and the planned Altamaha Green Energy facility is calculated by first multiplying the number of cases estimated in the regression analyses above by the percent of spending on COPD in the county by private insurance, Medicare, and Medicaid. This is multiplied by annual spending per beneficiary for each insurance type in the county (Table 11) and summed. Out-of-pocket spending is then added based on percentages in Table 10.

Annual spending for COPD in Census Tracts within 2 miles of Enviva Northampton is calculated as $154,847, with the majority (84%) paid by Medicare (Table 12). Medicaid (and Medicare) are publicly funded; Medicaid by the federal government and Medicare by federal and state governments. Approximately $6,194 of COPD spending in the 3 Enviva Northampton tracts (4% of $154,847 based on regression results) may be associated with the presence of the facility. An estimated $264,652 is spent on COPD care in the planned Altamaha Green Energy facility area (Table 13).

Table 10. Percent of Spending on COPD by Payee

County	Private Insurance	Medicare	Medicaid	Out-of-pocket
Northampton, NC	16.3%	61.9%	13.7%	8.1%
Wayne, GA	17.9%	60.8%	15.4%	5.9%
Long, GA	24.6%	51.4%	17.5%	6.4%

Source: Dieleman et al. (2025)

Table 11. Annual Spending for COPD per Insurance Beneficiary, All Ages (2024 dollars)

COPD	Private Insurance	Medicare	Medicaid
Northampton County, NC	$40.85	$295.38	$79.89
Wayne County, GA	$31.96	$340.51	$81.02
Long County, GA	$21.21	$257.85	$57.65

Sources: Dieleman et. al. (2025); U.S. Bureau of Labor Statistics (2025b)

Note:

(a) Includes spending for all types of care (ambulatory, inpatient, prescriptions, nursing facility, dental, emergency, and home health).

Table 12. Annual Spending for COPD in Census Tracts within 2 miles of Enviva Northampton (2024 dollars)

	COPD Spending
Private Insurance	$4,732
Medicare	$129,884
Medicaid	$7,778
Out-of-pocket	$12,453
Total	$154,847

Source: Dieleman et al. (2025)

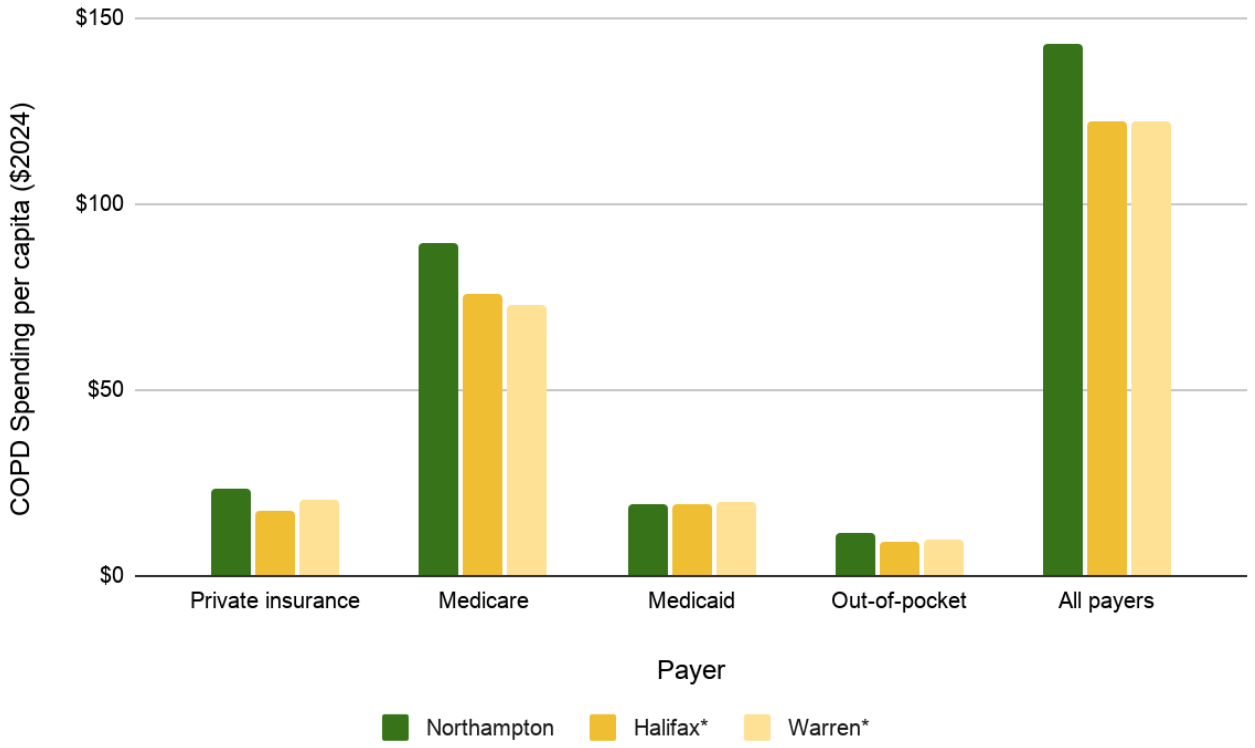
Table 13. Annual Spending for COPD in Census Tracts within 2 miles of Planned Altahamaha Green Energy (2024 dollars)

	Wayne County	Long County	Total
Private Insurance	$4,252	$2,853	$7,106
Medicare	$154,253	$72,391	$226,645
Medicaid	$9,317	$5,511	$14,828
Out-of-pocket	$10,523	$5,550	$16,073
Total	$178,346	$86,306	$264,652

Source: Dieleman et al. (2025)

Annual COPD spending per capita in Northampton County is $143 (2024 dollars), more than in adjacent counties in the area (Dieleman et al., 2025). Spending in Halifax and Warren Counties is $122. (Bertie County has a CHP and Hertford County has both a WPM and CHP facility).

Figure 3. Annual COPD spending per capita in Northampton County and adjacent counties in the study area without a biomass facility



Source: Dieleman et al. (2025)
An asterisk (*) denotes counties without a biomass facility

Productivity Loss

The cost of work hours lost by people suffering from COPD in the area near Enviva Northampton and the planned Altamaha Green Energy CHP, based on regression results, is calculated in the same manner as in the Occurrence of COPD, Asthma, and Cancer section above and involves multiple steps. First, the number of adults aged 18 to 64 years in the Census tract with COPD, asthma, and cancer is calculated by multiplying the percentage with each condition by the adult population aged 18-64 in the Tract. Second, the number of adults with each condition is multiplied by the (median) number of work hours lost per year per full-time employee for COPD, asthma, and cancer (Rojanasarot et al., 2023), providing an estimate of the total number of work hours lost. Third, the total number of work hours lost is multiplied by the county's median hourly earnings (median annual earnings for the county (U.S. Census Bureau, 2025b) divided by 2080 work hours per year) (Table 14).

Table 14. Productivity Loss: Estimated Work Hours and Wages Lost per Year

Facility	COPD		
	Workers Affected	Work Hours Lost	Wages Lost (2024 dollars)
Enviva Northampton	493	9,071	$209,890
Altamaha Green Energy	1,054	19,394	$399,854

Sources: Regression results, Rojanasarot et al. (2023)

Fiscal Impacts

The fiscal impacts of biomass facility development and operation include federal, state, and county spending on financial incentives to encourage facilities to locate within their jurisdictions. To some extent, these funds are derived from taxes so, in turn, taxes (such as property taxes) may increase to replace spending. Biomass facility operations may also reduce nearby housing values due to associated noise, emissions, dust, and traffic. In this section we describe federal and state financial incentives offered to biomass firms, and trends in property tax rates and median housing values in Northampton and Wayne Counties.

Financial Incentives

The federal government and many states provide financial incentives to firms seeking to develop biomass facilities. They include a Federal Production Tax Credit for CHP and state- and county-funded grants, tax credits, and infrastructure improvements (Appendix A).

Federal

Wood Pellet Manufacturing

Biomass companies don’t yet qualify for major subsidies under U.S. federal law (Engelfried, 2024). Enviva has submitted an application to the U.S. Treasury Department to receive clean energy tax breaks under climate provisions of the 2022 Inflation Reduction Act. Companies aren’t required to disclose publicly if they are applying for these incentives, so it’s unclear how many others in the biomass industry may be doing so.

Combined Heat and Power

Biomass energy facilities were eligible for a Production Tax Credit (PTC) under the Inflation Reduction Act of 2022 (U.S. Environmental Protection Agency, 2025b). It allowed taxpayers to deduct a percentage of the cost of renewable energy systems from their federal taxes. Through at least 2025, the Inflation Reduction Act extends the PTC of up to 2.75 cents per kWh (in 2022 dollars, adjusted for inflation annually), as long as projects meet prevailing wage and apprenticeship requirements for projects over 1 MW (U.S, Department of the Treasury, 2023; U.S. Environmental Protection Agency, 2025b). In connection with the Production Tax Credit, the Inflation Reduction Act provides a 10 percent bonus credit for qualifying clean energy production in energy communities.

For systems placed in service on or after January 1, 2025, the Clean Electricity Production Tax Credit will replace the traditional PTC. This tax credit is similar to the PTC but is not technology-specific. It applies to all generation

facilities (and energy storage systems formerly under the Investment Tax Credit) that have an anticipated greenhouse gas emissions rate of zero.

State

Government agencies in the southeastern states offer grants, tax credits,and other incentives for the development of wood pellet mills and CHP facilities. Information about current biomass incentive programs by state can be found on the Database of State Incentives for Renewables & Efficiency (DSIRE), operated by the N.C. Clean Energy Technology Center at North Carolina State University.[3]

Please see Appendix A for a summary of programs utilized in Alabama, Georgia, Mississippi, North Carolina, and South Carolina. Additional details about North Carolina and Enviva Northampton follow.

The state of North Carolina offers two main performance-based, competitive, discretionary incentive programs: the Job Development Investment Grant Program (JDIG) and the One North Carolina (One NC) Fund. Grants are targeted at attracting companies that are considering locating in North Carolina or considering expanding existing operations in the State and funds are disbursed for actual jobs created under these grants (North Carolina Department of Commerce, 2025).

In addition, Industrial Development Fund (IDF) funds are provided for publicly owned infrastructure expected to lead to job creation; creation of a specified number of jobs is not required or reported. This is a longer-range program designed to provide infrastructure that will attract job creation to the State's most distressed tier designations (North Carolina Department of Commerce, 2025). County Economic Development Commissions also offer incentives (Table 15) (Good Jobs First, 2025).

Since 2007, North Carolina has used a three-level system to designate County Development Tiers to create state funding opportunities to support economic development (North Carolina Department of Commerce, 2024). It is calculated based on 4 factors: average unemployment rate, median household income, percentage growth in population, and adjusted property tax base per capita. This process assigns each county to a designation of Tier One (most distressed), Tier Two, or Tier Three (least distressed). Northampton County is identified as Tier One in 2025 and every year prior, ranking among the 18 most distressed [of 100 total] (North Carolina Department of Commerce, 2024).

Property Tax Rates and Housing Value

Property taxes on land, buildings, and personal property are the primary source of revenue for states and local governments in the U.S. and are used to fund public services and infrastructure (Tax Foundation, 2025). Property tax rates in Northampton County have increased since Enviva Northampton's first air permit application in 2011. The median value of owner-occupied housing units in the Census tract where Enviva Northampton is located declined 22% between 2010 and 2013, the year the facility began operating, and has been substantially lower than Northampton County's since 2010. Data for Wayne County, Georgia, is provided as a baseline for future studies.

[3] https://www.dsireusa.org/

Northampton County, North Carolina

Since Enviva Northampton's first air permit application in 2011 (North Carolina Department of Environmental Quality, 2011), property tax rates in Northampton County have increased: from $1.337 per $100 appraised value in FY 2011 to $1.363 per $100 appraised value in FY 2013 (2024 dollars) (Table 16 and Figure 4) (North Carolina Office of State Management and Budget, 2025). Enviva began operations in 2013. Tax rates for the town of Garysburg have remained at $0.60 per $100 in nominal dollars since 1991, and varies annually in 2024 dollars. The Northampton County tax rate is currently $0.83 per $100 appraised value for FY 2026. The agreement with Enviva Northampton was among the drivers of higher property taxes in the community (see box), rather than boosting the economy out of the lowest Development Tier.

Northampton County's former Director of Economic Development, Franklin Williams, observed that the County "over-incentivized their efforts to get businesses here and it caused the tax rate to go up in order to meet the budget" (de Puy Kamp, 2021).

Table 15. State and County Incentives Provided to Wood Pellet Manufacturers in North Carolina (nominal dollars)

				Minimum Required		
Company	**Year**	**Funding Program**	**Value**	**New Jobs**	**Retained Jobs**	**Average Wage (nominal)**
Enviva LP, Northampton	2011	One NC	$195,000	56	53	$34,632
Enviva LP, Northampton	2012	IDF-Utility Account	$387,757	62	Not required	Not required
Enviva LP, Northampton	2011	Northampton County Economic Development Commission	$348,797 Value (a)	Infrastructure assistance	93	
Enviva LP, Hertford	2010	One NC	$270,000	48	0	$34,840
Enviva Management Company LLC, Sampson & Richmond	2014	Job Development Investment Grant	$1,905,000 Active; Net Value $782,850	144	178	$34,165
Enviva Pellets LLC, Sampson	2013	Sampson County Economic Development Commission Grant	$2,899,812 over 10 years	79		$36,862
American Wood Fibers, Inc. Scotland	2020	One NC	$0 (Closed)	46	0	$698

Sources: Good Jobs First (2025); North Carolina Department of Commerce (2025)
Note:

a. Enviva LP, Northampton Subsidy value is $299,216 of land (210 acres of Northampton Commerce Park) given to the company and $49,581 of surrounding infrastructural improvements such as access road, pumps, and project signs.

The occupied housing units in the Census tract where Enviva Northampton is located has been lower than median housing value in Northampton County 2010 to 2023 (Table 16 and Figure 4) (U.S. Bureau of Labor Statistics, 2025a; U.S. Census Bureau, 2025a). Tract value declined 22% between 2010 and 2013 from $83,997 to $65,623 (in 2024 dollars). It increased to $89,371 by 2018 and has since declined again to less than 2010 value.

Table 16. Property Tax Rates, Fiscal Years 2009-2025[a], and Median Value of Owner-Occupied Housing Units, Northampton County Locales, 2010-2023 (2024 dollars)

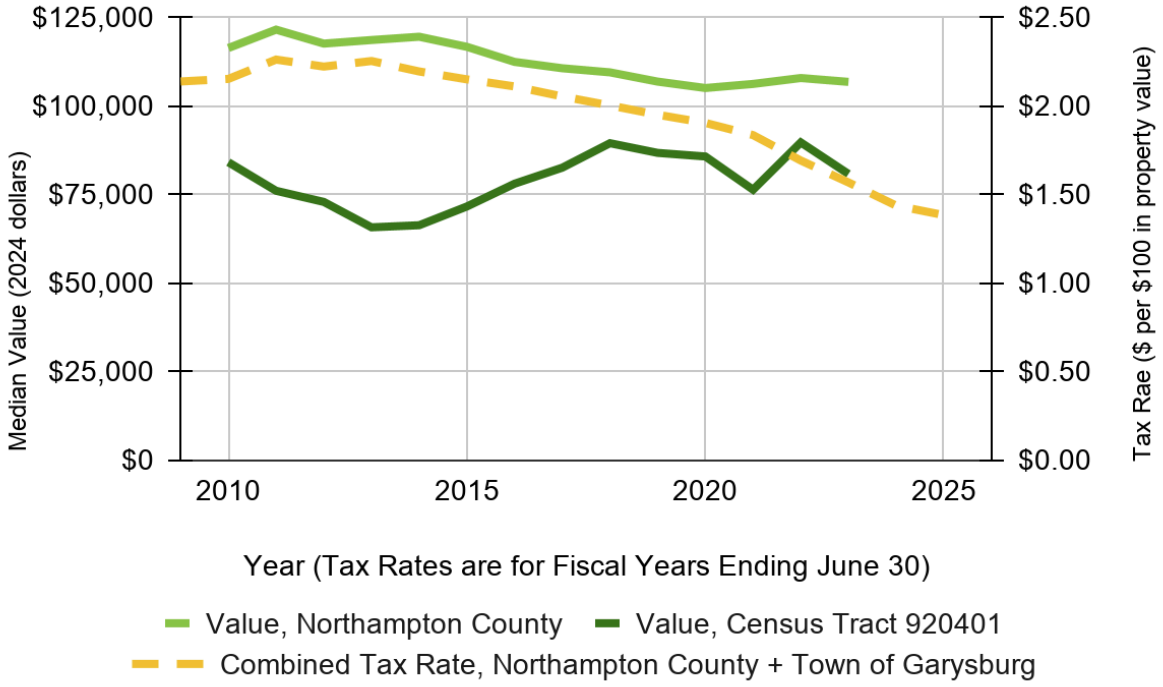
	Property Tax Rates ($ per $100 appraised value)			Median Housing Unit Value	
Year (a)	Northampton County	Town of Garysburg	Combined Rate	Northampton County	Census Tract 920401
2009	$1.207	$0.929	$2.136		
2010	1.216	0.935	2.151	$116,255	$83,997
2011	1.337	0.922	2.260	121,435	75,935
2012	1.314	0.906	2.220	117,497	72,794
2013	1.363	0.889	2.252	118,507	65,623
2014	1.327	0.865	2.193	119,435	66,209
2015	1.300	0.848	2.148	116,585	71,505
2016	1.276	0.832	2.108	112,331	77,938
2017	1.242	0.810	2.051	110,536	82,464
2018	1.211	0.790	2.001	109,378	89,371
2019	1.179	0.769	1.948	106,761	86,639
2020	1.149	0.753	1.902	104,957	85,623
2021	1.105	0.728	1.833	106,106	76,241
2022	1.016	0.674	1.690	107,777	89,589
2023	0.940	0.626	1.566	106,686	80,693
2024	0.835	0.600	1.435		
2025	0.802	0.580	1.381		

Sources: North Carolina Office of State Management and Budget (2025), U.S. Bureau of Labor Statistics (2025a); U.S. Census Bureau (2025a).

Notes:

a. Property tax rates are for fiscal years ending June 30 of the year listed.

Figure 4. Housing Value and Property Tax Rates in the Area Around Enviva Northampton, 2009-2025 (2024 dollars)



Source: North Carolina Office of State Management and Budget (2025);
U.S. Bureau of Labor Statistics (2025a); U.S. Census Bureau (2025a)

Wayne County, Georgia

The total property tax rate, or "millage," in Jesup, Georgia, has declined over the last 6 years (Table 17) (Georgia Department of Revenue, 2025). The rate is set annually. A tax rate of one mill represents a tax liability of one dollar per $1,000 of assessed value. (The assessed value is 40 percent of the fair market value.)

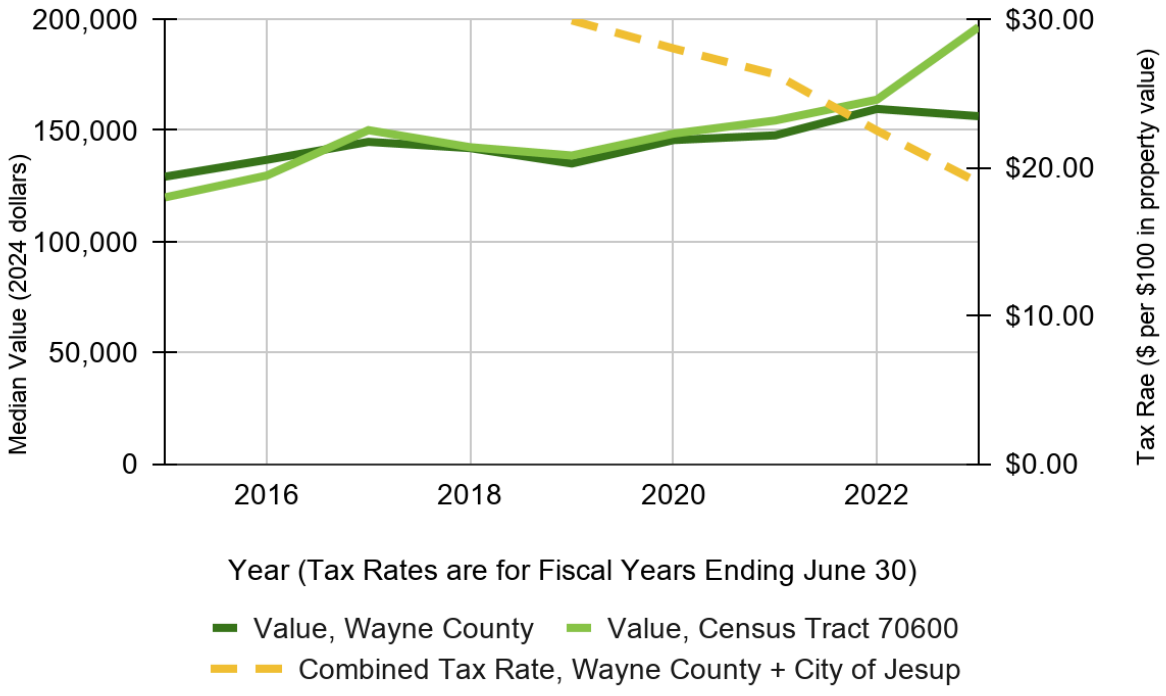
The median value of owner-occupied housing units in the Census tract where Altamaha would be located has been slightly higher than median housing value in Wayne County from 2017 to 2022 (Table 17, Figure 5). Between 2022 and 2023 rates increased 20%.

Table 17. Property Tax Rates, 2019-2024, and Median Value of Owner-Occupied Housing Units in the Area Around the Proposed Altamaha Green Energy Facility (2024 dollars)

	Property tax Rates ($ per $100 appraised value)			Median Housing Unit Value (2024 dollars)	
Year	Wayne County	Jesup	Total	Wayne County	Census Tract 70600
2015				$129,162	$119,835
2016				136,739	129,666
2017				144,817	150,081
2018				142,020	142,415
2019	$22.97	$6.95	$29.92	135,085	138,674
2020	21.25	6.78	28.03	145,635	148,522
2021	19.74	6.55	26.28	147,748	154,425
2022	16.75	5.73	22.48	159,644	163,798
2023	14.01	4.96	18.97	156,376	196,461
2024	12.22	4.09	16.31		

Sources: Georgia Department of Revenue (2025); U.S. Bureau of Labor Statistics (2025a); U.S. Census Bureau (2025a)

Figure 5. Housing Value and Property Tax Rates in the Area Around the Proposed Altamaha Green Energy Facility, 2015-2023 (2024 dollars)



Sources: U.S. Bureau of Labor Statistics (2025a); U.S. Census Bureau (2025a)

Conclusions

People who live near biomass energy facilities incur health-related costs related to the toxic air emissions from those facilities. Emissions have been found to cause respiratory and cardiovascular problems, and other neurological damage, which can lead to additional costs for medical care and lost workdays. Health costs include the cost of ED visits (and time and travel), ongoing medical care from chronic health conditions, and losses in pay when work is missed. In the area around the Enviva Northampton wood pellet production plant we find that residents spent $108,000 to $202,000 annually on ED visits associated with COPD and asthma between 2022 and 2024. Annual spending on medical care for COPD totals $155,000, the majority paid from public funds (Medicare and Medicaid). The cost of work hours lost due to COPD, asthma, and cancer in 2022 totaled $892,000. Biomass facilities may also reduce nearby housing values because of related noise, emissions, dust, and traffic. In the Census Tract where Enviva Northampton is located, the median value of owner-occupied housing units declined 22% between 2010 and 2013, the year the facility began operating, and has been substantially lower than Northampton County's since 2010.

The development of biomass energy facilities is often incentivized by state and/or local grants, tax credits, or other measures. With property taxes on land and buildings among the primary sources of revenue for states and local governments in the U.S., homeowners in government jurisdictions providing financial incentives are thus paying a portion of the development.

Our statistical analysis indicates that the presence of wood pellet mills and CHP facilities, as well as specific socioeconomic and demographic characteristics, are significantly related to COPD and asthma among adults. So, in addition to contributing to the development and operation of the biomass facilities, taxpayers are also paying for a share of the healthcare costs attributable to the facilities. This violates the notion that taxes on real property conform to the “benefit principle” — that is, taxes should relate to the benefits received (Tax Foundation, 2025).

Our analysis calls into question assertions that the expansion of Enviva Northampton or development of Altamaha Green Energy would only benefit nearby communities.

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About

Key-Log Economics is an independent ecological economic research and consulting firm that works with clients to develop the facts and arguments that make for a competent understanding of today's conservation, environmental, and sustainability challenges.

Appendix A

Financial Incentives

A sample of financial incentives provided to firms seeking to develop biomass facilities in the southern U.S. are presented below. They include state- and county-funded grants, tax credits, and infrastructure improvements.

Wood Pellet Production

Table 19. State and County Incentives Provided to Wood Pellet Manufacturers in Alabama, Georgia, Mississippi, and North Carolina (2024 dollars)

Company	County	Year	Subsidy Value	Subsidy Source & Type	Program Name	Awarding Agency	Jobs or Training Slots (number) (a)	Wage Data (b)
Alabama								
Lee Energy Solutions LLC		2010	$9,242	State Cost Reimburse-ment	Alabama Industrial Development Training	Alabama Department of Education		
Georgia								
FRAM Renewable Fuels LLC	Jeff Davis	2013	$322,308	State Grant	Economic Develop-ment, Growth and Expansion (EDGE) Fund	Georgia Department of Community Affairs	100	
Mississippi								
Enviva Pellets Lucedale LLC	George	2019	$1,858,894	State Grant	Industry Incentive Financing Revolving Fund	Mississippi Development Authority	90	
Enviva Pellets	Stone	2023	$2,059,139	State Grant	Development Infrastructure Program	Mississippi Development Authority	90	

Company	County	Year	Subsidy Value	Subsidy Source & Type	Program Name	Awarding Agency	Jobs or Training Slots (number) (a)	Wage Data (b)
BTH Quitman Hickory	Clarke	2011	$357,162	State Grant	Rural Impact Program	Mississippi Development Authority	15	
BTH Quitman Hickory	Clarke	2014	$529,489	State Grant/Loan Hybrid Program	Development Infrastructure Program	Mississippi Development Authority	20	
Quitman Wood Pellets		2011	$3,350,359	State Tax Credit/ Rebate	Investment Tax Credit	Mississippi Development Authority		
Quitman Wood Pellets		2012	$3,280,963	State Tax Credit/ Rebate	Investment Tax Credit	Mississippi Development Authority		
North Carolina								
Enviva	Northampton	2012	$683,534	State Grant	Industrial Development Fund	Department of Commerce	62	
Enviva	Hertford	2014	$357,405	State Grant	One North Carolina Fund	Department of Commerce	53	$745
Enviva LP	Northampton	2014	$258,126	State Grant	One North Carolina Fund	Department of Commerce	62	$740
Enviva Management Company LLC	Sampson, Richmond	2014	$2,521,692	State Grant	Job Development Investment Grant	Department of Commerce	160	$37,961
Enviva Pellets Sampson LLC	Sampson	2013	$3,903,410	Local Grant	Sampson County: Grant Back Incentives	Sampson County Economic Development	79	$36,862

Company	County	Year	Subsidy Value	Subsidy Source & Type	Program Name	Awarding Agency	Jobs or Training Slots (number) (a)	Wage Data (b)
						Commission		
Enviva Northampton Pellets LLC	Northampton	2011	$486,915	Local Infrastructure Assistance	Northampton County Incentive	Northampton County Economic Development Commission	93	
South Carolina - none located								

Source: Good Jobs First (2025)

Notes:

a. The number of jobs to be created or retained at a subsidized facility as a result of the financial assistance. In the case of training subsidies, this is the number of training slots.

b. Some programs include information on the quality of the jobs created or retained. This may be an hourly wage rate, an annual salary figure or an aggregate payroll figure (which can be divided by the number of jobs to get a rough salary estimate). The Wage Data field shows the dollar figure.

Combined Heat and Power

Table 20. State and County Incentives Provided to Combined Heat and Power Manufacturers in Georgia, Mississippi, North Carolina, and South Carolina (2024 dollars)

Company	County	Year	Subsidy Value	Subsidy Source & Type	Program Name	Awarding Agency	Jobs or Training Slots (number) (a)
Alabama - None located							
Georgia							
Pratt Paper LLC		2011	$25,868,920	Federal Grant	Payments for Specified Energy Property in Lieu of Tax Credits (ARRA Section 1603)	Department of Treasury	
Mississippi							
Calgon Carbon Corp	Hancock	2019	$1,549,078	State Grant	ACE Fund	Mississippi Development Authority	38
Calgon Carbon Corp	Hancock	2021	undisclosed	State Grant	Advantage Jobs Rebate Program	Mississippi Development Authority	35
Calgon Carbon DOD	Hancock	2022	$27,435	State Training Reimbursement	Mississippi Works Fund Training Program	Mississippi Development Authority	
Calgon Carbon Corp	Hancock	2022	$274,346	State Training Reimbursement	Mississippi Works Fund Training Program	Mississippi Development Authority	
Chevron Refinery Pascagoula	Jackson	2009	$140,955	State Training Reimbursement	Workforce Training Fund	Mississippi Community College	350

Company	County	Year	Subsidy Value	Subsidy Source & Type	Program Name	Awarding Agency	Jobs or Training Slots (number) (a)
						Board-Office of Workforce Education	
Chevron Refinery Pascagoula		2010	$115,466	State Training Reimbursement	Workforce Training Fund	Mississippi Community College Board-Office of Workforce Education	157
Chevron Refinery Pascagoula		2011	$17,059	State	Workforce Training Fund	Mississippi Community College Board-Office of Workforce Education	100
North Carolina							
Ingredion Inc.	Forsyth	2011	$5,964	State Tax Credit/Rebate	Article 3F Research & Development Tax Credits	Department of Revenue	
Ingredion Inc.	Forsyth	2012	$5,281	State Tax Credit/Rebate	Article 3F Research & Development Tax Credits	Department of Revenue	
Ingredion Inc.	Forsyth	2013	$5,480	State Tax Credit/Rebate	Article 3F Research & Development Tax Credits	Department of Revenue	
Ingredion Inc.	Forsyth	2016	$12,277	State Tax Credit/ Rebate	Article 3F Research & Development Tax Credits	Department of Revenue	

Company	County	Year	Subsidy Value	Subsidy Source & Type	Program Name	Awarding Agency	Jobs or Training Slots (number) (a)
Ingredion Inc.	Forsyth	2015	$18,591	State Tax Credit/ Rebate	Article 3F Research & Development Tax Credits	Department of Revenue	
Domtar Paper Company LLC		2012	$9,569,476	State Grant	Job Maintenance and Capital Development Fund	Department of Commerce	
Domtar Paper Company LLC	Martin	2015	$1,989,079	Local Grant	Martin County Incentive	Martin County Economic Development	
Prestage Farms Inc		2013	$202,883	State Tax Credit/ Rebate	Article 3B Tax Credits for Investing in Renewable Energy Property	Department of Revenue	
Prestage Farms Inc		2014	$199,512	State Tax Credit/ Rebate	Article 3B Tax Credits for Investing in Renewable Energy Property	Department of Revenue	
Prestage Farms Inc		2015	$199,863	State Tax Credit/ Rebate	Article 3B Tax Credits for Investing in Renewable Energy Property	Department of Revenue	
Prestage Farms Inc		2017	$387,422	State Tax Credit/ Rebate	Article 3B Tax Credits for Investing in Renewable Energy Property	Department of Revenue	
Prestage Farms Inc		2018	$288,098	State Tax Credit/ Rebate	Article 3B Tax Credits for Investing in Renewable Energy Property	Department of Revenue	

Company	County	Year	Subsidy Value	Subsidy Source & Type	Program Name	Awarding Agency	Jobs or Training Slots (number) (a)
Prestage Farms Inc.		2019	$244,259	State Tax Credit/ Rebate	Article 3B Tax Credits for Investing in Renewable Energy Property	Department of Revenue	
Prestage Farms Inc.		2020	$281,760	State Tax Credit/ Rebate	Article 3B Tax Credits for Investing in Renewable Energy Property	Department of Revenue	
Prestage Farms Inc.		2021	$288,288	State Tax Credit/ Rebate	Article 3B Tax Credits for Investing in Renewable Energy Property	Department of Revenue	
Prestage Farms Inc.		2022	$304,683	State Tax Credit/ Rebate	Article 3B Tax Credits for Investing in Renewable Energy Property	Department of Revenue	
Prestage Farms Inc.		2023	$277,765	State Tax Credit/ Rebate	Article 3B Business and Energy Tax Credits	Department of Revenue	
Perdue Agribusiness Inc.	Hertford	2008	$146,246	State Grant	Industrial Development Fund	Department of Commerce	20
Perdue Agribusiness Inc.	Hertford	2008	$207,669	State Grant	Industrial Development Fund	Department of Commerce	

Company	County	Year	Subsidy Value	Subsidy Source & Type	Program Name	Awarding Agency	Jobs or Training Slots (number) (a)
South Carolina							
Sonoco Products Company	Darlington	2006	undisclosed	State Tax Credit/Rebate	Enterprise Zone Job Retraining Credit	South Carolina Department of Commerce	1,200
Sonoco Products Company	Darlington	2011	undisclosed	State Tax Credit/ Rebate	Enterprise Zone Job Retraining Credit	South Carolina Department of Commerce	619
Sonoco	Darlington	2011	$139,598	State Grant	Rural Infrastructure Fund	Coordinating Council for Economic Development	10
Sonoco Products Company	Darlington	2015	$397,816	State Grant	Governor's Closing Fund	Coordinating Council for Economic Development	29
Westrock Cp LLC	Florence	2017	$642,618	State Grant	Governor's Closing Fund	Coordinating Council for Economic Development	330

Source: Good Jobs First (2025)

Note:

a. The number of jobs to be created or retained at a subsidized facility as a result of the financial assistance. In the case of training subsidies, this is the number of training slots.