

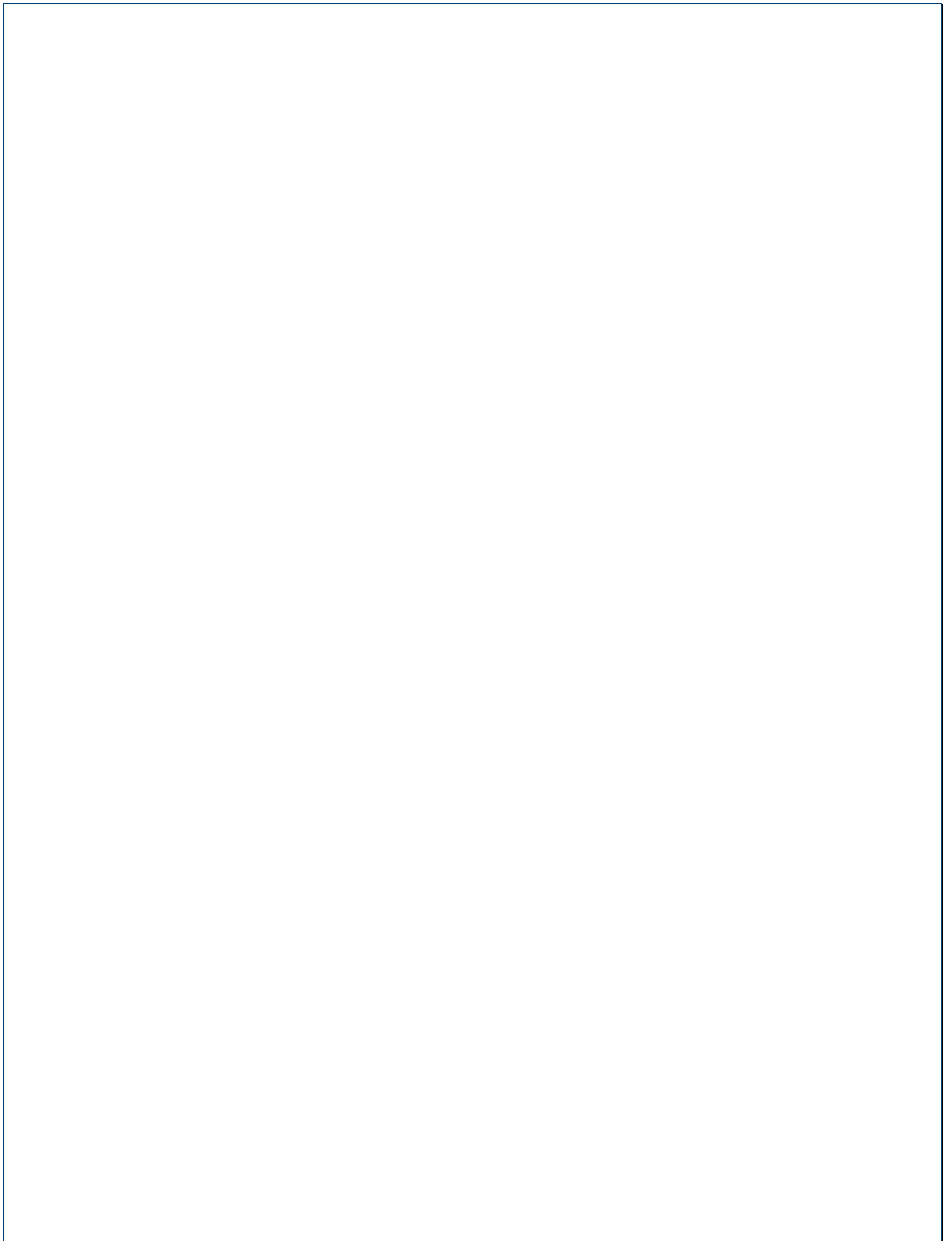
North Carolina Priority Climate Action Plan

NC DEPARTMENT OF ENVIRONMENTAL QUALITY (NCDEQ)

Prepared as a deliverable through the Climate Pollution Reduction Grants (CPRG) Program, Section 60114(a) of the Inflation Reduction Act

NORTH CAROLINA
Climate Pollution
REDUCTION GRANT





Disclaimer and Acknowledgments

This Priority Climate Action Plan (PCAP) was prepared by the NC Department of Environmental Quality (NCDEQ) as the lead organization for phase 1 of the United States Environmental Protection Agency's (EPA) Climate Pollution Reduction Grants (CPRG) program, Inflation Reduction Act Section 60114(a). The CPRG program comprises two program phases: planning and implementation. The planning phase provides \$250 million in noncompetitive planning grants for state and local agencies, tribes, and territories to develop a PCAP, a Comprehensive Climate Action Plan (CCAP) and a Status Report. The second phase provides \$4.6 billion for competitive grants to eligible applicants to implement greenhouse gas (GHG) reduction measures identified in a PCAP.

The NC PCAP does not exhaustively list all of NC's priorities to address climate pollution. Instead, the selected priority GHG reduction measures included in the PCAP meet the following criteria:

- The measure is considered implementation ready, meaning that the design work or technology for the policy, program, or project is complete enough that it can be included in a CPRG implementation grant application under the second phase of the program.
- The measure can be completed in the near term, meaning that all funds will be expended, and the project completed, within the five-year performance period for the CPRG implementation grants.

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Acronyms

AFC	Alternative fuel corridors
AFLEET	Alternative Fuel Life-Cycle Environmental and Economic Transportation
AIM	American Innovation and Manufacturing Act
ARTF	Agrivoltaics Research and Training Facility
BAU	Business-as-usual
BEV	Battery electric vehicles
BIPOC	Black, Indigenous, and People of Color
CCAP	Comprehensive Climate Action Plan
CEJST	Climate and Economic Justice Screening Tool
CFI	Charging and Fueling Infrastructure
CHPP	Coastal Habitat Protection Plan
CMAQ	Congestion Mitigation Air Quality
CO ₂ e	Carbon dioxide equivalent
COG	Councils of Government
CRPG	Climate Pollution Reduction Grant
CRP	Carbon Reduction Program
DAQ	Division of Air Quality
DCFC	Direct Current Fast Chargers
DOE	U.S. Department of Energy
EECBG	Energy Efficiency Community Block Grants
EnMS	Energy management systems
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EV	Electric vehicle
EVSE	Electric Vehicle Supply Equipment
FCS	Forest Land Converted to Settlements
FDP	Forest Development Program (NCFS)
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FLW	Food loss and waste
GESPC	Guaranteed Energy Savings Performance Contract
GHG	Greenhouse Gas

GHGI	Greenhouse Gas Inventory by State
GSP	Gross State Product
GWP	Global warming potential
HAP	Hazardous air pollution
HEAR	Home Electrification and Appliance Rebates
HER	Home Energy Rebates
HFC	Hydrofluorocarbons
HPMS	Highway Performance Monitoring System
HVAC	Heating, Ventilation and Air Conditioning
HWP	Harvested Wood Products
IAC	Industrial Assessment Center
ICE	Internal combustion engines
IIJA	Infrastructure Investment and Jobs Act
IMD	Integrated Mobility Division
IRA	Inflation Reduction Act
LCS	Land Converted to Settlement
LDV	Light-duty vehicle
LEA	Local education agency
LFG	Landfill gas
LFGTE	Landfill gas to energy
LIDAC	Low-income and disadvantaged community
LiDAR	Light Detection and Ranging
LMOP	Landfill Methane Outreach Project
LULUCF	Land Use Change and Forestry
MHD	Medium/heavy-duty
MOVES	Motor Vehicle Emissions Simulator Model
MSA	Metropolitan Statistical Area
MSW	Municipal solid waste
MT	Metric ton
NASS	National Agricultural Statistics Service
NBS	Nature-based solution
NC	North Carolina
NCCF	NC Coastal Federation
NCDDPA	NC Deep Decarbonization Pathways Analysis
NCDEQ	NC Department of Environmental Quality

NCDOT	NC Department of Transportation
NCFS	NC Forest Service
NCORR	NC Office of Recovery and Resiliency
NCUC	NC Utilities Commission
NEVI	National Electric Vehicle Infrastructure
NGO	Non-governmental organization
NOAA	National Oceanic and Atmospheric Administration
NWL	Natural and Working Land
ODS	Ozone-Depleting Substance
OSBM	Office of State Budget and Management
PFC	Perfluorochemical
PHMSA	Pipeline and Hazardous Materials Safety Administration
RFP	Request for funding proposal
SEDS	State Energy Data System
SEM	Strategic Energy Management
SFLR	Southeastern Forestry and Land Retention
SIT	State Inventory and Projection Tool
SRS	Settlements Remaining Settlement
STI	Strategic Transportation Investment
TDM	Transportation demand management
TNC	The Nature Conservancy
TRAP	Traffic-related air pollution
TREC	Training for Residential Energy Contractor
UNC	University of North Carolina
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
VMT	Vehicle miles traveled
VW	Volkswagen
WAP	Weatherization Assistance Program
VOC	Volatile organic compound
ZE	Zero Emission
ZEV	Zero-emission vehicle

Executive Summary

The NC Department of Environmental Quality (NCDEQ) developed this Priority Climate Action Plan (PCAP) in response to the requirements of EPA's Climate Pollution Reduction Grant (CPRG) program. This program offers funding to states, local governments, tribes, and territories to develop and implement plans aimed at reducing greenhouse gas (GHG) emissions and other harmful air pollutants. The PCAP serves to identify high-priority GHGs in NC.

Throughout the development process, NCDEQ focused on transparency and engagement, with ongoing efforts to involve stakeholders in the implementation and refinement of the PCAP. The finalized PCAP reflects a comprehensive strategy to address climate change and reduce GHG emissions in NC.

North Carolina's Climate Context

North Carolina's GHG inventory is a comprehensive assessment of the state's emissions sources and sinks that covers historical data from 1990 to 2020 and projections up to 2050. The most recent inventory was completed in January 2024 and is crucial for understanding the state's contribution to climate change and guiding reduction strategies. The methods used to prepare the state's GHG inventory are based on those used by EPA to prepare the national inventory.

In 2020, combustion activities accounted for 80% of total gross GHG emissions statewide, with transportation being the largest emissions sector (36%), followed by electricity generation and use (30%) and residential, commercial, and industrial combustion (14%). The COVID-related decrease in 2019–2020 onroad vehicle emissions is noted, with modest increases projected until 2026, followed by significant reductions. By 2030, gross and net emissions are forecasted to be 35% and 47% below 2005 levels, respectively, reaching a 64% reduction in net emissions by 2050.

Key findings include a 28% reduction in gross GHG emissions and a 38% reduction in net emissions from 2005 to 2020, despite a 20% population growth and 23% real Gross State Product (GSP) increase. Carbon dioxide comprises 79% of 2020 GHG emissions, primarily from fossil fuel combustion, which decreased by 33% from 2005 to 2020. Methane emissions (12% of total emissions) are mainly from waste management and agriculture, which have remained stable since 2005. Electricity generation emissions decreased by 49% from 2005 to 2020, with a 68% projected reduction by 2030.

North Carolina has five existing state goals regarding climate action and GHG reduction targets, including a 50% reduction from 2005 levels by 2030 and net-zero emissions as soon as possible but no later than 2050. Other goals include electric power sector emission reductions, an increased number of registered zero-emission vehicles, energy consumption reduction in state-owned buildings, and offshore wind energy development.

The PCAP highlights challenges such as structural impediments in transportation investments, limitations in energy-efficient building codes, and threats to non-jurisdictional wetlands. Positive developments include the 2021 energy legislation mandating 70% GHG reduction in the power sector by 2030. Existing policies and programs address climate change, with ongoing efforts to enhance GHG reduction strategies. The NC PCAP builds on existing initiatives and identifies priority areas where opportunities remain.

Low-Income and Disadvantaged Communities

The PCAP outlines NC's approach to engaging with Low-Income and Disadvantaged Communities (LIDACs) in the context of climate action as part of the CPRG program. The state used the Climate and Economic Justice Screening Tool (CEJST) and the NCDEQ North Carolina Community Mapping System to identify LIDACs based on criteria including transportation, health, energy, and climate change burdens. These criteria are determined at or above the 90th percentile for census tracts. Additionally, block group data from NCDEQ's analysis of Potentially Underserved Communities (PUC) is considered, defining underserved communities by racial/ethnic and poverty composition.

The combination of CEJST and PUC data identifies 1,661 Census tracts as LIDACs, constituting 75.7% of all NC 2010 Census tracts. The identified climate risks for these communities in NC include extreme heat, heavy precipitation, sea level rise, inland and coastal flooding, and hurricanes. Vulnerability to these risks is exacerbated among Black, Indigenous, and People of Color (BIPOC) individuals and communities, low-income households, unhoused individuals, rural communities, and agricultural workers. These communities not only feel the most severe impacts of climate change but are also the least able to prepare for and respond to these impacts due to a lack of resources and socio-political power.

North Carolina has experienced escalating economic and societal losses due to weather and climate-related disasters, now ranking second in the nation for these losses. Tropical cyclones account for most of these losses. The NC Office of Recovery and Resiliency (NCORR) mapped impacts from hurricanes Florence and Matthew, showing that the most impacted communities from these events overlapped with some of the state's most economically distressed counties.

Priority GHG Reduction Measures

Priority GHG reduction measures in the state's Climate Action Plan (PCAP) are identified as such for the purposes of pursuing funding through CPRG implementation grants. The measures are considered implementation ready, meaning that the design work or technology for the policy, program, or project is complete enough that it can be included in a CPRG implementation grant application under the second phase of the program. Additionally, they must be achievable within the near term, with all funds expended and projects completed within the five-year performance period for CPRG implementation grants.

While the list of priority measures is not exhaustive of NC's climate priorities, it meets the outlined criteria. To ensure cohesive consideration of priorities within each sector, NCDEQ has developed visions for climate action. These sector-specific visions will guide the implementation of measures and will be further developed and expanded upon in the Comprehensive Climate Action Plan (CCAP).

The following priority measures are detailed in the NC PCAP:

1. Increase the number of zero-emission and electric vehicles on the road through partnerships, technical assistance, financial incentives, and other mechanisms.
2. Identify, install, and maintain a public electric vehicle charging network accessible to all North Carolinians.
3. Increase the number of zero emission and electric vehicles in state and local government fleets.
4. Pursue programs to increase efficiency and reduce GHG emissions at port/freight terminals.
5. Pursue programs to improve the quality of life and reduce GHG emissions for all North Carolinians by increasing pedestrian accessibility and providing more options for multi-modal transportation.
6. Increase the amount of electricity generated by low- and no-carbon energy resources in NC.
7. Implement measures to increase energy resiliency in NC communities.
8. Reduce per square foot energy usage in buildings in NC.
9. Decarbonize buildings in NC through replacement of fossil fuel combustion sources and reduction of other GHG emissions.
10. Develop programs to support or incentivize implementation of energy efficiency and emission reduction measures in NC industry.
11. Reduce food waste entering the waste management system to reduce the methane emissions from food waste landfilling, direct food to communities in need, and create organic resources through composting or digestion.
12. Decarbonize waste collection to reduce GHG emissions during the collection and transport of wastes through electrification of fleets or through engine conversion from diesel to electric motors.
13. Reduce landfill gas emissions through improved landfill operations to collect gas more efficiently and earlier in a landfill life and utilize the emissions as a renewable energy source.
14. Protect and restore high-carbon coastal habitats and peatlands.
15. Protect, use, and develop agricultural and forest land.

Moving Forward

State, regional, municipal, and tribal agencies, as well as consortia, are eligible to apply for implementation funding immediately after the finalization of the PCAP. State applications for implementation funding are due April 1, 2024, with awards expected later in the same year.

Recipients of PCAP planning grants are required to submit a CCAP two years after receiving the PCAP award. The CCAP will provide an expanded GHG analysis, including both short-term and long-term GHG emission reductions targets, and will articulate a comprehensive set of measures to achieve these targets. The state will begin the CCAP development process in early 2024.

In 2027, NCDEQ will provide a CPRG Status Report detailing the implementation status of quantified GHG reduction measures from the CCAP, updated analyses or projections supporting CCAP implementation, and future steps and resource needs for continued implementation.

1 Introduction

NCDEQ developed a PCAP to meet the requirements of EPA's CPRG program. The CPRG program provides funding to states, local governments, tribes, and territories to develop and implement plans for reducing GHG emissions and other harmful air pollution.

1.1 CPRG Program Overview

The Inflation Reduction Act (IRA), signed into law on August 16, 2022, directs federal funding to reduce carbon emissions, lower healthcare costs, and improve taxpayer compliance. The IRA contains provisions that directly or indirectly address climate change, by reducing U.S. GHG emissions and investing in adaptation and resilience to climate change impacts.¹

The CPRG program, authorized under Section 60114 of IRA, provides \$5 billion in grants for two program phases: planning and implementation. The planning phase provides \$250 million in noncompetitive planning grants for state and local agencies, tribes, and territories to develop a PCAP, a CCAP and a Status Report. The second phase provides \$4.6 billion for competitive grants to eligible applicants to implement GHG reduction measures identified in a PCAP.

1.2 PCAP Purpose, Scope, and Overview

NC's PCAP identifies high priority, ready-to-implement GHG reduction measures that will provide significant climate, air quality, and other co-benefits to North Carolina and the communities

Definitions

- **Greenhouse Gas (GHG):** The air pollutants carbon dioxide, hydrofluorocarbons, methane, nitrous oxide, perfluorocarbons, and sulfur hexafluoride.
- **GHG Inventory:** A list of emission sources and sinks, and the associated emissions quantified using standard methods.
- **GHG Reduction Measure:** Policies, programs, actions, or projects that reduce GHG emissions or enhance carbon removal. Measures that enhance carbon removal are those that increase the removal of carbon dioxide from the atmosphere through, for example, the uptake and storage of carbon in soils, vegetation, and forests.
- **Co-benefits:** Positive effects beyond the stated goal of a GHG reduction measure e.g., improved public health outcomes, economic benefits, increased climate resilience).
- **Low Income and Disadvantaged Community (LIDACs):** Communities with residents that have low incomes, limited access to resources, and disproportionate exposure to environmental or climate burdens.
-

¹ Congressional Research Service. "Inflation Reduction Act of 2022 (IRA): Provisions Related to Climate Change." October 3, 2022. <https://crsreports.congress.gov/product/pdf/R/R47262>.

within it. A measure being included within a PCAP is a prerequisite for agencies and organizations to compete for implementation grant funding in the second phase of the CPRG program. Accordingly, the measures identified in this PCAP are designed to be broad enough to encompass state, regional and local priorities for addressing climate pollution. Further, the GHG reduction measures in this PCAP have been identified as “priority measures” for the purposes of pursuing funding through CPRG implementation grants under phase two of the CPRG program. This PCAP does not exhaustively list all of NC’s priorities for addressing climate pollution. Instead, the selected priority GHG reduction measures included in this PCAP meet the following criteria:

- The measure is considered implementation ready, meaning that the design work or technology for the policy, program, or project is complete enough that it can be included in a CPRG implementation grant application under the second phase of the program.
- The measure can be completed in the near term, meaning that all funds will be expended, and the project completed within the five-year performance period for the CPRG implementation grants.

The PCAP also serves as a starting point for a larger, more comprehensive region-wide climate planning effort to be conducted across North Carolina through 2024 and 2025 (CCAP).

Along with NCDEQ, two metropolitan areas and one federally recognized tribe within the state received CPRG planning grants: Charlotte-Concord-Gastonia, NC-SC Metropolitan Statistical Area (MSA); Raleigh-Cary-Durham-Chapel Hill, NC MSA; and the Eastern Band of Cherokee Indians. NCDEQ coordinated with these entities throughout the development of this PCAP to align priorities for climate action and engage with stakeholders.

Table 1 outlines the information included in the state’s PCAP, in line with the required and encouraged information outlined in EPA’s CPRG planning guidance, and where the relevant information may be found within the document.

Table 1. Crosswalk of CPRG PCAP requirements to NC PCAP Section 2.2

PCAP Required Elements	NC PCAP Section
GHG Inventory	Section 2.1 State Greenhouse Gas Inventory and Business-As-Usual Projections
Quantified GHG Reduction Measures	Section 4
Low-Income and Disadvantaged Community (LIDAC) Benefits Analysis	Sections 1.3.2 (LIDAC engagement), 3 (LIDAC identification and climate risks) and Section 4 within each measure (LIDAC benefits and impacts from priority measures)
Review of Authority to Implement	Section 4 within each measure
PCAP Encouraged Elements	
GHG Emissions Projections	Section 2.1
GHG Reduction Targets	Section 2.2
Benefits Analysis for Full Geographic Scope and Population	Section 4 within each measure, as available
Intersection with Other Funding Availability	Section 4 within each measure
Workforce Planning Analysis	Section 4 within each measure

1.3 Approach to PCAP Development

1.3.1 Developing the GHG Inventory, Business-As-Usual Projections, and GHG Reduction Targets

NCDEQ produced a statewide inventory of GHG emissions that represents the state's "carbon footprint." The inventory provides a high-level perspective of GHG emissions resulting from human activity and contains a detailed accounting of GHGs emitted or removed by key source categories. Along with the inventory, NCDEQ projected the business-as-usual (BAU) GHG emissions based on forecasted changes in fuel use, population, historical trends, and other factors. Both analyses, the GHG inventory and the BAU projections, were developed using EPA tools and models, including the Motor Vehicle Emissions Simulator Model (MOVES4) and the State Inventory and Projection Tool (SIT), a spreadsheet-based tool developed by EPA to assist state agencies in preparing state-level GHG inventories and projections. Further information on the GHG inventory and method used may be found in Section 2.1 and Appendix A.

Executive Order 80: North Carolina's Commitment to Address Climate Change and Transition to a Clean Energy Economy established statewide GHG reduction and related targets for NC. Additional goals are established in state plans, such as the Clean Energy Plan. These targets are reflected in Section 2.2.

1.3.2 Engaging with Stakeholders

NCDEQ used multiple forms of outreach to engage with diverse groups of stakeholders throughout the PCAP development, including state and local governments, regional planning agencies and councils of government, tribes, LIDAC representatives, industry, non-governmental organizations (NGOs), and the public.

Website, Email, and Online Forms

NCDEQ created and continually provides updated information on a public webpage dedicated to its CPRG program: <https://www.deq.nc.gov/energy-climate/state-energy-office/inflation-reduction-act/climate-pollution-reduction-grant>.

Along with this website, NCDEQ provided several communication channels to solicit comments, questions, and project ideas. These included a dedicated email inbox (CPRG@deq.nc.gov), online forms, a phone number for voicemail messages, and an email distribution list for ongoing program updates. Throughout the public engagement process, NCDEQ and partner agencies emphasized the importance of obtaining feedback from diverse sectors and communities to develop a more comprehensive and inclusive list of priority GHG reduction measures.

Through the website, NCDEQ posted an online form to collect CPRG project ideas. These project ideas were used to help develop priority GHG reduction measures and strategies around priorities and partners for climate action implementation. Appendix C lists the project ideas submitted to NCDEQ through the online survey.

NC State and Local Government Agencies

Outreach efforts included sharing program information with contacts representing all of NC's 16 Councils of Government (COGs) and Councils on Aging within the COGs. NCDEQ also engaged with many municipalities and counties throughout the state. Many contacts in local governments were already represented in existing outreach lists, and NCDEQ added additional contacts throughout the engagement process. NCDEQ also shared information on CPRG through the North Carolina City and County Management Association (NCCCMA). As part of this information sharing, NCDEQ encouraged submissions of potential CPRG project ideas through its online form.

NCDEQ continues to engage with the two MSAs in NC (Centralina Regional Council and Central Pines Regional Council) to explore partnership and build coalitions across the state.

NCDEQ also engages in biweekly meetings with the NC Office of Budget and Management, NC Department of Transportation, the NC Department of Commerce, and the Office of the Governor to discuss CPRG priorities, strategies, projects, and funding initiatives.

NC Tribes

NCDEQ shared information and feedback opportunities with the NC Commission of Indian Affairs for amplification to their networks and to offer a one-on-one meeting to discuss opportunities for involvement. Following this outreach effort, representatives of state-recognized tribes and tribal organizations attended LIDAC-focused CPRG engagement sessions. As with all other stakeholders, NCDEQ encouraged tribal organizations to share potential CPRG project ideas through its online form.

Public and Stakeholder Engagement

To enhance NC's PCAP, NCDEQ conducted a stakeholder and public engagement process in line with the NCDEQ Public Participation Plan and Language Access Plan.² The goal of this plan is to conduct North Carolinians' business in an open, clear, and transparent way and to create opportunities for fair and meaningful involvement. The plan guided the implementation of the state's CPRG engagement process, which aims to consider the diversity of the state's

² NCDEQ. Public Participation Plan and Language Access Plan.

<https://www.deq.nc.gov/outreach-education/environmental-justice/public-participation-plan-and-language-access-plan>

population and culture, as well as the needs of communities across the state when conducting outreach.

NCDEQ held a series of public and stakeholder engagement events to share information about CPRG and gain input from communities and industries on how they would like to see the state prioritize climate action and funding. Experts from NCDEQ, the Office of the Governor, the NC Department of Commerce, and other partner agencies delivered an overview of the program, NC’s GHG reduction goals, and priorities for the CPRG planning and implementation grants. They also introduced the online project ideas form to solicit input on project ideas for CPRG. During each session, members of the public and organization representatives engaged with presenters by asking questions about the process, expressing concerns that they would like addressed, and proposing possible projects that they felt would be beneficial for their communities. Breakout sessions focused on specific sectors (transportation, residential and commercial buildings, industry, waste and materials management, natural and working lands, and electric power) were offered to allow participants the chance to discuss topics in more depth.

Table 2 outlines the engagement sessions held between November 2023 and January 2024. All events except the special industry session were open to the public, and online sessions were posted to the NCDEQ CPRG website and announced in press releases, on social media and shared with NCDEQ contact lists to increase access and participation. Meeting materials and recordings of the online sessions were uploaded to the website and emailed directly to those who registered. Session attendance included members of the public and representatives from state and local government, business and industry, community groups, local/state and national non-profits, tribal groups, and universities. Examples of groups who attended and provided input include: the Southern Environmental Law Center, the Town of Boone, the Clean Air Task Force, Construction Partners Inc., NC League of Conservation Voters, Advanced Energy, Fayetteville State University, and the Lumbee Tribe of North Carolina.

Table 2. CPRG Events Held by NCDEQ

Date	Description	Stakeholder(s)	Attendance
November 28, 2023	In-person community event (Fayetteville)	Multiple/public	20
November 29, 2023	Special in-person event on industry decarbonization (Raleigh)	Industry	~45
December 5, 2023	In-person community event (Morganton)	Multiple/public	9
December 7, 2023	Statewide webinar event	Multiple/public	116
January 4, 2024	Statewide webinar specifically targeted for LIDACs	Public/LIDACs	71
January 9, 2024	Statewide webinar specifically targeted for LIDACs	Public/LIDACs	67

NC Low-Income and Disadvantaged Communities

NCDEQ conducted an analysis to identify areas of the state where LIDACs would benefit from targeted outreach during the planning phase. This analysis is based on NCDEQ's Community Mapping System,³ which incorporates several datasets to provide a representation of the sociodemographic and health characteristics of communities across NC, and EPA's EJScreen⁴ and the CEJST.⁵

NCDEQ integrated this analysis in its outreach efforts for in-person public events to target local LIDAC participation, and additional online sessions were scheduled and promoted to encourage further participation from groups or individuals associated with or serving LIDACs. The December and January public sessions were promoted in both English and Spanish, with the option to request live interpretation services to increase accessibility.

All public and LIDAC-focused sessions were promoted through a variety of channels, government and community networks and shared with NCDEQ's existing environmental justice contact lists. Prior to the in-person events in Fayetteville and Morganton, the NCDEQ Environmental Justice team conducted a search for contacts representing LIDACs in the surrounding 13-county areas for targeted outreach to increase participation. The DEQ Environmental Justice team also used EPA's EJScreen to scan for potential sensitive receptors to conduct further outreach. Overall, these included churches (some primarily Spanish-speaking), community centers (e.g., libraries), community/environmental organizations, environmental networks, local governments, local tribal organizations, and public engagement centers at local universities.

Throughout the public engagement process, new contacts were added to capture as many communities as possible. Examples of networks leveraged to boost LIDAC engagement include NCDEQ Secretary's Environmental Justice and Equity Advisory Board, the NC Commission of Indian Affairs, statewide Area Agencies on Aging, and the NC City and County Management Association. In addition to sharing information about the program and engagement opportunities, NCDEQ developed a flyer to provide information in an easy-to-share format.

PCAP Engagement Metrics

Table 3 provides a summary of metrics from NCDEQ's PCAP engagement efforts.

³ NC DEQ. "NC Community Mapping System." <https://www.deq.nc.gov/outreach-education/environmental-justice/deq-north-carolina-community-mapping-system>

⁴ EPA. "EJScreen: EPA's Environmental Justice Screening and Mapping Tool (Version 2.2)." <https://ejscreen.epa.gov/mapper/>

⁵ Council on Environmental Quality. "Climate and Economic Justice Screening Tool." <https://screeningtool.geoplatform.gov/en/#3/33.47/-97.5>

Table 3. Impact of Public Engagement Efforts

Engagement Metric	Count
Individuals registered for a public session	429
Groups represented at a public session	218
Feedback received (total number of comments, questions, and project ideas)	358
Unique visitors to the Climate Pollution Reduction Grant page (Nov. 2023-Jan. 2024) Climate Pollution Reduction Grant web page: https://www.deq.nc.gov/energy-climate/state-energy-office/inflation-reduction-act/climate-pollution-reduction-grant	3,987

Ongoing and Upcoming Engagement

As the climate action planning and implementation process progresses, NCDEQ and its partners will continue to engage the public and stakeholders, with emphasis on LIDACs, through updates and invitations to provide comment and feedback on CPRG implementation partnership opportunities, future projects, and comprehensive planning efforts. NCDEQ will continue to engage the communities identified in the initial round of public and LIDAC engagement sessions as part of targeted outreach. Discussions also continue with the MSAs in NC and other local governments outside the MSAs to further engage additional identified LIDAC communities that will benefit from GHG reduction programs and projects.

1.3.3 Prioritizing GHG Reduction Measures and Developing the PCAP

North Carolina has already been planning for and taking action to reduce climate pollution. Planning efforts such as NC’s Clean Transportation Plan, Zero Emission Vehicle Plan, and Clean Energy Plan were foundational to this PCAP and formed the groundwork for NCDEQ’s efforts. Specific steps NCDEQ took to develop and prioritize GHG reduction measures and develop the state’s PCAP are outlined in Figure 1.

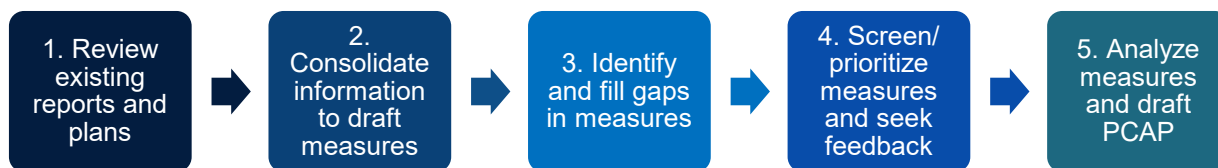


Figure 1. Approach to Developing the NC PCAP

Step 1. NCDEQ reviewed existing state documents to develop an initial list of GHG reduction measures. NCDEQ reviewed 48 state documents; identified and collated goals, existing actions, and proposed actions; and categorized them by sector in line with the sectors within NC’s GHG inventory.

Step 2. Once all actions and goals were collated, NCDEQ consolidated them into an initial measure list by grouping similar actions and goals and removing duplicates.

Step 3. NCDEQ then reviewed the measures list against the state GHG inventory to determine if there were any major gaps in potential reduction measures to address emissions across the state. These gaps were filled through discussions with input from the public and other stakeholders and in reviewing ideas from NCDEQ's CPRG project survey. The draft measures list was also cross-checked against the feedback received through the project survey and other stakeholder input to ensure all potential priorities were captured.

Step 4. NCDEQ developed and employed a prioritization framework for PCAP measures. The intent of the framework was to align with CPRG program outcomes and requirements. NCDEQ screened the initial list of PCAP measures based on potential magnitude of GHG reductions, community benefits (e.g., air pollution reduction), authority to implement, and benefits or impacts to LIDACs. NCDEQ also screened draft measures on potential implementation readiness, considering whether:

- The measure is considered implementation ready, meaning that the design work or technology for the policy, program, or project is complete enough that it can be included in a CPRG implementation grant application under the second phase of the program.
- The measure can be completed in the near term, meaning that all funds will be expended, and the project completed, within the five-year performance period for the CPRG implementation grants.

NCDEQ posted the draft GHG reduction measures list on its CPRG website for public review in January 2024.⁶ Measures that were eliminated during screening are being maintained by NCDEQ to consider for the CCAP, to be completed in 2025.

Step 5. Concurrent with the above steps, NCDEQ developed implementation information for each priority GHG reduction measure and conducted analyses to estimate GHG reductions, benefits to LIDACs, and other benefits and co-benefits. This information, along with other PCAP requirements were documented in the draft PCAP. Following additional internal reviews, NCDEQ has refined and finalized the PCAP for submission to the EPA.

1.3.4 Approach for Natural and Working Lands (NWL) Priority Measures

Most sectors are sources of GHG emissions, including transportation, electric power generation, industry, buildings, and waste management. By contrast, the NWL sector is a net sink of GHGs in North Carolina. As such, NCDEQ took a different approach to develop priority NWL

⁶ NCDEQ. "DEQ Accepting Public Comment on Greenhouse Gas Reduction Priorities for the Climate Pollution Reduction Grant Program." January 12, 2024.

<https://www.deq.nc.gov/news/press-releases/2024/01/12/deq-accepting-public-comment-greenhouse-gas-reduction-priorities-climate-pollution-reduction-grant>

measures, performed separately but in parallel to the development and prioritization of measures to reduce GHG emissions in other sectors.

To identify NWL priority actions, NCDEQ first considered an aggregate list that comprised all recommendations described in the NWL Action Plan,⁷ Coastal Habitat Protection Plan (CHPP),⁸ and Flood Resiliency Blueprint.⁹ Similar to the review of other state plans, a high degree of redundancy among recommendations made across NWL-related plans exists. To reduce duplicative considerations and simplify the prioritization process, NCDEQ chose to focus prioritization efforts on only the recommendations from the NWL Action Plan because this list represents the most general and comprehensive set of actions. NCDEQ planned to then sub-align corresponding CHPP and NC Division of Mitigation recommendations under the prioritized NWL measures in the PCAP later in the process. Intra-agency and academic subject matter experts performed an initial screen of the list of priority actions to identify the subset of NWL actions that:

- Require funding to implement.
- Do not require state legislation (indicating a faster potential implementation timeframe).
- Support on-the-ground practices that lead to reduced carbon emissions or increased carbon sequestration of reasonable magnitude (i.e., high confidence that actions will result in non-negligible GHG impacts).
- Were marked as a high priority by the NC NWL executive committee during an evaluation performed during summer 2023.

A subset of 13 NWL actions met all the above criteria and were retained for subsequent evaluation and prioritization for the PCAP. After this initial screening, a set of criteria, like those used for other sectors, was used to prioritize the NWL actions that formed the basis for the NWL PCAP measures. These criteria reflected CPRG implementation outcomes and accounted for current implementation capacities and availability of scientific data. These criteria included:

- **GHG benefit in high-carbon habitat** - Action is expected to create GHG benefits in one of the three high-carbon habitats (forest including floodplain forest, peatlands including pocosins, and coastal habitats).

⁷ NCDEQ. "NC Natural and Working Lands Action Plan." June 2020.

<https://www.deq.nc.gov/energy-climate/climate-change/adaptation-and-resiliency/natural-working-lands>

⁸ NCDEQ. "NC Coastal Habitat Protection Plan." 2016 and 2021.

<https://www.deq.nc.gov/about/divisions/marine-fisheries/habitat-information/coastal-habitat-protection-plan>

⁹ NCDEQ. "North Carolina Flood Resiliency Blueprint." <https://ncfloodblueprint.com/>

- **Resilience benefits** - Action is likely to provide at least one significant resilience benefit to (a) low-income and disadvantaged communities and (b) ecosystem health within the expected scope and scale of implementation.
- **Implementation readiness** - Action has been conducted before in NC, and programs/partnerships needed to implement this measure exist or could be in place within one year.
- **Feasibility** - Action is feasible to complete in the 5-year implementation grant performance period.
- **Ability to measure impacts** - Methods exist to measure GHG impacts of this action given sufficient funding for monitoring.

Five interagency and academic subject matter experts performed independent evaluations to allow for either a consensus or majority opinion on each action and criteria. In almost all cases, the results were unanimous. Nine actions meeting all the evaluation criteria were deemed as high priority for the NWL sector. These priority actions were then grouped into four focus areas identified in the NWL Action Plan and form the basis of the NWL PCAP measures.

2 NC's Climate Context

2.1 State Greenhouse Gas Inventory and Business-As-Usual Projections

North Carolina's greenhouse gas (GHG) inventory¹⁰ is a comprehensive assessment of the state's emissions sources and sinks, including historical data and projections through 2050. The most recent GHG inventory, completed in January 2024, details historical activities and associated GHGs emitted or stored by key source categories from 1990 to 2020. In addition, the NCDEQ projects the state's GHG emissions from 2021 to 2050 in a BAU scenario, based on forecasted changes in fuel use, population, historical trends, and other factors. North Carolina uses the inventory to benchmark progress on GHG reductions against state goals and policies to determine which sectors offer opportunities for future reductions. The inventory is crucial for understanding the state's contribution to climate change and serves as a foundation for planning reduction strategies.

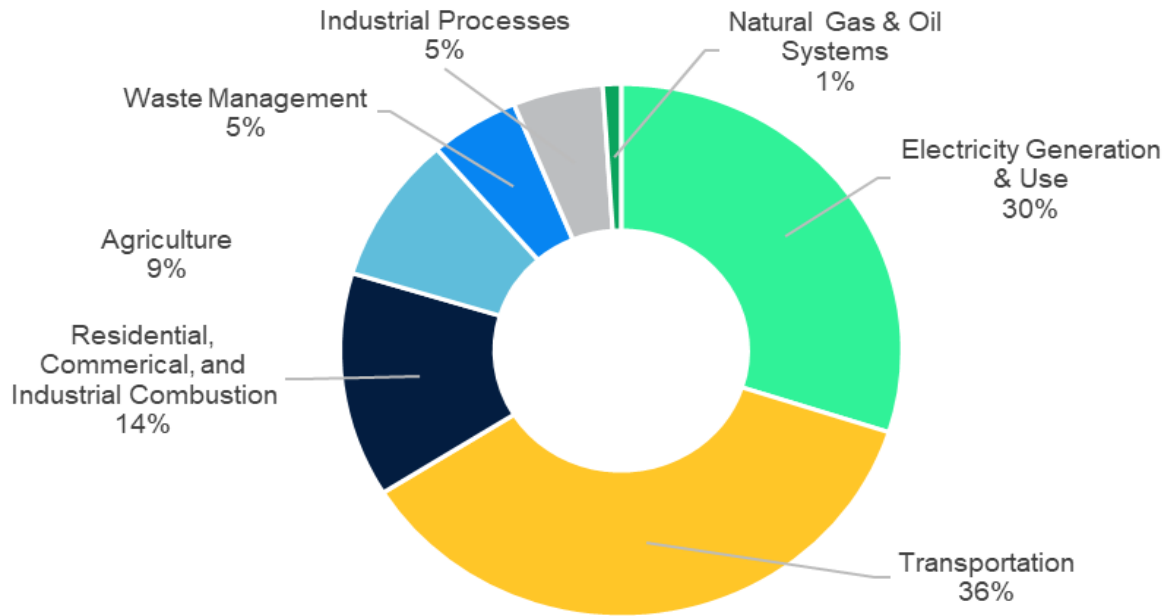
The methods and tools used to prepare the NC GHG inventory are based on those used to prepare the national GHG inventory prepared by EPA annually, which is consistent with the 2006 Intergovernmental Panel on Climate Change Guidelines for National GHG Inventories. These methods are reflected in the U.S. EPA SIT. The SIT includes default data supplied by EPA for North Carolina and other states. The default data are generally publicly available information from various federal agencies such as the U.S. Department of Energy (DOE), U.S. Department of Agriculture (USDA), Federal Highway Administration (FHWA), U.S. Geological Survey (USGS), U.S. Census Bureau, and EPA. These data are frequently used by state and local agencies to develop air pollutant emissions inventories. A limited number of source categories contained in the SIT utilize data obtained from third party vendors (e.g., fertilizer application). Where default data were unavailable or considered inferior relative to other information sources, data obtained from state agencies are used in the SIT to provide more accurate emissions estimates for NC.

For the Transportation sector, the latest version of EPA's MOVES was used to calculate historical and projected GHG emissions. A third major resource for estimating NC emissions is EPA's Greenhouse Gas Inventory by State (GHGI).¹¹ The GHGI includes updates to some data sources and/or methodologies which EPA has not yet integrated into the SIT. The NCDEQ coordinated with EPA staff to identify where the GHGI is the preferred resource, which resulted in use of GHGI data for multiple Land Use, Land Use Change and Forestry (LULUCF) subsectors.

¹⁰ NCDEQ. "NC Greenhouse Gas Inventory (1990-2050)." January 2024.
<https://www.deq.nc.gov/energy-climate/climate-change/greenhouse-gas-inventory>

¹¹ EPA. "State GHG Emissions and Removals." <https://www.epa.gov/ghgemissions/state-ghg-emissions-and-removals>

Figure 2 shows the gross GHG emissions contributed by each sector in 2020 in million metric tons of carbon dioxide equivalent (MMT CO_2e). Transportation is the largest source sector at 36% followed by Electricity Generation and Use at 30%, and Residential, Commercial, and Industrial Combustion at 14%. Together, combustion activities contribute to 80% of the total statewide gross GHG emissions.



2020 NC Gross Emissions: 139.45 MMT CO_2e

Figure 2. Percentage of NC 2020 GHG Emissions by Source Sector

Table 4. Summary of NC's GHG Inventory and Projections (million metric tons carbon dioxide equivalent [MMTCo₂e])

	Historical					Projected			
	1990	2005	2010	2015	2020	2025	2030	2040	2050
Electricity Generation and Use	55.39	82.66	82.98	58.58	41.77	43.08	26.71	14.08	8.50
Electricity Generation	47.12	75.78	73.32	52.31	37.24	39.05	24.00	12.34	7.12
Imported Electricity ^a	8.26	6.88	9.66	6.27	4.54	4.04	2.70	1.74	1.38
Residential/Commercial/Industrial Combustion^b	25.93	24.97	21.45	20.17	19.01	20.61	21.14	21.99	22.69
Industrial	16.72	13.09	9.73	9.39	9.23	9.97	10.43	11.07	11.51
Commercial	3.80	5.08	5.13	5.31	4.88	5.44	5.59	5.90	6.20
Residential	5.41	6.79	6.59	5.47	4.90	5.20	5.13	5.02	4.98
Transportation	42.68	58.56	58.45	58.47	50.35	54.10	52.07	43.55	35.84
Gasoline & Diesel Highway	36.66	53.78	53.39	52.74	45.45	47.53	44.95	35.49	26.84
Non-Highway	6.01	4.72	4.95	5.58	4.71	6.31	6.79	7.74	8.70
Alternative Fuel Vehicles	0.00	0.06	0.10	0.15	0.18	0.27	0.34	0.31	0.29
Agriculture	9.06	12.63	12.21	12.54	12.46	12.31	12.46	12.87	13.28
Manure Management	2.69	6.58	6.27	6.08	6.49	6.39	6.58	7.10	7.61
Agricultural Soil Management	4.58	3.95	4.01	4.54	4.12	4.20	4.16	4.09	4.01
Enteric Fermentation	1.78	2.10	1.93	1.91	1.85	1.72	1.71	1.68	1.66
Burning of Agricultural Crop Waste	0.002	0.003	0.001	0.003	0.002	0.003	0.003	0.003	0.003
Waste Management	5.56	7.21	7.98	5.99	7.17	7.35	7.48	7.74	7.99
Municipal Solid Waste	4.67	5.90	6.48	4.42	5.49	5.50	5.50	5.49	5.48
Wastewater	0.89	1.31	1.49	1.57	1.69	1.85	1.98	2.25	2.52
Industrial Processes	1.25	4.87	4.98	6.56	7.22	8.54	9.00	9.53	10.12
Natural Gas and Oil Systems	1.18	1.53	1.62	1.39	1.48	1.65	1.65	1.65	1.65
Gross Emissions	141.04	192.42	189.67	163.71	139.45	147.65	130.51	111.41	100.07
Gross Emissions Reduction from 2005					28%	23%	32%	42%	48%
Net Carbon Sinks - LULUCF^c	-48.99	-45.08	-47.26	-48.29	-47.68	-47.23	-47.23	-47.23	-47.23
Net Emissions	92.05	147.34	142.40	115.42	91.77	100.41	83.28	64.18	52.83
Net Emissions Reduction from 2005					38%	32%	43%	56%	64%

Note: Totals may not equal exact sum of subtotals shown in this table due to independent rounding.

^a Includes estimates of emissions from Imported Electricity that are generated outside NC.

^b Represents emissions associated with onsite fuel combustion activities in the Residential, Commercial, and Industrial sectors.

^c Land Use, Land Use Change, and Forestry.

North Carolina experienced a large decrease between 2019 and 2020, which is mostly attributable to a reduction in on-road vehicle emissions due to the COVID pandemic-related reductions in vehicle miles traveled (VMT). Although emission increases are projected through 2026, they are modest. As indicated by Table 4, a continuation of the state's downward trend in historical GHG emissions is projected to continue after 2025. Given these projected reductions, year 2030 gross and net emissions are forecast to be about 35% and 47%, respectively, below those of the 2005 baseline year. Post-2030 forecasts inherently have greater uncertainty, but reflect continued reductions given the projected impacts of the state's Carbon Plan and federal vehicle fuel efficiency standards. By 2050, gross GHG emissions are projected to be 48% below 2005 baseline levels, and net GHG emissions 64% lower than 2005 emissions.

Based on the estimated emissions in Table 4, NC's gross GHG emissions in 2020 are estimated at about 139 MMTCO_{2e} and are projected to decrease by 6% to about 131 MMTCO_{2e} by 2030 and decrease by 28% to about 100 MMTCO_{2e} by 2050.¹² Accounting for carbon sinks, NC's net GHG emissions in 2020 are estimated at about 92 MMTCO_{2e} and are projected to decrease by 9% to about 83 MMTCO_{2e} by 2030 and decrease by 42% to about 53 MMTCO_{2e} by 2050.

Below are key findings from both the GHG emissions inventory and from the analysis of the data used to develop the emissions for each source sector. Unless otherwise stated, emission reductions are generally expressed as the percent change in gross GHG emissions from the baseline year of 2005.

2.1.1 NC's Gross and Net Emissions

- Between 2005 and 2020, NC reduced gross GHG emissions by 28% and net GHG emissions by 38%.
- During this same time, NC's population and real GSP grew by 20% and 23%, respectively.
- By 2030, net GHG emissions are forecast to decrease by 43% relative to the 2005 baseline.
- By 2050, net GHG emissions are forecast to decrease by 64% relative to the 2005 baseline.
- Although the COVID pandemic in 2020 caused a decrease in emissions on a short-term basis, projections show a rebound in GHG emissions in 2021, although lower than 2019 emissions.
- The 2025 through 2050 projections do not include reductions expected because of all policies due to the lack of methods/data for modeling impacts of the most recent policies.¹³

¹² NCDEQ. "NC Greenhouse Gas Inventory (1990-2050)."

¹³ One example is EPA's "Phasedown of Hydrofluorocarbons: Restrictions on the Use of Certain Hydrofluorocarbons Under the American Innovation and Manufacturing Act of 2020," 88 FR 73098, October 24, 2023. This effort will eventually reduce ozone-depleting substance (ODS) substitute emissions in the Industrial Processes category.

2.1.2 GHG Compounds

- Carbon dioxide emissions currently account for approximately 79% of total GHG emissions in 2020.
- The primary source of CO₂ emissions is fossil fuel combustion.
- GHG emissions from fossil fuel combustion have decreased by 33% between 2005 and 2020. This is due to both a shift in fuel use, from coal to natural gas and renewable generation resources, and increased energy efficiency.
- Methane emissions currently account for approximately 12% of total GHG emissions.
- The primary sources of methane are Waste Management and Agriculture.
- Emissions from Waste Management and Agriculture have not changed significantly since 2005, even with a growing population and economy.

2.1.3 Electricity Generation and Use

- Electricity Generation and Use is the second largest emissions sector and represents 30% of all gross GHG emissions in 2020.
- GHG emissions from the Electricity Generation and Use sector in 2020 decreased by 49% since 2005.
- NC's electricity generation has undergone a transformation, including:
 - Increased use of natural gas combined cycle plants and renewable energy.
 - State legislation to promote renewable energy and reduce CO₂ emissions from Duke Energy facilities in NC.
- Solar, hydroelectric and wind energy represented 14% of NC's electricity generation in 2020.
- Avoided GHG emissions due to renewable energy generation are estimated at 5.24 MMTCO₂e for 2020.
- Emissions from imported electricity in 2020 have decreased by 34% since 2005.
- GHG emissions in the Electricity Generation and Use sector are projected to decline by 68% in 2030 relative to 2005. This projection reflects generation from all facilities in NC. For Duke Energy facilities, the forecast reflects fossil fuel consumption projections for Pathway 1/Core Portfolio 1 that Duke Energy included in its proposed Carbon Plan and Integrated

Resource Plan submitted to the NC Utilities Commissions (NCUC) on August 17, 2023, to achieve the objectives of State Law 2021-165.^{14, 15}

2.1.4 Transportation

- The Transportation sector is the largest emissions sector and represents about 36% of all GHG emissions.
- Emissions from the Transportation sector increased 1.14% from 2005 to 2019 emphasizing the need for further investments and reduction measures in this source category. 2020 Transportation sector emissions dropped; however, those emissions were atypically low because of the COVID pandemic. Emissions from the Transportation sector decreased by an estimated 14% from 2005 to 2020. However, 2020 was a year of atypically low emissions for many Transportation-emitting activities because of the COVID pandemic impact on personal travel.
- Onroad light-duty gasoline vehicles (LDV) represented 72% of total Transportation sector GHG emissions in 2019, while onroad medium/heavy-duty (MHD) diesel vehicles were the next largest contributor (16%).
- Following a recovery from the COVID pandemic and resumption of typical travel activities after 2020, the Transportation sector emissions projections showed an increase in 2021, but decreased thereafter reflecting the impact of onroad vehicle federal fuel efficiency and engine standards.

2.1.5 Residential, Commercial, and Industrial Combustion

- These combustion emissions represent 14% of all GHG gross emissions.
- Residential sector emissions from fuel combustion have decreased by 28% between 2005 and 2020, while NC's population grew by 20% over that time.
- Commercial sector emissions from fuel combustion in the Commercial sector decreased by 4% between 2005 and 2020.
- Industrial sector fuel combustion emissions decreased by 30% from 2005 to 2020.

¹⁴ NC Utilities Commission, Docket No. E-100, Sub 190, Verified Petition For Approval of 2023-2024 Carbon Plan and Integrated Resource Plans of Duke Energy Carolinas LLC and Duke Energy Progress LLC, August 17, 2023, Appendix C (Quantitative Analysis), page 49, <https://starw1.ncuc.gov/NCUC/PSC/PSCDocumentDetailsPageNCUC.aspx?DocumentId=70c6dc5c-502d-4a62-9743-2e3bcecc044cc&Class=Filing>.

¹⁵ These objectives include reducing CO₂ emission in 2005 by 70% by 2030 and achieving net zero CO₂ emissions by 2050. Section 3.2 provides additional detail on the development of the Electricity Generation and Use sector projections.

- GHG emissions from Industrial Processes increased by nearly 50% from 2005 to 2020, mainly due to increased emissions of HFCs and Perfluorochemicals (PFCs) resulting from their use as substitutes for ozone-depleting substances.

2.1.6 Land Use, Land Use Change, and Forestry

- LULUCF sector carbon sequestration is greater than estimated in the previous inventory, which reflects larger estimates of carbon stored in NC forests and Urban Trees (as estimated by the U.S. Forest Service (USFS)).
- Forests, natural lands, settlements, and agricultural lands sequestered an estimated 47.68 MMT of CO₂ or 34% of total gross GHG emissions in 2020.
- Forests and settlement lands in NC are net sinks, and agricultural lands are a net source of emissions.

Further information on the methods and data used to prepare the GHG inventory are provided in Appendix A and NCDEQ's most recent GHG inventory report: <https://www.deq.nc.gov/energy-climate/climate-change/greenhouse-gas-inventory>.

2.2 GHG Reduction Targets

North Carolina has five existing state goals regarding climate action and GHG emission reductions, all developed since 2018:

- Reduce statewide GHG emissions to at least 50% below 2005 levels by 2030 and achieve net-zero emissions as soon as possible but no later than 2050. *Established by Executive Order (EO) 246 in 2022. Supersedes previous goal developed by EO 80 in 2018: Reduce statewide GHG emissions to 40% below 2005 levels.*
- Reduce electric power sector GHG emissions by 70% below 2005 levels by 2030 and attain carbon neutrality by 2050. *Established by NC's 2019 Clean Energy Plan and enacted by HB951 in 2021.*
- Increase the total number of registered zero-emission vehicles (ZEVs) to at least 1,250,000 by 2030 and increase the sale of ZEVs so that 50% of in-state sales of new passenger vehicles are zero-emission by 2030. *Established by EO 246 in 2022. Supersedes previous goal developed by EO 80 in 2018: Increase the number of registered ZEVs to at least 80,000 by 2025.*
- Reduce energy consumption per square foot in state-owned buildings by at least 40% from fiscal year 2002–2003 levels by 2025. *Established by EO 80 in 2018.*
- Develop 2.8 gigawatts (GW) of offshore wind energy resources off the NC coast by 2030 and 8.0 GW by 2040. *Established by EO 218 in 2021.*

2.3 Existing State Climate Policy, Plans, Programs and Actions

North Carolina has made substantial strides in implementing climate policies, but the state is also encumbered by several restrictions on potential additional climate action and needs increased investment across several sectors. Beginning with the transportation sector, in 2013, the NC General Assembly passed the Strategic Transportation Investments (STI) Law.¹⁶ The STI Law mandates a formula-based allocation of state transportation funding on a statewide and regional basis. The overwhelming majority of state funding is allocated to highway investments with limited flexibility in state support for projects that increase multi-modal transportation options. Independent bicycle and pedestrian projects, among other investments, are prohibited outside of federal investments designed for that purpose. This structural impediment, combined with predominantly local land use policies that have encouraged suburban sprawl, has historically limited the state's ability to invest in active transportation strategies, street connectivity, and other strategies to reduce VMT. Additionally, the 2023 state budget prohibited the state from enacting any new sales requirements for Medium and Heavy Duty Zero Emission Vehicles, raised registration fees for electric vehicles, and introduced a new fee for plug-in hybrid vehicles.

Looking to the building sector, in 2023 the NC General Assembly overrode Governor Cooper's veto to pass HB 488, substantially limiting the state's ability to implement more energy efficient building codes. HB 488 splits the NC Building Code Council into a Residential and Commercial Code Council, strips the Governor's power of appointment, and prohibits any new code updates before 2031.¹⁷

Regarding natural lands, in 2023, NC legislation removed state protection for wetlands existing outside of federal jurisdiction, creating potential lack of protection for isolated areas with carbon sequestration potential in North Carolina's natural lands. This action, in concert with the *Sackett vs. EPA* Supreme Court decision,¹⁸ may put roughly 2.5 million acres of wetlands at high risk to development and alteration according to preliminary estimates by NCDEQ. Wetlands make up a significant portion of the state's land cover. According to preliminary estimates, 7% of NC's total land cover is under threat of unmitigated conversion as NC's population continues to rapidly grow. Funding for voluntary programs like the measures outlined in this PCAP to preserve and restore wetlands in the state are needed to supplement policy and regulatory limitations.

In the power sector, there have been some recent positive developments. In 2021, Governor Cooper signed HB 951,¹⁹ a landmark bipartisan bill mandating 70% reductions in GHG

¹⁶ NC G.S. 136-14(b)

https://www.ncleg.net/EnactedLegislation/Statutes/PDF/ByArticle/Chapter_136/Article_14B.pdf

¹⁷ NC G.S. 143-9. <https://www.ncleg.gov/Sessions/2023/Bills/House/PDF/H488v7.pdf>

¹⁸ https://www.supremecourt.gov/opinions/22pdf/21-454_4q15.pdf

¹⁹ <https://www.ncleg.gov/BillLookup/2021/H951>

emissions from NC's power sector by 2030 and net-zero emissions by 2050. To enact this mandate, the Utilities Commission is instructed to retain discretion in determining the least cost path to compliance with these targets. This legislation builds on NC's historic progress in developing its renewable energy market, spurred by the 2007 adoption of the southeast's first Renewable Energy and Energy Efficiency Portfolio Standard (REPS) -- now a Clean Energy and Energy Efficiency Portfolio Standard following recent changes to the law.

The strategies outlined in this PCAP and increased federal investments in renewable energy sources serve to strengthen the case for an accelerated pathway to reaching NC's mandated power sector targets.

North Carolina has made significant efforts to reduce its impact on the climate and reduce statewide GHG emissions. Between 2018 and 2023, NC released more than 40 plans and reports that address climate change within the state. Some examples of these documents include a GHG inventory, a clean energy plan, a clean transportation plan, a zero-emission vehicle plan, climate strategy reports, and a NWL action plan.

The state also has existing policies established by executive orders and legislation that address climate and clean energy, including:

- **EO 80:** Establishes goals for addressing climate change and transitioning to a clean energy economy.
- **EO 218:** Establishes goals for investing in NC's burgeoning offshore wind industry.
- **EO 246:** Establishes climate and GHG reduction goals for the state as well as requirements to create a clean transportation plan and conduct a deep decarbonization pathways analysis.
- **EO 271:** Instructs state agencies to prioritize ZEVs in the purchase or lease of medium/heavy-duty vehicles (MDHVs) for the state's vehicle fleet, conduct a MHD needs assessment for the state's ZEV transition, and other complementary strategies to expand the MHD ZEV market in NC.
- **HB 951:** Enables several key recommendations in the Clean Energy Plan including significant carbon reductions in the power sector, coal retirements, and promoting growth of solar power plants.
- **EO 305:** Sets statewide goals for North Carolina public and private partners to collectively conserve 1 million new acres of forests and wetlands, restore 1 million new acres of forest and wetlands, plant 1 million new trees in urban areas, and other directives to protect natural and working lands and sequester carbon.

Additionally, NC has existing programs that are already reducing GHG emissions in the state. Some examples of these programs include:

- Low-income home energy assistance program (LIHEAP).
- Clean energy workforce development program and youth apprenticeship program.

- Electric school bus, electric transit bus, and light duty electric charging station program.
- State fleet electrification program.
- State agency building utility consumption reduction program.

NC's PCAP builds upon this previous work and these existing plans, policies, and programs while also identifying priority areas where gaps in action remain.

3 Low-Income and Disadvantaged Communities in NC

The CPRG program emphasizes engaging with, understanding, and providing benefits to LIDACs. A summary of how NCDEQ has and is planning to engage with LIDACs for climate action is presented above in Section 1.3.2. This section presents the identified LIDACs in NC and climate change risks to these communities. The benefits of NC’s priority GHG reduction measures for LIDACs are presented for each measure in Section 4 (Identified Low-Income and Disadvantaged Communities).

Using CEJST²⁰, NCDEQ identified LIDACs as communities in census tracts that are at or above the 90th percentile for 5 categories including 17 associated burdens (Table 1). Based on CEJST, 815 census tracts were identified as LIDACs, which makes up 37.13% of all NC census tracts.²¹ The LIDAC population is 3,436,399, which makes up 33.48% of the NC population. The population of people of color (non-white) is 1,668,943, which makes up 48.57% of the LIDAC population.

Table 5. Summary of CEJSTs categories and burdens

CEJST Categories	Burdens
Transportation	Transportation Barriers
	Traffic Proximity and Volume
	PM _{2.5} in the Air
	Diesel Particulate Matter Exposure
Health	Asthma
	Diabetes
	Heart Disease
	Low Life Expectancy
Energy	Energy Cost
Climate Resilience	Expected Agricultural Loss Rate
	Expected Population Loss Rate
	Expected Building Loss Rate
	Projected Flood Risk
	Projected Wildfire Risk
Workforce Development	Unemployment
	Low Median Income
	Below 200% Poverty Line

²⁰ Council on Environmental Quality. “Climate and Economic Justice Screening Tool.”

²¹ Any repeated census tract IDs identified under more than one category evaluated within CEJST were counted only once when calculating the total LIDAC census tracts and percentage for the PCAP report. The same applied to any repeated census tract IDs identified by NCDEQ potentially underserved block group data set.

To supplement the CEJST data and to build on the work NCDEQ has already done to understand LIDACs in the state, NCDEQ also reviewed block group data from its analysis of Potentially Underserved Communities.²² NCDEQ designates Potentially Underserved Communities by examining the racial/ethnic and poverty composition for each block group within the state (based on 2019 data).

To identify a Potentially Underserved Community, a specific block group is compared to both the county and the state composition and is classified as a potentially underserved community if it meets the following criteria for both racial/ethnic composition and poverty composition:

- Racial/Ethnic Composition:
 - The share of nonwhites and Hispanic or Latino (of any race) is $\geq 50\%$; OR
 - The share of nonwhites and Hispanic or Latino (of any race) is $\geq 10\%$ higher than the County or State share; AND
- Poverty Composition:
 - The share of population experiencing poverty is $\geq 20\%$; AND
 - The share of households in poverty is $\geq 5\%$ higher when compared to the County or State share.

Examples:

- If a block group has a share of nonwhites and Hispanic or Latino (of any race) $\geq 50\%$ AND a share of population experiencing poverty $\geq 20\%$ AND a share of households is $\geq 5\%$ higher when compared to the County or State share, then the block group is considered a potentially underserved community.
- If a block group has a share of nonwhites and Hispanic or Latino (of any race) $\geq 50\%$ AND a share of the population experiencing poverty $\geq 20\%$, but the share of households in poverty is NOT $\geq 5\%$ higher when compared to the County or State share, then the block group is NOT considered a potentially underserved community.

Figure 3 displays the location of LIDACs across NC as identified using both data sets. The figure shows a significant overlap between the CEJST-identified LIDACs and the NCDEQ potentially underserved block groups. By using both data sources, NCDEQ evaluated an expanded number of LIDACs for the PCAP when compared to CEJST alone.

²² NCDEQ. "NCDEQ's Potentially Underserved Block Groups 2019." <https://data-ncdenr.opendata.arcgis.com/maps/13a1aace03134969b8181c1f9f026960>

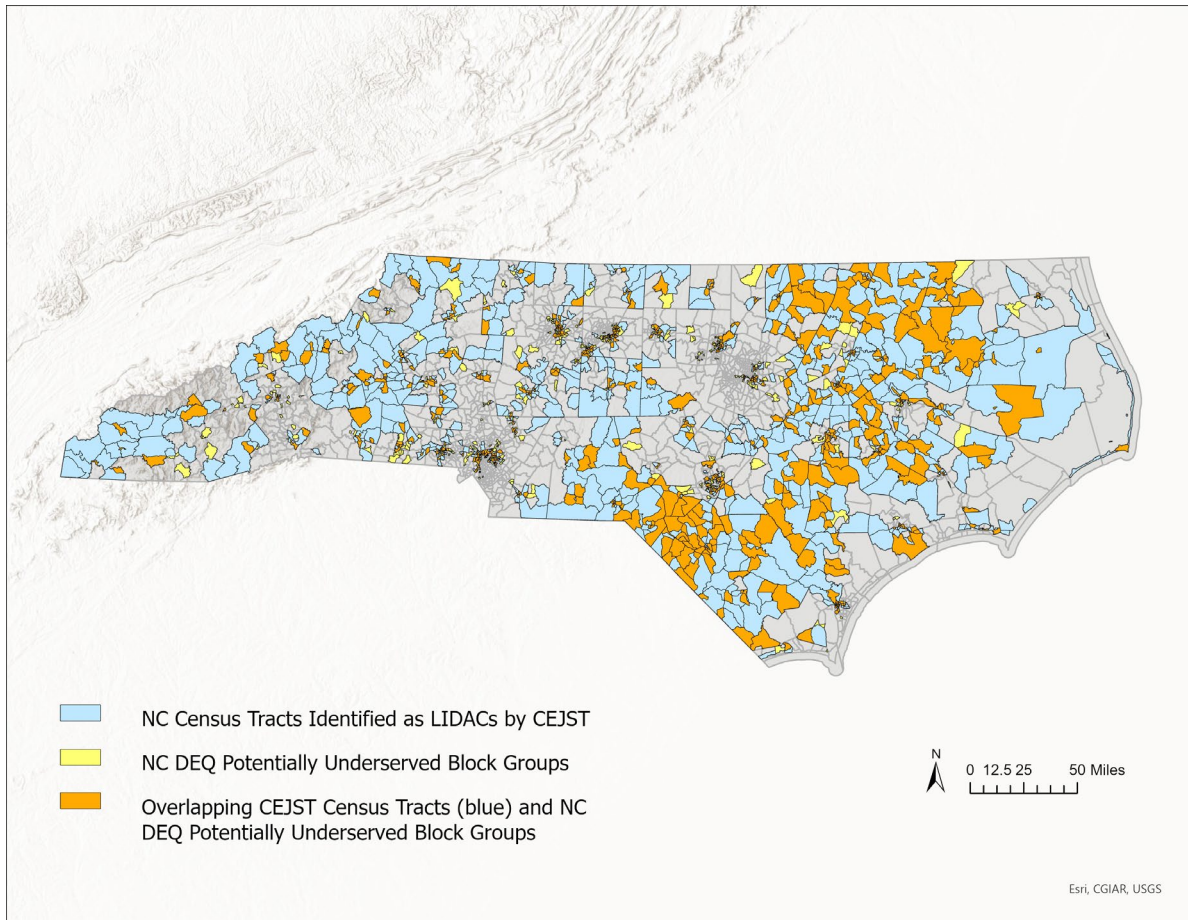


Figure 3. LIDAC Census Tracts (as identified by CEJST) and NCDEQ Potentially Underserved Block Groups in North Carolina.

An additional 512 census tracts identified by the NCDEQ's potentially underserved block groups data were added to the LIDAC census tracts identified by CEJST. In total, 1327 census tracts were identified as LIDACs, which makes up 60.46% of all NC census tracts. The overall LIDAC population is 5,927,863, or 57.75% of the NC population. The overall population of people of color (non-white) is 2,613,193, which makes up 44.08% of the LIDAC population. Table 6 summarizes the two data sets. Appendix B includes the LIDAC census tract IDs identified by both CEJST and NCDEQ's potential underserved block groups.

Table 6. Summary of LIDACs identified by CEJST data set alone and by both CEJST and NCDEQ Potentially Underserved Community data sets.

	Total Census Tracts	Percentage of NC Census Tracts (n=2195)	Total LIDAC Population	Percentage of NC Population (n=10,264, 876)	Total Population of People of Color in LIDACs	Percentage of LIDAC population who are People of Color
LIDACs identified by CEJST	815	37.13	3,436,399	33.48	1,668,943	48.57
Additional LIDACs identified by NCDEQ Potentially Underserved Block Groups	512	23.33	2,491,464	24.27	944,250	37.9
LIDACs identified by both CEJST and NCDEQ Potentially Underserved Block Groups	1,327	60.46	5,927,863	57.75	2,613,193	44.08

3.1 Climate Impacts or Risks to NC’s LIDACs

The climate risks most prevalent in the United States include extreme weather events (e.g., hurricanes, extreme rainfall), extreme heat and urban heat island effects, flooding, sea level rise, drought, and wildfires. Social systems inequitably distribute negative impacts from these climate risks on BIPOC individuals and communities, low-income households, unhoused individuals, rural communities, and agricultural workers.²³ Not only do these communities feel the most severe impacts of climate change, but they are also the least able to prepare for and respond to said impacts due to a lack of resources and socio-political power. According to a 2021 EPA analysis, racial and ethnic minorities are more likely to live in areas with the highest projected levels of climate change impacts.²⁴

Within North Carolina, the most prevalent climate risks are extreme heat, heavy precipitation, sea level rise, inland and coastal flooding, and hurricanes. In 2020, climate experts in NC assessed historical trends and potential future changes for the NC Climate Science Report.²⁵ This report helped inform the state’s 2020 Climate Risk Assessment and Resilience Plan.²⁶ Key information on climate risks in NC includes:

- Average temperature has risen about 1.0°F in NC since 1895. Under a high emissions scenario (Representative Concentration Pathway [RCP] 8.5), average temperatures are expected to rise another 6°-10°F compared to the baseline. Although NC has not experienced an increase in days over 90°F or 95°F, the number of warm and very warm nights – defined as having nighttime temperatures above 70°F and 75°F, respectively – has increased and is projected to continue increasing. Higher temperatures will also increase potential evapotranspiration, leading to a higher frequency and intensity of droughts in the

²³ Marino, E.K., K. Maxwell, E. Eisenhauer, A. Zycherman, C. Callison, E. Fussell, M.D. Hendricks, F.H. Jacobs, A. Jerolleman, A.K. Jorgenson, E.M. Markowitz, S.T. Marquart-Pyatt, M. Schutten, R.L. Shwom, and K. Whyte, 2023: Ch. 20. Social systems and justice. In: Fifth National Climate Assessment. Crimmins, A.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, B.C. Stewart, and T.K. Maycock, Eds. U.S. Global Change Research Program, Washington, DC, USA. <https://doi.org/10.7930/NCA5.2023.CH20>

²⁴ EPA. “Climate Change and Social Vulnerability in the United States: A Focus on Six Impacts. U.S. Environmental Protection Agency, EPA 430-R-21-003.” 2021. www.epa.gov/cira/social-vulnerability-report

²⁵ Kunkel, K.E., D.R. Easterling, A. Ballinger, S. Bililign, S.M. Champion, D.R. Corbett, K.D. Dello, J. Dissen, G.M. Lackmann, R.A. Luettich, Jr., L.B. Perry, W.A. Robinson, L.E. Stevens, B.C. Stewart, and A.J. Terando, 2020: NC Climate Science Report. NC Institute for Climate Studies, 233 pp. <https://ncics.org/nccsr>

²⁶ “NC Climate Risk Assessment and Resilience Plan.” 2020. <https://www.deq.nc.gov/energy-climate/climate-change/nc-climate-change-interagency-council/climate-change-clean-energy-plans-and-progress/nc-climate-risk-assessment-and-resilience-plan>

future. Furthermore, higher evapotranspiration will create better conditions for wildfire; it is likely that the frequency of wildfire danger days will increase in NC.

- The number of extreme precipitation events – defined as having three or more inches of precipitation in a day – is also expected to rise. The 2015-2018 period saw the greatest number of extreme precipitation events in NC since 1900. Although there is no long-term trend in annual total precipitation averaged across the state, it is likely that annual precipitation will increase throughout the century due to increases in atmospheric water vapor content.
- Sea levels have risen drastically along the coasts of North Carolina; along the northeastern coast, levels have risen about 1.8 inches per decade since 1978, and 0.9 inches per decade since 1935 along the southeastern coast. Sea levels will continue to rise in the future. Under RCP 8.5, storm-driven water levels that have a 1% chance of occurring each year in the beginning of the 21st century could have a 30%-100% chance of occurring by late-century. This, along with extreme precipitation events, will cause more flooding (both inland and coastal) throughout the state.
- Hurricanes will also contribute to flooding. The intensity of the strongest hurricanes is projected to increase on a global scale due to warming temperatures. While it is difficult to obtain accurate hurricane projections for NC specifically, it is very likely that the state will be affected by this global increase in the strength of hurricanes.

The 2020 NC Climate Risk Assessment and Resilience Plan used NCDEQ’s mapping of Potentially Underserved Communities to illustrate inequities in climate exposure for wildfires, inland flooding, extreme heat, storm surges, and landslides.²⁷

Maps of these exposures and risks overlaid with the Potentially Underserved Communities along with details on specific impacts (e.g., health, air quality) may be found in the 2020 NC Climate Risk Assessment and Resilience Plan (see example map for extreme heat in Figure 4).

²⁷ For the 2020 Climate Risk Assessment and Resilience Plan, NCDEQ relied on data derived from the American Community Survey (U.S. Census Bureau) 2017. The map in Figure 4 relies on an updated assessment of Potentially Underserved Communities using data from 2019.

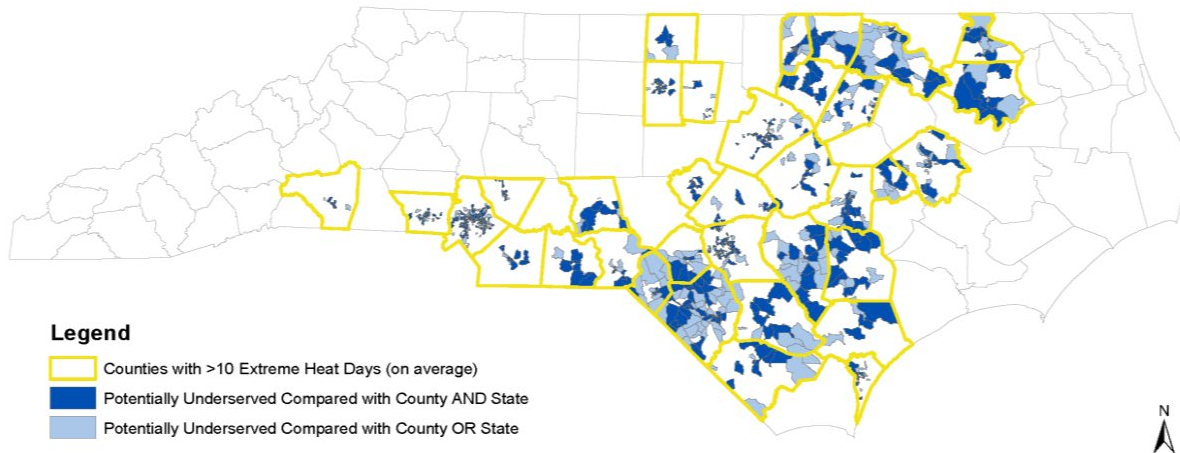


Figure 4. Potentially Underserved Populations in Counties with > 10 Average Extreme Heat Days Annually

Climate risks for NC’s Potentially Underserved Communities include:

- **Extreme Heat** - Areas with elevated extreme heat days are largely concentrated in the Eastern part of the state, creating a band from Northampton and Hertford counties south to Robeson, Columbus, and Brunswick counties. Several counties, including Robeson, Sampson, Duplin, Wayne, Bertie, and Halifax have both high percentages of potentially underserved populations and elevated extreme heat days. High heat in urban areas is magnified by the urban heat island effect. The heat island effect also triggers an increase in energy consumption for air conditioning, which increases adverse public health impacts due to emissions from energy production and consumption. Many households in potentially underserved communities are in urban areas, including the cities of Charlotte, Raleigh, Durham, Fayetteville, Greenville, and Wilmington, which already experience an elevated number of extreme heat days.
- **Wildfires** - Wildfire risk is greatest among potentially underserved communities in the southern and western regions of the state. Some of the most affected counties include Robeson, Hoke, Brunswick, and Bladen in the southern region of the state, and Henderson, Buncombe, Cleveland, Burke, Catawba, and Iredell counties in the western region of the state.
- **Inland Flooding** - Inland flooding is one of the most widespread risks in the state, even as acute impacts are very localized. Inland flooding affects people of all socioeconomic backgrounds, but NCDEQ’s analysis demonstrates that exposure is often concentrated in areas of social vulnerability. An example of this is Robeson County, which has a high risk of inland flooding on potentially underserved communities in the county.
- **Sea-level Rise and Coastal Storms** - Sea-level rise and increasing intensity of coastal storms will certainly impact high-value and ocean-facing properties. Communities on the Inner Banks, or otherwise near coastal waters, also face significant risk, e.g., New Bern or the Down East villages of Carteret County. Many of these communities have unique historic

cultures and heritage which is threatened by climate change. Clusters of potentially underserved communities exposed to storm surge exist along the entire NC coastline and throughout the sounds, including Shallotte, Wilmington, South Jacksonville, New Bern, East Greenville, Edenton, and Elizabeth City. Differential impacts of storm surge are like those of inland flooding. Homes in higher poverty areas are unlikely to be elevated, poor households and people with disabilities face a greater burden for evacuating, and navigating insurance and government recovery programs favors people with more education.

3.1.1 Value of Resilience

North Carolina has experienced escalating economic and societal losses due to weather and climate-related natural disasters. The state consistently ranks as one of the highest in the nation for these losses each year. Figure 5 gives the losses due to drought, wildfires, floods, and tropical cyclones from 1980 to 2019. This figure shows that tropical cyclones account for most of these losses.

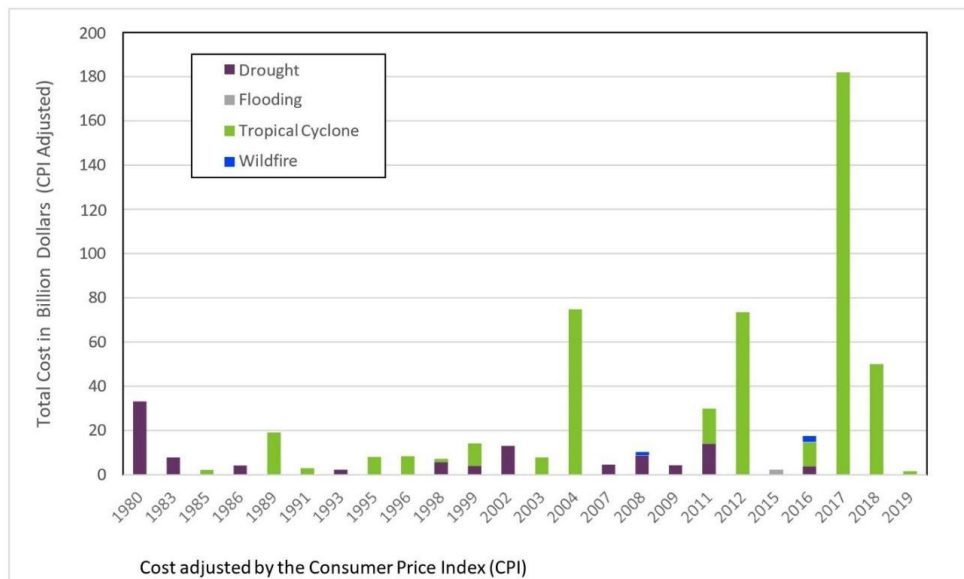


Figure 5. Cost of Weather and Climate-Related Natural Disasters (\$ billion)

In four years (2016-2019), these natural disasters have cost North Carolina \$251 billion. This is roughly equivalent to the expense of natural disasters over the previous 20 years (\$257 billion, 1995-2015).

The National Oceanic and Atmospheric Administration’s National Centers for Environmental Information reports that of the events that caused impacts to the state of greater than \$1 billion from 1980-2023, hurricanes and tropical storms were only 26% of occurrences but caused 76% of costs. The NC Office of Recovery and Resiliency (NCORR) mapped impacts from hurricanes

Florence and Matthew, showing the most impacted communities from these events, which overlap some of the state's most distressed counties.²⁸

²⁸ CoastalReivew.org. "State has \$47M for hurricane-impacted residents." May 17, 2023. <https://coastalreview.org/2023/05/state-has-47m-for-hurricane-impacted-residents/>

4 Priority Climate Action Plan Measures

The measures in this section have been identified as “priority measures” for the purpose of working towards the state’s climate goals as well as leveraging federal funding opportunities (e.g., EPA’s CPRG implementation grants). This list is not exhaustive of NC’s priorities but represents selected priority measures that meet the following criteria:

- The measure was identified as a near-term approach that aligns with NC’s climate goals and was deemed a priority based on an internal benefits analysis and broader stakeholder feedback.
- The measure is considered implementation ready, meaning that the design work or technology for the policy, program, or project is complete enough that it can be included in a CPRG implementation grant application under the second phase of the program.

Each measure was grouped within a sector and combined to develop an overarching vision for climate action. These visions will be carried through the PCAP report and expanded upon in the CCAP.

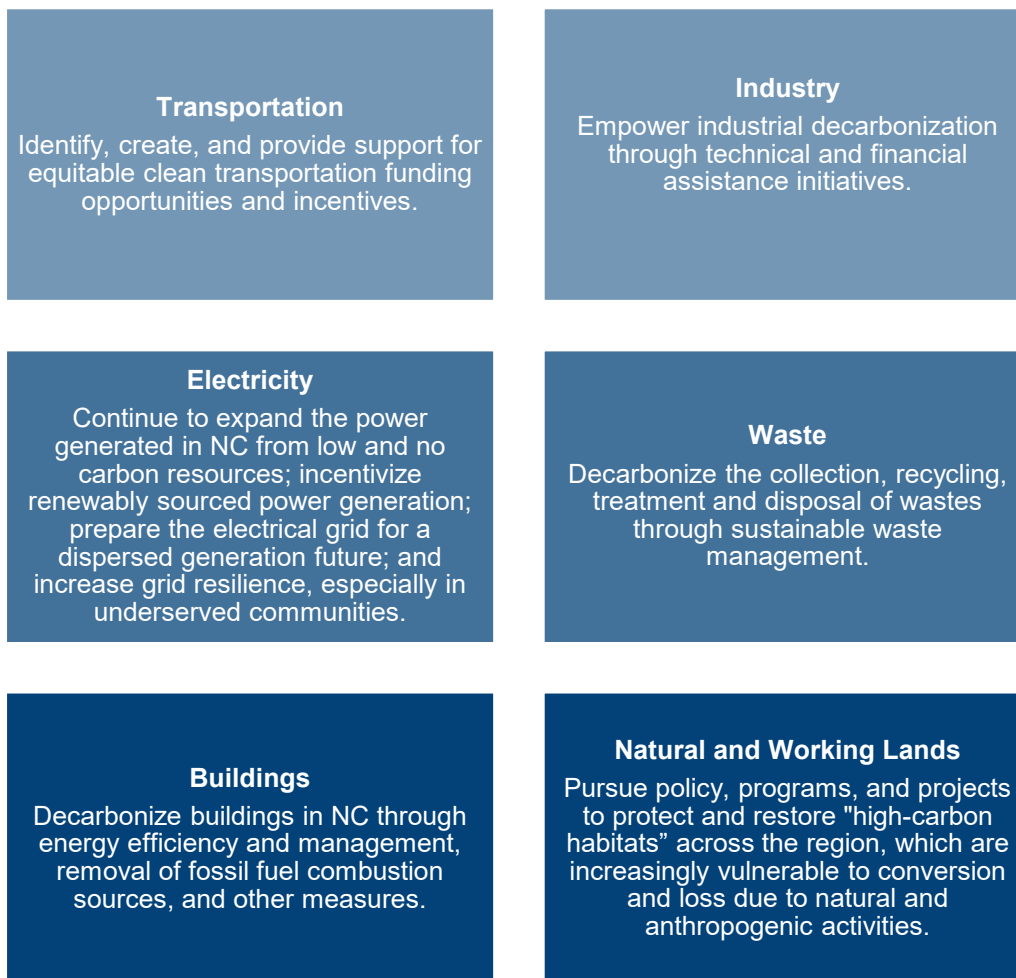


Figure 6. NCDEQ’s Priority Climate Action Visions for Sectors

Table 7. Summary of NC's PCAP priority GHG reduction measures, by sector

Sector	PCAP Measure	Description
Transportation	1. Increase the number of zero-emission and electric vehicles on the road through partnerships, technical assistance, financial incentives, and other mechanisms.	Drive electric vehicle adoption by implementing a practical framework of incentives and assistance programs, making ownership more accessible and appealing to consumers.
Transportation	2. Identify, install, and maintain a publicly accessible electric vehicle charging network accessible to all North Carolinians.	Develop a charging infrastructure, making EV ownership more accessible to North Carolinians.
Transportation	3. Increase the number of zero-emission and electric vehicles in the state fleet, school buses, and transit buses.	Lead by example through electrifying NC's state fleets.
Transportation	4. Pursue programs to increase efficiency and reduce GHG emissions at port/freight terminals.	Advance efficiency at port and freight terminals by maximizing utilization of new intermodal rail service for container transport and systematically transitioning from diesel to electric or low-emission equipment.
Transportation	5. Pursue programs to improve the quality of life and reduce GHG emissions for all North Carolinians.	Pursue VMT reduction strategies, including increasing support for bike/pedestrian projects, improvements to public transportation, ride-share programs, and other unique strategies that best fit communities across the state.
Electricity	6. Increase the amount of electricity generated by low and no carbon energy resources in NC.	Continue to reduce carbon emissions from the electricity sector by continuing to increase the utilization of renewable energy sources.
Electricity	7. Implement measures to increase energy resiliency in NC communities.	Pursue policy, programs, and projects that will increase resiliency, especially in communities with higher climate impacts.

Sector	PCAP Measure	Description
Buildings	8. Reduce per square foot energy usage in buildings in NC.	Explore policy, funding/incentives, and program solutions to bolster energy efficiency initiatives for all buildings, including direct funds for state agencies, universities, industries, public buildings, and the residential sector to maximize energy efficiency.
Buildings	9. Decarbonize buildings in NC, through replacement of fossil fuel combustion sources and other greenhouse gas emissions.	Explore policy, funding/incentives, and program solutions to electrify buildings, including direct funds toward electrification initiatives in county schools and public buildings, while also promoting the phase-out of high-global warming potential substances in existing appliances and cooling systems.
Industry	10. Develop programs to support or incentivize implementation of energy efficiency and emissions reduction measures in NC industry	Establish initiatives to increase energy efficiency in the industrial sector, including energy audits, strategic energy management, equipment upgrades, and waste heat utilization.
Waste	11. Reduce food waste to avoid improper management, reduce GHG emissions, and reduce food insecurity.	Reduce food waste entering the waste management system through school refrigerators for uneaten food, logistics to move excess food to food banks, and co-digestion with other feedstocks.
Waste	12. Decarbonize waste collection to reduce GHG emissions associated with inefficient diesel fueled collection vehicles.	Decarbonize waste collection to reduce GHG emissions during the collection and transport of wastes through electrification of fleets or through engine conversion from diesel to electric motors.
Waste	13. Reduce landfill gas emissions through improved landfill operations to collect gas more efficiently and earlier in a landfill life and.	Reduce landfill gas emissions through improved landfill operations to collect gas more efficiently and earlier in a landfill life and utilize the emissions as a renewable energy source.
Natural and Working Lands	14. Protect and restore high-carbon coastal habitats and peatlands.	Pursue policy, programs, and projects to conserve and restore high-carbon habitats in NC's coastal plain, including pocosin wetlands and other peatlands, brackish and saline coastal marsh, and high-salinity seagrass, to avoid carbon emissions resulting from projected conversion, wildfire, and soil emissions

Sector	PCAP Measure	Description
		from unhealthy habitats, and to enhance carbon sequestration.
Natural and Working Lands	15. Protect, use, and develop agricultural and forest land.	Pursue policy, programs, and projects for agricultural and forest land protection and best use, supporting expanded land stewardship programs, and promoting reforestation and restoration initiatives in rural and urban areas that increase resilience, ecosystem services, and wildlife habitat.

4.1 Transportation

PCAP Measures 1 and 2. Increase the number of zero-emission and electric vehicles on the road through partnerships, technical assistance, financial incentives, and other mechanisms. Identify, install, and maintain a public electric vehicle charging network accessible to all North Carolinians.

Accelerating the widespread adoption of zero emission (ZEVs) and electric vehicles (EVs) that replace higher carbon emitting vehicles will translate into emission reductions from everyday use of onroad vehicles. This measure includes activities that support a multifaceted approach to achieving the state’s vehicle electrification priorities, like facilitating equitable access to low-carbon vehicles, incentivizing North Carolinians to purchase ZEVs and EVs, and transforming the state fleet to decrease GHG emissions. Complementary to the ZEVs and EVs will be investments in EV charging infrastructure. This measure aims to advance the expansion of an EV charging network across NC to support the widespread adoption of EVs. This measure could involve conducting gap assessments to understand current and future charging needs. State and local government could also promote the installation of EV charging infrastructure with a focus on equitable access to EV charging. Additionally, workforce development and infrastructure maintenance plans and activities will ensure the long-term viability of EV charging infrastructure.

Quantified GHG Reductions

PCAP Measure	GHG reductions (MMTCO ₂ e), 2025-2030	GHG reductions (MMTCO ₂ e), 2025-2050
Increase the number of zero emission and electric vehicles on the road through partnerships, technical assistance, financial incentives, and other mechanisms.	2.69 - 3.54	63.1 - 143.5

Appendix E provides information on how these GHG emission reductions were quantified.

The projects listed within this sector are illustrative examples of what could be funded. This is not the comprehensive list of projects that will be funded in this sector.

Key Implementing Agencies

Lead Activity Implementer:

- **NC Department of Transportation (NCDOT):** Implements the NC Clean Transportation Plan and coordinates the National Electric Vehicle Infrastructure (NEVI) Program in the state.
- **NCDEQ:** Coordinates the implementation of the Volkswagen Mitigation Plan to support the adoption of low-emission vehicles and charging infrastructure.

Regional Coordination and Implementation Support:

- **Centralina Regional Transit Council:** Works with vehicle fleets, fuel providers, community leaders and other stakeholders to save energy and promote the use of domestic fuels and advanced vehicle technologies in transportation, including investments in ZEVs or EV and associated charging infrastructure.
- **Land of Sky Clean Vehicles Coalition (Asheville/Western NC):** Works with vehicle fleets, fuel providers, community leaders and other stakeholders to save energy and promote the use of domestic fuels and advanced vehicle technologies in transportation, including investments in ZEVs or EV and associated charging infrastructure.
- **Triangle Clean Cities Coalition (Raleigh/Durham Area):** Works to reduce regional dependence on petroleum-based fuel, including supporting the Southeast Alternative Fuel Corridor Initiative and DRIVE Electric USA through Plug-in NC.
- **COGs/MPOs/Local Governments:** Support local implementation and coordination of EV adoption mechanisms, EV charging infrastructure expansion and workforce development.
- **Local Air Quality Programs:** Support implementation of air quality requirements including efforts to lower emissions through adoption of EVs and ZEVs and associated charging infrastructure. These include but are not limited to:
 - Mecklenburg County Land Use and Environmental Services – Air Quality
 - Asheville-Buncombe Air Quality Agency
 - Forsyth County Office of Environmental Assistance and Protection

Implementation Activities and Milestones

Activities that may be used to implement this measure include, but are not limited to:

- **Support State and Local Initiative to Accelerate ZEV Adoption:** Through state and local government action, promote electric vehicle adoption and support the removal of barriers that inhibit adoption to achieve the ZEV and EV targets set out in EOs 80 and 246. State alliances and coalitions may also encourage continued investment.
- **Provide Financial Incentives and Assistance:** Offer rebates on ZEVs to incentivize the purchase or lease of these types of vehicles to achieve the State’s goal of 1,250,000 new registered ZEVs by 2030 as set forth in EO 246. Modify rebate offers overtime to respond to shifts in the market and target LIDAC communities. Establish a competitive vehicle replacement program specifically focused on underserved communities to encourage

equitable deployment of ZEVs statewide. Additionally, implement financial policies supporting the removal of high-emitting older vehicles from the road.

- **Expand EV-Trained Workforce:** Conduct state and local workforce assessments to understand gaps in the labor market needed to support widespread EV adoption. Partner with technical and community colleges to provide workforce development programs to support the deployment of EVs and the installation and maintenance of EV infrastructure throughout the state.
- **Inform North Carolinians about EV Benefits and Opportunities:** Create and manage a resource hub to inform consumers about the benefits and opportunities to purchase or lease a ZEV along with financial resources to increase accessibility to these vehicles. Partner with dealerships, insurance companies and other private entities to distribute these resources directly to consumers and maximize public information exposure.
- **Expand DC Fast Charging Infrastructure:** Continue to explore the most efficient ways to provide infrastructure upgrades needed to enable broad-scale EV charging at home and on highway corridors. Identify needs and level of investment required, and ensure cost-effective deployment of new infrastructure, including life cycle cost-benefit analysis. Increase funding to expand charging infrastructure. NC received applications for 20 DC fast chargers under Phase 1 of the DC Fast Charging Infrastructure Program under the VW Settlement and 168 DC fast chargers under Phase 2. In Phase 2, \$26,040,288 was requested and \$4.9 million was allocated illustrating the significant interest in investing in this infrastructure.
- **Expand Level 2 Charging Infrastructure:** Increase funding for Level 2 charging infrastructure. Through the VW Settlement program, NC has 119 unfunded Level 2 rebates requesting \$196,597 and 29 unfunded Level 2 State Agency Projects requesting \$2,629,352 for a total of \$4,225,949.
- **Revise Building Codes:** Investigate the feasibility of revising residential building codes to require or recommend pre-wiring for Level 2 EV charging.
- **Develop Permitting Best Practices:** Develop a clearinghouse of best practices and other resources for local governments to expedite charging infrastructure permitting and review, including coordination with electric utilities.

Authority to Implement

Aspects of this measure will focus on providing incentives and funding for low- or zero-emission vehicles and charging infrastructure that could be implemented with existing authority. NCDEQ has administered Transportation sector emission reduction grant programs for over two decades and are well positioned do the same with this CPRG opportunity. Several existing EOs further support this measure, including:

- **EO 271:** Instructs cabinet agencies to pursue and invest eligible federal funds, in a manner consistent with applicable law, toward growing the MHD ZEV market in NC, including but not limited to investing in charging infrastructure and vehicle purchase incentives. Cabinet

agencies are instructed to support an affordable and reliable transition to ZEVs in the MHD sector, including but not limited to increasing affordability and access to MHD ZEVs in underserved communities.

- **EO 246:** NC will strive to accomplish the following goals related to transportation sector emissions: increase the total number of registered ZEVs to at least 1,250,000 by 2030 and increase the sale of ZEVs so that 50 percent of in-state sales of new vehicles are zero-emission by 2030.

Additionally, EO 246 instructs cabinet agencies to invest applicable federal and state funding, consistent with applicable law, with an emphasis on achieving directives in this EO and EOs 80 and 218, including but not limited to actions that reduce GHG emissions and air pollution, promote resiliency, invest in historically underserved communities, increase affordability for low- and moderate-income households, advance health equity, and create jobs and economic growth through a clean NC economy.

- **EO 80:** NC's Commitment to Address Climate Change and Transition to a Clean Energy Economy, charged NCDEQ with collaborating with businesses, industries, power providers, technology developers, NC residents, local governments, and other interested stakeholders to increase the utilization of clean energy technologies, energy efficiency measures and clean transportation solutions.

Geographic Coverage

The geographical coverage of this measure will include the state of North Carolina with a specific emphasis on LIDACs. NC is already promoting the adoption of EVs within the state.

Relevant Funding Sources

Along with state funding opportunities, federal tax credits to support EVs and ZEVs are available, such as the IRA – Clean Vehicle Tax Credit, Previously Owned Vehicle Tax Credit, Clean Commercial Vehicle Tax Credit, and the Alternative Fuel Vehicle Refueling Property Tax Credit. Additional charging infrastructure examples include the FHWA National Electric Vehicle Infrastructure (NEVI) program and FHWA Charging and Fueling Infrastructure (CFI) grants.

LIDAC Benefits

The actions in this measure will not only reduce GHGs in and around LIDAC communities but will also reduce other air pollutants such as fine particulate matter (PM_{2.5}) and ozone. The state of North Carolina is in attainment for both PM_{2.5} and ozone, and further reducing these criteria pollutants will help ensure the state remains in attainment given any future regulatory actions by the EPA.

LIDAC areas are commonly found where the main highway corridors intersect with large cities, especially seen in Raleigh/Durham, Greensboro/Winston-Salem, Charlotte, and Fayetteville. Reducing emissions from the transportation sector has the greatest health benefits to LIDAC

communities, especially for mitigating respiratory illnesses. Additional benefits of reduced noise pollution can be realized with the adoption of EVs over internal combustion engines (ICEs).

Metrics for Tracking Progress

Examples include:

- Number of EVs or ZEVs registered and/or purchased.
- Number of publicly accessible installed charging stations by type (e.g., Level 2 or DC Fast Chargers).
- Uptime hours (for chargers).
- Number of maintenance/repair workers trained.

PCAP Measure 3. Increase the number of zero emission and electric vehicles in state and local government fleets.

Promote the adoption of ZEVs and EVs in state and local fleets such as school buses, transit buses, garbage trucks, emergency vehicles and off- and onroad construction vehicles. As state and local governments adopt these new low-emission vehicles, this measure will also focus on the decommissioning of high-emission vehicles as they are replaced in public fleets.

Quantified GHG Reductions

PCAP Measure	GHG reductions (MMTCO ₂ e), 2025-2030	GHG reductions (MMTCO ₂ e), 2025-2050
Increase the number of zero emission and electric vehicles in state and local government fleets.	0.05 - 0.07	1.3 - 2.9

Appendix E provides information on how these GHG emission reductions were quantified. The projects listed within this sector are illustrative examples of what could be funded. This is not the comprehensive list of projects that will be funded in this sector.

Key Implementing Agencies

Lead Activity Implementer:

- **NCDOT:** Implements the NC Clean Transportation Plan and coordinates the NEVI Program in the State.

- **NCDEQ:** Coordinates the implementation of the Volkswagen Mitigation Plan to support the adoption of EV charging infrastructure.

Regional Coordination and Implementation Support:

- **NC Public School Districts:** Manages and maintains fleets of over 14,000 school buses serving over 800,000 students across the state.
- **NC Department of Public Instruction:** Oversees and provides guidance for NC Public Schools Districts including coordinating communications and programming for school buses fleet transformation.
- **NC Department of Administration:** Manages and maintains a fleet of over 7,500 personal vehicles for state officials requiring personal transportation for their job.
- **Regional Transit Authorities:** Manages and maintains bus fleets for 16 major regions of NC.
- **COGs/MPOs/Local Governments:** Supports local implementation and coordination of EV adoption mechanisms, EV charging infrastructure expansion, and workforce development.
- **Local Air Quality Programs:** Supports implementation of air quality requirements including transitioning to lower emission EVs and ZEVs. These programs include but are not limited to:
 - Mecklenburg County Land Use and Environmental Services – Air Quality
 - Asheville-Buncombe Air Quality Agency
 - Forsyth County Office of Environmental Assistance and Protection

Implementation Activities and Milestones

Activities that may be used to implement this measure include, but are not limited to:

- **Transition Public Fleets to EVs or ZEVs:** Increase funding to cover the 37 proposed or unfunded projects across NC to transition public fleets to EVs or ZEVs which currently total about \$2.7 billion in funding requested. These requests include school buses, public transit buses and vans, garbage trucks, emergency vehicles (ambulances, firetrucks, police vehicles, other on and off-road vehicles), and off-road maintenance vehicles, all of which would provide significant GHG reductions and air quality benefits to align with existing state priorities.
- **Transition Public Fleets to Lower Emission Diesel or Hybrid Alternatives (Non-EV):** For some vehicles, EV or ZEV alternatives may not exist or may be too expensive when comparing the costs to the GHG reductions and other benefit values. Transitioning to vehicles with lower emission fuel options and more efficient engines provides an alternative to EVs and ZEVs, where appropriate. The aim of this activity would be to increase the

funding available to cover the 67 proposed or unfunded projects across NC to transition public fleets to EVs or ZEVs which currently total about \$56 million in requested funding. These requests include school buses, public transit buses and vans, garbage trucks, emergency vehicles (ambulances, firetrucks, police vehicles, other on and off-road vehicles), and off-road maintenance vehicles, all of which would provide significant GHG reductions and air quality benefits to align with existing state priorities.

- **Establish Decommissioning and Repurposing Programs for Replaced Higher Emission Fleet Vehicles:** Support policy and programming to systematically remove high-emission fleet vehicles as new low-emission alternatives take their place. Partner with local governments operating such fleets and private partners to establish best practices for vehicle decommissioning to maintain necessary fleet coverage and minimize the waste produced in the transition to low-emission vehicles.
- **Expand EV-Trained Workforce:** Conduct state and local workforce assessments to understand gaps in the labor market needed to support widespread EV adoption. Partner with technical and community colleges to provide workforce development programs to support the deployment of EVs and the installation and maintenance of EV infrastructure throughout the state.

Authority to Implement

Aspects of this measure focus on providing incentives and funding for low- or ZEVs that could be implemented with existing authority. NCDEQ has administered Transportation sector emission reduction grant programs for over two decades and is well positioned to do the same with this CPRG opportunity. Cabinet agencies are also instructed to prioritize ZEVs in the purchase of new MHD vehicles. The NC Department of Administration has been instructed to add MHD ZEVs to state term contracts for its replacement vehicle program. Several existing EOs further support this measure, including:

- **EO 271:** Instructs cabinet agencies to pursue and invest eligible federal funds, in a manner consistent with applicable law, toward growing the MHD ZEV market in NC, including but not limited to investing in charging infrastructure and vehicle purchase incentives. Cabinet agencies are instructed to support an affordable and reliable transition to ZEVs in the MHD sector, including but not limited to increasing affordability and access to MHD ZEVs in underserved communities.
- **EO 246:** NC will strive to accomplish the following goals related to transportation sector emissions: Increase the total number of registered ZEVs to at least 1,250,000 by 2030 and increase the sale of ZEVs so that 50 percent of in-state sales of new vehicles are zero-emission by 2030.

Additionally, EO 246 instructs cabinet agencies to invest applicable federal and state funding, consistent with applicable law, with an emphasis on achieving directives in this EO and EOs 80 and 218, including but not limited to actions that reduce GHG emissions and air

pollution, promote resiliency, invest in historically underserved communities, increase affordability for low- and moderate-income households, advance health equity, and create jobs and economic growth through a clean NC economy.

- **EO 80:** NC's Commitment to Address Climate Change and Transition to a Clean Energy Economy, charged the Department of Environmental Quality, NCDEQ, with collaborating with businesses, industries, power providers, technology developers, NC residents, local governments, and other interested stakeholders to increase the utilization of clean energy technologies, energy efficiency measures, and clean transportation solutions.

Geographic Coverage

The geographical coverage of this measure will include the state of North Carolina with a specific emphasis on LIDACs.

Relevant Funding Sources

North Carolina has identified a total of \$64.3 million in existing funding awards from a variety of awards for school bus fleet electrification. For example, the state will receive 26.7 million in federal funding earmarked for purchasing 114 electric school buses through the EPA's Clean School Bus Grant Program.

LIDAC Benefits

The actions in the measure will not only reduce GHGs in and around LIDAC communities, but the actions will also reduce other air pollutants, such as fine particulate matter (PM_{2.5}) and ozone. The state of North Carolina is in attainment for both PM_{2.5} and ozone and further reducing these criteria pollutants will help ensure the state remains in attainment given any future regulatory actions by the EPA.

LIDAC areas are commonly found where the main highway corridors intersect with large cities, especially seen in Raleigh/Durham, Greensboro/Winston-Salem, Charlotte, and Fayetteville. Reducing emissions from the transportation sector has the greatest health benefits to LIDAC communities especially for respiratory illnesses. Additional benefits of reduced noise pollution can be realized with the use of EVs over ICEs.

Metrics for Tracking Progress

Examples include:

- Number of electric or ZEV buses/vehicles procured.
- Number of public fleets or school districts with EV or ZEVs.

PCAP Measure 4. Pursue programs to increase efficiency and reduce GHG emissions at port/freight terminals.

This measure aims to pursue programs that aim to improve energy efficiency associated with freight shipping across the State and lower emissions along the State’s critical freight corridors, including railway terminals and sea and inland ports. These programs may include upgrading technology at freight terminals and ports, expanding more efficient freight corridors across the state, and coordinating with private industry to increase electrification of equipment.

Quantified GHG Reductions

PCAP Measure	GHG reductions (MMTCO ₂ e), 2025-2030	GHG reductions (MMTCO ₂ e), 2025-2050
Pursue programs to increase efficiency and reduce GHG emissions at port/freight terminals.	0.01 – 0.05	0.11 – 0.55

Appendix E provides information on how these GHG emission reductions were quantified. The projects listed within this sector are illustrative examples of what could be funded. This is not the comprehensive list of projects that will be funded in this sector.

Key Implementing Agencies

Lead Activity Implementer:

- **NCDOT:** Oversees the NC Port Authority, the Rail Division, and is responsible for the implementation of the 2017 Statewide Multimodal Freight Plan which includes GHG emissions reductions goals.

Regional Coordination and Implementation Support:

- **NC Port Authority:** Operates and oversees all ports in NC as an enterprising agency under NCDOT; this includes the two primary ports in Wilmington and Morehead City as well as the inland terminals in Greensboro and Charlotte.
- **NC Rail Division (NCDOT):** Operates and oversees the State’s rail corridors and terminals and is responsible for the implementation of the 2015 Comprehensive State Rail Plan.
- **Freight Companies with In-State Operations:** Supporting the transition to lower-emission, high efficiency equipment and mechanisms.
- **Local Air Quality Programs:** Supports implementation of air quality requirements including promoting lower emission transportation solutions. These programs include but are not limited to:

- Mecklenburg County Land Use and Environmental Services – Air Quality
- Asheville-Buncombe Air Quality Agency
- Forsyth County Office of Environmental Assistance and Protection

Implementation Activities and Milestones

Activities that may be used to implement this measure include, but are not limited to:

- **Significantly increase efficiency of freight container shipment system to reduce GHG emissions and foster many other benefits.** Currently, North Carolina’s intermodal container rail service moves freight from the Port of Wilmington to Charlotte on the Queen City Express and Rocky Mount on the new Wilmington Midwest Express. In fiscal year 2023 (July 1, 2022 – June 30, 2023) the intermodal rail volume was 15,186 containers. At present, the service is capped at about 16,000 containers per year due to the positioning and length of rail tracks for loading intermodal flat cars and lack of storage for cars awaiting loads at the Port of Wilmington. Using funding provided by a RAISE grant from U.S. Department of Transportation (USDOT), NC Ports will complete a project by the end of 2024 to build a dedicated Intermodal Rail Yard at the Port of Wilmington that will expand rail capacity to more than 50,000 container rail movements annually. This level of activity has the potential to divert nearly 250,000 container boxes from trucks to rail at the Port of Wilmington over the next decade. North Carolina's goal is to secure operating funds to maximize utilization of this new intermodal container shipping capacity as quickly as possible over the next three years (2025-2028) to reduce GHG and other pollutant emissions as quickly as possible.
- **Support Equipment Electrification at Ports:** Supporting equipment electrification at both deepwater ports, such as forklifts and small on-site vehicles, will reduce GHG emissions locally and provides immediate reductions. This activity may involve replacing outdated equipment initially and scaling up electric equipment in the future to meet demand at the ports.
- **Deploy Shore Power:** Assess the electricity needs at ports to allow for the deployment of shore power, enabling ships to stop idling while docked. Install the necessary electricity infrastructure at ports to provide and maintain shore power on site and consider using low-emission electricity sources such as solar or wind power.

Authority to Implement

Aspects of this measure focus on providing incentives and gap funding for intermodal rail which promotes diversion of MHD trips and reductions in VMT. This measure could be implemented with existing NCDOT NC Ports authority. However, several existing EOs further support this measure, including:

- **EO 271:** Instructs cabinet agencies to pursue and invest eligible federal funds, in a manner consistent with applicable law, toward growing the MHD ZEV market in North Carolina, including but not limited to investing in charging infrastructure and vehicle purchase incentives. Cabinet agencies are instructed to support an affordable and reliable transition to ZEVs in the MHD sector, including but not limited to increasing affordability and access to MHD ZEVs in underserved communities.
- **EO 246:** North Carolina will strive to accomplish the following goals related to transportation sector emissions: Increase the total number of registered ZEVs to at least 1,250,000 by 2030 and increase the sale of ZEVs so that 50 percent of in-state sales of new vehicles are zero-emission by 2030.

Additionally, EO 246 instructs cabinet agencies to invest applicable federal and state funding, consistent with applicable law, with an emphasis on achieving directives in this EO and EOs 80 and 218, including but not limited to actions that reduce GHG emissions and air pollution, promote resiliency, invest in historically underserved communities, increase affordability for low- and moderate-income households, advance health equity, and create jobs and economic growth through a clean North Carolina economy.

- **EO 80:** North Carolina's Commitment to Address Climate Change and Transition to a Clean Energy Economy, charged NCDEQ with collaborating with businesses, industries, power providers, technology developers, North Carolina residents, local governments, and other interested stakeholders to increase the utilization of clean energy technologies, energy efficiency measures, and clean transportation solutions.

Geographic Coverage

The geographical coverage of this measure will include the transportation routes for the movement of freight between the Wilmington port and inland areas such as Charlotte and Rocky Mount.

Relevant Funding Sources

Funds from the EPA Clean Ports Program may serve as an additional source of funding for the electrification of equipment at the port, but CPRG may serve as the best (only) source of funding for maximizing the utilization of the new intermodal container shipping capacity at the port.

LIDAC Benefits

The actions in the measure will not only reduce GHGs in and around LIDAC communities, but the actions will also reduce other air pollutants, such as fine particulate matter (PM_{2.5}) and ozone. The state of North Carolina is in attainment for both PM_{2.5} and ozone and further

reducing these criteria pollutants will help ensure the state remains in attainment given any future regulatory actions by the EPA.

LIDAC areas are commonly found where the main highway corridors intersect with large cities. Therefore, maintaining and expanding the intermodal rail connections between the port and cities will divert MHD truck trips and emissions providing health benefits to LIDAC communities along those routes and at each of the route endpoints.

Metrics for Tracking Progress

Examples include:

- Distance of new rail added.
- Equipment in Ports inventory electrified.

PCAP Measure 5. Pursue programs to improve the quality of life and reduce GHG emissions for all North Carolinians.

The purpose of this measure is to leverage and adopt innovative methods, technologies, and programs to reduce VMT, increase access to multimodal transportation, increase support for bike and pedestrian-friendly infrastructure, and create equitable access to healthier living and working environments across the state.

Quantified GHG Reductions

PCAP Measure	GHG reductions (MMTCO ₂ e), 2025-2030	GHG reductions (MMTCO ₂ e), 2025-2050
Pursue programs to improve the quality of life and reduce GHG emissions for all North Carolinians. *	0.004	0.02

Appendix E provides information on how these GHG emission reductions were quantified.

*It should be noted that potential emission reductions shown here are for a subset (sidewalk projects) of the potential projects that could take place under this measure. Additional work is underway to estimate the more substantial GHG reductions associated with other potential projects (increased access to multi-model transit, zoning reforms, innovative technologies, etc.).

Key Implementing Agencies

Lead Activity Implementer:

- **NCDOT:** Oversees the Integrated Mobility Division that is responsible for developing bicycle and pedestrian plans and providing oversight of NC’s transit systems. The Department oversees and promotes transportation demand management (TDM) and has developed a VMT reduction toolkit that outlines TDM strategies. The Department is responsible for coordinating the implementation of the NC Clean Transportation Plan which seeks to reduce emissions from the transportation sector.

Regional Coordination and Implementation Support:

- **COGs/MPOs/RPOs/Local Governments:** Supports local implementation and coordination of programs supporting decreasing VMTs.
- **Local Air Quality Programs:** Supports implementation of air quality requirements including solutions for reducing overall transit related GHG emissions. These programs include but are not limited to:
 - Mecklenburg County Land Use and Environmental Services – Air Quality
 - Asheville-Buncombe Air Quality Agency
 - Forsyth County Office of Environmental Assistance and Protection
- **Local Businesses and Businesses with in-State Operations:** Supports programs to encourage low-emission commuting options such as telecommuting, carpooling, and non-vehicular transportation, like biking.

Implementation Activities and Milestones

Activities that may be used to implement this measure include, but are not limited to:

- **Promote Bike/Pedestrian-Friendly Infrastructure and Programming:** Create living spaces that encourage biking and walking as an accessible and safe mode of transportation both decreases GHG emissions and increases the quality of life for North Carolinians benefiting from more exercise and less air pollution. Encouraging public information campaigns around the benefits of biking and walking, in addition to safety campaigns, could improve public opinion around finding alternatives to single-passenger vehicle travel. Additionally, supporting programs to incorporate bike lanes and pedestrian zones in more urban areas in particular is necessary to ensure biker and pedestrian safety. Further efforts such as financial incentives for e-bikes also have potential to decrease VMT, improve quality of life, and achieve more equitable outcomes in this arena. Local governments also can improve pedestrian accessibility and safety by implementing the Complete Streets principles including leveraging maintenance activities to add complete street improvements (e.g., sidewalk maintenance).
- **Collaborate with Businesses to Reduce VMT:** Businesses in NC have the authority to make smart choices to encourage low-carbon commuting options that work for their company, improve the lives of NC workers, and reduce VMT. Government entities and other organizations can engage with the private sector to encourage commuting solutions such as

telecommuting schedules (i.e., hybrid or remote work), implementing incentives like employee cash out programs and guaranteed ride home programs to promote carpooling, walking, biking, or commuting on public transit. Additionally, implementing infrastructure improvements, like expanding broadband access, and investing in transit stop upgrades will make these options more accessible and attractive for NC workers.

- **Support Land Development and Zoning Efforts Aimed at Reducing VMT:** Support local efforts to allow for greater ease of compact development, bike lanes, car-free zones, and other strategies in new and existing developments to make micro-modal transportation accessible and safe. Focus on climate-smart development using mixed use land zoning, compact development strategies, transit-oriented planning, and enforcing Development Impact Mitigation programs.
- **Support Investments in Public Transit and Multi-Modal Infrastructure:** Invest in public transportation such as, but not limited to, bus lanes, passenger and light rail infrastructure, transportation hubs, transportation demand strategies, and “last mile” transportation solutions. Utilize state funding within existing authority, federal funding, and finance strategies to support these investments, and coordinate with local governments to provide technical assistance and planning support for projects within their jurisdiction.

Authority to Implement

Aspects of this measure focus on providing incentives and gap funding for the adoption of innovative methods, technologies, and programs to reduce VMT, increase access to multimodal transportation, increase support for bike and pedestrian-friendly infrastructure, and create equitable access to healthier living and working environments across the state. This measure could be implemented with existing NCDOT authority to manage such projects through FHWA and FTA, but as outlined, state restrictions on spending levels by project type and prohibitions on direct state funding for stand-alone bicycle and pedestrian projects hamper the state’s ability to fully invest in strategies outlined here. However, several existing EOs further support this measure, including:

- **EO 246:** Required the development of the North Carolina Clean Transportation Plan. North Carolina will strive to accomplish the following goals related to reducing transportation sector emissions: Increase the total number of registered ZEVs to at least 1,250,000 by 2030 and increase the sale of ZEVs (i.e., 50 percent of in-state sales of new vehicles are zero-emission by 2030).

Additionally, EO 246 instructs cabinet agencies to invest applicable federal and state funding, consistent with applicable law, with an emphasis on achieving directives in this EO and EOs 80 and 218, including but not limited to actions that reduce GHG emissions and air pollution, promote resiliency, invest in historically underserved communities, increase affordability for low- and moderate-income households, advance health equity, and create jobs and economic growth through a clean North Carolina economy.

- **EO 80:** North Carolina's Commitment to Address Climate Change and Transition to a Clean Energy Economy, charged NCDEQ with collaborating with businesses, industries, power providers, technology developers, North Carolina residents, local governments, and other interested stakeholders to increase the utilization of clean energy technologies, energy efficiency measures, and clean transportation solutions.

Geographic Coverage

The geographical coverage of this measure will include the state of North Carolina with a specific emphasis on LIDACs. NC is already working on developing bicycle and pedestrian plans as well as promoting VMT reduction programs such as Travel Demand Management and investment in transit in all 100 counties.

Relevant Funding Sources

FHWA provides funding to reduce transportation measures through both the Congestion Mitigation Air Quality (CMAQ) Program and the Carbon Reduction Program (CRP). While the purpose of the CMAQ Program is to reduce criteria pollutants, projects selected for funding also result in carbon emission reductions, which are calculated and reported on CMAQ applications. The purpose of CRP is GHG reductions through reducing carbon in transportation projects. NC's apportionment for the CRP is \$170,984,555.

LIDAC Benefits

The actions in the measure will not only reduce GHGs in and around LIDAC communities, but the actions will also reduce other air pollutants such as fine particulate matter (PM_{2.5}) and ozone. The state is in attainment for both PM_{2.5} and ozone and further reducing these criteria pollutants will help ensure the state remains in attainment given any future regulatory actions by the EPA.

LIDAC areas in NC are commonly found where the main highway corridors intersect with large cities, especially seen in Raleigh/Durham, Greensboro/Winston-Salem, Charlotte, and Fayetteville. Reducing emissions from the transportation sector has the greatest health benefits to LIDAC communities especially for respiratory illnesses.

Additional economic and environmental benefits stem from land-use planning reforms in support of VMT reduction strategies. These benefits can include lowered housing costs in high demand areas, decreased transportation costs and financial risk through decreased dependency on private vehicle ownership, decreased or eliminated work commutes, greater access to employment opportunities, increased foot traffic to local businesses, economic resilience through self-sustaining neighborhoods, and decreased energy consumption through compact development.

Metrics for Tracking Progress

Examples include:

- Miles of new bike lanes or trails.
- Frequency and coverage of public transit services.
- Miles of safe pedestrian infrastructure.
- Average distance to crucial amenities for local residents.
- Changes in population density in urban cores.
- Annual transit ridership.
- Changes in VMT.

4.2 Electricity

PCAP Measure 6. Increase the amount of electricity generated by low and no carbon energy resources in NC.

For this measure, NC's CPRG work will focus on creating programs and incentives to increase low and no carbon distributed energy resources, focused on but not limited to residential, commercial, government, institutional, and other small scale solar, with an emphasis on adding solar in underrepresented communities (LIDAC) and for low- and moderate-income residents.

As other sectors seek to electrify to reduce emissions, being able to source that electricity from renewable resources is what drives those reductions. Increasing the amount of electricity generated from renewable resources will help offset generation from carbon-emitting sources.

Utility scale power generation over the last 15 years has shifted away from coal and toward natural gas, accompanied by a dramatic rise in large scale utility solar generation, which now supplies more than 9% of the state's power generation. This shift continues toward goals defined in EO 246 and House Bill 951 Energy Solutions for North Carolina (HB 951), which outlines a 70% reduction in carbon emissions by 2030 and carbon neutrality by the year 2050. The North Carolina Utilities Commission is charged with developing a Carbon Plan to achieve these reductions. For residential and other small scale distributed solar, NC lags other states, ranking just 17th in residential net-metered solar capacity and 28th in projected solar growth over the next 5 years.

Quantified GHG Reductions

PCAP Measure Actions	GHG reductions (MMTCO ₂ e), 2025-2030	GHG reductions (MMTCO ₂ e), 2025-2050
Implement residential and community solar through EnergizeNC.	0.015 - 0.15	0.74 -1.2
Develop programs and incentives to facilitate small scale solar installments by local governments, commercial entities, institutions, and others. (Per \$10,000,000)	0.008	0.04

Appendix E provides information on how these GHG emission reductions were quantified. The projects listed within this sector are illustrative examples of what could be funded. This is not the comprehensive list of projects that will be funded in this sector.

Key Implementing Agencies

Lead Activity Implementer:

- EnergizeNC Partners:
 - NCDEQ
 - NC Clean Energy Fund
 - NC Clean Energy Technology Center
 - Advanced Energy

Regional Coordination and Implementation Support:

- NC Utilities Commission – Public Staff
- Other state agencies and state educational facilities
- Local governments, including educational and institutional entities

Implementation Activities and Milestones

Activities that may be used to implement this measure include, but are not limited to:

- Install solar at low- and moderate-income residences, multifamily residences, and other locations in NC through the EnergizeNC program, with storage added at select critical locations as appropriate.
- Identify and/or develop programmatic pathways and incentives to encourage installation of solar at local government, educational, commercial, and other sites, especially in underserved locations in the state, possibly including storage at critical facilities in vulnerable communities, where appropriate.
- Explore partnerships to provide solar information, technical assistance, and funding to public school systems in selected underserved communities to implement energy efficiency measures, install solar panels, install small scale solar with optional battery backup and provide energy education, and other measures in K-12 schools.
- Provide information sharing and technical support opportunities to communities on incorporating energy and infrastructure needs, goals, and strategies in master plans, comprehensive plans, and small area plans.

Many of these activities are ongoing and will continue to be implemented throughout the state but need to be scaled up. Other activities, such as developing new policies to overcome community choice aggregation adoption barriers, still need to be implemented and depend on existing authorities. Some of these planned activities can commence in a shorter timeframe, contingent upon available resources (e.g., regional solar opportunity mapping), whereas others may take more time (e.g., adopting solar-ready ordinances) and may be location-dependent.

Authority to Implement

NC DEQ and/or the key implementing agencies listed have the authority to implement the planned programs and projects under this sector. Additionally, these programs and projects will support executive orders and legislation in NC, including:

- **EO 246:** Instructs cabinet agencies to invest applicable federal and state funding, consistent with applicable law, with an emphasis on achieving directives in this EO and EOs 80 and 218, including but not limited to actions that reduce GHG emissions and air pollution, promote resiliency, invest in historically underserved communities, increase affordability for low- and moderate-income households, advance health equity, and create jobs and economic growth through a clean NC economy.
- **EO 80:** NC's Commitment to Address Climate Change and Transition to a Clean Energy Economy, charged the NCDEQ with collaborating with businesses, industries, power providers, technology developers, NC residents, local governments, and other interested stakeholders to increase the utilization of clean energy technologies, energy efficiency measures, and clean transportation solutions.

Geographic Coverage

The geographical coverage of this measure will include the state of North Carolina with a specific emphasis on LIDACs.

Relevant Funding Sources

NC anticipates receiving funding for state, local, and private efforts to support the transition to lower-emission energy sources for electricity. These sources include, but are not limited to:

- Federal tax incentives.
- The Greenhouse Gas Reduction Fund Solar for All Grant Program was created to expand the number of LIDACs that receive residential and community solar. NC has applied for \$250M in funding for EnergizeNC. Additional funding from the Greenhouse Gas Reduction Fund National Clean Investment Fund and Clean Communities Accelerator Fund could also fund similar projects.
- The Department of Agriculture's Rural Energy for America Program Grant provides funding to farmers and small businesses in rural areas who want to permanently reduce operating expenses by installing a solar energy system.
- Other federal funding for solar research, manufacturing incentives, and technological development to improve the reliability and affordability of wind energy and address barriers to wind energy deployment.

LIDAC Benefits

Through increased clean and renewable electricity generation, air quality improvements will be realized for communities in and around fossil fuel generating units. As the clean energy transition moves forward, the potential for new jobs, with a focus on training and developing a workforce in LIDACs presents an opportunity to bring additional benefits. Where distributed energy is used, opportunities also exist for cost savings and increased resilience.

Metrics for Tracking Progress

Examples include:

- Solar installations completed.
- Capacity of solar installations.
- Number of low-and moderate-income residents receiving solar.
- Number of LIDAC communities where installations are completed.
- Energy cost savings.

PCAP Measure 7. Implement measures to increase energy resiliency in NC communities.

Resilience Hubs support communities and the residents by providing a centralized location for distribution and services before, during, or after a natural hazard event. They can equitably enhance community resilience while simultaneously reducing GHG emissions. Within this measure NCDEQ could look to create a pilot program to install a Resiliency Hub and measure community impacts at K-12 public school systems (or any other appropriate community buildings) in potentially underserved communities (LIDACs) across the state, focused on the most overburdened/underserved communities first and those that are high risk for climate threats.

Quantified GHG Reductions

PCAP Measure	GHG reductions (MMTCO ₂ e), 2025-2030	GHG reductions (MMTCO ₂ e), 2025-2050
Implement measures to increase energy resiliency in NC communities.	0.02	2.08

Appendix E provides information on how these GHG emission reductions were quantified.

The projects listed within this sector are illustrative examples of what could be funded. This is not the comprehensive list of projects that will be funded in this sector.

Key Implementing Agencies

Lead Implementing Agencies:

- NC Emergency Management
- NC State Energy Office
- NC Office of Recovery and Resiliency

Regional Coordination and Implementation Support:

- Local governments, including educational and institutional entities

Implementation Activities and Milestones

Activities that may be used to implement this measure include, but are not limited to:

- **Implement Grid Resilience Projects in NC Communities:** Develop grid resilience projects with a focus on decreasing outage times for vulnerable and disadvantaged communities. This activity could include a variety of ways to mitigate, and recover from, disruptions to the electric power grid from increased storm intensity by securing a diverse source of utility scale and distributed generation assets. Examples include hardening the grid/transmission infrastructure, reducing demand for power, and modernizing existing grid assets with smart meters, controllers, automation, and analytics to manage a diverse source of power supply, transmission, and distribution system components, with an emphasis on vulnerable communities and critical infrastructure locations.
- **Develop an NC Resiliency Hub Advisory Council:** Work with a diverse group of stakeholders to develop a program to select and implement a Resiliency Hub(s) in disadvantaged and/or vulnerable communities to provide emergency services to the community and residents. The Hub locations will be evaluated for additional energy saving and resilience measures, such as energy efficiency projects, electrification projects, solar installation, energy storage, EV bus charging, emergency shelter facilities, and related projects that can be used to measure savings and demonstrate resilience and emergency response benefits.

To advance this measure, NCDEQ envisions a program that would follow the timetable laid out below.

- **Year 1:** Work with the NC Resiliency Hub Advisory Council to evaluate potential locations.
- **Year 2:** Select locations and evaluate to determine potential project scope and estimated savings.

- **Year 2-3:** Implement hub(s).
- **Year 3-5:** Measure and communicate savings and resiliency benefits.

Authority to Implement

NC DEQ and/or the key implementing agencies listed have the authority to implement the planned programs and projects under this sector and can work with existing entities such as the State Disaster Recovery Task Force and others on the implementation of these programs and projects. Additionally, these programs and projects will support executive orders and legislation in NC, including:

- **EO 246:** NC's Transformation to a Clean, Equitable Economy instructs cabinet agencies to invest applicable federal and state funding, consistent with applicable law, with an emphasis on achieving directives in this EO and EOs. 80 and 218, including but not limited to actions that reduce GHG emissions and air pollution, promote resiliency, invest in historically underserved communities, increase affordability for low- and moderate-income households, advance health equity, and create jobs and economic growth through a clean NC economy.
- **EO 80:** NC's Commitment to Address Climate Change and Transition to a Clean Energy Economy, charged NCDEQ, with collaborating with businesses, industries, power providers, technology developers, NC residents, local governments, and other interested stakeholders to increase the utilization of clean energy technologies, energy efficiency measures, and clean transportation solutions.
- **NC Clean Energy Plan:** This plan presents goals to reduce electric power sector GHG emissions by 70% below 2005 levels by 2030 and attain carbon neutrality by 2050; foster long-term energy affordability and price stability for NC's residents and businesses; and accelerate clean energy innovation, development, and deployment to create economic opportunities for both rural and urban areas of the state. A key recommendation identified in the plan is modernizing the grid to support clean energy resource adoption, resilience, and other public interest outcomes.

Geographic Coverage

The geographical coverage of this measure will include the state of North Carolina with a specific emphasis on underserved and vulnerable communities.

Relevant Funding Sources

- DOE Grid Resilience Program, BIL Section 40101(d). NC has received \$18.2M in funding for the first two years and will receive \$8.6M for year three. The state is providing the required 15% match.

- DOE Grid Innovation Fund, GRIP Program. NC submitted three projects in funding round one but did not receive funds; NC has submitted two projects in round two.
- Other DOE funding is available, including Grid Resilience Utility and Industry Grants, the Energy Improvements in Rural or Remote Areas Program, Transmission Siting and Economic Development (TSED) Grant Program, and other opportunities as shown at: <https://www.energy.gov/qdo/grid-and-transmission-program-conductor>.

LIDAC Benefits

Community resilience hubs can provide highly localized benefits across North Carolina. With a focus on installing hubs in LIDACs, the benefits this measure can bring to these communities include additional public safety and health benefits (e.g., if hubs can be offered as cooling centers for extreme heat days), reduced energy costs for residents and local schools or other institutions, improved local air quality through transitions to EVs and ZEVs and onsite renewable electricity, increased resilience in highly vulnerable areas, and potential new jobs and training opportunities while also lessening financial disruptions and burdens due to extreme weather (e.g., from blackouts or flooding events). From a societal perspective, Resilience Hubs can also serve to bring more cohesion and a sense of place for residents.

Metrics for Tracking Progress

- Number of Resiliency Hubs installed.
- Number of LIDAC communities directly impacted.
- Number of additional energy measures installed.
- Amount of energy savings.

4.3 Buildings

PCAP Measure 8. Reduce per square foot energy usage in buildings in NC.

Establish programs and initiatives to increase energy efficiency in buildings, including government, commercial, industrial, institutional and residential, by conducting energy audits, installing equipment upgrades, improving energy management systems, weatherization, training, materials management, recycling, and other measures, for new buildings and existing buildings.

For the purposes of this program, energy efficiency and decarbonization projects for publicly owned water and wastewater systems that service buildings will be allowed and counted under this priority measure.

Quantified GHG Reductions (MTCO₂e)

Reductions from this measure will be attributed to increasing energy efficiency and reducing energy usage with a long-term goal of 25% reduction across both residential and commercial sectors.

PCAP Measure	GHG reductions (MMTCO ₂ e), 2025-2030	GHG reductions (MMTCO ₂ e), 2025-2050
Reduce per square foot energy usage in buildings in NC	95.3	476.7

Appendix E provides information on how these GHG emission reductions were quantified.

The projects listed within this sector are illustrative examples of what could be funded. This is not the comprehensive list of projects that will be funded in this sector.

Key Implementing Agencies

Lead Activity Implementer:

- NCDEQ: Coordinates the implementation of funding mechanisms to the MSAs below and to other local governments. Waste Reduction Partners provide technical assistance and energy audits.

Regional Coordination and Implementation Support:

- Centralina Council of Government
- Central Pines Council of Government
- Other N.C. Councils of Government and local governments
- NC Weatherization Assistance Program (NC WAP): NC WAP has helped weatherize more than 1,250 homes and repair 800 Heating, Ventilation and Air Conditioning (HVAC)

units. Through the Low-Income Home Energy Assistance Program, the State Energy Office's energy projects were estimated to reduce NC's annual electricity sector emissions of carbon dioxide, sulfur dioxide, and oxides of nitrogen by 1,461 tons/year, 0.6 tons/year, and 0.9 tons/year, respectively.

- Local NC Air Quality Programs
 - Mecklenburg County Land Use and Environmental Services – Air Quality
 - Asheville-Buncombe Air Quality Agency
 - Forsyth County Office of Environmental Assistance and Protection

Implementation Activities and Milestones

Activities that may be used to implement this measure include, but are not limited to:

- Explore pathways to offer building energy audits and site assessments to identify potential energy efficiency projects, to identify and develop funding sources, and to offer incentives for implementation across all sectors.
- Provide support for energy efficiency and electrification projects on the waiting lists for state agencies, state universities, and community colleges in the NC Utility Savings Initiative program. Prioritize and manage these wait lists based on the entity's needs and energy savings potential.
- Support local governments in reaching their energy efficiency and electrification goals. This includes improving building efficiency, electrification retrofits, street and stadium lighting retrofits, microgrids, and more.
- Work with local utility providers to better understand their energy efficiency programs and offerings across all sectors.
- Reduce deferrals on the Weatherization Assistance Program (WAP) deferral lists of single-family homes to allow those homes to be eligible for weatherization; provide multifamily deep retrofits and focus on preservation of Naturally Occurring Affordable Housing (NOAH).
- Develop a revolving loan fund for energy efficiency and electrification projects to reduce energy usage at public, private, institutional, and/or industrial entities.
- Work with stakeholders to create low or no cost bridge loan options for energy efficiency projects in buildings.
- Encourage the utilization of Guaranteed Energy Savings Performance Contracts (GESPC) to implement and finance major facility upgrades that reduce utility consumption and costs in government-owned buildings.
- Utilize BIL and IRA funding to expand workforce training opportunities in clean energy and create long-term jobs with family-sustaining wages and benefits for low-income communities and displaced workers.

- Implementation of the NC's Home Energy Rebates (HER, also known as HOMES, Homeowner Managing Energy Savings) and NC's Home Electrification and Appliance Rebates (HEAR, also known as HEEHRA, the High Efficiency Home Energy Rebate Act), IRA residential rebate programs in NC.

Authority to Implement

In 2002, North Carolina G.S. §143-64.12 set a goal for all state agencies and state institutions of higher learning to reduce energy consumption by 30% from their 2002/2003 baseline levels by 2015.²⁹

To assist with this goal, the statute also established the Utility Savings Initiative (USI) in DEQ, which is charged with the management of energy, water, and other utility usage. Further building on this effort in 2018, Executive Order 80 (EO80) increased the energy reduction goal to 40% per square foot by 2025 for Cabinet Agencies.³⁰

Higher education institutions, K-12 schools, and governmental units are encouraged to adopt the same 40% energy reduction goal. USI supports all state-owned buildings in achieving these efficiency targets. In fact, the USI program, since inception, has avoided the state over \$1.3 billion dollars in utility costs since 2002/2003.

Additionally, these programs and projects will support executive orders and legislation in NC, including:

- **EO 246:** NC's Transformation to a Clean, Equitable Economy instructs cabinet agencies to invest applicable federal and state funding, consistent with applicable law, with an emphasis on achieving directives in this EO and EOs. 80 and 218, including but not limited to actions that reduce GHG emissions and air pollution, promote resiliency, invest in historically underserved communities, increase affordability for low- and moderate-income households, advance health equity, and create jobs and economic growth through a clean NC economy.
- **EO 80:** NC's Commitment to Address Climate Change and Transition to a Clean Energy Economy, charged NCDEQ, with collaborating with businesses, industries, power providers, technology developers, NC residents, local governments, and other interested stakeholders to increase the utilization of clean energy technologies, energy efficiency measures, and clean transportation solutions.

²⁹ North Carolina G.S. §143-64.12. 2002. https://www.ncleg.gov/EnactedLegislation/Statutes/PDF/BySection/Chapter_143/GS_143-64.12.pdf

³⁰ North Carolina E.O. 80. 2018. <https://www.deq.nc.gov/environmental-assistance-and-customer-service/climate-change/eo80-nc-s-commitment-address-climate-change-transition/download>

Geographic Coverage

The geographical coverage of this measure will include the state of North Carolina with a specific emphasis on LIDAC and underserved communities. NC has been charged to develop specific actions to increase energy efficiency assistance within the state.

Relevant Funding Sources

Identification of other funding sources to support the measure (existing or planned):

- Federal tax incentives
- Federal IRA rebate programs:
 - Home Energy Rebates (HER)
 - Home Electrification and Appliance Rebates (HEAR)
- Utility Rebate Programs
- NC Weatherization Assistance Program and WAP Infrastructure Investment and Jobs Act (IIJA) funding
- GHG Reduction Fund Solar for All Program – NC has applied for \$250M in funding for Energize NC
- NC Repair and Renovation funding in the state of North Carolina biennial budget
- Training for Residential Energy Contractor (TREC) grant
- Energy Auditor Training grant
- Energy Efficiency Community Block Grants for energy efficiency
- Energy Efficiency Revolving Loan Fund Program
- Using GESPC as a financing mechanism
- Other funding, including private or local government funding.

LIDAC Benefits

Improving energy efficiency will bring benefits to LIDACs and underserved communities including reduced energy costs for residents and local schools or other institutions, improved local air quality, increased resilience in highly vulnerable areas, and potential new jobs and training opportunities while also lessening financial disruptions and burdens due to rising energy costs.

Metrics for Tracking Progress

Expected outputs and outcomes from the measure in the form of key performance metrics:

- Number of energy audits or site assessments conducted.
- Number of energy efficiency projects successfully installed across all sectors.
- Amount of funding secured for energy efficiency projects across all sectors.
- Number of GESPCs entered into by governmental units.
- Energy reductions (kWh, therms, etc.) achieved and dollars saved from implementation of energy efficiency measures.
- Number of LIDAC communities directly impacted.

PCAP Measure 9. Decarbonize buildings in NC through replacement of fossil fuel combustion sources and reduction of other greenhouse gas emissions.

Establish programs and initiatives to remove fossil fuel combustion and other carbon emissions sources (e.g., refrigerants) in government, commercial, industrial, institutional and residential buildings through energy audits and assessments, identification of refrigerant use and leaks, and incentives programs for electrification technologies.

Quantified GHG Reductions

PCAP Measure	GHG reductions (MMTCO ₂ e), 2025-2030	GHG reductions (MMTCO ₂ e), 2025-2050
Decarbonization through building electrification and removal of GHG emissions sources, including refrigerants	35.9	179.5

Appendix E provides information on how these GHG emission reductions were quantified.

The projects listed within this sector are illustrative examples of what could be funded. This is not the comprehensive list of projects that will be funded in this sector.

Key Implementing Agencies

Lead Implementing Agency:

- NCDEQ

Regional Coordination and Implementation Support:

- NC regional COGs
- NC State Energy Office
- Local Air Quality Agencies (e.g., Mecklenburg County Land Use and Environmental Services – Air Quality, Asheville-Buncombe Air Quality Agency, Forsyth County Office of Environmental Assistance and Protection)

Implementation Activities and Milestones

Activities that may be used to implement this measure include, but are not limited to:

- Implement the HEAR IRA residential rebate programs in NC.
- Provide education and assistance on heat pump bulk purchase agreements.
- Provide education and assistance to identify, recover and properly dispose of high-global warming potential (GWP) hydrofluorocarbons (HFCs) used in existing appliances, air conditioning systems, and commercial chillers.
- Investigate opportunities that would expand combined heat and power (CHP) deployment for industrial, large commercial and public buildings.
- Provide education and assistance to encourage HVAC and water heating systems to be regularly commissioned or retro-commissioned in leased public buildings.
- Partner with external stakeholders to educate multiple sectors on the benefits of fuel-switching in the context of decarbonization, energy cost reductions, and facility management.
- Provide programs to incentivize the installation of electric residential appliances, such as the HEAR rebate program.

Authority to Implement

In 2002, North Carolina G.S. §143-64.12 set a goal for all state agencies and state institutions of higher learning to reduce energy consumption by 30% from their 2002/2003 baseline levels by 2015.³¹

To assist with this goal, the statute also established the Utility Savings Initiative (USI) in DEQ, which is charged with the management of energy, water, and other utility usage. Further building on this effort in 2018, Executive Order 80 (EO80) increased the energy reduction goal

³¹ North Carolina G.S. §143-64.12. 2002.
https://www.ncleg.gov/EnactedLegislation/Statutes/PDF/BySection/Chapter_143/GS_143-64.12.pdf

to 40% per square foot by 2025 for Cabinet Agencies.³² Higher education institutions, K-12 schools, and governmental units are encouraged to adopt the same 40% energy reduction goal. USI supports all state-owned buildings in achieving these efficiency targets. In fact, the USI program, since inception, has avoided the state over \$1.3 billion dollars in utility costs since 2002/2003.

Additionally, these programs and projects will support executive orders and legislation in NC, including:

- **EO 246:** NC's Transformation to a Clean, Equitable Economy instructs cabinet agencies to invest applicable federal and state funding, consistent with applicable law, with an emphasis on achieving directives in this EO and EOs. 80 and 218, including but not limited to actions that reduce GHG emissions and air pollution, promote resiliency, invest in historically underserved communities, increase affordability for low- and moderate-income households, advance health equity, and create jobs and economic growth through a clean NC economy.
- **EO 80:** NC's Commitment to Address Climate Change and Transition to a Clean Energy Economy, charged NCDEQ, with collaborating with businesses, industries, power providers, technology developers, NC residents, local governments, and other interested stakeholders to increase the utilization of clean energy technologies, energy efficiency measures, and clean transportation solutions.

Geographic Coverage

The geographical coverage of this measure will include the state of North Carolina with a specific emphasis on LIDACs and underserved communities.

Relevant Funding Sources

- Federal tax incentives
- Federal IRA Rebate programs:
 - Home Energy Rebates (HER)
 - Home Electrification and Appliance Rebates (HEAR)
- Utility Rebate Programs
- NC Weatherization Assistance Program (WAP) and WAP IIJA Funding

³² North Carolina E.O. 80. 2018. <https://www.deq.nc.gov/environmental-assistance-and-customer-service/climate-change/eo80-nc-s-commitment-address-climate-change-transition/download>

- GHG Reduction Fund Solar for All Program: NC has applied for \$250M in funding for EnergizeNC.
- NC Repair and Renovation funding in the state of North Carolina biennial budget
- Training for Residential Energy Contractor (TREC) grant
- Energy Auditor Training grant
- Energy Efficiency Community Block Grants for energy efficiency
- Energy Efficiency Revolving Loan Fund Program

LIDAC Benefits

Reduced use of fossil fuels will result in improved indoor and local air quality, reduced energy burden, and bring potential new jobs and training opportunities for LIDACs. In implementing fuel switching measures and programs, particular attention should be paid to renter/owner dynamics and responsibilities for various energy utility bills to ensure additional costs/increased cost burdens are not being transferred to low-income households/renters.

Metrics for Tracking Progress

Examples include:

- Number of fossil fuel appliances and systems replaced with electric alternatives.
- Number of repaired or replaced refrigerant leaks.
- Amount of energy cost savings.
- Amount of fuel saved.
- Air pollution reductions.
- Number of LIDAC communities directly impacted.

4.4 Industry

PCAP Measure 10. Develop programs to support or incentivize implementation of energy efficiency and emissions reduction measures in NC industry.

Establish initiatives to increase energy efficiency in the industrial sector, including but not limited to energy assessments, strategic energy management, equipment upgrades, low carbon building/transportation materials, and waste heat reduction and utilization. Reduce GHG emissions with the transition toward less carbon-intensive production methods and materials, including use of low-carbon fuels and feedstocks, process equipment electrification, process improvements, and more appropriate material selections. This also includes the transition to onsite clean energy generation. Industry stakeholders have expressed the lack of trained workforce available to implement and maintain basic industry-related energy efficiency and equipment upgrades. To achieve the GHG reductions that come from industrial decarbonization, the current NC workforce will require additional trained workforce, which will be a focus for this measure.

Quantified GHG Reductions

PCAP Measure	GHG reductions (MMTCO ₂ e), 2025-2030	GHG reductions (MMTCO ₂ e), 2025-2050
Develop programs to support or incentivize implementation of energy efficiency, thermal strategies, and emissions reduction measures in NC industry	2.1-3.9	10.5-19.4

Appendix E provides information on how these GHG emission reductions were quantified.

The projects listed within this sector are illustrative examples of what could be funded. This is not the comprehensive list of projects that will be funded in this sector.

Key Implementing Agencies

Lead Activity Implementer:

- NCDEQ
- NC Department of Commerce
- Other NC State Departments

Implementation Activities and Milestones

Activities that may be used to implement this measure include, but are not limited to:

- **Establish an Industry Working Group:** Work directly with businesses and other industry stakeholders to form a working group dedicated to determining the needs and gaps for implementing these priority measures. Conduct outreach and education to businesses across the state, particularly in LIDAC communities.
- **Prepare a Trained Workforce:** Conduct state and local workforce assessments to understand gaps in the labor market needed to support widespread expansion of industrial energy efficiency installations, low- and zero-carbon fuels and feedstocks, and other newly deployed technologies. Engage and partner with technical and community colleges, established workforce development organizations, and industry and manufacturing alliances to provide workforce development programs in these focus areas.
- **Expand on Current Technical Assistance Programs:** Partner with existing technical assistance programs including Waste Reduction Partners and DEQ's ESI program, to expand the reach of these programs and identify potential energy savings projects. Provide resources and roadmaps for businesses to make informed decisions.
- **Provide Financial Incentives and Assistance:** Establish financial incentives and assistance programs that may support:
 - Technical assistance programs
 - Pilots that deploy innovative emission reduction technologies
 - Gap funding loans for IRA tax credits
 - Workforce development initiatives
 - Small businesses in LIDAC communities
 - Revolving loan funds for Environmental Stewardship Initiative (ESI) partners

Authority to Implement

DEQ receives state and federal funding to distribute in the form of grants and loans for a variety of environmental projects. DEQ awards millions in grant funding and other assistance each year to a variety of recipients, from local governments to businesses and non-profit organizations. Recurring and one-time funding sources provide opportunities for communities and governments across North Carolina to achieve their environmental stewardship goals. The Environmental Stewardship Initiative, housed in DEQ, recognizes and supports companies and facilities that go above and beyond to reduce their impact on the environment. Additionally, the programs and projects in the industrial sector will support executive orders and legislation in NC, including:

- **EO 246:** NC’s Transformation to a Clean, Equitable Economy instructs cabinet agencies to invest applicable federal and state funding, consistent with applicable law, with an emphasis on achieving directives in this EO and EOs 80 and 218, including but not limited to actions that reduce GHG emissions and air pollution, promote resiliency, invest in historically underserved communities, increase affordability for low- and moderate-income households, advance health equity, and create jobs and economic growth through a clean NC economy.
- **EO 80:** NC’s Commitment to Address Climate Change and Transition to a Clean Energy Economy, NCDEQ, with collaborating with businesses, industries, power providers, technology developers, NC residents, local governments, and other interested stakeholders to increase the utilization of clean energy technologies, energy efficiency measures, and clean transportation solutions. EO80 creates the Climate Change Interagency Council³³ to help the cabinet agencies work together to achieve those goals.

Geographic Coverage

The geographical coverage of this measure will include the state of North Carolina with a specific emphasis on LIDACs and underserved communities.

Relevant Funding Sources

The IRA has many tax credits available to incentivize the industrial sector to implement clean energy technologies. However, small companies lack the capital to bridge the cost gap until the tax credit is received. Financial assistance paired with the IRA tax credits can make these technologies feasible for smaller entities with less fluid capital.

There are currently two grant funded programs available in NC that offer industrial technical assessment (or energy audits):

- **Waste Reduction Partners:** NC-based no-cost energy efficiency assessment program administered by Land of Sky Regional Council in partnership with the NCDEQ Division of Environmental Assistance and Customer Service, helping to prevent pollution statewide. This program is funded in part by NC State Energy Program funds.³⁴
- **Industrial Assessment Center (IAC), University of North Carolina Charlotte (UNCC):** Nationwide technical assessment program based in Charlotte, NC sponsored and funded by DOE to strengthen small and medium-sized manufacturing firms.³⁵

³³ NCDEQ. “NC Climate Change Interagency Council.” <https://www.deq.nc.gov/energy-climate/climate-change/nc-climate-change-interagency-council>

³⁴ Waste Reduction Partners. “Energy Efficiency and Energy Management Services.” <https://wastereductionpartners.org/services/energy-efficiency-assesment>

³⁵ UNC Charlotte. “Industrial Assessment Center.” <https://iac.university/center/CC>

LIDAC Benefits

Based on a review of large point sources of industrial GHG emissions in NC using the EPA Facility-Level Information on Greenhouse Gases Tool and the CEJST data, there is overlap in these points sources and LIDAC areas in NC (e.g., for a phosphoric acid production facility in Eastern NC).³⁶ Industrial energy efficiency improvements and decarbonization will result in localized air quality benefits translating to improved health benefits (e.g., PM_{2.5} may lead to children living near industrial sites having a higher likelihood of asthma and overall population risk for heart disease).³⁷

Metrics for Tracking Progress

Examples include:

- Number of LIDAC communities directly impacted.
- Number of industry partners reached with technical assistance.
- Number of innovative emission-reduction technology pilots deployed.
- MMBTU energy saved per year.
- Number of people trained within the workforce.
- Number of trainees who secured jobs.
- Number of workforce training programs developed or expanded.

³⁶ EPA. "Facility Level Information on GreenHouse gases Tool (FLIGHT)." https://ghgdata.epa.gov/ghgp/main.do?site_preference=normal

³⁷ American Council on Energy Efficiency. "Funded Strategically, Industrial Decarbonization Can Cut Pollution in Disadvantaged Communities." December 2023. [Funded Strategically, Industrial Decarbonization Can Cut Pollution in Disadvantaged Communities | ACEEE](#)

4.5 Waste

PCAP Measure 11. Reduce food waste entering the waste management system to reduce the methane emissions from food waste landfilling, direct food to communities in need, and create organic resources through composting or digestion.

Across the country more than one-third of food goes uneaten each year. When individuals, businesses, non-profit organizations, and local governments reduce food waste, they lower their environmental impact, save money, and feed their community. In 2021, NC generated about 2.7 million tons of food waste. As food breaks down in landfills, it gives off methane, a powerful GHG that contributes to climate change. According to the EPA, each year wasted food in the United States produces the same GHG emissions as 42 coal-fired power plants and uses enough water and energy to supply 50 million homes. Nationwide, consumers, and the food industry lose \$285 billion annually in food waste. Despite the amount of food available, there are many North Carolinians who are food insecure, meaning they do not have reliable, consistent access to food. This measure aims to reduce food waste before it enters the waste management system as well as divert food waste from landfills.

Quantified GHG Reductions

PCAP Measure	GHG reductions (MMTCO ₂ e), 2025-2030	GHG reductions (MMTCO ₂ e), 2025-2050
Diversion of organics from landfills	0.89	4.45

Appendix E provides information on how these GHG emission reductions were quantified.

The projects listed within this sector are illustrative examples of what could be funded. This is not the comprehensive list of projects that will be funded in this sector.

Key Implementing Agency

Lead Activity Implementer:

- NCDEQ

Regional Coordination and Implementation Support:

- Public and private landfill management entities
- Local schools

- Local food banks
- Local municipalities

Implementation Activities and Milestones

Activities that may be used to implement this measure include, but are not limited to:

- **Install refrigerators in schools:** Evaluate the logistics needed to install refrigerators to store unused food that can be redistributed to children in need. Additionally, solicit proposals from individual schools or districts to install refrigerators at schools.
- **Transfer excess food to food banks:** Evaluate the logistics and policies needed to get excess food to food banks. Solicit proposals for pilot programs across NC.
- **Deploy food waste collection, digestion, and composting:** Residential organics collection, digestion, and composting pilot programs would support multiple projects as a proof-of-concept for greater investment in permanent city and county-level programming.

Authority to Implement

Four NC General Statutes govern the authority of the implementing agencies to carry out this measure:

- § 130A-309.04: Establishes the state's solid waste management policy and goals. This includes the directive to avoid waste disposal at landfill, with a preference for other methods in the following order: 1) Waste reduction at the source; 2) Recycling and reuse; 3) Composting; 4) Incineration with energy recovery; 5) Incineration without energy recovery. Additionally, this order requires state agencies to develop a waste recovery plan and encourages public-private partnerships to improve waste management outcomes.
- § 130A-309.09B: Governs local government bodies in their management of waste reduction programs and encourages the implementation of recycling, composting, and other sustainable waste management programs.
- § 130A-309.10: Prohibits acts relating to packaging to support recycling efforts and other sustainable waste management practices. Governs the disposal of coded plastics and other materials prohibited to landfill or incinerate.
- § 130A-309.11: Governs compost standards and applications to protect the state's natural lands and water sources from improper waste disposal.

Geographic Coverage

The actions within this measure are focused on the state of North Carolina with a specific emphasis on LIDACs.

LIDAC Benefits

Recovery of food waste that would otherwise be landfilled can bring multiple benefits to LIDACs. The discarded food can be diverted to individuals and families facing food insecurity. It can impact the agricultural sector by increasing the efficiency of food production and use. Avoiding landfilling of food waste reduces the amount of methane generated and emitted, thus improving local air quality in nearby communities which are frequently LIDACs. The recovery and reuse of food waste creates potential new jobs and training opportunities for LIDACs. The measure will focus on schools in LIDAC areas where recovered food can be provided to children in need.

Metrics for Tracking Progress

Examples include:

- Amount of food waste diverted from landfills.
- Number of students receiving diverted food.
- Policies and procedures adopted by communities.
- Avoided GHG emissions.
- Amount of digestate or compost available for agricultural purposes.

PCAP Measure 12. Decarbonize waste collection to reduce GHG emissions during the collection and transport of wastes through electrification of fleets or through engine conversion from diesel to electric motors.

This measure proposes the conversion of an existing municipal solid waste collection contract currently serviced with conventional diesel fueled trucks to an EV fleet or other low-carbon fuels (e.g., compressed natural gas or renewable natural gas). The project would include the option to receive funding for the installation of charging infrastructure at both the hauling company (for overnight charging) and the transfer station (for additional charging to complete collection routes). The benefits of this measure include reduced GHG emissions and co-pollutants.

Quantified GHG Reductions

PCAP Measure	GHG reductions (MMTCO ₂ e), 2025-2030	GHG reductions (MMTCO ₂ e), 2025-2050
Decarbonize waste collection system	0.04	0.140

Appendix E provides information on how these GHG emission reductions were quantified.

The projects listed within this sector are illustrative examples of what could be funded. This is not the comprehensive list of projects that will be funded in this sector.

Key Implementing Agency

Lead Implementing Agency:

- NC DEQ

Regional Coordination and Implementation Support:

- Public and private landfill management entities

Implementation Activities and Milestones

Activities that may be used to implement this measure include, but are not limited to:

- Issue request for proposals to pilot the replacement of diesel vehicles with electric motors and conversion of diesel to natural gas.

Authority to Implement

Four NC General Statutes govern the authority of the implementing agencies to carry out this measure:

- § 130A-309.04: Establishes the state's solid waste management policy and goals. This includes the directive to avoid waste disposal at landfill, with a preference for other methods in the following order: 1) Waste reduction at the source; 2) Recycling and reuse; 3) Composting; 4) Incineration with energy recovery; 5) Incineration without energy recovery. Additionally, this order requires state agencies to develop a waste recovery plan and encourages public-private partnerships to improve waste management outcomes.
- § 130A-309.09B: Governs local government bodies in their management of waste reduction programs and encourages the implementation of recycling, composting, and other sustainable waste management programs.
- § 130A-309.10: Prohibits acts relating to packaging to support recycling efforts and other sustainable waste management practices. Governs the disposal of coded plastics and other materials prohibited to landfill or incinerate.
- § 130A-309.11: Governs compost standards and applications to protect the state's natural lands and water sources from improper waste disposal.

Geographic Coverage

The geographical coverage of this measure will include the state of North Carolina with a specific emphasis on LIDACs.

LIDAC Benefits

The actions in this measure will not only reduce GHGs in and around LIDAC communities but will also reduce other air pollution such as fine particulate matter (PM_{2.5}) and ozone. The state of North Carolina is in attainment for both PM_{2.5} and ozone and further reducing these criteria pollutants will help ensure the state remains in attainment given any future regulatory actions by the EPA.

LIDAC areas are commonly found where the main highway corridors intersect with large cities, especially seen in Raleigh/Durham, Greensboro/Winston-Salem, Charlotte, and Fayetteville where waste disposal facilities are most frequently located. Reducing emissions from the waste sector has the greatest health benefits to LIDAC communities especially for respiratory illnesses. Additional benefits of reduced noise pollution can be realized with the adoption of EV over internal combustion engines (ICEs).

Metrics for Tracking Progress

Examples include:

- Number of vehicles and charging stations
- Volume of offset diesel
- Number of road miles driven by vehicles
- GHG emissions reduction

PCAP Measure 13. Reduce landfill gas emissions through improved landfill operations to collect gas more efficiently and earlier in a landfill life.

The breakdown of municipal solid waste (MSW) produces GHGs (methane and carbon dioxide) which are captured through landfill gas collection systems. Methane may be oxidized to carbon dioxide (lower GWP) as landfill gas moves through soil covers. Although landfill gas collection systems are complex because of the heterogeneity of MSW, infiltration of moisture, and atmospheric conditions, the industry has evaluated ways to reduce fugitive emissions and improve collection efficiency. The latter allows gas to be captured and used as a renewable energy source either onsite or added to the electricity grid. Gas collection efficiency is affected by the following: active gas collection system operation, cover type across the landfill (daily, interim, final as well as soil, clay, geomembrane), and other site-specific conditions. An example of ways that gas collection efficiency can be increased, and fugitive emissions reduced is

through installation of a transitional cover system on exterior slopes of landfills prior to final cover installation. A transitional cover is often composed of an exposed geomembrane or an enhanced soil interim cover.

Quantified GHG Reductions

PCAP Measure	GHG reductions (MMTCO ₂ e), 2025-2030	GHG reductions (MMTCO ₂ e), 2025-2050
Measures to reduce fugitive emissions at landfills and improve collection efficiency and utilize as a renewable energy source	0.1125	0.90

Appendix E provides information on how these GHG emission reductions were quantified.

The projects listed within this sector are illustrative examples of what could be funded. This is not the comprehensive list of projects that will be funded in this sector.

Key Implementing Agency

Lead Implementing Agency:

- NCDEQ

Regional Coordination and Implementation Support:

- Public and private landfill management entities

Implementation Activities and Milestones

Activities that may be used to implement this measure include, but are not limited to:

- Conduct aerial survey, LandGEM studies to identify highest landfill emitters.
 - Milestone 1: Complete survey prior to implementation grant award
- Request proposals for pilot programs to reduce uncontrolled methane emissions from landfills: Pilot programs could include early installation of landfill gas collection systems, landfill gas wellhead flowmeters, cover improvements, or gas pipeline maintenance. Milestones could include:
 - Milestone 1: Request for funding proposal (RFP) out within 3 months of grant award.
 - Milestone 2: Proposals received and evaluated; awards made within 9 months.
 - Milestone 3: Completion of design and installation of interventions within 18 months.
 - Milestone 4: Test completed for impact on GHG emissions within 36 months.

Authority to Implement

Four NC General Statutes govern the authority of the implementing agencies to carry out this measure:

- § 130A-309.04: Establishes the state's solid waste management policy and goals. This includes the directive to avoid waste disposal at landfill, with a preference for other methods in the following order: 1) Waste reduction at the source; 2) Recycling and reuse; 3) Composting; 4) Incineration with energy recovery; 5) Incineration without energy recovery. Additionally, this order requires state agencies to develop a waste recovery plan and encourages public-private partnerships to improve waste management outcomes.
- § 130A-309.09B: Governs local government bodies in their management of waste reduction programs and encourages the implementation of recycling, composting, and other sustainable waste management programs.
- § 130A-309.10: Prohibits acts relating to packaging to support recycling efforts and other sustainable waste management practices. Governs the disposal of coded plastics and other materials prohibited to landfill or incinerate.
- § 130A-309.11: Governs compost standards and applications to protect the state's natural lands and water sources from improper waste disposal.

Geographic Coverage

The geographical coverage of this measure will include the state of North Carolina with a specific emphasis on LIDACs.

LIDAC Benefits

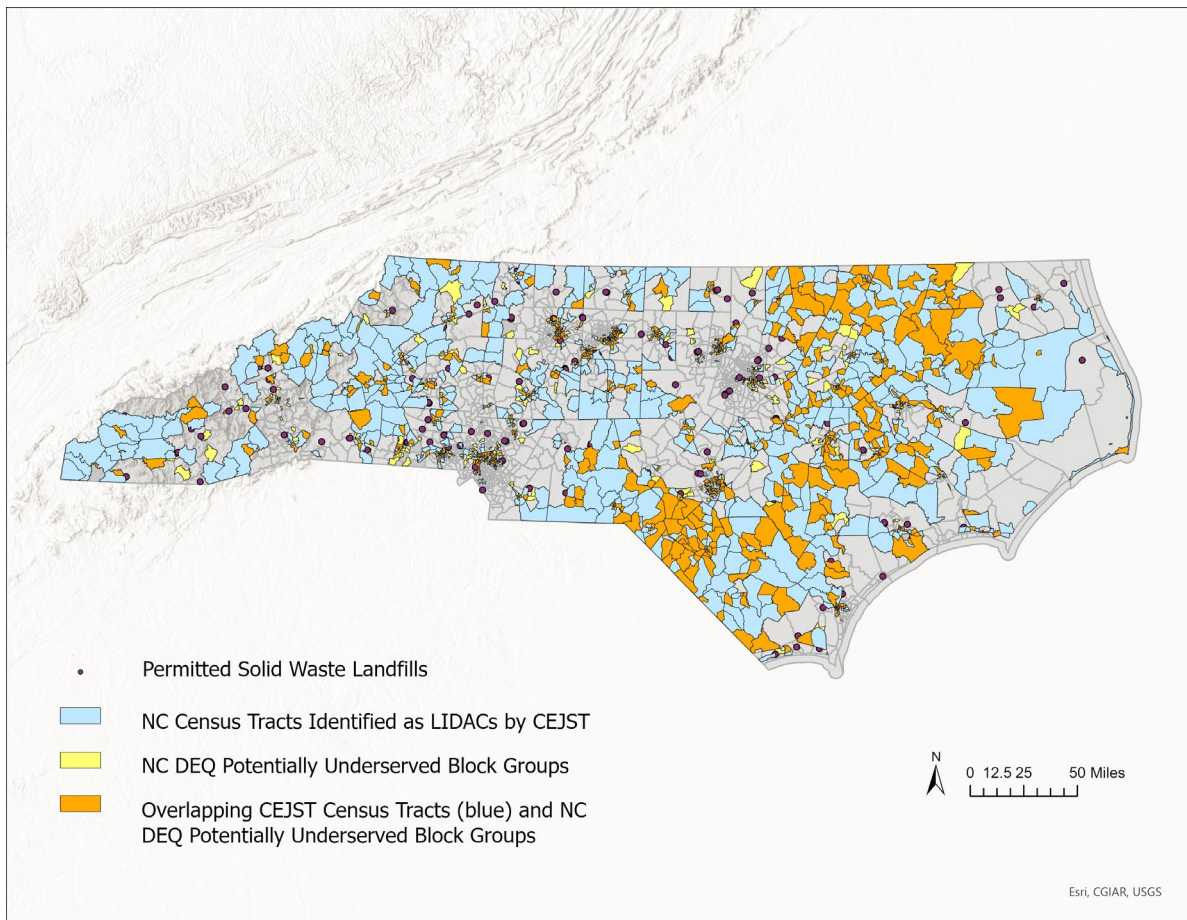


Figure 7. Summary of Permitted Solid Waste Landfills Across NC

As can be seen in Figure 7, landfill sites are uniformly distributed around the state. Historically most waste disposal facilities nationwide are in LIDACs. Therefore, reduced fugitive emissions in these communities will have beneficial health and aesthetic effects related to air quality including particulates, odors, and volatile organic matter content. The enhanced collection of methane can reduce dependency on fossil fuels which in turn brings benefits to all communities in terms of air quality and energy security. The reduction of the potent GHG is beneficial to LIDACs which are disproportionately affected by climate change.

Metrics for Tracking Progress

Examples include:

- Number of projects funded.
- Estimated LFG emissions avoided.
- RE production.

4.6 Natural and Working Lands

Whereas most conventional sectors are net sources of GHGs, there is compelling potential for NWL to substantially offset GHG emissions by permanently storing atmospheric carbon in the ground and plants. In 2020, activity on forestland and agricultural lands resulted in a net sequestration of approximately 48 MMTCO₂e in NC. The NWL sector “netted out” 34% of the state’s gross GHG emissions in 2020. In addition to the climate benefits, the priority measures for the NWL sector notably have the high potential to achieve numerous co-benefits and transformative impacts through a combination of:

- Resilience benefits, including flood mitigation, nature-based solutions, and enhanced climate readiness.
- Synergistic benefits to ecosystem health, including water quality improvements, wetland migration corridors, and enhanced biodiversity habitat.
- Community benefits, including reduced disaster costs, green space, quality of life, and carbon credit economies, particularly in rural LIDACs.

NC’s NWLs contribute to the state’s economy primarily through agricultural food and fiber products, harvested wood products, commercial and recreational fisheries, tourism, and recreation. In addition to the direct contributions to the state’s economy, these NWLs provide numerous benefits that improve communities and lifestyles in NC but are more difficult to quantify. There are several data gaps that, if filled, would enable more effective targeting of NWL projects to enhance carbon benefits and support community resilience as well as more accurate quantification of action outcomes. For example, many peatlands in NC were drained many decades ago for forestry or agriculture. Drained peatlands slowly emit carbon and are vulnerable to fires that rapidly release large amounts of carbon. Rewetting peatlands returns these wetlands to a carbon sink and reduces their vulnerability to fires. Information about where drainage ditches exist is necessary for effective restoration planning in NC’s peatlands.

Currently, the only ditch maps that cover the entire coastal plain are from a national dataset that is outdated and omits many smaller ditches. An updated, high-resolution map of ditches in the coastal plain would facilitate restoration planning and improved estimates of carbon fluxes from degraded peatlands in NC. Existing Light Detection and Ranging (LiDAR) data collected by USGS in 2020 could be used to create updated ditch maps, and new drone-based LiDAR could be used for ground-truthing and collecting more detailed information on ditch geometry and obstructions within ditch networks, which would be useful for site-level restoration planning.

The measures outlined below include addressing this and other challenges and will enable the continued and enhanced sequestration of carbon through NC’s NWLs.

PCAP Measure 14. Protect and restore high-carbon coastal habitats and peatlands.

Pursue policy, programs, and projects to conserve and restore high-carbon habitats in NC's coastal plain, including pocosin wetlands and other peatlands, brackish and saline coastal marsh, and high-salinity seagrass, to avoid carbon emissions resulting from projected conversion, wildfire, and soil emissions from unhealthy habitats, and to enhance carbon sequestration.

NC's coastal plain contains the vast majority of the state's wetlands, including pocosin wetlands (evergreen shrub wetlands with deep peat soils), other peatlands including Carolina bays and Atlantic White Cedar forests, and brackish and saline coastal marshes. These coastal plain wetlands accumulate and store large amounts of carbon, acting as carbon sinks. However, many of these wetlands have already been degraded or are vulnerable to degradation and conversion to other land uses. Carbon emissions are already occurring or expected to occur over the coming decades if action is not taken to restore and preserve NC's high-carbon coastal plain wetlands.

Examples of activities to achieve this measure would include developing a program to conserve and restore high-carbon habitats in NC's coastal plain (including pocosins wetlands and other peatlands, brackish and saline coastal marsh, and high-salinity seagrass), to avoid carbon emissions resulting from projected conversion, wildfire, and soil emissions from unhealthy habitats, and to enhance carbon sequestration. Avoided emissions and enhanced sequestration will be monitored and evaluated to ensure projects provide long-term carbon benefits under sea level rise. Projects that will benefit LIDACs will be prioritized.

Quantified GHG Reductions, Costs, and Geographic Coverage

PCAP Measure	GHG reductions (MMTCO ₂ e), 2025-2030	GHG reductions (MMTCO ₂ e), 2025-2050
Coastal Protection and Restoration	4.4 - 4.8	23.5 - 25.9

Appendix E provides information on how these GHG emission reductions were quantified.

The projects listed within this sector are illustrative examples of what could be funded. This is not the comprehensive list of projects that will be funded in this sector.

Key Implementing Agency

Lead Implementing Agency:

- NCDNCR

Regional Coordination and Implementation Support:

- Multiple NCDEQ divisions
- NC Coastal Federation (NCCF)
- The Nature Conservancy (TNC)
- NC Department of Natural and Cultural Resources (DNCR)
- NC Land and Water Fund (NCLWF)
- NC Department of Public Safety
- NC Department of Agriculture & Consumer Services
- NC Forest Service
- NC Wildlife Resources Commission
- U.S. Fish and Wildlife Service (USFWS)
- United States Department of Agriculture, Natural Resources Conservation Service (USDA-NRCS)
- U.S. Department of Agriculture Forest Service
- United States Geological Survey
- National Oceanic and Atmospheric Administration (NOAA)
- National Park Service
- Department of Defense
- Eastern NC Sentinel Landscape
- Local land trusts
- Chesapeake Bay Program
- Universities
- Local governments
- Private landowners
- Engineering consultants and contractors

Implementation Activities and Milestones

Anticipated projects for peatlands include acquiring essential property interests in fee or through easements, restoring hydrology to rewet peat soils (frequently using water control structures), and ongoing maintenance and management to ensure hydrologic conditions and ecological uplift are retained. Anticipated projects for coastal marshes and seagrass include easements

and acquisitions of development-pressured marsh migration corridors, salt marsh enhancement and drowning-prevention through sediment application or the installation of shellfish beds and living shorelines to help stabilize marshes, restoration of lost seagrass beds, and nature-based solutions (NBS) pilot projects that will achieve GHG reductions, avoid projected carbon emissions from marsh conversion, and increase the resilience of coastal ecosystems and communities in NC to SLR.

To carry out these projects, funds will be transferred to two implementing organizations and potentially one other conservation trust organization: both the TNC and the NCCF will engage in peatland restoration and conservation with TNC focusing primarily on properties already under public ownership and the NCCF will focus on lands that are currently in private ownership. The NCCF will also advance projects that facilitate salt marsh migration, restoration, and conservation, as well as seagrass restoration and conservation. Both organizations have extensive experience planning and implementing similar projects in NC. TNC has restored drained peatlands on Pocosin Lakes and Great Dismal Swamp National Wildlife Refuges (in partnership with USFWS) and on the Angola Bay Game Land (in partnership with the NC Wildlife Resources Commission) and facilitated acquisition of intact pocosin wetlands for the State of North Carolina at the Buckridge Coastal Reserve, Holly Shelter Game Land, Boiling Spring Lakes Plant Conservation Preserve, and other sites. The NCCF has restored more than 15,000 acres of privately owned freshwater (including pocosin) wetlands as well as worked to protect and restore NC's coastal habitats and water quality since 1982.

Implementing organizations would submit a detailed project narrative describing planned project activities, how projects will be sited (including prioritization for LIDAC and resilience benefits as well as carbon benefits), expected achievements, timeline, and budget.

Authority to Implement

For NWL, the authority to implement was a criterion included in the prioritization process. Actions for which NCDEQ does not have the authority to implement were thus not prioritized. NCDEQ is authorized under statutory or regulatory authority to create programs and make subawards using federal funding to implement this priority measure. This program supports priority actions identified in the NC NWL Action Plan (5.a, 5.b, 7.a, 8.a, 9.b, 12.a, 12.d, 16.a, 16.b, 16.e) and the CHPP (5.1, 5.11, 5.5, 5.7).

These actions are complemented by 2024's EO 305: An Order to Protect and Restore North Carolina's Critical Natural and Working Lands, which sets the following goals by 2040: permanently conserve one million new acres of natural lands (with a focus on wetlands), restore or reforest one million new acres of forests and wetlands, and plant one million trees in urban areas. EO 305 also directed state agencies to pursue federal funding to meet the goals and objectives outlined in the order.

Relevant Funding Sources

Funds for acquisition and restoration would continue to be leveraged from local, state, federal, and private sources. For example, four different grants from multiple sources were utilized to complete the Angola Bay restoration project. Existing funding from NRCS, USFWS, NOAA and other sources for coastal fisheries, water quality, flood reduction and resiliency, will all be leveraged to help advance this work. A mix of federal and state funding is currently being used for NOAA Coastal Change Analysis Program 1-meter resolution land cover mapping that will support prioritization of all coastal plain restoration actions. In addition, funds of \$723,000 (over four years) from NCDEQ will support a Coastal Habitat Assessment Program to map and monitor coastal habitats, with a focus on seagrass.

Carbon credits may also be able to cover some project costs. An American Carbon Registry protocol³⁸ has been developed and a pocosin restoration project underway in North Carolina³⁹ plans to use the protocol to generate carbon credits. A seagrass restoration project in Virginia is currently in the process of verifying carbon credits, which will make it the first verified seagrass-based carbon credit program and a potential model for additional projects.

LIDAC Benefits

Restoring and conserving NC's coastal plain wetlands creates additional benefits beyond avoided carbon emissions and enhanced carbon sequestration. Fires in drained peatlands expose nearby communities to unhealthy smoke; restoring peatlands reduces smoke-related health impacts as well as disruptions and economic losses from active fires. Healthy peatlands are also valued for hunting and wildlife watching, and therefore can attract visitors who spend money in local communities. Coastal marshes and seagrasses buffer coastal communities from waves and storm surge, provide nursery habitat for commercially and recreationally harvested fish species, and attract tourists and residents for recreational opportunities including boating, fishing, and birdwatching. 39% of census tracts in the NC Coastal Area Management Act counties are identified as LIDACs by CEJST, and several are also designated as FEMA Community Disaster Resilience Zones (Figure 8). Many of the opportunity areas for peatland, coastal marsh, and seagrass restoration, as well as preservation of marsh migration corridors, occur within these LIDACs who would therefore receive benefits from these activities.

³⁸ American Carbon Registry. "Restoration of Pocosin Wetlands." October 2017. [Restoration of Pocosin Wetlands - ACR \(acrcarbon.org\)](https://www.acrcarbon.org/)

³⁹ [Hyde County, NC | Carolina Ranch \(carolinaranchhydenc.com\)](https://www.carolinaranchhydenc.com/)

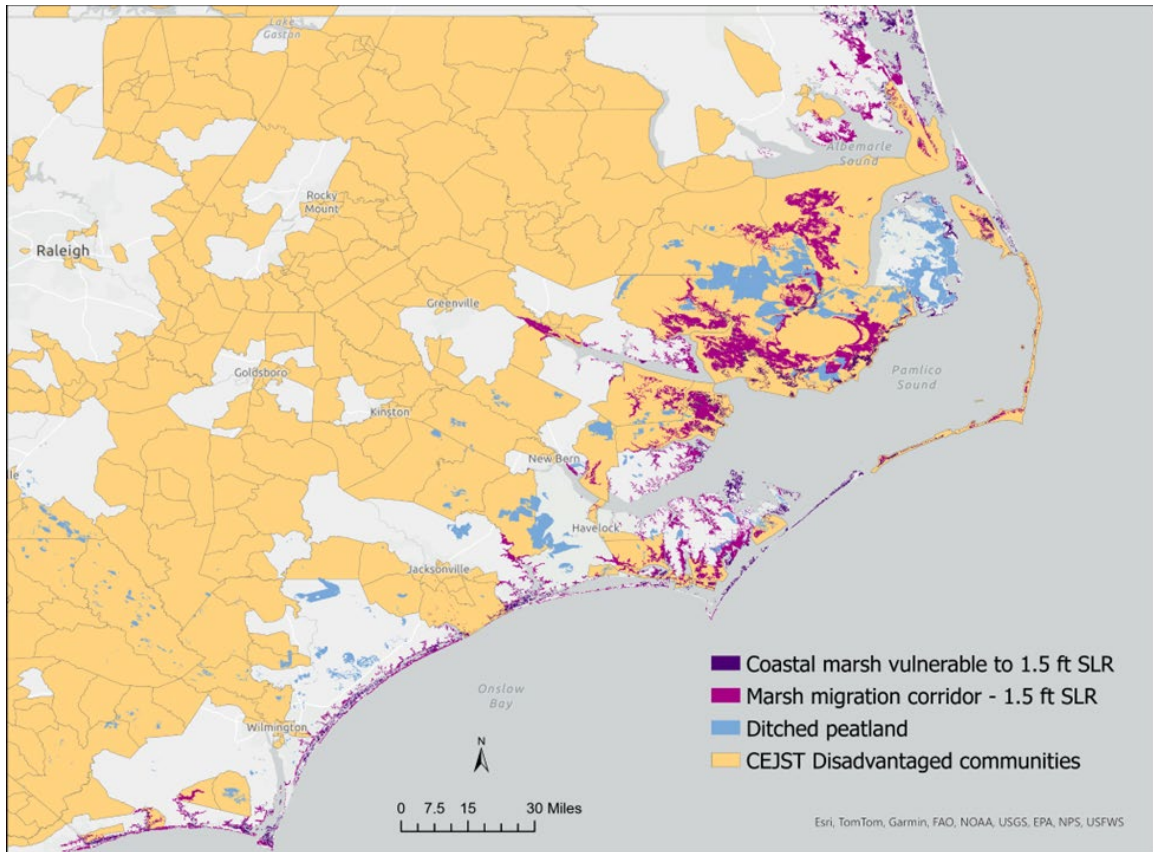


Figure 8. Coastal Protection and Restoration Opportunities with Additional LIDAC Benefits

Proactively conserving and restoring coastal habitats will result in decreased risk from hazard damage and will result in lower costs required to restore coastal habitats and repair assets and property after major storm events: coastal wetlands prevented an estimated \$625 million in property damages from Maine to North Carolina during Hurricane Sandy. In addition to providing protection from storm damage, protected coastal habitats provide valuable ecosystem services that have measurable economic value. For example, seagrass was valued at \$3,000/acre/year for water quality improvements and \$7,000/acre/year when considering all ecosystem services provided. Public health benefits of coastal habitat conservation and restoration include improved local food access through improved fishery production, improved public safety through reduced flooding and erosion, and improved recreational water quality through the filtering services of coastal habitats. For every \$1 invested in land conservation in NC, there is estimated to be a \$4 return in economic value from natural resource goods and services alone without considering numerous other economic benefits.

Metrics for Tracking Progress

Examples include:

- Acres of coastal plain habitats restored or conserved.

- Avoided GHG emissions.
- Increased carbon sequestration.
- Reduction in peatland areas vulnerable to fire due to drainage.
- Area of wildfires in peatlands and associated GHG emissions.
- Area of peatland burned intentionally to reduce wildfire hazard and maintain ecological integrity.
- Number of hazardous air quality days caused by peatland fire.
- Number of people exposed to hazardous air quality due to peatland fires.
- Number of visitors to restored coastal plain wetlands.
- Number of properties protected (from waves/storm surge/erosion) due to coastal habitat restoration/NBS implementation.
- Length of roads protected (from waves/storm surge/erosion) due to coastal habitat restoration/NBS implementation.
- Fish population in restored coastal habitats.
- Area of “impaired” coastal waters listed on the 303(d) list submitted to EPA every two years.
- Annual change in fisheries value.
- Water quality improvements (measured via traditional parameters including turbidity, dissolved oxygen and nutrient load).
- Reduction in statewide swimming health advisories and shellfish closures.

PCAP Measure 15. Protect, use, and develop agricultural and forest land.

Pursue policy, programs, and projects for agricultural and forest land protection and best use, supporting expanded land stewardship programs, and promoting reforestation and restoration initiatives in rural and urban areas that increase resilience, ecosystem services, and wildlife habitat.

Conservation and restoration of forests represent NC’s largest opportunity to sequester carbon and supports a suite of co-benefits. The state is uniquely positioned to sequester large amounts of carbon in its forests due to its climate and ecosystems. The USDA Forest Inventory Analysis estimated NC’s total forest carbon in 2017 at 5.29 billion mtCO_{2e}, which is 3% of the total carbon stored in US forests. Forests cover more than 60% of NC and sequestered 47.52 MMTCO_{2e} in 2020 per the most recent state GHG inventory. Urban forests not only sequester carbon, but also reduce emissions through energy savings. Floodplain forests and swamps also provide significant climate resilience, ecosystem health, and biodiversity benefits, and provide filtration that improves water quality.

The following is an example of an activity toward achieving this measure: Expand cost-share program(s) for forest development and sustainable management on private lands; develop a program to acquire, protect, and restore floodplain and wetland forests on public and private lands; and create initiatives to expand the scale and magnitude of “carbon farming” and urban forestry to enhance carbon sequestration by agricultural and forest land and avoid emissions from forest conversion to other land uses.

Most (~85%) of NC’s forests are privately owned and therefore potentially vulnerable to conversion to other land uses; between 2001 and 2019, more than 300,000 acres of forestland in NC was lost to land conversion.⁴⁰ Private forest owners also frequently need support to implement sustainable forest management practices; demand for the NC Forest Service (NCFS) Forest Development Program (FDP) exceeded available funding by more than 50% in FY 2020-2021.⁴¹ In addition, there are roughly 5.1 million acres of land in the state that are not currently forested or developed that could support forests.⁴² Restoring forest lands (including reforestation and afforestation) offers one of the largest land sector pathways to carbon sequestration by storing carbon aboveground in standing biomass as well as by increasing soil carbon. Forest management and restoration generally involves site preparation, tree planting, prescribed burning, and forest stand improvement treatments. Many forest restoration opportunities are on agricultural lands that are in transition.⁴³ Additional protection and restoration opportunities, particularly near urban cores, are under intense development pressure. If they are not protected now, these opportunities are likely to be lost forever.

Quantified GHG Reductions and Geographic Coverage

PCAP Measure	GHG reductions (MMTCO ₂ e), 2025-2030	GHG reductions (MMTCO ₂ e), 2025-2050
Forest Protection and Development	15.4	77.0

Appendix E provides information on how these GHG emission reductions were quantified.

⁴⁰ Duke Nicholas Institute. “NC Natural & Working Lands Overview Dashboard.” [NC NWL Overview Dashboard \(arcgis.com\)](https://www.dni.edu/arcgis.com)

⁴¹ NC Department of Agriculture and Consumer Services. “Forest Development Program 2023 Legislative Report.” January 15, 2023. [N.C. Forest Service: Forest Development Program 2023 Legislative Report \(ncforests.gov\)](https://www.ncforests.gov/legis-report)

⁴² NCDEQ. “NC Natural and Working Lands Action Plan.” June 2020. <https://www.deq.nc.gov/energy-climate/climate-change/adaptation-and-resiliency/natural-working-lands>.

⁴³ The Nature Conservancy and American Forests. “Reforestation Hub - Reforestation Opportunities for Climate Change Mitigation.” [March 2023. https://www.reforestationhub.org/](https://www.reforestationhub.org/).

The projects listed within this sector are illustrative examples of what could be funded. This is not the comprehensive list of projects that will be funded in this sector.

Both forest conservation and reforestation/afforestation opportunities occur statewide; Figure 9 presents forest conservation and reforestation opportunities that would contribute to community resilience in a variety of ways. Yet, forests contributing to flood risk reduction and the removal of pollutants from floodwaters tend to be located in the coastal plain, where there are wide, populated floodplains and a high concentration of water quality hazards. Approximately 98% of the land identified in this map is privately owned land. Figure 9 shows conservation opportunities in the Piedmont and mountains.

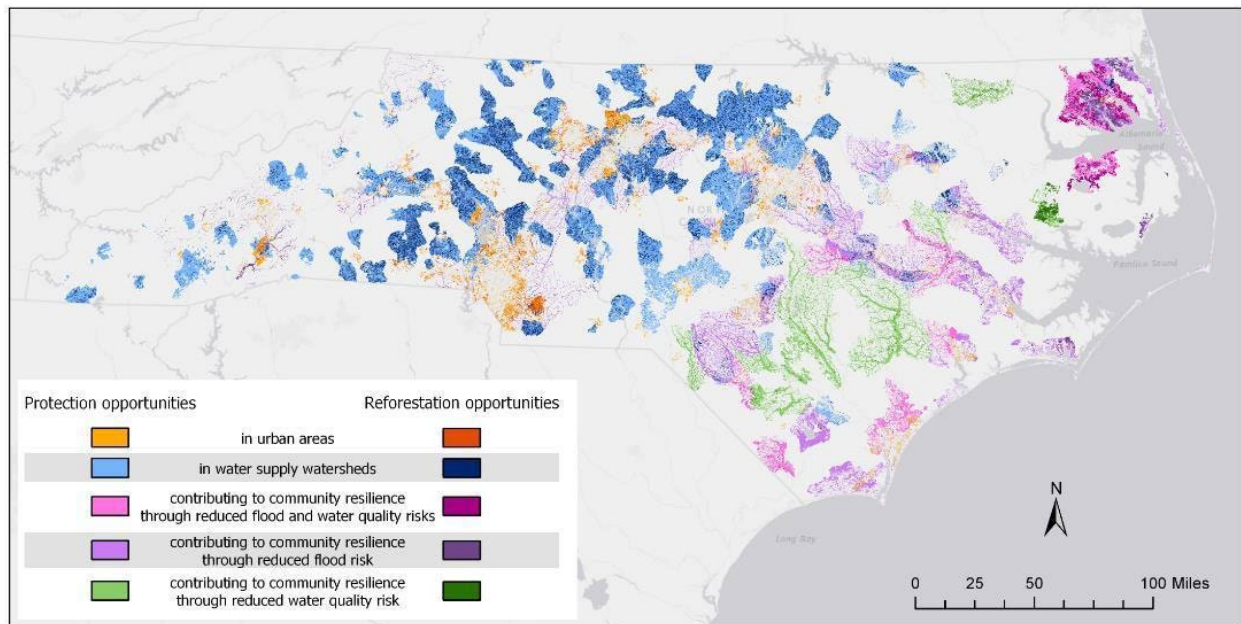


Figure 9. Protection and Reforestation Opportunities with Community Resilience Benefits (NWL Action Plan)

Key Implementing Agency

Lead Implementing Agency:

- NCDNCR

Regional Coordination and Implementation Support:

- NCFS
- Southeastern Forestry and Land Retention (SFLR) Network
- Multiple DEQ divisions
- NC Soil & Water Conservation Division
- NC Plant Conservation Program

- Department of Public Safety
- NCORR
- NCWRC
- Roanoke Sustainable Forestry
- TNC
- NC Coastal Federation
- Eastern NC Sentinel Landscapes
- Local land trusts
- Universities (e.g., NC State)
- USDA – NRCS
- Forest Legacy Program
- USFWS
- NPS

Implementation Activities and Milestones

Activities that may be used to implement this measure include, but are not limited to:

- Expand funding for the FDP under NCFS with a primary focus on restoration and afforestation projects.
- Expand capacity through subawards to regional organizations such as the Southeastern Forestry and Land Retention (SFLR) and TNC.
- Develop a grant program that issues requests for proposal for land acquisition and forest restoration projects that are prioritized by resilience and economic benefits⁴⁴ to LIDACs, and ecosystem health; and by geographic area, with a focus on floodplains, habitats that are naturally rich in carbon, and the protection status of land within the state (in conjunction with the NCFS Forest Legacy Program Assessment of Need, NC Forest Action Plan priority areas).
- Require long-term stewardship funding to monitor, maintain and repair projects for all investments in infrastructure, including natural infrastructure. The largest stewardship component for natural infrastructure is monitoring and enforcement easements. NC will set

⁴⁴ Duke Nicholas Institute for Energy, Environment & Sustainability and Conservation Trust for North Carolina. "NC Conservation Benefits Calculator." 2023.

<https://prioritizationcobenefitstool.users.earthengine.app/view/cobenefitscalculator>

aside a percentage of the funding for long-term stewardship. NC has several entities that steward natural infrastructure including the NC Stewardship Program, NCFS, NC Parks, NC Agriculture Commission, NC Wildlife Resources Commission, local governments, and non-profit conservation organizations. NC will align stewardship requirements with the entity that is best suited for that project. For example, the NC Division of Mitigation Services worked with land conservancy NGOs across the state to invest heavily in High-Quality Preservation. Several of those projects have become state parks stewarded by the NC Division of Parks and Recreation and game lands that are stewarded by the NC Wildlife Resources Commission. Budgets will include funds to cover programmatic costs, new positions needed to administer the programs, and long-term stewardship costs.

- Quantify measurements of sequestered carbon and resilience benefits from cost-share and restoration projects using existing tools such as the terraPulse Monitoring, Reporting, and Verification platform.⁴⁵ Similar carbon quantification methodologies have been successfully implemented in other states.⁴⁶

Authority to Implement

For NWL, the authority to implement was a criterion included in the prioritization process. Actions for which NCDEQ does not have the authority to implement were thus not prioritized. NCDEQ is authorized under statutory or regulatory authority to create programs and make subawards using CPRG funding to implement this priority measure. This program would target the following priority actions and habitats: NWL Action Plan: 5.a, 5.b, 7.a., 8.a., 9.b.; CHPP: 5.16; Forests and Floodplain Forests.^{47, 48} These actions are complemented by 2024's EO 305: An Order to Protect and Restore North Carolina's Critical Natural and Working Lands, which sets the following goals by 2040: permanently conserve one million new acres of natural lands (with a focus on wetlands), restore or reforest one million new acres of forests and wetlands, and plant one million trees in urban areas.

Estimated Costs and Intersection with Other Funding

⁴⁵ terraPulse. <https://apps.terrapulse.com/>

⁴⁶ For example, in Massachusetts. See: "Forests as Climate Solutions." <https://www.mass.gov/info-details/forests-as-climate-solutions-~-:text=Forests%20as%20Climate%20Solutions%20will,greenhouse%20gas%20emissions%20by%202050>

⁴⁷ NCDEQ. "NC Natural and Working Lands Action Plan." June 2020. <https://www.deq.nc.gov/energy-climate/climate-change/adaptation-and-resiliency/natural-working-lands>

⁴⁸ NCDEQ. "NC Coastal Habitat Protection Plan." 2016 and 2021. <https://www.deq.nc.gov/about/divisions/marine-fisheries/habitat-information/coastal-habitat-protection-plan>

The NC FDP prevailing rates for tree planting for Hurricane Florence restoration are \$65-160 per acre (depending on planting method and forest type). At these rates, the average cost to the state for reforestation of one million acres was estimated at \$113 million using the Conservation Reserve Enhancement rate for planting hardwoods, longleaf, loblolly, and shortleaf, not accounting for inflation. While this represents a very significant increase in the state budget for conservation, the cost of flooding due to tropical cyclones has cost the state much more (~\$180 billion in 2018). Conservation and restoration of forest lands would lower the economic losses and recovery costs associated with the next storm.⁴⁹ In addition, if carbon offsets could be obtained for these restoration projects, the costs could be recovered in approximately two years.⁵⁰

Legislative appropriations and forest product assessment revenues are insufficient to meet current and historical demands for the FDP cost-share program. An additional \$3 million could be spent annually to support the cost-share program. The long-term average cost to the NCLWF for land acquisition is \$1,200-\$1,300 per acre in rural areas but can range as high as \$10,000-\$50,000 per acre in urbanized areas. RFP program cost for forest restoration and afforestation can be calculated using the current FDP rates⁵¹ as a model. Implementation cost estimates will account for easement purchases and long-term stewardship and account for inflation along with increasing land cost in rapidly urbanizing areas.

The cost to enhance urban forest management was estimated at \$500,000 in 2020. This cost is what it would take to support four full-time positions within the Urban & Community Forestry program, which would allow for three regional urban foresters across the state and more hands-on assistance for municipalities managing their urban forests.

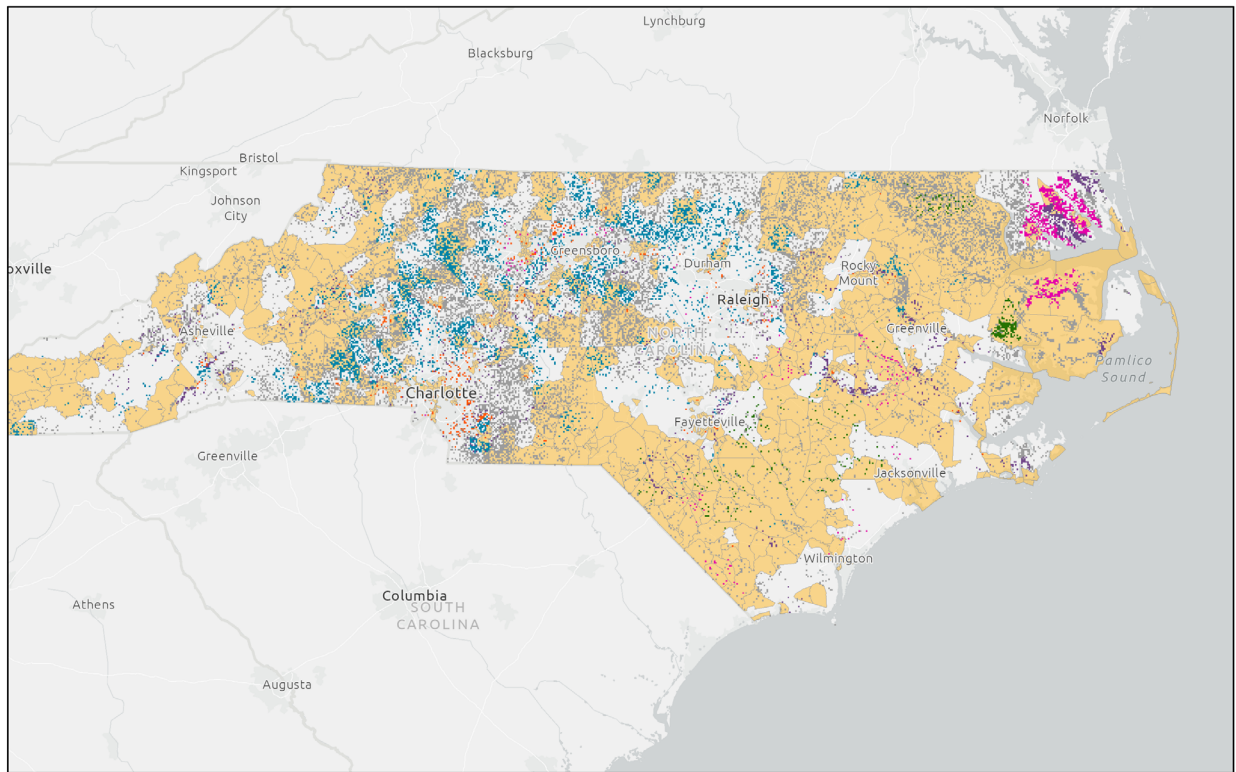
LIDAC Benefits

Forest restoration can dramatically increase the value of ecosystem services provided by open fields. Strategically placed shoreline parks and natural lands buffer cities from rising seas, coastal storms, and flooding, a benefit that was seen in coastal cities during Hurricane Florence. Restoring forest lands can increase biodiversity by providing food and habitat for native species. There are 441,000 acres of reforestable land in North Carolina that are highly rated (> 5) on the Natural Heritage Program Biodiversity and Wildlife Habitat Assessment (Figure 9). Expanding the SFLR Network has uniquely transformational impacts for racial and environmental justice in LIDAC communities. This network promotes retention of black-owned forests following property transition to heirs through legal assistance and provides resources and guidance on sustainable forestry practices.

⁴⁹ NCDEQ. "NC Natural and Working Lands Action Plan."

⁵⁰ NCDEQ. "NC Natural and Working Lands Action Plan."

⁵¹ NC Forest Service. "Prevailing Rates for Sub-Practices." February 23, 2023. [FDP Prevailing Rates FY 2023-24 Spreadsheet DRAFT jlc.xlsx \(ncforestservice.gov\)](#)



1/26/2024

- contributing to community resilience through reduced flood and water quality risks
- contributing to community resilience through reduced flood risk
- contributing to community resilience through reduced water quality risk
- in water supply watersheds
- in urban areas
- all other reforestation opportunities
- CEJST Disadvantaged

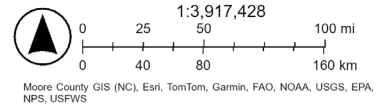
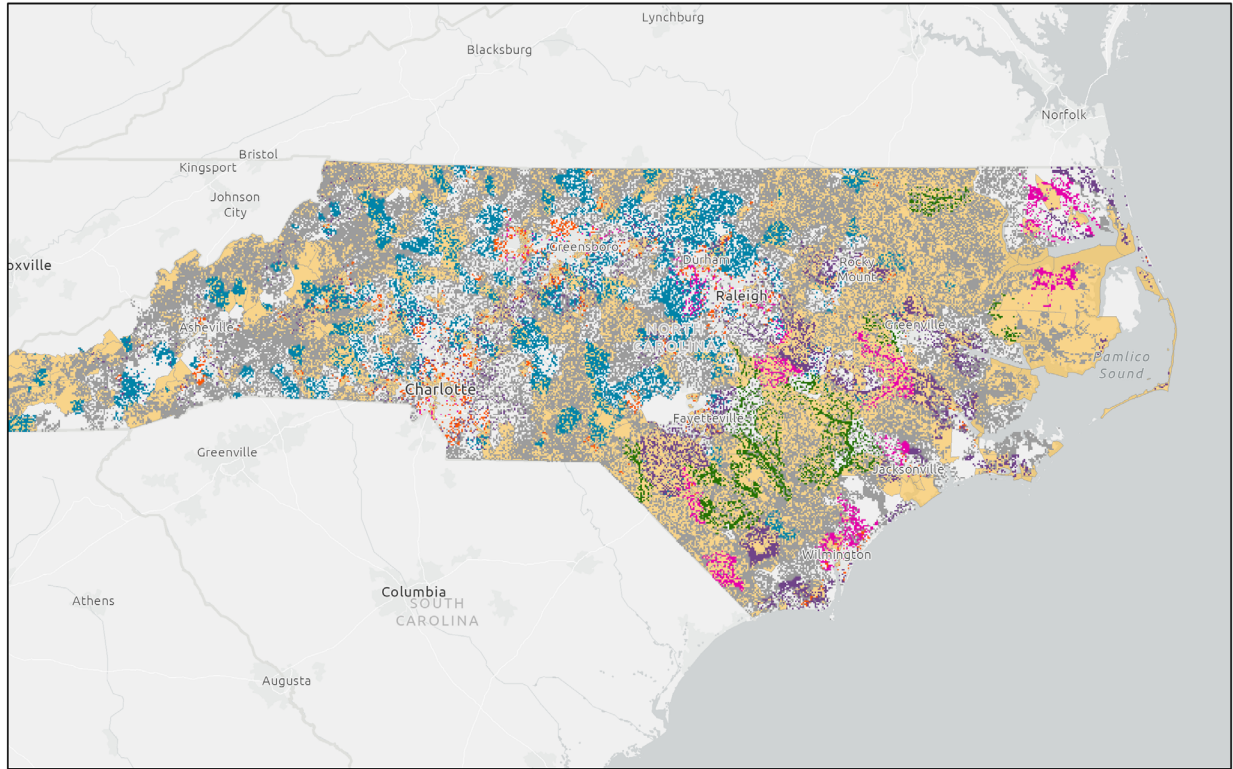


Figure 10. Reforestation Opportunities with LIDAC Resilience Benefits

Developed and managed urban forests reduce stormwater runoff, increase air and water quality, provide shade, increase wildlife habitat and diversity, and increase resilience to pest/disease outbreaks. There are over six million people in North Carolina living in communities with urban forest programs. Developed and managed urban forests increase community resilience for droughts and stormwater impacts, and provide shade, aesthetics, and recreational opportunities. Though carbon sequestration may not vary much based on location, the value of flood resiliency is much greater in urbanizing areas. Forests in urban areas also reduce air pollution, help to mitigate urban heat effects, (which also reduces energy use for cooling), and enhance human well-being through access to parks and green spaces. Climate change affects everyone, but in cities, low-income communities often face the greatest threats. According to the Trust for Public Land, on average, low-income neighborhoods have fewer parks and green spaces to absorb stormwater, provide cooling shade, and protect homes and businesses from flooding. Natural areas and green spaces can also positively influence real estate values and local tax revenue.



1/26/2024

- contributing to community resilience through reduced flood and water quality risks
- contributing to community resilience through reduced water quality hazard risk
- contributing to community resilience through reduced flood risk
- in urban areas
- in water supply watersheds
- all other unprotected forests and woody wetlands
- CEJST Disadvantaged

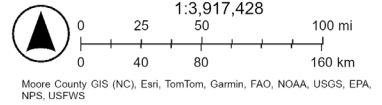


Figure 11. Forest Protection Opportunities with LIDAC Resilience Benefits

Forest conservation, enhanced management, and reforestation/afforestation opportunities are located throughout NC, allowing for prioritization of projects that occur within and provide benefits to LIDACs (Figure 10).

Metrics for Tracking Progress

Examples include:

- Acres of forests restored or conserved.
- Reductions in the rate of land conversion from forests to cropland, pasture, and development.
- Acres of cropland and pasture converted to forests.
- Avoided GHG emissions.
- Increased carbon sequestration.
- Changes in annual value of statewide timber production.
- Reductions in energy usage and cost in urban areas.

- Acres of green spaces created.
- Reduction in wildfire incidence.
- Area of wildfires in forests and associated GHG emissions.
- Area of controlled burns to reduce wildfire hazard and maintain ecological integrity.
- Number of hazardous air quality days caused by wildfires.
- Number of people exposed to hazardous air quality due to wildfire.
- Number of properties protected from flooding after storm events.
- Area of “impaired” waters listed on the 303(d) list submitted to EPA every two years.
- Improvements in stream and river water quality as measured through biological assessments.
- Water quality improvements as measured via traditional parameters including turbidity, dissolved oxygen, and nutrient load.
- Reduction in statewide swimming health advisories and shellfish closures.

5 Moving Forward

5.1 CPRG Implementation Grants

Immediately following the finalization of this PCAP, state, regional, municipal, and tribal agencies and consortia are eligible to apply for CPRG competitive funding to implement the targeted measures presented within this plan. The September 20, 2023, CPRG Implementation Notice of Funding Opportunity sets the stage for \$4.3 billion of funds that are available through a general competition, and potentially resulting in individual grants ranging from \$2 million to \$500 million each.⁵² An additional \$300 million will be available for tribes and territories for implementation. Implementation funding applications are due April 1 and May 1, 2024, for tribes and territories, with anticipated awards of funding later in 2024.

5.2 Other CPRG Planning Grant Deliverables

Recipients of a PCAP planning grant must submit a CCAP two years after the date of the PCAP award (June 29, 2025). NCDEQ continues to develop a CCAP that builds off the PCAP by providing an expanded GHG analysis covering all significant sources and sinks, creating both short-term and long-term GHG emissions reduction targets, and articulating a comprehensive set of measures to achieve the targets.⁵³ The CCAP will include the following:

- An updated GHG inventory for the state
- BAU GHG emissions projections and an economy wide GHG emissions reduction scenario
- GHG reduction targets for NC (short- and long-term)
- A comprehensive list of GHG reduction measures that address economy-wide emissions. Building on the PCAP, this will include the following for each measure:
 - Quantified estimates of GHG reduction and costs
 - Key implementing agency or agencies
 - Implementation schedule and milestones
 - Expected geographic location, if applicable

⁵² US EPA. "CPRG Implementation Grants." October 23, 2023. <https://www.epa.gov/inflation-reduction-act/cprg-implementation-grants>.

⁵³ US EPA. "Climate Pollution Reduction Grant Program Planning Grant Question and Answer Document," June 22, 2023. <https://www.epa.gov/system/files/documents/2023-04/QA%20for%20web%204-21-2023.pdf>.

- Quantified estimates of co-pollutant reductions (e.g., PM_{2.5}, NO_x, SO₂, volatile organic compounds (VOCs), and air toxics)
 - A more robust or quantified analysis of benefits for LIDACs
 - A review of the statutory or regulatory authority to implement the measure (and a schedule and milestones for key entities to obtain it if not existing).
 - Identification of funding sources that have been secured for implementation.
 - Metrics for tracking progress.
- A workforce planning analysis

In 2027, NCDEQ will develop and share a CPRG Status Report that will include:

- The implementation status of the quantified GHG reduction measures from the CCAP.
- Relevant updated analyses or projections supporting CCAP implementation.
- Next steps and future budget or staffing needs to continue CCAP implementation.

Appendix A. NCGHG Inventory and BAU Projections

Methodology

Additional information about the state's GHG inventory may be found at:

<https://www.deq.nc.gov/energy-climate/climate-change/greenhouse-gas-inventory>

The historical GHG emissions are calculated to show how emissions in NC have changed from 1990 through 2020, the last year of available historical data in the U.S. Environmental Protection Agency State Inventory Tool (SIT), a spreadsheet-based tool developed by EPA and designed to assist state agencies in preparing state-level GHG inventories and projections.⁵⁴ For this inventory, the NCDEQ Division of Air Quality (DAQ) developed updated 1990-2020 emissions estimates for all sectors.

The historical GHG emissions were primarily prepared using the SIT. The SIT simplifies the effort for preparing state-level GHG inventories that is generally consistent with EPA's national inventory. The SIT applies a "top-down" approach to calculate GHG emissions from all relevant anthropogenic source sectors and uses methodologies consistent with those recommended in the 2006 IPCC Guidelines.⁵⁵ The use of consistent methodologies ensures that GHG inventories prepared by various entities are comparable.

The SIT is organized into 12 modules for calculating historical emissions and one module for projecting emissions.⁵⁶ However, these modules do not correspond to the layout of the sector and source emissions tables presented in Sections 2.0 and 3.0. Instead, they are organized to facilitate the emissions estimation process. Each module has a User's Guide that outlines the methodology, and documents the default data sources, emission factors, references, and other pertinent information utilized by the module. There is also a synthesis module which pulls the historical emissions data from each module into a single spreadsheet tool to assist in generating reports and graphics.

The SIT includes default data supplied by EPA. The default data are generally publicly available from various federal agencies. A limited number of source categories utilize data obtained from third-party vendors. The default data in the SIT are also frequently used by state and local agencies to develop emission inventories for other air pollutants. For a select number of source categories, the DAQ has replaced the SIT default data with data obtained from NC's state agencies. These data support the development of more accurate emissions estimates for the

⁵⁴ EPA. "State Inventory and Projection Tool." <https://www.epa.gov/statelocalenergy/state-inventory-and-projection-tool>, accessed June 2023.

⁵⁵ 2006 IPCC Guidelines for National Greenhouse Gas Inventories, The National Greenhouse Gas Inventories Programme, The Intergovernmental Panel on Climate Change. Hayama, Kanagawa, Japan, 2006.

⁵⁶ NC only utilizes 12 of these 13 modules because one module estimates emissions from coal production which does not occur in NC.

state. The historical emissions estimation methodologies, and default and substituted data sources used in each module, are presented below.

A detailed discussion of the uncertainty associated with the SIT default data used for the historical GHG emission inventory is outlined in each of the SIT modules, which are available for download from the EPA SIT webpage.⁵⁷

CO₂ Emissions from Fossil Fuel Combustion

Description

The SIT Fossil Fuel Combustion Module calculates CO₂ emissions from combustion of fossil fuels including coal, natural gas, and petroleum products. The sectors included in the module are listed below.⁵⁸

Residential Commercial	Industrial Electric Power	Transportation
---------------------------	------------------------------	----------------

It also calculates CO₂ that is stored or released using fossil fuels in the production of solvents, asphalt, synthetic rubber, naphtha, lubricants, and other products.

CH₄ and N₂O emissions from fossil fuel combustion are calculated in two separate modules, the Mobile Combustion Module and the CH₄ and N₂O Stationary Combustion Module.

Background and Default Data

The methodology for estimating CO₂ emissions from fossil fuel combustion is provided in the User's Guide for this module as well as instructions and information provided in the spreadsheets for each module.⁵⁹

The default historical fuel consumption data provided in the SIT module for NC are used without any adjustments. These default data, which consist of the estimated amount of each type of fuel consumed by each sector in each state, are from the Energy Information Administration's (EIA) State Energy Data System (SEDS).⁶⁰

⁵⁷ EPA. "State Inventory and Projection Tool." <https://www.epa.gov/statelocalenergy/download-state-inventory-and-projection-tool>, accessed June 2023.

⁵⁸ The Fossil Fuel Combustion Module estimates emissions from international bunker fuel use. These emissions are from international transportation; therefore, they are not included in state inventories.

⁵⁹ EPA. "User's Guide for Estimating Direct Carbon Dioxide Emissions from Fossil Fuel Combustion Using the State Inventory Tool." Prepared for EPA's State Energy and Environment Program by ICF, June 2023.

⁶⁰ EIA. "State Energy Data System (SEDS): 1960-2021 (complete)." June 2023.

Note that the SIT estimates non-combustion consumption of Industrial sector fuel for each fossil fuel type.

Deviations from Defaults

Wood, ethanol, and biodiesel are biomass fuels for which CO₂ emissions are excluded from gross GHG emissions. To provide additional transparency, however, the DAQ developed CO₂ emissions estimates for the consumption of these biomass fuels in NC.

Future Refinements

Future refinements for biomass emissions estimates could investigate the availability of data for estimating CO₂ emissions from the combustion of landfill and manure gas.

CO₂ Emissions from Transportation

For the onroad mobile source sector, the DAQ applied the 4.0.0 version of EPA's MOVES4 model to estimate emissions for the key years of 2005 and 2021.⁶¹ The MOVES4 model is used in place of the SIT because it is EPA's official onroad mobile source emissions estimation model, it facilitates consistency with all other DAQ onroad mobile source emissions estimation efforts, and it provides emissions forecasting and policy analysis capabilities that are not available from the SIT. Because of the time and resources necessary for performing a MOVES4 run for a given year, it was necessary for the DAQ to limit use of MOVES4 to two historical years: 2005 and 2021. The year 2005 was chosen because it is the baseline year specified by various federal, multi-state, and NC-specific GHG mitigation policies, and 2021 because it was the latest year for which we had a complete set of historical data.

Because ethanol is a biomass fuel, it was necessary to adjust the CO₂ emissions output from MOVES4 to subtract ethanol-related emissions. The DAQ developed adjustment values for 2005 and 2021 from EIA SEDS transportation sector fuel heat input data to back out estimated ethanol-related CO₂ emissions. In 2005, ethanol contributed 0.39% of heat input to transportation sector motor gasoline in NC, and this contribution rose to 6.88% in 2021. The DAQ reduced the CO₂ emission estimates from MOVES4 for these two years using these heat input percentages.

To estimate pre-2005 onroad mobile source emissions, the DAQ relied on emission trends generated by the SIT's Mobile Combustion Module (see discussion in the following section). Specifically, the DAQ calculated pre-2005 adjustment factors reflecting the SIT's 1990-2005 emission trends, and then multiplied these factors by the 2005 MOVES4-based emission values. The MOVES4 model was run with output options allowing reporting of results by vehicle regulatory class categories as well as by the default MOVES4 vehicle use categories. The MOVES4 output

⁶¹ EPA. "MOVES4: Latest Version of Motor Vehicle Emission Simulator." <https://www.epa.gov/moves/latest-version-motor-vehicle-emission-simulator-moves>. Accessed September 2023.

was also broken down by fuel type. This allowed better alignment of MOVES4 output data with the vehicle and fuel categorizations used in the SIT.

Because a review of the SIT default VMT data, which had originally been compiled by FHWA and EPA, indicated anomalous values for certain years, the DAQ coordinated with the NC Department of Transportation (NCDOT) to develop VMT data that revised the SIT default values. The DAQ's review of the 2005 VMT data identified substantial differences when compared to the 2005 Highway Performance Monitoring System (HPMS) VMT data published by FHWA. Consultation with NCDOT revealed that for years 2008 and earlier, NCDOT used a methodology that tracked VMT on state-maintained roads and locally maintained roads separately, with fewer traffic counts conducted for roadways with lower traffic volume. The NCDOT VMT data for these years was consistently lower than the corresponding FHWA HPMS data. To improve HPMS VMT data quality, the FHWA changed the state VMT reporting requirements in 2009. To meet these new requirements, NCDOT added traffic count stations to cover lower-functional class roadways and implemented geographic information system-based processes for tracking VMT. This has led to consistency between the VMT data reported by NCDOT and the HPMS VMT data published by FHWA for 2009 and subsequent years. Based on methods recommended by NCDOT, the 1990-2008 VMT data were adjusted by the DAQ to be consistent with the 2009 and later HPMS data. The 2005 VMT data disaggregated at the county-level were used for GHG emissions modeling with MOVES4. For the 2021 GHG emissions modeling, the DAQ used the county-level VMT data directly as provided by NCDOT. No revisions were warranted because NCDOT VMT tracking and reporting procedures were aligned with FHWA HPMS requirements beginning in 2009.

The DAQ developed 2006-2020 onroad CO₂ emission estimates in three steps. The first step was to develop 2006-2020 VMT estimates for the vehicle/fuel type output by MOVES4. These estimates were calculated from state-level VMT for 2006-2020 and interpolated ratios of each vehicle/fuel type's VMT in that year to the state total VMT. The second step was to develop 2006-2020 CO₂ emission factors for the vehicle/fuel type output by MOVES4. These factors were developed by interpolating between the years 2005 and 2021 emission factors that were computed from MOVES4 output for those two years. The final step was to multiply the vehicle/fuel type VMT in each year by the CO₂ emission factors for the vehicle/fuel type in that year.

For the remainder of the Transportation sector, which covers non-highway sources including aircraft, locomotives, and boats, the DAQ generally used the CO₂ emissions estimation methods/data incorporated into the SIT's CH₄ and N₂O Emissions from Mobile Combustion Module. The DAQ replaced SIT default jet fuel consumption data for aircraft for select years after identifying suspect trends in the SEDS transportation sector jet fuel consumption data that are used to estimate aviation emissions. A review of these SEDS data indicates that, beginning with year 2010, the EIA adopted a substantially different methodology for estimating jet fuel sales. To develop a more consistent series of jet fuel consumption, the DAQ applied the 1990-

2010 trend in total NC landing and take-off operations for commercial and military aircraft to backcast NC jet fuel consumption for the years 1990-2009.⁶²

In addition, estimates were developed to adjust the SIT's fuel consumption estimates for aircraft and boats to remove international bunker fuels (i.e., fuels consumed outside of the U.S.). Because NC-specific data were not available to perform this adjustment, the DAQ used emissions data from EPA's national GHG inventory to develop these adjustment factors.⁶³

Future Refinements

Future refinements could include additional research into ways to better perform the international bunker fuel adjustments to reflect NC activity.

CH₄ and N₂O Emissions from Mobile Combustion

Description

The SIT Mobile Combustion Module calculates CH₄ and N₂O emissions from the following mobile sources:

Gasoline Highway	Non-Highway
Diesel Highway	Alternative Fuel Vehicles

CO₂ emissions from the Transportation sector are calculated as discussed below. The Mobile Combustion Module provides an alternate method for calculating CO₂ emissions for highway vehicles that the DAQ used to extrapolate trends in vehicle CO₂ emissions for historical years not modeled via MOVES4.

Background and Default Data

The methodology for estimating CH₄ and N₂O emissions from mobile combustion is provided in the User's Guide for the SIT module as well as instructions and information provided in the spreadsheets for each module.⁶⁴

⁶² Federal Aviation Administration. "The Operations Network (OPSNET) > Airport Operations." <https://aspm.faa.gov/opsnet/sys/Airport.asp>. Accessed December 2023.

⁶³ EPA. Table 3-13, "Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2021." EPA 430-R-23-002. <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2021>. Accessed December 2023.

⁶⁴ EPA. "User's Guide for Estimating Methane and Nitrous Oxide Emissions from Mobile Combustion Using the State Inventory Tool." Prepared for EPA's State Energy and Environment Program by ICF, September 2020.

For highway/alternative fuel vehicles, CH₄ and N₂O emissions can be calculated in the SIT based on several factors including VMT, fuel type, engine type, and control technology type for the population of vehicles on roads in NC. However, as noted below, the DAQ used the MOVES4 model to calculate highway vehicle emissions.

CH₄ and N₂O emissions from non-highway mobile sources (e.g., aviation, marine, locomotives, construction equipment) and other non-highway equipment are derived from fuel consumption estimates. The default historical non-highway mobile source fuel consumption estimates provided in the SIT module for NC were used, except where noted above (CO₂ Emissions from Transportation).

Deviations from Defaults

For consistency with the development of highway vehicle CO₂ emission, the DAQ compiled CH₄ and N₂O estimates from the same 2005 and 2021 MOVES4 runs and extrapolation/interpolation procedures that were used to develop onroad vehicle CO₂ estimates. The VMT data that were used to calculate CH₄ and N₂O emissions were the same data that were used to estimate CO₂ emissions.

Future Refinements

No future refinements have been identified at this time.

CH₄ and N₂O Emissions from Stationary Combustion

Description

The SIT Stationary Combustion Module calculates CH₄ and N₂O emissions at stationary sources combusting (1) fossil fuels including coal, natural gas, and petroleum products, and (2) biofuels. The source sectors included in the module are listed below.

Residential	Industrial
Commercial	Electric Power

It also calculates CH₄ and N₂O that are stored or released using fossil fuels in the production of solvents, asphalt, synthetic rubber, naphtha, lubricants, and other products. Stationary Combustion CO₂ emissions are calculated in the Fossil Fuel Combustion Module as discussed above.

Background and Default Data

The methodology for estimating CH₄ and N₂O emissions from fossil fuel and biofuel stationary sources is provided in the User's Guide for this module as well as instructions and information provided in the spreadsheets for each module.⁶⁵

The default historical fuel consumption data provided in the SIT module for NC are used without any adjustments. These default data are from the EIA's SEDS.⁶⁶ It consists of the estimated amount of each type of fuel consumed by each sector.

Note that for the Industrial sector, the SIT also estimates consumption of fuel for non-combustion use for each fossil fuel type.

Deviations from Defaults

No data or estimation methods outside of those provided by the SIT are utilized in calculations.

Future Refinements

No future refinements have been identified at this time.

Natural Gas and Oil

Description

The SIT Natural Gas and Oil Module calculates CH₄ (and its CO₂e) emissions from Natural Gas and Oil systems. The subsectors included in the module are listed below.

Natural Gas Production	Natural Gas Distribution
Natural Gas Transmission	Petroleum Production, Refining, and Transportation

GHG emissions from the combustion of natural gas and oil are calculated in the Fossil Fuel Combustion Module as discussed below.

Background and Defaults

The methodology for estimating GHG emissions from Natural Gas and Oil systems is summarized in the User's Guide for the module, as well as information provided in the module's

⁶⁵ EPA. "User's Guide for Estimating Methane and Nitrous Oxide Emissions from Stationary Combustion Using the State Inventory Tool." Prepared for EPA's State Energy and Environment Program by ICF, June 2023.

⁶⁶ EIA. "State Energy Data System (SEDS): 1960-2021." <https://www.eia.gov/state/seds/seds-data-complete.php?sid=NC#Consumption>. Accessed September 2023.

spreadsheets.⁶⁷ Default activity data are generally not provided in the Natural Gas and Oil Module of the SIT. The focus for NC was the Natural Gas Transmission and Distribution sectors because the State does not produce or refine any oil or natural gas. CH₄ emission factors in the module for Natural Gas Transmission and Distribution are taken from a study conducted by the Gas Research Institute and EPA.⁶⁸ The CH₄ emission factor for natural gas transmission compressor stations used the module's default value of 983.66 metric tons (MT) per compressor station from 1990-2012 because these are years before data were available for estimating NC-specific compressor station emission factors from EPA's GHG Reporting Program.

Deviations from Defaults

A review of the NC emissions data reported to EPA's GHG Reporting Program suggested two periods with significantly different natural gas transmission compressor CH₄ emission rates. The CH₄ emissions factor for natural gas transmission compressor stations was calculated to be 500 metric tons/station from 2013-2014 and 300 metric tons/station from 2015-2020. These updated values reflect the approximate median values calculated from CH₄ emissions reported by NC compressor stations to EPA's GHG reporting program for each timeframe.⁶⁹ The 2010-2020 natural gas transmission pipeline miles data are input into the module were obtained from a NC query performed on the webpage of the U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA).⁷⁰ Natural gas distribution pipeline miles in NC by material and natural gas service data for select years (1990-1997, 2000, 2002, 2004-2005, 2007, 2009-2020) were compiled from PHMSA files.⁷¹ Values for other years were estimated via interpolation.

According to the PHMSA there were five liquefied natural gas liquefaction and storage facilities and 13 natural gas compressor stations operating in NC in 2020.⁷² Due to a lack of historical

⁶⁷ EPA. "User's Guide for Estimating Carbon Dioxide and Methane Emissions from Natural Gas and Oil Systems Using the State Inventory Tool." Prepared for EPA's State Energy and Environment Program by ICF, June 2023.

⁶⁸ Gas Research Institute and EPA. "Methane Emissions from the Natural Gas Industry, EPA-600/R96-080a and GRI-94/0257." June 1996. https://www.epa.gov/sites/production/files/2016-08/documents/1_executiveummary.pdf.

⁶⁹ EPA Greenhouse Gas Reporting Program. "Find and Use GHGRP Data." <https://www.epa.gov/ghgreporting/find-and-use-ghgrp-data>. Accessed December 2023.

⁷⁰ PHMSA. "2010+ Pipeline Miles and Facilities." <https://www.phmsa.dot.gov/data-and-statistics/pipeline/pipeline-mileage-and-facilities>. Accessed October 2023.

⁷¹ PHMSA. "Gas Distribution, Gas Gathering, Gas Transmission, Hazardous Liquids, Liquefied Natural Gas (LNG), and Underground Natural Gas Storage (UNGS) Annual Report Data." <https://www.phmsa.dot.gov/data-and-statistics/pipeline/distribution-transmission-gathering-lng-and-liquid-annual-data>. Accessed October 2023.

⁷² PHMSA. "2010+ Pipeline Miles and Facilities." <https://www.phmsa.dot.gov/data-and-statistics/pipeline/pipeline-mileage-and-facilities>. Accessed October 2023.

data, the NCUC facility/station counts are used for all pre-2020 years. There were no natural gas venting and flaring operations associated with natural gas production in NC from 1990-2020 based on EIA information.⁷³

Future Refinements

The EPA's GHGI incorporates a major change to the methodology for this sector. In future revisions to the inventory for this sector, the DAQ will evaluate the merits of this alternative approach relative to the SIT methodology.

Imported Electricity

Description

Imported electricity is the amount of electricity that NC imports from power plants that are located outside the State via the regional electricity grid system. Note that emissions associated with generating imported electricity do not occur in NC. However, the emissions are generated due to the demand for electricity in NC, therefore, these emissions can be considered part of NC's carbon footprint. Since this electricity is coming from the regional electricity grid, the average emission factors developed by EPA for the regional grid that contains NC were used to estimate GHG emissions from imported electricity.

Background and Defaults

Because the SIT does not specifically estimate emissions associated with imported electricity, the DAQ developed an approach. In keeping with the use of fuel consumption estimates used elsewhere in the SIT, the DAQ used EIA SEDS data to reflect the amount of electricity imported into NC. The DAQ specifically used NC "net interstate flow" of electricity data from SEDS.⁷⁴ The SEDS "net interstate flow" of electricity represents the difference between the sum of electricity sales and transmission losses within a state and the total amount of electricity generated within that state.

The average GHG emission factors developed by EPA for NC's regional electrical grid (Southeastern Electric Reliability Council - Virginia/Carolina Subregion or SRVC) as part of the EPA's Emissions & Generation Resource Integrated Database (eGRID) are used to calculate

⁷³ EIA. "Natural Gas Gross Withdrawals and Production."
https://www.eia.gov/dnav/ng/ng_prod_sum_a_EPG0_VGV_mmcf_a.htm. Accessed October 2023.

⁷⁴ EIA. "State Energy Data System (SEDS): 1960-2021 (complete)."
<https://www.eia.gov/state/seds/seds-data-complete.php?sid=US#Consumption>. Accessed October 2023.

emissions from imported electricity.⁷⁵ These emission factors are available on a per-kilowatt-hour-of-electricity basis. The EPA does not estimate emission factors for every year. If an emission factor is not available for a given year, the value for the first available year was used (e.g., 2004 CO₂ emission factor is used for all pre-2004 years), or an interpolated value was used. The GHG emissions from imported electricity are reported in the inventory under the “Electricity Generation and Use” sector.

Future Refinements

No future refinements have been identified at this time.

Agriculture

Description

The SIT Agriculture Module calculates CH₄ and N₂O emissions from agricultural operations. The subsectors included in the module are listed below.

Enteric Fermentation	Rice Cultivation	Agricultural Soils
Manure Management	Burning of Agricultural Crop Waste	

Background and Defaults

The methodology for estimating CH₄ and N₂O emissions from the Agriculture Sector is described within the SIT User’s Guide for this module as well as instructions and information provided in the spreadsheets for each subsector of the module.⁷⁶ The default historical activity data provided in the SIT module for NC were used without adjustments for the burning of agricultural crop waste; agricultural soils – plant residues and legumes; and agricultural soils – plant fertilizer subsectors. Default animal population and crop production data in the module are from the USDA’s National Agricultural Statistics Service (NASS). Because there is no rice production in NC, it is not necessary to perform calculations for the rice cultivation subsector. Default fertilizer use data are from the Association of American Plant Food Control Officials and The Fertilizer Institute. It should be noted that the module applies a national adjustment factor to reconcile differences between methodologies for estimating N₂O from agricultural soils between the SIT and EPA’s national inventory.

⁷⁵ EPA Clean Air Markets Division. “Download Data, eGRID with 2021 data.” <https://www.epa.gov/energy/emissions-generation-resource-integrated-database-egrid>. Accessed September 2023.

⁷⁶ EPA. “User’s Guide for Estimating Methane and Nitrous Oxide Emissions from Agriculture Using the State Inventory Tool.” Prepared for EPA’s State Energy and Environment Program by ICF, June 2023.

Deviations from Defaults

The default USDA data in the module were revised for the following livestock categories to reflect the most recent set of available livestock inventory estimates: beef cows; milk cows; goats; turkeys; and hogs. These data are from online queries of USDA datasets (note that USDA compiles these data sets in cooperation with the NC Department of Agriculture and Consumer Services).⁷⁷ These livestock data were used to calculate emissions for the following subsectors: enteric fermentation, manure management, and agricultural soils, animals and runoff.

Future Refinements

The agricultural soils – plant residues and legumes subsector does not include default production data for the following crop types: red clover, white clover, birdsfoot trefoil, arrowleaf clover, and crimson clover. Also, the agricultural soils – plant fertilizer subsector does not provide default data for the following organic types of fertilizers: compost, dried blood, dried manure, other sewage sludge, and tankage. Further research can be conducted to determine if it may be possible to supplement the default crop production and fertilizer use data with data for additional types of crops and fertilizers.

Municipal Solid Waste

Description

The SIT MSW module of the SIT calculates CH₄ emissions from landfilling MSW and CO₂ and N₂O from the combustion of MSW. Some landfills have added gas collection systems to collect and burn landfill gas (LFG) for electricity production and other energy uses (landfill-gas-to-energy projects or LFGTE). Other landfills flare LFG which converts the CH₄ portion to CO₂.

CO₂ emitted directly from landfills as biogas and CO₂ emitted from CH₄ combustion at the flares are not counted as anthropogenic GHG emissions in this inventory.

Background and Defaults

There are two subsectors in this module, landfills and combustion, and the emissions calculation methodology is different for each. The methodology for estimating GHG emissions

⁷⁷ USDA. “National Agricultural Statistics Service, Quick Stats.” NC data obtained October 2023 via online query of data from <https://quickstats.nass.usda.gov/>.

from MSW is provided in the User's Guide for this module as well as instructions and information provided in the spreadsheets for the module.⁷⁸

The default SIT values were used for landfill flaring which comes from EPA's Landfill Methane Outreach Project (LMOP) database.⁷⁹ Default population data from the US Census were included for the LFG emissions calculation.

The CH₄ emissions from industrial landfills in the SIT were assumed to be 7% of the MSW landfill emissions. No additional information has been found so the default value was used. Default fractions for plastics, synthetic rubber, and synthetic fiber combustion were also used.

Deviations from Defaults

For the landfill sector, total landfill disposal data from 1990 to 2022 were obtained from the NC Division of Waste Management.⁸⁰ These data are published in an annual report based on fiscal year, (July 1 through June 30 of the following year) and contain construction and demolition (C&D) debris. Since the SIT is based on calendar year rather than fiscal year, the disposal value was apportioned to the two partial calendar years represented by the fiscal year (half of the value is assigned to each year), then the two values from different fiscal years are summed to get the total for a calendar year. The C&D debris was apportioned in the same manner and subtracted from the disposal value. Each annual report encompassed a range of years so the report with the latest values for each year was used.

Information regarding LFGTE projects was extracted from EPA's LMOP database to estimate LFG annual flow and years of use.⁸¹

To maintain consistency with other modules, NC Office of State Budget and Management (OSBM) population data were used instead of the default population values.

⁷⁸ EPA. "User's Guide for Estimating Emissions from Municipal Solid Waste Using the State Inventory Tool." Prepared for EPA's State Energy and Environment Program by ICF, June 2023.

⁷⁹ EPA. "Landfill Technical Data, Landfill and Landfill Gas Energy Project Database, Landfill Methane Outreach Program (LMOP)." <https://www.epa.gov/lmop/landfill-technical-data>. Accessed September 2023.

⁸⁰ NCDEQ. "Solid Waste Management Annual Reports." <https://deq.nc.gov/about/divisions/waste-management/sw/data/annual-reports>. Accessed September 2023.

⁸¹ EPA. "Landfill Gas Energy Project Data, Landfill and Landfill Gas Energy Project Database, Landfill Methane Outreach Program (LMOP)." <https://www.epa.gov/lmop/landfill-technical-data>. Accessed September 2023.

Future Refinements

Further research into landfill flaring, CH₄ emissions from industrial landfills, and factors for the combustion of plastics, synthetic rubber and synthetic fibers would enhance the accuracy of the emission estimations.

Wastewater

Description

The Wastewater module of the SIT calculates CH₄ and N₂O emissions from the treatment of Industrial and Municipal Wastewater. The tool is separated into Municipal Wastewater and Industrial Wastewater sections. The Municipal Wastewater section calculates direct N₂O from biosolids, and CH₄ emissions. The Industrial section calculates CH₄ emissions from the fruit and vegetable, red meat, poultry, and pulp and paper industries.

Background and Defaults

The calculation methodology in the Wastewater module is complex and varies within the two sections. The methodology for estimating GHG emissions from Wastewater is provided by the User's Guide for this module as well as instructions and information provided on the spreadsheets for each module.⁸²

The source for Municipal Wastewater default values for CH₄ emissions is reported as state and local public works agencies. The default data were used for the Municipal Wastewater section of this tool.

The Industrial section of this module provides default data for the red meat industry but not for the poultry, pulp and paper, or fruit and vegetable industries. The default red meat data were obtained from the USDA's NASS.⁸³

Deviations from Defaults

No source of wastewater activity data for the fruits and vegetables industry was located. Wastewater emissions for the pulp and paper industry are reported for 2003 and later years because these are the only years with emission source specific emissions covered by the DAQ's Internet-Based Enterprise Application Management – Emissions Data (IBEAM-

⁸² EPA. "User's Guide for Estimating Emissions from Wastewater Using the State Inventory Tool." Prepared for EPA's State Energy and Environment Program by ICF, June 2023.

⁸³ USDA. "National Agricultural Statistics Service, Quick Stats." <https://quickstats.nass.usda.gov/>.

ED). Other sources of pulp and paper industry wastewater emissions would need to be identified to estimate pre-2003 emissions.

Production data for calculating wastewater emissions for the poultry sector were compiled for broiler chickens and turkeys from the USDA's NASS. These data were cross-referenced with production data for commercial broilers and turkeys from the 2022 NC Agricultural Statistics.⁸⁴

Future Refinements

NC-specific red meat production data and fruit and vegetable production data would enhance the emission estimates for this module if such data could be identified.

For consistency with other modules, NC OSBM population data could be used instead of the default population values if the SIT would allow replacement of the Wastewater module's default population data.

Industrial Processes

Description

The Industrial Processes module of the SIT calculates GHG emissions as follows:

- CO₂ emissions from cement production, lime manufacture, limestone and dolomite use, soda ash manufacture and consumption, iron and steel production, and ammonia manufacture.
- CO₂ and PFC emissions from aluminum production.
- N₂O emissions from nitric acid production and adipic acid production; and
- HFC, PFC, nitrogen trifluoride (NF₃), and SF₆ from HCFC-22 production, consumption of substitutes for Ozone-Depleting Substances (ODS), semiconductor manufacture, electricity transmission and distribution, and magnesium production and processing.

Background and Defaults

The methodology for estimating GHG emissions from Industrial Processes is provided in the User's Guide for this module as well as instructions and information provided in the spreadsheets for each module.⁸⁵ The methodology in the Industrial Processes module varies by sector so each sector is discussed separately with specific examples in the SIT's User Guide.

⁸⁴ USDA. "2022 NC Agricultural Statistics."

https://www.nass.usda.gov/Statistics_by_State/North_Carolina/Publications/Annual_Statistical_Bulletin/index.php. Accessed December 2023.

⁸⁵ EPA. "User's Guide for Estimating Emissions from Industrial Processes Using the State Inventory Tool." Prepared for EPA's State Energy and Environment Program by ICF, June 2023.

NC does not have the following Industrial Processes operating in the State: cement production; lime manufacture; ammonia manufacture; nitric acid production; adipic acid production; magnesium production; and HCFC-22 production.

Consumption of ODS substitutes reflects national emissions allocated to each state. National emissions are apportioned to each state using a hybrid approach, based on both population and regional emission estimates from specific HFCs. Regional HFC emission estimates were provided by Hu, L., et al. (2017).⁸⁶

Deviations from Defaults

Iron and steel production and semiconductor manufacture are the only sectors in the Industrial Processes module where estimates deviated from SIT defaults. The default values for the Iron and Steel Production sector are based on national averages and appeared to overestimate emissions in NC. There is only one permitted facility in NC that operates using a production method listed in the SIT. Therefore, production/activity data from the DAQ's IBEAM-ED module for that permitted facility were converted to MT. These values were entered into the SIT for calendar years 2001 to 2020.

Semiconductor manufacture GHG estimates for calendar years 1990 through 2015 were calculated using SIT defaults. In the SIT, default estimates of national emissions from the semiconductor manufacturing sector are distributed to NC based on the ratio of the monetary value of NC semiconductor shipments to the value of national semiconductor shipments. For the years available (2016 through 2020), NC semiconductor manufacturer emissions of SF₆, HFC, NF₃, and PFC were obtained directly from the GHG Reporting Program. All three NC permitted facilities in the semiconductor manufacturer sector reported emissions to the GHG Reporting Program, so these emissions were summed and entered into the SIT for each calendar year.

Phosphoric acid production is not included in the SIT Industrial Processes module; however, NC emissions data are reported for this process to EPA's GHG Reporting Program. Because NC has one phosphoric acid production facility that reports emissions to EPA, the DAQ added these emissions for the years for which they were available (2010 through 2020). Calendar year 2002-2009 emissions were estimated using data reported to the DAQ, current carbon weight percent values obtained from the facility, and the calculation equation Z-1A in Part 98 Subpart Z of the Federal Mandatory GHG Reporting Rule. No throughput data or weight percent of carbon are readily available for calendar years 1990 through 2001, therefore, the 2002 CO₂ emission value is reported for these years as a best estimate.

⁸⁶ Hu, L., et al., "Considerable contribution of the Montreal Protocol to declining greenhouse gas emissions from the United States," *Geophys. Res. Lett.*, 44, 8075–8083, 2017.

Future Refinements

For the two sectors that use national emissions, consumption of ODS substitutes and semiconductor manufacturing, the SIT default population values for NC from 1990 to 2020 were used because these tables are protected and could not be accessed. For consistency with other modules, the NC OSBM's population data could be used for the allocation process instead of the default population values.

The ODS substitutes sector is the largest contributor to PFC, HFC, and SF₆ emissions for NC. A more in-depth review of the calculation methodology for this sector may be warranted because the projected values for this sector reflect a significantly large increase.

Land Use, Land Use Change, and Forestry

Description

The LULUCF sector accounts for emissions and/or sequestration of CO₂, CH₄, and N₂O from activities on NWL. These are broken down into subsectors by major land use type, including Forest Lands; Cropland and Grassland; Settlements; and Wetlands. The source of best-available estimates varies by subsector and category, which are summarized in Table A-1 below.

GHG inventories report fluxes occurring within each land use type, as well as those resulting from conversions between land use types. A land use change refers to land converted to a different use within the previous 20 years. This inventory follows the structure of the EPA GHGI, which groups sources of emissions and sinks by current land use category.

Table A-1. Source of LULUCF Sector Emissions/Sink Estimate by Subsector/Category

Data Source/Subsector	Category
SIT Module	
Forest Lands	<i>Forest Carbon Flux*</i> <i>Non-CO₂ Emissions from Forest Fires**</i>
Cropland and Grassland	<i>Agricultural Soil Carbon</i>
Settlements	<i>N₂O on Settlement Soils</i>
EPA Greenhouse Gas Inventory for NC	
Settlements***	<i>SRS: Urban Trees</i> <i>SRS: Landfilled Yard Trimmings and Food Scraps</i> <i>LCS: Ecosystem Carbon</i> <i>SRS: Organic Soil</i>
Wetlands	<i>Flooded Lands and Peatlands</i>
NC Coastal Habitats Greenhouse Gas Workgroup	
Wetlands	<i>Coastal Wetlands</i>

* Forest Land Remaining Forest Land and Land Converted to Forest Land. Forest Carbon Flux in the SIT also includes Forest Land Converted to Settlements, see text for details.

** SIT with acreage burned data compiled from NC and federal databases, see text for details.

*** Settlements Categories: *Settlements Remaining Settlements (SRS)* and *Land Converted to Settlements (LCS)*

Since the 2022 NC GHG Inventory, EPA has updated data and/or methods in every LULUCF subsector. As a result, some estimates in this report are substantially different from those reported in the 2022 inventory. The LULUCF SIT module includes default data from the USFS and the GHGI for Forest Lands; Cropland and Grassland; and some categories within the Settlements subsector. The GHGI also includes updates to some data sources and/or methodologies which EPA has not yet integrated into the SIT.⁸⁷ As with the previous (2022) GHG inventory, this inventory includes EPA estimates of NC emissions/sinks for some Settlements and Wetlands categories missing from the SIT. The DAQ incorporated the EPA state-level estimates for these missing source categories in this inventory and incorporated the updated estimates for other source categories. Estimates used in this inventory for Coastal Wetlands were developed by the NC Coastal Habitats Greenhouse Gas Workgroup.⁸⁸

Background and Defaults

The methodologies used within the SIT for estimating CO₂, CH₄, and N₂O emissions from the LULUCF sector are provided in the User's Guide as well as instructions and information in the spreadsheets of the LULUCF module.⁸⁹ The default input data within the SIT are revised periodically to reflect the latest data sources and methodologies, though these updates may not be completed at the same intervals as updates incorporated into EPA's GHGI. The DAQ used the SIT's LULUCF module and default inputs to develop estimates for Forest Carbon Flux (FRF and *Land Converted to Forest Land*), non-CO₂ emissions from Forest Fires, Agricultural Soil Carbon Flux, and N₂O emissions from fertilization of Settlement Soils. The inputs varied considerably from category to category but included estimates of carbon stock changes in forests, wood products, and agricultural soils, and the amount of synthetic fertilizer applied to soil on developed lands. Carbon dioxide emissions from forest fires are automatically accounted for in the SIT's inventory of forest carbon stocks, and non-CO₂ emissions from forest fires are estimated separately in the SIT. Significant changes to estimates of carbon flux in the forest and agriculture subsectors reflect EPA's updates to the SIT default data since the previous (2022) GHG inventory.

⁸⁷ EPA. "Inventory of U.S. Greenhouse Gas Emissions and Sinks by State: 1990-2020." April 2022. <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2020>.

⁸⁸ NC Coastal Habitats GHG Workgroup. "NC Coastal Habitat Greenhouse Gas Inventory." September 2023.

⁸⁹ EPA. "User's Guide for Estimating Emissions and Sinks from Land Use, Land-Use Change, and Forestry Using the State Inventory Tool." Prepared for EPA's State Energy and Environment Program by ICF, June 2023.

Deviations from Defaults

Forest Fires

Emissions of CH₄ and N₂O from forest fires are estimated in the SIT module, requiring inputs of annual area burned. No single source of acreage burned data is available for all inventory years, and some sources only report data for certain fire types or jurisdictions. To compile forest fire acreage burned data, the DAQ used a combination of approaches and the best-available data sources for each year, consistent with the methods in the previous (2022) NC GHG inventory.

The acreage burned estimates developed for this inventory prioritized wildfire data from the NCFS, supplemented by the federal interagency “SIT-209” database for wildfires and prescribed burning.^{90,91} Because data were not accessible from the SIT-209 for every year, the DAQ used other methods/data to estimate values in some (mostly earlier) years. Sources included the National Interagency Fire Center and the EPA’s National Emissions Inventory.^{92,93} The DAQ is working to identify additional sources of burn acreage data to refine these estimates for future versions of NC’s inventory.

Settlements

Three Settlements categories are included in the SIT’s LULUCF module. Emissions of N₂O from Settlement Soils were modeled in the SIT using default data. Estimates for carbon stock changes in both the Urban Trees and Landfilled Yard Trimmings and Food Scraps categories differed significantly between the EPA’s GHGI and the SIT. In communication with EPA, it was determined that the GHGI estimates were developed using the latest data and methods and are a better representation of NC’s carbon sequestration in these categories. Therefore, the DAQ incorporated carbon flux estimates from the 1990-2020 GHGI into this inventory for these categories.

The GHGI also provides estimates for other Settlements categories not included in the SIT. To provide a comprehensive LULUCF sector inventory, the previous NC GHG Inventory

⁹⁰ NCFS. “Wildfire and Acreage Statistics: 1928- Present.” https://www.ncforestservice.gov/fire_control/wildfire_statistics.htm. Accessed November 2023.

⁹¹ U.S. Department of Agriculture and the U.S. Department of the Interior. SIT-209 data obtained from Wildland Fire Application Information Portal: <https://www.wildfire.gov/application/sit209>. Accessed October 2023.

⁹² U.S. Department of Interior, National Interagency Fire Center. Historical year-end fire statistics by state compiled from National Interagency Coordination Center fire records. <https://www.nifc.gov/nicc/predictive-services/intelligence>.

⁹³ EPA. "Pollutant Emissions Summary Files for Earlier NEIs." <https://www.epa.gov/air-emissions-inventories/pollutant-emissions-summary-files-earlier-neis>. Accessed February 2021.

supplemented SIT Settlements estimates with additional GHGI Settlements estimates. In the previous NC inventory, GHGI estimates for Land Converted to Settlements (LCS) – *Changes in Ecosystem Carbon Stocks* were incorporated into a category listed as “Categories not included in SIT.” At that time, it was not clear that Forest Land Converted to Settlements (FCS) was also included in the SIT’s Forest Carbon Flux subsector. The SIT/GHGI overlap is demonstrated in Table A-2 showing LCS estimates by carbon pool from both the SIT (which only includes FCS) and the GHGI (which includes all land use types converted to settlements). The SIT and GHGI estimates for living biomass and dead plant matter are an exact match, because those LCS carbon pools only apply to FCS. SIT data includes estimates for mineral soils in FCS, and GHGI includes those FCS mineral soil estimates as well as mineral and organic soil estimates for other land use types converted to settlements.

Table A-2. LCS Emissions Estimates by Data Source (MMTCO_{2e})

LCS* Carbon Pools	1990		2005		2020	
	SIT (only FCS**)	GHGI (all LCS)	SIT (only FCS)	GHGI (all LCS)	SIT (only FCS)	GHGI (all LCS)
Aboveground Biomass	1.75	1.75	1.81	1.81	1.85	1.85
Belowground Biomass	0.34	0.34	0.35	0.35	0.36	0.36
Deadwood	0.23	0.23	0.24	0.24	0.24	0.24
Litter	0.41	0.41	0.42	0.42	0.43	0.43
Soil (Mineral)	0.04	0.23	0.07	0.65	0.05	0.41
Soil (Organic)	-	0.05	-	0.08	-	0.03
Total LCS	2.77	3.00	2.89	3.55	2.93	3.32
Non-forest LCS	0.23		0.66		0.39	

* Land Converted to Settlements

** Forest Land Converted to Settlements

Because this NC Inventory follows the GHGI’s category structure, LCS emissions are reported within the Settlements subsector. The GHGI estimates for LCS, which include all land use types converted to settlements (including FCS), are incorporated into this inventory as LCS:

Ecosystem Carbon Flux. The removal of previously double-counted FCS estimates results in significantly lower LCS estimates in the current inventory. The correction, summarized in Table A-3 results in lower emissions by about 3 MMT.

The EPA’s GHGI estimates for Settlements Remaining Settlements – *Organic Soil Carbon Flux* are also incorporated into this NC inventory.

Table A-3. LCS Emissions Estimates by Inventory Year (MMTCO₂e)

Report year/ Subsector	Category/ Subcategory/ Data Source	1990	2005	2010	2015	2018	Average 2005-2018
2022	Total LCS Reported	5.92	6.57	6.47	6.40	6.35	6.46
<i>Forest Carbon Flux Categories not included in SIT</i>	<i>FCS from SIT</i>	2.84	2.94	2.95	2.98	2.97	
	<i>LCS from GHGI</i>	3.08	3.64	3.52	3.42	3.38	
2024 Settlements	Total LCS from GHGI	3.00	3.55	3.43	3.35	3.32	3.42
Average Difference							-3.04

Wetlands

The Wetlands subsector includes emissions/sequestration estimates for Peatlands, Flooded Lands, and Coastal Wetlands. The GHGI includes estimates for Wetlands subcategories related to Peatlands and Flooded Lands.⁹⁴ Three new GHGI subcategories are incorporated into this updated NC inventory: Land Converted to Wetlands – *Changes in Carbon Stocks in Lands Converted to Flooded Lands*, Wetlands Remaining Wetlands – *Flooded Lands Remaining Flooded Lands* (CH₄), and Land Converted to Wetlands – *Land Converted to Flooded Lands* (CH₄).

In 2023, the NC Coastal Habitats Greenhouse Gas Workgroup (Workgroup), formed within the NC Natural and Working Lands Stakeholder Group, developed a new inventory of GHG emissions/sinks from land converted to/remaining coastal wetlands.⁹⁵ In order to refine estimates for NC, the Workgroup utilized high-resolution federal land use and land cover data for coastal wetlands that have not yet been integrated into the SIT or GHGI methodologies. The DAQ has incorporated Workgroup estimates for estuarine coastal wetlands (salinity ≥ 0.5 practical salinity units) into this inventory. The Workgroup also developed estimates of GHG emissions and removals within high-salinity seagrass meadows, which are not inventoried in any EPA inventory. The Workgroup’s seagrass estimates are included as a new subcategory in this inventory. NC’s Coastal Wetlands are a net GHG emitter, but at a very small scale relative to the overall LULUCF Sector. Table A-4 shows Coastal Wetlands emissions and sinks by gas and category in kilotons (kt) CO₂e (1 MMT = 1,000 kt). The estimates reflect a decrease in both annual carbon sequestered and annual emissions from Coastal Wetlands between 2005 and

⁹⁴ EPA. “Inventory of U.S. Greenhouse Gas Emissions and Sinks by State: 1990-2020.” April 2022. <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2020>.

⁹⁵ NC Coastal Habitats GHG Workgroup. “NC Coastal Habitat Greenhouse Gas Inventory.” September 2023.

2020. For 2020, net Coastal Wetlands flux was estimated at 34.1 kiloton of carbon dioxide equivalent (kt CO₂e) (0.034 MMTCO₂e).

Carbon sequestered in high-salinity seagrass meadows has decreased over time due to a loss in coverage area. The Workgroup expects that this trend will continue over the coming decades and has projected acreage and emissions for 2030 and 2050 as shown in Table A-5 below.⁹⁶ Because of their small magnitude and the uncertainty surrounding these projected emission changes, this projection is not incorporated into the LULUCF sector forecast for the state.

Table A-4. GHG Emissions and Sinks from Coastal Wetlands (kt CO₂e)

Gas/Category	1990	2005	2017	2018	2019	2020
CO₂						
Coastal Wetlands Remaining Vegetated Coastal Wetlands	-276.03	-270.57	-279.91	-278.58	-277.25	-275.92
Land Converted to Vegetated Coastal Wetlands	-2.58	-1.24	-2.07	-2.09	-2.11	-2.14
Seagrass Soil Carbon Flux	-70.46	-70.46	-60.53	-59.18	-57.83	-56.49
Coastal Wetlands Carbon Flux	-349.08	-342.27	-342.51	-339.86	-337.20	-334.54
CH₄						
Coastal Wetlands Remaining Vegetated Coastal Wetlands	373.29	382.31	373.25	371.32	369.38	367.44
Land Converted to Vegetated Coastal Wetlands	0.07	0.07	0.86	0.97	1.08	1.19
Coastal Wetlands Emissions	373.37	382.37	374.12	372.29	370.46	368.63
Net GHG Flux (kt CO₂e)	24.29	40.11	31.60	32.43	33.26	34.09

Table A-5. Workgroup Projections for Seagrass Area (acres) and Emissions (kt CO₂e)

Seagrass Projections	2020	2030	2050
Area (acres)	88,526	67,383	36,399
Soil Carbon Flux (kt CO ₂ e)	-56.49	-42.99	-23.22

Planned integration by EPA of coastal land use and land cover datasets into future inventories will result in further refinement of coastal wetlands GHG estimates.

Future Refinements

The EPA releases annual state-level estimates of emissions/sinks for the LULUCF sector as part of its state GHGI. For several subsectors, these data have matched the default data in the

⁹⁶ NC Coastal Habitats GHG Workgroup. "High Salinity Seagrass Meadows: Projections of area and carbon net accumulation to 2030 and 2050." Email transmitted by Workgroup to Amanda Crenshaw, NCDAQ, December 2023.

SIT module. Where the estimates differed between the two sources, DAQ made the determination of which data to include in this inventory through communication with EPA. The DAQ anticipates that future LULUCF sector estimates from EPA will be more closely aligned between the two sources. For those LULUCF sector subcategories that are not estimated in the SIT, EPA's state-level emission/sink estimates are incorporated into NC's inventory. The notable exceptions are coastal wetlands subcategories, which are taken from the NC Coastal Habitats Greenhouse Gas Inventory. Future versions of the LULUCF sector inventory will incorporate emissions/carbon flux estimates reflecting the best information available at that time.

Harvested Wood Products (HWP) are a component of Forest Carbon Flux, estimating carbon sequestered in trees that are cut for wood products such as building materials, furniture, or paper. The EPA and USFS are working to develop refined state-level estimates of carbon flux in HWP. These estimates are of particular interest in NC, where forestry and HWP manufacturing are among the state's largest industries. The DAQ anticipates that more accurate assessments of carbon stored in wood products will be available for inclusion in future versions of NC's inventory.

An expert panel exploring the carbon sequestration potential of NC's NWL found that restoration of peatlands may have the potential to convert them into a net sink, as well as building resilience to fire and creating broad ecosystem benefits.⁹⁷ Further study, including data from restoration projects, may allow development of sequestration estimates in NC peatlands for future inventories.

Projected GHG Emissions (2021-2050)

Description

Because of delays in preparing and releasing historical data by various government agencies, 2020 is generally the last year for which historical data are used in estimating NC's GHG emissions. This section summarizes the methods and data sources that are used to project the 2020 emissions from 2021 through 2050. These projections represent a characterization of future emissions based on information available at the time of this study and only reflect the effects of "on-the-books" measures to limit GHG emissions where information is available to characterize their effects.

⁹⁷ "NC Climate Risk Assessment and Resilience Plan: Appendix B: North Carolina Natural and Working Lands Action Plan." June 2020.

Background and Defaults

Emissions forecasts are generally developed using the Projections Tool module within EPA's SIT. The Projections Tool has 18 sub-modules for estimating source sector emissions using different default data and forecasting techniques for each sector. The methodologies incorporated into the Projections Tool are summarized in the User's Guide for this module, as well as instructions and information provided in the spreadsheets for each module subsector.⁹⁸

This module forecasts emissions for each source sector using one of the following approaches.

- (1) Projections of emissions activity such as fuel use or number of livestock or surrogates for such activity (e.g., human population is used to develop state-level projections from national forecasts).
- (2) Extrapolation of historical trends in emissions or emissions activity.

The following table summarizes the default projection methodology for each source sector.

Table A-6. Projection Methods for Each Source Sector

Forecast Based on Projections Data	Forecast Based on Historical Trend
Electric Generation and Consumption*	Agricultural Soils
RCI Combustion*	Agricultural Residue Burning
Transportation/Mobile Source Combustion	Waste Combustion
ODS Substitutes; Electric Power Systems	Industrial Processes (except subsectors at left)
Solid Waste Management	Wastewater
Livestock	
Natural Gas Systems	

*Excludes wood. Wood consumption is based on the historical trend in fuel consumption.

For sectors that forecast emissions based on projections data, the tool relies on projections of activity data (or surrogate activity data) obtained from similar federal and state resources as those used in calculating historical emissions.

Note that the Projections Tool does not have a sub-module for the LULUCF sector, therefore, the 2020-year estimates for GHG emissions and carbon sinks are generally carried forward to each forecast year (the one exception, as discussed below, is the Forest Fires category).

Deviations from Defaults

In some cases, different projections methods/data are used to estimate emissions than the default methods/data provided in EPA's Projections Tool. These revisions reflect the use of more current data, NC-specific data, or a methodology that results in projected emissions better in line with NC historical trends. The revisions to the use of Tool defaults are summarized in

⁹⁸ EPA. "User's Guide for States Using the Greenhouse Gas Projection Tool." Prepared for EPA's State Energy Program by ICF, June 2023.

Table A-7. In addition to the revisions listed in this table, the Tool default population projections are replaced with projections from the NC OSBM.⁹⁹

Table A-7. Summary of Revisions to EPA Projections Tool Defaults

Sector	Revised Projections Approach(es)	Rationale for Use
Electricity Generation and Imported Electricity	<p><u>Electricity Generation</u> For 2021 & 2022, heat input (in MMBtu) by fuel type from fuel used in 2021 & 2022, which was obtained from EIA Form 923 data.¹⁰⁰ For 2023 through 2050 heat input, two different approaches are used:</p> <p>(a) For Duke Energy facilities: 2024 through 2050 - Duke Energy Corporation's October 2023 Pathway 1/ Core Portfolio 1 forecast of NC fuel use (in MMBtu).¹⁰¹ For 2023, values interpolated between actual 2022 EIA fuel input and Duke Energy's 2024 forecast fuel use. (b) All other NC electricity generation reflect the average of the last three available years (2020-2022) of fuel consumption (in MMBtu) compiled from EIA Form 923 data.</p>	<p>Historical fuel use data are preferable to a projection.</p> <p>Duke Energy's forecast is preferred because it is developed via the Integrated Resource Plan process. 2023 interpolated values are used because 2023 actual values are not yet available.</p> <p>The historical average fuel use is used because these sources represent a small percentage of sector emissions and forecasts for all these smaller sources are not available.</p>
	<p><u>Imported Electricity</u> (a) For 2021-2050, SIT projections of retail electricity consumption are used. (b) The percent of imported electricity for all projection years is assumed to be the average of the percent imported over the last three (2019-2021) available years (11.22%) based on EIA data.¹⁰²</p>	<p>Imported electricity emissions were calculated using the most recent data available for characterizing net imports (2019-2021). This value was held constant for projection years since there are many</p>

⁹⁹ NC Office of State Budget and Management. "County/State Population Projections." <https://www.osbm.nc.gov/facts-figures/population-demographics/state-demographer/countystate-population-projections>. Accessed November 2023.

¹⁰⁰ EIA. "2020-2022 Form EIA-923 detailed data with previous form data (EIA-906/920)." <https://www.eia.gov/electricity/data/eia923/>. Accessed July 2023.

¹⁰¹ Duke Energy, 2023 CPIRP NCDQA Data Request – P1.xlsx, e-mail transmittal from Cynthia Winston to Ming Xie, NC Division of Air Quality, October 11, 2023.

¹⁰² EIA, State Energy Data System (SEDS): 1960-2021, available from <https://www.eia.gov/state/seds/seds-data-complete.php?sid=NC#Consumption>, accessed September 2023.

Sector	Revised Projections Approach(es)	Rationale for Use
Transportation	<p>(c) The imported electricity used for a given year is calculated as the projected retail electricity consumption multiplied by the percent imported.</p> <p>(d) Projected GHG emission rates are based on information provided in a recent EPA regulatory impact analysis.¹⁰³</p> <p><i>Onroad Vehicles</i> – MOVES4 model runs with NC historical/forecast VMT inputs used to estimate 2021, 2030, and 2050 emissions. Emissions for 2022-2029 estimated as product of VMT and emission factors interpolated from 2021 and 2030 MOVES4 model run output. Emissions for 2031-2049 estimated similarly from 2030 and 2050 MOVES4 model run output.</p>	<p>uncertainties in projecting imported electricity.</p> <p>Projected rates for South Carolina are the highest of the rates of adjoining states, so represent a conservative assumption.</p> <p>A more sophisticated modeling approach that uses official EPA onroad mobile source emissions estimation model, provides additional subsector granularity, and future year modeling flexibility.</p>
Industrial Processes	<p><i>Non-highway</i> – Aviation and Boats use a linear extrapolation of historical emissions data. Locomotives, Farm Equipment, Construction Equipment, and Other Equipment apply the average of 2003-2020 emissions in each category and apply this value to each forecast year.</p> <p><i>ODS substitutes</i> – apply HFC emissions growth rates from national EPA non-CO₂ projections report to 2020 NC emissions.¹⁰⁴</p>	<p>Forecast emission trends were not in line with historical trends. Forecast approach based on historical emissions trend – if there is a clear trend (Aviation/Boats) or not (all other categories). With Aviation and Boats, a clear trend only started with 2003 emissions (probably due to post-9/11 travel/economic impacts), so pre-2003 data were excluded from use in each forecast approach.</p> <p>Default Tool projections result in emission values that are unrealistically high.</p>

¹⁰³ EPA, "Regulatory Impact Analysis for the Proposed New Source Performance Standards for Greenhouse Gas Emissions from New, Modified, and Reconstructed Fossil Fuel-Fired Electric Generating Units; Emission Guidelines for Greenhouse Gas Emissions from Existing Fossil Fuel-Fired Electric Generating Units; and Repeal of the Affordable Clean Energy Rule," EPA-452/R-23-006, May 2023.

¹⁰⁴ EPA, "Global Non-CO₂ Greenhouse Gas Emission Projections & Mitigation, 2015–2050," Office of Atmospheric Programs, EPA-430-R-19-010, October 2019.

Sector	Revised Projections Approach(es)	Rationale for Use
Solid Waste/Landfill CH ₄ Emissions	<p><i>Phosphoric acid production</i> is not included in the SIT Industrial Processes module; however, NC emissions data are reported for this process to EPA's GHG Reporting Program. The 2021 CO₂e value is carried forward every year to 2050. Apply average of 2003-2020 emissions to each forecast year.</p>	<p>Reported GHG emissions from phosphoric acid production are relatively constant from 2002 through 2016, so the 2016 value is held constant for projected years.</p> <p>Best identified approach given historical emissions did not indicate a clear trend (periods with increases and periods with decreases), while the SIT Projection Tool consistently forecast unrealistically large emissions increases.</p>
Land Use/Forest Fires	Forest Fire emissions held constant at the 10-year average for 2011-2020.	Emissions from wildfires and prescribed burns are highly variable. Recent longer-term values capture high, medium, and low occurrence years related to shorter-term climate interactions with normal seasonal trends.

Electricity Generation

To incorporate an initial estimate of the impact associated with the 2030 and 2050 CO₂ emissions reduction targets established in SL 2021-165, the emissions forecast for the electricity generation sector in this report incorporates the generation forecast for Pathway 1/Core Portfolio 1 Duke Energy included in its proposed Carbon Plan/Integrated Resources Plan (CPIRP) submitted to the NCUC on August 17, 2023.¹⁰⁵

For use in this Electricity Generation forecast, the DAQ summed Duke Energy's proposed Pathway 1/Core Portfolio 1 unit-level fuel use (i.e., heat input) projections by fuel type for each year from 2024 through 2050. These projections were used along with the SIT's Projection Tool fuel-specific emission factors to project GHG emissions for Duke Energy facilities for these years. Because actual 2021 and 2022 heat input by fuel type was available from EIA for Duke Energy facilities, these data were used to develop emission projections for these years. Because 2023 heat input data were not available at the time that this forecast was produced, the DAQ interpolated between the actual 2022 heat input by fuel type and the 2024 proposed CPIRP Pathway 1 fuel type projections to estimate 2023 fuel use for Duke Energy units. The

¹⁰⁵ Duke Energy, 2023 CPIRP NCDQAQ Data Request - P1.xlsx, e-mail transmittal from Cynthia Winston to Ming Xie, NC Division of Air Quality, October 11, 2023.

fuel use estimates for Duke Energy for 2021-2023 were combined with the SIT Projection Tool's fuel-specific emission factors to estimate emissions in these years.

For non-Duke Energy units in NC, emission projections reflect use of the Tool's emission factors and the average of the last three available years of fuel consumption data (2020-2022), compiled from the EIA.¹⁰⁶ This approach is consistent with that used in the previous GHG inventory, and reflects the lack of information for projecting fuel use/emissions for these generating units.

The DAQ applied the same approach to estimating net interstate flow of electricity for NC as was used in the previous GHG inventory. This approach relies on electricity demand forecasts for NC from EPA's Projections Tool, and the recent historical average percentage of NC demand met by imports (approximately 11% for 2019-2021). To estimate future year imported electricity CO₂ emission factors per kilowatt-hour (kWh), the DAQ applied the emission rates projected for South Carolina from EPA's regulatory impact analysis for its proposed New Source Performance Standards/Emission Guidelines for GHGs from Electric Generating Units.¹⁰⁷ Because EPA did not develop CH₄ and N₂O emission projections in this regulatory analysis, the DAQ calculated forecast year CH₄ and N₂O emission rates by first calculating ratios of the projected South Carolina CO₂ emission rate in each forecast year to the 2021 CO₂ emission rate. The DAQ then applied these ratios to 2021 CH₄ and N₂O emission rates to develop projected CH₄ and N₂O emission rates for imported electricity.

Onroad Vehicles

Forecasts for the onroad vehicle sector were developed from a 2021 emissions baseline. For the 2021 GHG onroad emissions modeling, the DAQ used 2021 VMT estimates from the NCDOT based on the data compiled for the HPMS. For the 2030 and 2050 onroad vehicle GHG emissions modeling, the DAQ used VMT estimates projected from the 2022 NC HPMS VMT dataset. County-level growth factors for 2023 through 2050, relative to a 2022 base year, were first developed based on population forecasts for each NC county obtained from the NC OSBM State Demographer's Office and on annual per capita VMT forecasts obtained from Annual Energy Outlook (AEO) 2023. The DAQ then developed 2030-year and 2050-year county-level VMT projections by multiplying each county's 2022 annual VMT by their corresponding 2030 and 2050 growth factors.

¹⁰⁶ EIA, "2020-2022 Form EIA-923 detailed data with previous form data (EIA-906/920)," available from <https://www.eia.gov/electricity/data/eia923/>, accessed July 2023.

¹⁰⁷ EPA. "Regulatory Impact Analysis for the Proposed New Source Performance Standards for Greenhouse Gas Emissions from New, Modified, and Reconstructed Fossil Fuel-Fired Electric Generating Units; Emission Guidelines for Greenhouse Gas Emissions from Existing Fossil Fuel-Fired Electric Generating Units; and Repeal of the Affordable Clean Energy Rule," EPA-452/R-23-006. May 2023.

To evaluate the impact of battery electric vehicles (BEVs) on future GHG emissions, estimates of VMT by vehicle type and fuel type were developed for 2021, 2030, and 2050 from MOVES4 model runs using statewide vehicle fleet and VMT estimates for each year. The output data, which reflected the MOVES4 default fractions of BEVs in the fleet, were compiled to provide statewide annual VMT estimates by vehicle type and fuel type. Estimates of 2030 and 2050 fleet populations of light-, medium-, and heavy-duty BEVs were then developed for the Duke Energy service areas of the state (roughly 83 counties) and were extended to cover the remaining 17 counties serviced by other utilities. Duke Energy provided projected annual numbers of light-, medium-, and heavy-duty BEVs in operation within the Duke Energy service areas for the years 2023 through 2040, consistent with its corresponding projections for BEV-related energy generation.¹⁰⁸ Based on these data, the DAQ developed estimates of BEVs in service for years 2041-2050. The DAQ then used the 2030 and 2050 BEV population estimates to revise the distribution, by vehicle type and fuel type, of the 2030 and 2050 statewide VMT estimates, assuming that BEVs would be one-to-one replacements of light-, medium-, and heavy-duty internal combustion engine vehicles. Under this assumption, each BEV introduced into the fleet effectively zeroes out the GHG emissions from an internal combustion engine vehicle of the same type. This provided 2030 and 2050 VMT estimates consistent with the Duke Energy BEV projections.

To generate statewide GHG onroad mobile source emission factors, MOVES4 modeling runs, using the model default inputs data for NC, were completed for 2021, 2030, and 2050. GHG emission factors, in units of grams per mile, were calculated for each vehicle type and fuel type combination. GHG emissions for each year were calculated by multiplying the annual VMT estimates described above by the corresponding emission factors to provide annual grams per year emissions by vehicle type and fuel type, and then converted to annual MT.

Projected onroad emission estimates for each interim year between the modeled years (2021-2029 and 2031-2049) were developed by first interpolating VMT estimates and emission factors between adjacent modeled years (2021-2030 and 2030-2050) and then multiplying the values as described above. Combined with the modeled years, this provided GHG emissions by vehicle/fuel type for each of the three GHGs for all years from 2021 through 2050.

Ozone-Depleting Substances (ODS)

Although there are some other ODS substitutes, HFCs are by far the most prevalent. The EPA has been working to implement the American Innovation and Manufacturing (AIM) Act, which authorizes EPA to reduce production and consumption of HFCs on the same schedule as the Kigali Amendment, which the U.S. recently ratified. The EPA has begun evaluating the impacts on HFC emissions from the AIM Act, but information is not currently sufficient for use in forecasting emissions from ODS substitutes in NC. Therefore, the DAQ applied growth rates

¹⁰⁸ Winston, Cynthia, Duke Energy Corporation, "NC EV Forecast," transmitted to Andy Bollman, NCDEQ, October 23, 2023.

reflecting national HFC emission projections developed by EPA in 2019 to forecast this category (this approach was deemed reasonable when described with an EPA ODS substitute contact).¹⁰⁹ While these projections account for other ODS substance reducing policies (e.g., EPA's Significant New Alternatives Policy Program), they do not account for AIM Act-related emission reductions. Therefore, the projections for this category should be considered conservatively high. Future support from EPA will be essential in developing state-level ODS substitute projections reflecting the AIM Act.

Future Refinements

Additional research may identify improved forecast data/methods for sectors for which projections are based on historical trends. It is also important to keep current with the regulatory landscape and determine when the existing projections no longer reflect current standards. For example, the EPA is planning to finalize MHD vehicle CAFE/GHG emissions standards later this year. In addition, projections for a few subsectors are based on EPA national forecasts from many years ago (e.g., the ODS substitute projections are from a 2019 report). The EPA information used to project emissions for this inventory does not account for the impacts of the IRA and IIJA. As these statutes become more fully implemented, it is expected that EPA will release projection information and tools for estimating their associated GHG reductions.¹¹⁰ Future versions of this inventory will utilize the most recent available forecast data at the time that the inventory is prepared. Finally, it is good practice to review the accuracy of these projections as historical data become available, and to incorporate any lessons learned in preparing future GHG forecasts.

Uncertainty

In keeping with our approach of using the SIT for developing historical emissions estimates, the DAQ generally relied on the SIT's Projection Tool to forecast emissions over the 2019-2050 period (major exceptions are use of Duke Energy heat input forecasts for electricity generation and MOVES4-based emissions forecasts for onroad vehicles). In cases where more state-specific and/or recent data were identified than provided in the SIT, the DAQ replaced default values with these more representative data.

There is associated uncertainty with the forecast capability of the SIT and MOVES4, use of potentially outdated default data, and inherent uncertainty of future GHG policy changes. The

¹⁰⁹ EPA, "Global Non-CO₂ Greenhouse Gas Emission Projections & Mitigation, 2015–2050," Office of Atmospheric Programs, EPA-430-R-19-010, October 2019.

¹¹⁰ The DAQ has incorporated Duke Energy's heat input and electric vehicle projections reflecting their modeling of the estimated impacts of IRA. We anticipate that these projections will be further refined in the future by Duke Energy as additional IRA and IIJA program information becomes available.

DAQ emphasizes our commitment to review the validity of the GHG projections methods used in this effort when undertaking future GHG inventory efforts.

Appendix B. Identification of LIDACs in NC

Table B-1 and Table B-2 list the LIDAC census tract IDs anticipated to be affected by implementation of priority measures included in this PCAP.

Table B-1. A full list of NC Counties with LIDAC census tracts identified by the CEJST dataset.

County Name (CEJST LIDAC)	Census Tract GEOIDS	Total Census Tracts by County
Alamance	37001020400	11
	37001021201	
	37001020300	
	37001020200	
	37001021000	
	37001020802	
	37001020702	
	37001022002	
	37001021102	
	37001021207	
	37001021803	
Alexander	37003040500	3
	37003040400	
	37003040200	
Alleghany	37005950100	3
	37005950300	
	37005950200	
Anson	37007920500	5
	37007920600	
	37007920100	
	37007920200	
	37007920400	
Ashe	37009970200	4
	37009970300	
	37009970500	
	37009970800	
Avery	37011930301	4
	37011930302	
	37011930400	
	37011930200	
Beaufort	37013930100	7
	37013931000	
	37013930800	
	37013930300	

County Name (CEJST LIDAC)	Census Tract GEOIDS	Total Census Tracts by County
Beaufort (continued)	37013930400	
	37013930502	
	37013930501	
Bertie	37015960100	4
	37015960300	
	37015960400	
	37015960200	
Bladen	37017950400	6
	37017950500	
	37017950600	
	37017950300	
	37017950100	
	37017950200	
Brunswick	37019020509	7
	37019020603	
	37019020101	
	37019020104	
	37019020204	
	37019020403	
	37019020505	
Buncombe	37021000600	11
	37021000100	
	37021000200	
	37021000900	
	37021001300	
	37021002900	
	37021000700	
	37021002506	
	37021002803	
	37021002401	
	37021002603	
Burke	37023020802	15
	37023020900	
	37023021301	
	37023021100	
	37023021203	
	37023021202	
	37023020100	
	37023020302	
	37023020600	

County Name (CEJST LIDAC)	Census Tract GEOIDS	Total Census Tracts by County
Burke (continued)	37023021302	
	37023020801	
	37023020201	
	37023020301	
	37023021201	
	37023021400	
Cabarrus	37025041000	8
	37025040800	
	37025041902	
	37025042101	
	37025040701	
	37025040703	
	37025041702	
	37025041901	
Caldwell	37027030900	10
	37027031000	
	37027030400	
	37027030200	
	37027030300	
	37027030800	
	37027030100	
	37027031201	
	37027031202	
	37027031403	
	Carteret	
37031970103		
37031970304		
37031970501		
37031970401		
37031970402		
37031970704		
37031970101		
37031970302		
37031970603		
37031970701		
Caswell	37033930200	3
	37033930100	
	37033930300	
Catawba	37035011802	13
	37035011101	
	37035010303	

County Name (CEJST LIDAC)	Census Tract GEOIDS	Total Census Tracts by County
Catawba (continued)	37035010304	
	37035010201	
	37035010700	
	37035011000	
	37035010900	
	37035011300	
	37035011602	
	37035011402	
	37035011401	
	37035011601	
Chatham	37037020300	5
	37037020500	
	37037020600	
	37037020402	
	37037020401	
Cherokee	37039930300	6
	37039930200	
	37039930400	
	37039930100	
	37039930602	
	37039930601	
Chowan	37041930102	2
	37041930101	
Clay	37043950200	1
Cleveland	37045950200	10
	37045950400	
	37045951200	
	37045950900	
	37045951000	
	37045950500	
	37045951100	
	37045950102	
	37045950301	
	37045950101	
Columbus	37047930300	12
	37047930400	
	37047931300	
	37047930100	
	37047930200	
	37047930600	
	37047930700	

County Name (CEJST LIDAC)	Census Tract GEOIDS	Total Census Tracts by County
Columbus (continued)	37047931200	
	37047930500	
	37047930900	
	37047931000	
	37047931100	
Craven	37049960800	7
	37049960300	
	37049960500	
	37049960600	
	37049960900	
	37049960200	
	37049961302	
Cumberland	37051001603	28
	37051002401	
	37051003104	
	37051003310	
	37051003403	
	37051003405	
	37051003800	
	37051002900	
	37051001100	
	37051002300	
	37051001400	
	37051000500	
	37051000200	
	37051000900	
	37051001000	
	37051001200	
	37051001500	
	37051001700	
	37051002200	
	37051003600	
	37051003500	
	37051003204	
	37051001901	
	37051001903	
	37051003302	
37051003305		
37051003002		
37051002402		
Currituck	37053110402	1

County Name (CEJST LIDAC)	Census Tract GEOIDS	Total Census Tracts by County
Dare	37055970502	3
	37055970602	
	37055970601	
Davidson	37057060800	13
	37057061400	
	37057061100	
	37057061500	
	37057061300	
	37057061600	
	37057060202	
	37057061201	
	37057061702	
	37057061902	
	37057062002	
	37057061901	
	37057061703	
Davie	37059080700	2
	37059080500	
Duplin	37061090400	8
	37061090600	
	37061090200	
	37061090300	
	37061090100	
	37061090802	
	37061090801	
	37061090702	
Durham	37063001802	17
	37063001502	
	37063001801	
	37063001100	
	37063001709	
	37063001400	
	37063000500	
	37063001002	
	37063000102	
	37063000900	
	37063000200	
	37063001001	
	37063001301	
	37063002009	
	37063001304	

County Name (CEJST LIDAC)	Census Tract GEOIDS	Total Census Tracts by County
	37063001806	
	37063002300	
Edgecombe	37065020800	14
	37065020900	
	37065021000	
	37065021100	
	37065021200	
	37065021300	
	37065020700	
	37065020600	
	37065021600	
	37065021500	
	37065020200	
	37065020300	
	37065020400	
	37065021400	
Forsyth	37067003108	26
	37067003105	
	37067003313	
	37067001700	
	37067001800	
	37067002901	
	37067001500	
	37067001602	
	37067002806	
	37067000500	
	37067001400	
	37067001601	
	37067000200	
	37067000302	
	37067000301	
	37067000600	
	37067000400	
	37067000802	
	37067000700	
	37067001901	
	37067000801	
	37067002002	
	37067002001	
	37067003701	
	37067002903	

County Name (CEJST LIDAC)	Census Tract GEOIDS	Total Census Tracts by County
	37067003404	
Franklin	37069060100	7
	37069060700	
	37069060302	
	37069060402	
	37069060401	
	37069060801	
	37069060802	
Gaston	37071033400	20
	37071033100	
	37071032100	
	37071031500	
	37071032000	
	37071031600	
	37071032800	
	37071031900	
	37071031800	
	37071033202	
	37071032302	
	37071032704	
	37071033203	
	37071033204	
	37071030902	
	37071031101	
	37071030205	
	37071030302	
	37071030802	
37071030801		
Graham	37075920100	3
	37075920200	
	37075920300	
Granville	37077970300	4
	37077970400	
	37077970703	
	37077970702	
Greene	37079950200	4
	37079950300	
	37079950101	
	37079950102	
Guilford	37081010100	34
	37081010200	

County Name (CEJST LIDAC)	Census Tract GEOIDS	Total Census Tracts by County
Guilford (continued)	37081012706	
	37081013800	
	37081011101	
	37081011400	
	37081012604	
	37081012608	
	37081014200	
	37081012707	
	37081015402	
	37081014412	
	37081016405	
	37081014300	
	37081012611	
	37081014000	
	37081013900	
	37081014503	
	37081011000	
	37081011602	
	37081011102	
	37081012705	
	37081013601	
	37081011500	
	37081012805	
	37081012704	
	37081014408	
	37081014406	
	37081010300	
	37081016600	
	37081016800	
	37081011300	
37081014501		
37081011200		
Halifax	37083930600	12
	37083930800	
	37083930700	
	37083930900	
	37083931000	
	37083931100	
	37083930100	
	37083930300	
	37083930200	

County Name (CEJST LIDAC)	Census Tract GEOIDS	Total Census Tracts by County
Halifax (continued)	37083930400	
	37083930502	
	37083930501	
Harnett	37085071101	12
	37085071401	
	37085070901	
	37085070100	
	37085070300	
	37085070200	
	37085070700	
	37085070600	
	37085070500	
	37085070402	
	37085070902	
	37085070801	
Haywood	37087920700	2
	37087920900	
Henderson	37089930200	4
	37089931000	
	37089931400	
	37089931300	
Hertford	37091950200	4
	37091950100	
	37091950300	
	37091950402	
Hoke	37093970300	5
	37093970402	
	37093970202	
	37093970201	
	37093970401	
Hyde	37095920100	1
Iredell	37097060400	9
	37097060200	
	37097060300	
	37097060603	
	37097060601	
	37097060802	
	37097060801	
	37097061501	
Jackson	37099950300	3

County Name (CEJST LIDAC)	Census Tract GEOIDS	Total Census Tracts by County
Jackson (continued)	37099950900	
	37099940200	
Johnston	37101040700	13
	37101040600	
	37101041400	
	37101040400	
	37101040500	
	37101040100	
	37101041300	
	37101040201	
	37101040202	
	37101040301	
	37101041201	
	37101041202	
	37101040302	
Jones	37103920100	3
	37103920300	
	37103920200	
Lee	37105030300	6
	37105030200	
	37105030402	
	37105030401	
	37105030502	
	37105030503	
Lenoir	37107011300	12
	37107010700	
	37107011200	
	37107011100	
	37107010200	
	37107010100	
	37107010300	
	37107010500	
	37107010600	
	37107010900	
	37107010400	
	37107011400	
Lincoln	37109070300	5
	37109070800	
	37109070201	
	37109071002	
	37109070901	

County Name (CEJST LIDAC)	Census Tract GEOIDS	Total Census Tracts by County
Macon	37113970200	3
	37113970400	
	37113970302	
Madison	37115010100	4
	37115010400	
	37115010200	
	37115010700	
Martin	37117970500	6
	37117970400	
	37117970100	
	37117970600	
	37117970200	
	37117970300	
McDowell	37111970200	7
	37111970800	
	37111970700	
	37111970500	
	37111970300	
	37111970902	
	37111970901	
Mecklenburg	37119004900	47
	37119001509	
	37119001801	
	37119001608	
	37119001607	
	37119005305	
	37119005307	
	37119006109	
	37119001920	
	37119005306	
	37119005616	
	37119001508	
	37119001507	
	37119005000	
	37119005308	
	37119003902	
	37119004302	
	37119005200	
	37119001916	
	37119001922	
37119003600		

County Name (CEJST LIDAC)	Census Tract GEOIDS	Total Census Tracts by County
Mecklenburg (continued)	37119001702	
	37119001701	
	37119004800	
	37119005100	
	37119003807	
	37119005916	
	37119004700	
	37119003903	
	37119005301	
	37119006005	
	37119004305	
	37119004304	
	37119000700	
	37119000800	
	37119000900	
	37119001603	
	37119001912	
	37119004600	
	37119004500	
	37119004200	
	37119004000	
37119003700		
37119005401		
37119002300		
37119003802		
37119001504		
Mitchell	37121950200	2
	37121950100	
Montgomery	37123960500	5
	37123960200	
	37123960100	
	37123960402	
	37123960401	
Moore	37125950200	3
	37125951200	
	37125950801	
Nash	37127011300	7
	37127011500	
	37127010900	
	37127011000	
	37127010300	

County Name (CEJST LIDAC)	Census Tract GEOIDS	Total Census Tracts by County
Nash (continued)	37127010200	
	37127010400	
New Hanover	37129010300	15
	37129010800	
	37129011400	
	37129011500	
	37129010501	
	37129011902	
	37129010100	
	37129010200	
	37129010502	
	37129010700	
	37129011000	
	37129011100	
	37129011200	
	37129011300	
	37129011903	
Northampton	37131920300	4
	37131920200	
	37131920100	
	37131920401	
Onslow	37133002400	15
	37133002500	
	37133001800	
	37133001500	
	37133001700	
	37133000500	
	37133000600	
	37133000800	
	37133000900	
	37133001000	
	37133000302	
	37133000301	
	37133002202	
	37133001102	
	37133002600	
Pamlico	37137950101	2
	37137950102	
Pasquotank	37139960300	5
	37139960400	
	37139960100	

County Name (CEJST LIDAC)	Census Tract GEOIDS	Total Census Tracts by County
Pasquotank (continued)	37139960503	
	37139960701	
Pender	37141920300	5
	37141920501	
	37141920502	
	37141920601	
	37141920401	
Perquimans	37143920201	1
Person	37145920300	4
	37145920400	
	37145920602	
	37145920601	
Pitt	37147001700	14
	37147001800	
	37147000800	
	37147000701	
	37147002002	
	37147000900	
	37147001900	
	37147000100	
	37147001500	
	37147002001	
	37147000702	
	37147001402	
	37147001401	
	37147000601	
Polk	37149920301	1
Randolph	37151030100	17
	37151030202	
	37151030301	
	37151030302	
	37151030400	
	37151030600	
	37151031100	
	37151031400	
	37151030900	
	37151030700	
	37151031000	
	37151031200	
	37151031501	
	37151031601	

County Name (CEJST LIDAC)	Census Tract GEOIDS	Total Census Tracts by County
Randolph (continued)	37151031602	
	37151031305	
	37151031304	
Richmond	37153970100	11
	37153970200	
	37153970800	
	37153970900	
	37153971000	
	37153971100	
	37153970300	
	37153970400	
	37153970600	
	37153970700	
	37153970500	
Robeson	37155960600	31
	37155961700	
	37155961500	
	37155961400	
	37155961900	
	37155961000	
	37155961100	
	37155960900	
	37155961200	
	37155960300	
	37155960102	
	37155960701	
	37155960202	
	37155960201	
	37155960101	
	37155960402	
	37155962001	
	37155960401	
	37155960501	
	37155961801	
	37155962002	
	37155960801	
	37155961601	
	37155961802	
	37155960503	
	37155961302	
	37155961301	

County Name (CEJST LIDAC)	Census Tract GEOIDS	Total Census Tracts by County
	37155961602	
	37155960502	
	37155960802	
	37155960702	
Rockingham	37157040700	13
	37157040102	
	37157040900	
	37157041400	
	37157040800	
	37157041300	
	37157040101	
	37157040400	
	37157041200	
	37157040200	
	37157040502	
	37157040501	
	37157041500	
Rowan	37159051700	15
	37159050201	
	37159051303	
	37159050700	
	37159051202	
	37159050400	
	37159050901	
	37159050800	
	37159050202	
	37159051204	
	37159050904	
	37159051502	
	37159051801	
	37159051501	
37159052000		
Rutherford	37161960100	6
	37161960700	
	37161961000	
	37161960800	
	37161960900	
	37161961102	
Sampson	37163970200	8
	37163970500	
	37163970900	

County Name (CEJST LIDAC)	Census Tract GEOIDS	Total Census Tracts by County
Sampson (continued)	37163971000	
	37163970100	
	37163970600	
	37163970800	
	37163970700	
Scotland	37165010200	7
	37165010600	
	37165010300	
	37165010400	
	37165010500	
	37165010102	
	37165010101	
Stanly	37167931100	3
	37167930500	
	37167931202	
Stokes	37169070700	3
	37169070300	
	37169070100	
Surry	37171930400	9
	37171930202	
	37171930101	
	37171930201	
	37171930102	
	37171931102	
	37171930502	
	37171930802	
	37171930801	
Swain	37173960200	4
	37173940100	
	37173960302	
	37173960301	
Transylvania	37175960100	4
	37175960500	
	37175960200	
	37175960600	
Tyrrell	37177960100	1
Union	37179020901	6
	37179020800	
	37179020602	
	37179020502	
	37179020601	

County Name (CEJST LIDAC)	Census Tract GEOIDS	Total Census Tracts by County
	37179020404	
Vance	37181960200	10
	37181960300	
	37181960100	
	37181960400	
	37181960600	
	37181960700	
	37181960800	
	37181960900	
	37181961000	
	37181960500	
Wake	37183052102	17
	37183052101	
	37183054108	
	37183054104	
	37183052001	
	37183054302	
	37183054008	
	37183052704	
	37183052701	
	37183050900	
	37183050700	
	37183050800	
	37183052002	
	37183051102	
	37183052408	
	37183051101	
37183052806		
Warren	37185950300	5
	37185950400	
	37185950200	
	37185950103	
	37185950101	
Washington	37187950100	3
	37187950300	
	37187950200	
Watauga	37189920200	3
	37189920500	
	37189920601	
Wayne	37191000700	16
	37191000602	

County Name (CEJST LIDAC)	Census Tract GEOIDS	Total Census Tracts by County
Wayne (continued)	37191001200	
	37191000601	
	37191001500	
	37191001800	
	37191001900	
	37191001400	
	37191000200	
	37191000302	
	37191000101	
	37191000304	
	37191001302	
	37191001301	
	37191000902	
	37191002000	
Wilkes	37193960200	7
	37193960900	
	37193960300	
	37193960500	
	37193960600	
	37193960700	
	37193961001	
Wilson	37195001000	15
	37195001600	
	37195001200	
	37195000802	
	37195000700	
	37195001300	
	37195001100	
	37195000600	
	37195000801	
	37195000400	
	37195001700	
	37195000900	
	37195000100	
	37195000300	
37195000200		
Yadkin	37197050200	3
	37197050400	
	37197050300	
Yancey	37199960200	5
	37199960300	

County Name (CEJST LIDAC)	Census Tract GEOIDS	Total Census Tracts by County
Yancey (continued)	37199960400	
	37199960102	
	37199960101	
TOTAL		815

Table B-2. A full list of additional LIDAC census tracts identified by the NCDEQ dataset of Potentially Underserved Communities.

County Names (NCDEQ LIDAC)	GEOIDS	Total Census Tracts by County
Alamance	37001021204	9
	37001021400	
	37001021300	
	37001020100	
	37001020901	
	37001020801	
	37001020502	
	37001021101	
	37001021206	
Alexander	37003040100	1
Anson	37007920300	1
Ashe	37009970700	1
Avery	37011930100	1
Beaufort	37013930700	3
	37013930900	
	37013930200	
Brunswick	37019020506	11
	37019020511	
	37019020601	
	37019020202	
	37019020303	
	37019020305	
	37019020404	
	37019020504	
	37019020508	
	37019020602	
	37019020203	
Buncombe	37021002000	27
	37021000500	
	37021000800	

County Names (NCDEQ LIDAC)	GEOIDS	Total Census Tracts by County
	37021001500	
	37021001400	
	37021000300	
	37021000400	
	37021003001	
	37021002102	
	37021002101	
	37021001600	
	37021001000	
	37021001100	
	37021001802	
	37021002402	
	37021002505	
	37021003201	
	37021003203	
	37021002203	
	37021002204	
	37021002604	
	37021002607	
	37021002701	
	37021002702	
	37021002703	
	37021002804	
37021003104		
Burke	37023021000	2
	37023020500	
Cabarrus	37025041200	7
	37025041100	
	37025040500	
	37025042200	
	37025042300	
	37025040702	
	37025042102	
Caldwell	37027030600	4
	37027031100	
	37027030500	
	37027031401	
Camden	37029950102	2
	37029950101	
Carteret	37031970703	4
	37031970403	

County Names (NCDEQ LIDAC)	GEOIDS	Total Census Tracts by County
	37031970503	
	37031970604	
Caswell	37033930600	3
	37033930500	
	37033930400	
Catawba	37035010102	8
	37035010600	
	37035011701	
	37035010401	
	37035010202	
	37035010302	
	37035010402	
	37035011102	
Chatham	37037020200	2
	37037020702	
Cherokee	37039930500	1
Chowan	37041930200	1
Clay	37043950100	1
Cleveland	37045950800	7
	37045950700	
	37045951300	
	37045950302	
	37045950602	
	37045951602	
	37045951601	
Columbus	37047930800	1
Craven	37049961001	6
	37049960402	
	37049961002	
	37049960401	
	37049960404	
	37049961301	
Cumberland	37051001604	27
	37051003102	
	37051003103	
	37051003401	
	37051003408	
	37051980200	
	37051002600	
	37051002700	
	37051002501	

County Names (NCDEQ LIDAC)	GEOIDS	Total Census Tracts by County
	37051002502	
	37051002503	
	37051002504	
	37051000600	
	37051001800	
	37051001902	
	37051002100	
	37051003201	
	37051003205	
	37051003203	
	37051003307	
	37051003304	
	37051003309	
	37051002001	
	37051002002	
	37051003001	
	37051003314	
	37051003311	
Dare	37055970200	2
	37055970300	
Davidson	37057060700	12
	37057060500	
	37057061000	
	37057060900	
	37057061802	
	37057060601	
	37057060602	
	37057060203	
	37057061803	
	37057061804	
	37057061701	
	37057060101	
Davie	37059080100	5
	37059080600	
	37059080200	
	37059080300	
	37059080400	
Duplin	37061090501	2
	37061090701	
Durham	37063000301	14
	37063002100	

County Names (NCDEQ LIDAC)	GEOIDS	Total Census Tracts by County
	37063001711	
	37063000600	
	37063001710	
	37063002015	
	37063000302	
	37063001303	
	37063002016	
	37063001501	
	37063000101	
	37063002200	
	37063002027	
	37063002021	
Forsyth	37067003703	23
	37067002801	
	37067002807	
	37067002804	
	37067003903	
	37067002604	
	37067002701	
	37067000900	
	37067003201	
	37067002702	
	37067002703	
	37067001300	
	37067002200	
	37067001000	
	37067003500	
	37067001100	
	37067003600	
	37067001902	
	37067003805	
	37067003106	
37067003107		
37067003309		
37067003403		
Franklin	37069060200	1
Gaston	37071031401	13
	37071032505	
	37071030700	
	37071031302	
	37071032200	

County Names (NCDEQ LIDAC)	GEOIDS	Total Census Tracts by County
	37071031701	
	37071032600	
	37071032900	
	37071032702	
	37071032402	
	37071032506	
	37071032507	
	37071032703	
Gates	37073970200	2
	37073970300	
Granville	37077970200	5
	37077970603	
	37077970101	
	37077970102	
	37077970701	
Guilford	37081014502	31
	37081012504	
	37081012703	
	37081010602	
	37081012803	
	37081010900	
	37081012607	
	37081011601	
	37081010800	
	37081014411	
	37081015901	
	37081016701	
	37081014410	
	37081015902	
	37081016407	
	37081016410	
	37081016505	
	37081014407	
	37081011904	
	37081013602	
	37081011905	
	37081010601	
	37081012612	
37081012617		
37081015300		
37081012609		

County Names (NCDEQ LIDAC)	GEOIDS	Total Census Tracts by County
	37081016502	
	37081016503	
	37081012804	
	37081015100	
	37081012601	
Harnett	37085071203	4
	37085071402	
	37085071201	
	37085071202	
Haywood	37087920500	8
	37087920200	
	37087921000	
	37087921200	
	37087920800	
	37087920300	
	37087920400	
	37087921302	
Henderson	37089930300	7
	37089930100	
	37089931500	
	37089931100	
	37089931200	
	37089930402	
	37089932000	
Hertford	37091950401	1
Hoke	37093970101	3
	37093970103	
	37093970102	
Iredell	37097060100	10
	37097061101	
	37097060701	
	37097061301	
	37097061303	
	37097061602	
	37097061601	
	37097061404	
	37097061403	
	37097060901	
Jackson	37099950500	6
	37099950700	
	37099950800	

County Names (NCDEQ LIDAC)	GEOIDS	Total Census Tracts by County
	37099950200	
	37099950400	
	37099950600	
Johnston	37101040800	7
	37101040902	
	37101041001	
	37101040901	
	37101041002	
	37101041501	
	37101040203	
Lee	37105030601	5
	37105030101	
	37105030701	
	37105030501	
	37105030702	
Lenoir	37107010800	2
	37107011002	
Lincoln	37109070100	1
Macon	37113970700	3
	37113970600	
	37113970301	
Madison	37115010500	2
	37115010600	
McDowell	37111970100	2
	37111970400	
Mecklenburg	37119005710	51
	37119005618	
	37119005612	
	37119002100	
	37119001605	
	37119003109	
	37119001802	
	37119001609	
	37119001606	
	37119001915	
	37119001923	
	37119006006	
	37119005613	
	37119001510	
	37119004303	
	37119001917	

County Names (NCDEQ LIDAC)	GEOIDS	Total Census Tracts by County
	37119005524	
	37119000600	
	37119005523	
	37119005609	
	37119001919	
	37119001914	
	37119005604	
	37119006104	
	37119005706	
	37119980300	
	37119001918	
	37119005620	
	37119003008	
	37119005829	
	37119000500	
	37119003806	
	37119001505	
	37119003108	
	37119003808	
	37119005907	
	37119005906	
	37119004100	
	37119001200	
	37119006009	
	37119006010	
	37119006208	
	37119006406	
	37119005521	
	37119005610	
	37119003201	
	37119004400	
	37119005826	
	37119003106	
	37119003300	
	37119005605	
Mitchell	37121950300	2
	37121950400	
Moore	37125951000	5
	37125951100	
	37125950301	
	37125950302	

County Names (NCDEQ LIDAC)	GEOIDS	Total Census Tracts by County
	37125950802	
Nash	37127010503	9
	37127011400	
	37127011200	
	37127010800	
	37127010700	
	37127010502	
	37127011102	
	37127011101	
	37127010504	
New Hanover	37129012101	3
	37129011606	
	37129011605	
Northampton	37131920402	1
Onslow	37133001200	11
	37133001300	
	37133001400	
	37133002300	
	37133000700	
	37133002800	
	37133000402	
	37133000401	
	37133001101	
	37133002201	
	37133000403	
Orange	37135011000	16
	37135011800	
	37135011101	
	37135010701	
	37135010703	
	37135011102	
	37135012100	
	37135011700	
	37135010706	
	37135010705	
	37135012202	
	37135010901	
	37135010902	
	37135011602	
	37135012201	
37135011901		

County Names (NCDEQ LIDAC)	GEOIDS	Total Census Tracts by County
Pasquotank	37139960600	4
	37139960200	
	37139960502	
	37139960501	
Pender	37141920204	3
	37141920602	
	37141920403	
Perquimans	37143920100	1
Person	37145920100	3
	37145920500	
	37145920200	
Pitt	37147001600	11
	37147001100	
	37147000202	
	37147000302	
	37147001001	
	37147000502	
	37147000501	
	37147000603	
	37147001301	
	37147000602	
	37147000201	
Polk	37149920200	1
Randolph	37151030201	3
	37151030502	
	37151030801	
Rockingham	37157041001	1
Rowan	37159051301	7
	37159051902	
	37159051201	
	37159050500	
	37159051102	
	37159050300	
	37159051600	
Rutherford	37161960200	4
	37161960600	
	37161960500	
	37161961101	
Sampson	37163970400	3
	37163970302	
	37163970301	

County Names (NCDEQ LIDAC)	GEOIDS	Total Census Tracts by County
Stanly	37167931000	2
	37167931201	
Surry	37171930600	5
	37171931002	
	37171930902	
	37171930901	
	37171930302	
Transylvania	37175960300	1
Union	37179020702	4
	37179020701	
	37179020501	
	37179020306	
Wake	37183054014	35
	37183054115	
	37183054114	
	37183054110	
	37183054111	
	37183054210	
	37183054015	
	37183052809	
	37183053517	
	37183054500	
	37183052705	
	37183052404	
	37183054301	
	37183054001	
	37183054402	
	37183051000	
	37183054106	
	37183052301	
	37183052803	
	37183052801	
	37183052302	
	37183051900	
	37183054004	
	37183050600	
	37183052802	
37183052706		
37183052407		
37183052409		
37183052406		

County Names (NCDEQ LIDAC)	GEOIDS	Total Census Tracts by County
	37183054018	
	37183052707	
	37183052807	
	37183052808	
	37183053516	
	37183054113	
Warren	37185950102	1
	37189920100	
	37189920900	
Watauga	37189920400	5
	37189921000	
	37189920703	
	37191000800	
	37191001000	
	37191000500	
	37191001101	
Wayne	37191000401	10
	37191000402	
	37191000303	
	37191001102	
	37191000901	
	37191000102	
	37193961100	
	37193961200	
Wilkes	37193960100	5
	37193960400	
	37193960802	
	37195001400	
	37195001500	
Wilson	37195000502	3
Yadkin	37197050502	1
TOTAL		512

Appendix C. CPRG Project Ideas and Stakeholder Input

The NCDEQ used webinars, workgroups, and a survey to gather ideas for potential CPRG projects. NCDEQ received more than 137 total project ideas that were collected through public and stakeholder engagement efforts. Some of the project ideas submitted were multiple projects within one submission. The project ideas are summarized in Table C-1 by category within each sector. Many of these ideas are aligned with PCAP measures, but some, that did not align with PCAP prioritization criteria (see Section 1.3.3) are being maintained for consideration to include in the comprehensive climate plan NCDEQ will be developing later in 2024 into 2025. The entire list of project ideas was considered during the creation of PCAP measures. The project summaries are an illustrative list of potential project categories that were submitted to NCDEQ.

Table C-1 – Summary of Organizations Submitting CPRG Project Ideas by Category within each Sector

Organizations Submitting Project Ideas by Category and Sector	Total Project Ideas
Buildings Sector	19
Energy Audit Tools	1
North Carolina League of Conservation Voters Foundation	1
Energy Efficiency Improvements	8
Appalachian State University	2
Buncombe County	1
Individual	1
NC GreenPower	1
North Carolina Advanced Energy Corp	1
Town of Chapel Hill	1
WNC Communities	1
Financial Incentives	2
Citizens' Climate Lobby	1
North American Sustainable Refrigeration Council (NASRC)	1
Planning	1
Durham Public Schools	1
Policy Changes	1
Schneider Electric	1
Resiliency	2
NC Clean Energy Technology Center	1
NCDHHS/DPH/EPI/OEEB	1
Solar Solutions	4
Buncombe County	1
Department of Environmental Sciences and Engineering, University of North Carolina at Chapel Hill	1
Individual	1
Town of Chapel Hill	1

Organizations Submitting Project Ideas by Category and Sector	Total Project Ideas
Electricity Sector	29
Alternative Fuels	6
Buncombe County Solid Waste	1
Cape Fear Public Utility Authority	1
Montauk Renewables, Inc.	1
Town of Selma	1
UNC Wilmington	2
Education and Outreach	1
Town of Boone	1
Energy Efficiency Improvements	4
Cape Fear Public Utility Authority	1
City of Winston-Salem	2
Individual	1
Equipment Conversions	1
City of Winston-Salem	1
EV's and Charging	1
Individual	1
Financial Incentives	1
Western Carolina University	1
Other	1
Green Built Alliance	1
Planning	1
City of Winston-Salem	1
Resiliency	1
Buncombe County	1
Solar Solutions	12
Appalachian State University	1
Buncombe County	1
Cape Fear Public Utility Authority	2
Durham Public Schools	1
East Carolina University	1
Individual	1
Johnson Controls Inc.	1
NC Department of Information Technology	1
Town of Boone	1
Town of Waynesville's Environmental Sustainability Board	1
UNC Wilmington	1
Industry Sector	27
Alternative Fuels	1
Corning Incorporated	1

Organizations Submitting Project Ideas by Category and Sector	Total Project Ideas
Education and Outreach	2
Grifols Therapeutics LLC	1
North Carolina Museum of Life and Science Inc	1
Energy Efficiency Improvements	8
Carolina Utility Customers Association on behalf of a member manufacturer	5
Corning Incorporated	1
North Carolina Advanced Energy Corp	2
Equipment Conversions	13
Carolina Utility Customers Association on behalf of a member manufacturer	7
Corning Incorporated	6
Other	1
Construction Partners, Inc.	1
Policy Changes	1
Jay Jordan Deluxe Realty, LLC	1
Solar Solutions	1
WOLFSPEED, INC.	1
Natural and Working Lands Sector	7
Alternative Fuels	1
NC State University - Forestry	1
Education and Outreach	2
EarthShare NC	1
Pamlico County Planning and Economic Development	1
Energy Efficiency Improvements	1
Warren Wilson College - Dean and Director, The Center for Working Lands	1
Equipment Conversions	1
Community Technical Assistance, Inc.	1
Financial Incentives	1
Citizens' Climate Lobby	1
Solar Solutions	1
Orange County	1
Transportation Sector	42
EV's and Charging	10
Buncombe County	1
ChargePoint	1
City of Wilmington	1
Greenspeed Energy	1
Kenworth Truck Company	1

Organizations Submitting Project Ideas by Category and Sector	Total Project Ideas
Land of Sky Regional Council	1
Murfreesboro Chamber of Commerce	1
Town of Boone	1
Town of Chapel Hill	1
Town of Rutherfordton	1
Fleet Efficiency	12
Asheville-Buncombe Air Quality Agency	1
Buncombe County	3
Durham Public Schools	1
Individual	1
Model 1 Commercial Vehicles	1
NCDHHS/DPH/EPI/OEEB	1
NFI	1
Republic Services, Inc.	1
The Shyft Group	1
Town of Spring Lake	1
Policy Changes	5
Clean Air Task Force	1
Daimler Trucks North America	1
Fayetteville Area System of Transit (FAST)	1
NCDHHS/DPH/EPI/OEEB	1
UNC Charlotte	1
Port Improvements	1
Southeast Energy Efficiency Alliance (SEEA)	1
Transit Improvements	3
Citizens' Climate Lobby	1
Individual	1
Key Environmental Consulting	1
Transit Infrastructure	11
City of Fayetteville NC	1
Individual	2
NCDOT Division 6	7
Prologis Mobility LLC	1
Waste Sector	13
Alternative Fuels	3
Cumberland County	1
Waste Not Group, LLC	1
Water Funding Financial	1
Equipment Conversions	1
Republic Services, Inc.	1

Organizations Submitting Project Ideas by Category and Sector	Total Project Ideas
Fleet Efficiency	1
Republic Services, Inc.	1
Policy Changes	1
Stop Over-development in Brunswick County NC	1
Waste Diversion	7
Fayetteville State University	1
Ghost Fleet Oyster Company	1
RGJ, The Waste Not Group	2
RTI International	1
The Farmlink Project	1
Town of Chapel Hill	1
Grand Total	137

Appendix D. State and Federal Climate Funding Opportunities

Table D-1 summarizes state and federal climate funding opportunities that could be or are being used for climate actions in NC. This table does not represent an exhaustive list of all funding opportunities.

Table D-1. State and Federal Climate Funding Opportunities

Program/Grant Name	Funding Source	Description of Funding Opportunity
State Energy Program	Federal – Formula	Provides funding and technical assistance to enhance energy security, advance state-led energy initiatives, and increase energy affordability. Eligible uses for this funding include energy conservation measures, renewable energy measures, and programs to increase deployment of clean energy technologies in buildings, industry, and transportation. NC’s formula allocation is approximately \$1.4 million annually.
Energy Efficiency Revolving Loan Fund Capitalization Grant Program	Federal – Formula	Provides capitalization grants to States to establish a revolving loan fund under which the state shall provide loans and grants for energy efficiency audits, upgrades, and retrofits to increase energy efficiency and improve the comfort of buildings. NC’s allocation of this Infrastructure Investment and Jobs Act program was \$2,358,830.
Weatherization Assistance Program	Federal – Formula	Provides funds to reduce energy costs for low-income households by increasing the energy efficiency of their homes in addition to health and safety measures. Eligible uses for this funding include Improvement of heating and cooling of dwellings by the installation of weatherization materials such as attic insulation, caulking, weather-stripping, furnace efficiency modifications, certain mechanical measures to heating and cooling systems, and replacement furnaces, boilers, and air-conditioners. NC’s Fiscal Year 2023 total allocation of Weatherization Assistance funds is \$6,094,445.
Energy Efficiency and Conservation Block Grant	Federal – Formula	Activities must be for a financial incentive program, such as a rebate, loan, energy savings performance contracts, or other financing program for the purpose of improving energy efficiency; and limited to resident, non-profits,

Program/Grant Name	Funding Source	Description of Funding Opportunity
		government entities, or businesses within the jurisdiction of the eligible entity. Funds available until expended.
Home Energy Performance-Based, Whole-House Rebate Program	Federal – Rebates Administered by States	Uses money provided to states to incentivize whole-house energy-saving retrofits for homeowners. NC may receive up to \$37 million for program implementation.
High Efficiency Electric Home Rebate Program	Federal – Rebates Administered by States	Provides point-of-sale consumer discounts on the purchase of high-efficiency electric home appliances, specifically targeted to low-income households. NC may receive up to \$37 million for program implementation.
VW Mitigation Plan	State – VW Mitigation Plan	NC developed a phased VW Mitigation Plan that focuses on medium- and heavy-duty road reduction projects and electric vehicle infrastructure programs. NC ware has been allocated approximately \$92 million from the Environmental Mitigation Trust.
National Electric Vehicle Infrastructure Program	Federal – Formula	Provides dedicated funding to states to strategically deploy electric vehicle charging infrastructure and establish an interconnected network to facilitate data collection, access, and reliability. NC submitted their National Electric Vehicle Infrastructure Plan in August 2023 and expects to receive \$109 million in funding.
Carbon Reduction Program	Federal – Formula	Provides funds for projects designed to reduce transportation emissions, defined as CO ₂ emissions from onroad highway sources. Eligible activities under this program include projects to establish or operate a traffic monitoring, management, and control facility or program, eligible public transportation projects, eligible transportation alternatives projects.
Assistance for Latest and Zero Building Energy Code Adoption	Federal – Formula	Provides funding for state activities regarding the adoption, implementation, training, enforcement, and measurement of compliance rates of specified building energy codes. Funding can be used to adopt the latest versions of the building code (ICC and IRC) as long as adoption of such code includes an eligible energy code. NC’s total initial allocation is \$8,658,687.
Solid Waste Infrastructure for	Federal – Competitive	Provides funding to support state and local waste management infrastructure and recycling programs.

Program/Grant Name	Funding Source	Description of Funding Opportunity
Recycling Grant Program		DEQ applied for and received a grant to support activities in the state including conducting a statewide materials management optimization study, a market assessment for key commodities, a gap analysis of statewide Materials Recovery Facility capacity and effectiveness, a recycling hub and spoke infrastructure assessment, and other components as appropriate.
Clean School Bus Program	Federal – Competitive	Provides \$5 billion over five years (FY 2022-2026) to replace existing school buses with zero-emission and low-emission models.
Green and Resilient Retrofit Program	Federal – Competitive	Provides funding for direct loans and grants to fund projects that improve energy or water efficiency, enhance indoor air quality or sustainability, implement the use of zero-emission electricity generation, low-emission building materials or processes, energy storage, or building electrification strategies, or address climate resilience, of eligible HUD-assisted multifamily properties.
Renew America’s Schools Program	Federal – Competitive	Provides funding to support the implementation of energy infrastructure improvements in schools, with a focus on local education agencies (LEAs) that qualify as rural and/or high poverty. Eligible projects include a range of energy improvements, including new HVAC.
Zero-Emission Technologies Grant Program	Federal – Competitive	Provides funding for competitive grants to mobilize financing and leverage private capital for clean energy and climate projects that reduce greenhouse gas emissions, with an emphasis on projects that benefit low-income and disadvantaged communities.
Clean Diesel Grant Program/Diesel Emissions Reduction Act	Federal – Competitive	Provides funding assistance to accelerate the upgrade, retrofit, and turnover of legacy diesel fleet vehicles. NC has previously received DERA funding to replace diesel vehicles in the state.
Powering Affordable Clean Energy	Federal – Competitive	PACE program funding enables loan forgiveness (USDA Rural Development Rural Utilities Service) of up to 60 percent for renewable energy projects that use wind, solar, hydropower, geothermal, or biomass, in addition to renewable energy storage projects.

Program/Grant Name	Funding Source	Description of Funding Opportunity
Greenhouse Gas Reduction Fund	Federal – Competitive	Provides funding through three grant programs: National Clean Investment Fund, Clean Communities Investment Accelerator, and Solar for All with the goal to support projects that reduce emissions and air pollutants and mobilize financing and private capital to stimulate deployment of such projects.
Rural Energy for America Program	Federal – Competitive	Provides guaranteed loan financing and grant funding to agricultural producers and rural small businesses for renewable energy systems or to make energy efficiency improvements.
Empowering Rural America Program	Federal – Competitive	Provides funds for energy efficiency improvements to eligible generation and transmission systems, to purchase, build, or deploy renewable energy, zero-emission systems, carbon capture storage systems, or to purchase renewable energy.
Urban and Community Forestry Grants	Federal – Competitive	Provides funding to increase tree cover in urban, suburban, and rural communities nationwide.
Surface Transportation Block Grant Program	Federal – Formula	Provides flexible funding that may be used by states and localities for projects to preserve and improve the conditions and performance on any federal-aid highway, bridge and tunnel projects on any public road, pedestrian and bicycle infrastructure, and transit capital projects, including intercity bus terminals.

Appendix E. Approaches for Quantifying GHG Reductions from PCAP Measures

This appendix outlines the approaches used to quantify GHG emission reductions for the PCAP measures. In some instances, NCDEQ conducted new analysis, and in others already modeled or quantified data was used.

Transportation

Emission reductions for Measures 1 and 2 are combined due to the investments in electric vehicles and charging infrastructure being intrinsically linked.

Measure 1: Increase the number of zero-emission and electric vehicles on the road through partnerships, technical assistance, financial incentives, and other mechanisms.

Measure 2: Identify, install, and maintain a public electric vehicle charging network accessible to all North Carolinians.

2025-2030 Low Emission Reductions (Reference Scenario)

2025-2030 Low Emission Reductions (Reference Scenario)	GHGs	CO	NO_x	PM₁₀	PM_{2.5}	VOC	SO_x
	Million Metric Tons						
<i>LDV - Low Range</i>	2.57	26.6	0.643	0.066	0.058	2.60	0.012
<i>MHD -Low Range</i>	0.121	0.347	0.536	0.005	0.004	0.025	0.001
Total Million Metric Tons	2.69	26.9	1.18	0.071	0.063	2.63	0.013

2025-2030 High Emission Reductions (High Decarbonization/electrification Scenario)

2025-2030 High Emission Reductions (High Decarbonization/electrification)	GHGs	CO	NO_x	PM₁₀	PM_{2.5}	VOC	SO_x
	Million Metric Tons						

<i>LDV - Low Range</i>	3.44	35.5	0.860	0.089	0.078	3.48	0.016
<i>MHD -Low Range</i>	0.102	0.291	0.449	0.004	0.004	0.021	0.001
<i>Total Million Metric Tons</i>	3.54	35.8	1.31	0.092	0.082	3.50	0.016

Cumulative Reductions from 2025-2050

2025-2050 Low Emission Reductions (Reference Scenario)

<i>2025-2050 Low Emission Reductions (Reference Scenario)</i>	GHGs	CO	NO_x	PM₁₀	PM_{2.5}	VOC	SO_x
	Million Metric Tons						
<i>LDV - Low Range</i>	58.8	608.1	14.7	1.52	1.34	59.6	0.27
<i>MHD -Low Range</i>	4.26	12.2	18.9	0.16	0.15	0.87	0.04
<i>Total Million Metric Tons</i>	63.1	620.3	35.6	1.68	1.49	60.4	0.30

2025-2050 High Emission Reductions (High Decarbonization/ Electrification Scenario)

<i>2025-2050 High Emission Reductions (High Decarbonization/ electrification)</i>	GHGs	CO	NO_x	PM₁₀	PM_{2.5}	VOC	SO_x
	Million Metric Tons						
<i>LDV - Low Range</i>	132.6	1,370	33.1	3.41	3.01	134.2	0.60
<i>MHD -Low Range</i>	11.0	31.4	48.5	0.42	0.39	2.23	0.09
<i>Total Million Metric Tons</i>	143.5	1,401	81.6	3.83	3.40	136.4	0.69

GHG reduction calculations approach

The process used to calculate the cumulative GHG reductions was completed in four steps. First the potential vehicle population growth from 2025 to 2050 was determined using a linear growth model. Vehicle population growth was calculated yearly using constants for the estimated annual vehicle sales and end of life. The NC Pathways Analysis (NCPA) Deep Decarbonization Scenario and the NCPA References Scenario were used for the high and low range boundaries. The estimated ZEV LDV population range in 2050 is 2 million to 5.9 million

and 2050 ZEV MHD vehicle population range is 74,614 to 263,632. The 2050 projected statewide vehicle population is 11 million. The ZEV population estimates were then used as inputs in the Alternative Fuels Data Centers Electric Vehicle Infrastructure Projection Tool (EVI-Pro) Lite to find the amount of charging infrastructure needed to charge the expected ZEV population. The infrastructure requirements were added to the AFLEET CFI Emissions Tool to estimate the emission reductions from expected charging based on fuel savings. Next the emissions reductions for each year were added to find the cumulative emissions for each range of vehicle populations. This was done for both NCPA Reference and High Decarbonization Pathways Scenarios.

Notes:

- The AFLEET CFI Emissions Tool estimates well-to-wheel GHG emissions and vehicle operation air pollutant emissions for proposals to the FHWA Charging and Fueling Infrastructure Discretionary Grant Program (CFI Program). The CFI Program covers EVs charging, as well as hydrogen, propane, and natural gas fueling infrastructure. This tool was developed with the support of the Joint Office of Energy and Transportation, using the AFLEET Tool available at: <https://greet.es.anl.gov/afleet>. The AFLEET Tool uses emissions data from both the EPA's MOVES (Motor Vehicle Emission Simulator) and Argonne's GREET (Greenhouse gases, Regulated Emissions, and Energy use in Technologies) models.
- In 2030 the NCPA Reference and High Decarbonization Scenarios estimates 400,000 registered light duty ZEV's. Under the Reference Scenario the sales growth was a business-as-usual case increasing the ZEV populations to 2 million in 2050. Under the High Decarbonization Scenario the 2030, the ZEV population is estimated to be 400,000 with a more aggressive sales growth projection through 2050. This increased the ZEV vehicle population to 5,900,000 in 2050.
- Current Registered Vehicle Population 8,417,030
- Annual Sales of LDV were constant at 422,967.
- LD ZEV sales increase under the Reference case from 11% to 35% in 2050.
- LD ZEV sales increase under the High Decarbonization case from 35% to 100% in 2045.
- Annual Sales of MHD were constant at 18,542.
- MHD ZEV sales increase under the Reference case from 11% to 29% in 2050.
- MHD ZEV sales increase under the High Decarbonization case from 32% to 100% in 2045.
- Fleet End of Life is 4% LDV and 1.5% for MHD.

Measure 3: Increase the number of zero emission and electric vehicles in the state fleet, school buses, and transit buses.

Action	GHG reductions (MMT CO ₂ e), 2025-2030	GHG reductions (MMT CO ₂ e), 2025-2050
Increase the number of zero emission and electric vehicle in state and local government fleets	0.05 - 0.07	1.3 - 2.9

GHG reduction calculations approach

- Used a percentage of the ranges of emission reductions explained above for Measures 1 and 2.
- Public fleets make up 2% of the total registered vehicle population, therefore the range of emission reductions noted here for Measure 3 are 2% of the ranges outlined for Measures 1 and 2.

Measure 4: Pursue programs to increase efficiency and reduce GHG emissions at port/freight terminals.

Action	GHG reductions (MMT CO ₂ e), 2025-2030	GHG reductions (MMT CO ₂ e), 2025-2050
Support intermodal rail service from seaports to inland ports	0.01 – 0.05	0.11 – 0.55

GHG reduction calculations approach

The CO₂ emission reductions calculated for this measure were estimated for 2025-2044 and held constant for 2045-2050. It is estimated that numbers of containers that could be shipped by rail would reach the 50,000 container rail movements per year capacity limit by 2040. Net emission reduction estimates were prepared for each year and summed to develop cumulative estimates for 2025-2030 and 2025-2050.

The incremental avoided CO₂ emissions for trucks was estimated using the total number of containers that could be diverted from trucks (one container per truck) to trains (200 containers/train for Charlotte and 234 containers/train for Rocky Mount) and the mileage from the Port of Wilmington to Charlotte (206 miles one way) or Rocky Mount (169 miles one way).

Total truck miles diverted was multiplied by the CO2 emission factor to estimate emissions. For truck container shipments to Charlotte, emissions were estimated incremental to existing shipments; therefore, container shipments diverted to train would not occur until 2036. The inland port in Rocky Mount is new; therefore, container shipments diverted to train would start in 2025. The CO2 emission factor for a heavy truck (1,646.77 grams CO2 per mile) was multiplied by the total miles diverted from trucks to trains to estimate avoided CO2 emissions (see U.S. Environmental Protection Agency, Emission Factors for Greenhouse Gas Inventories, Last Modified March 9, 2018, see Table 2).

The incremental increase in CO2 emissions for trains was estimated using the total amount of incremental fuel that would be consumed by transporting containers diverted from trucks. The incremental fuel consumption was based on an estimate of the additional rail revenue ton miles using an average weight of the cargo per container (40 tons per train car), transport distance from the Port of Wilmington to Charlotte (206 miles one way) or Rocky Mount (169 miles one way), and number of containers transferred from trucks to trains. The Association of American Railroads reports rail fuel efficiency in 2018 at about 470 ton-miles of cargo hauled per gallon of fuel on average (see Association of American Railroads, The Environmental Benefits of Moving Freight by Rail, July 2019). The inverse of this value (0.00188 gallon per revenue ton mile) was multiplied by total revenue ton miles to estimate total fuel consumption. Total fuel consumed for both routes was then multiplied by a CO2 emission factor for diesel fuel (10,180 grams CO2 per gallon) to calculate the incremental increase in CO2 emissions (see U.S. Environmental Protection Agency, Greenhouse Gases Equivalencies Calculator)

There are many other benefits associated with this measure including a net decrease in PM_{2.5}, NOx, and SO2 emissions; travel time savings; and contributions to a decrease in on-road highway congestion, accidents, and fatalities.

Measure 5: Pursue programs to improve the quality of life and reduce GHG emissions for all North Carolinians.

Leverage and adopt innovative methods, technologies, and programs to reduce VMT, increase access to multimodal transportation, increase support for bike and pedestrian-friendly infrastructure, and create equitable access to healthier living and working environments across the state.

GHG reduction calculations approach

The Federal Highway Administration (FHWA) Office of Natural Environment developed the Congestion Mitigation and Air Quality Improvement (CMAQ) Emissions Calculator Toolkit. These spreadsheet-based tools facilitate the calculation of representative air quality benefit data. These publicly available tools can be downloaded here:

https://www.fhwa.dot.gov/environment/air_quality/cmaq/toolkit/

Using the CMAQ Toolkit, potential benefits were calculated with past (reasonable) activity data. Here, we have assumed 37.5 kg/day (CO2e) per project. This assumes a trip length of 2 miles on a facility with 5000 vehicles per day and a mode switch of 1%.

Assumes incentive and gap funding is provided for up to 59 projects statewide.

Low end estimate	
37.5	kg/day/project
	Assumes a trip length of 2 miles on a facility with 5000 vehicles per day and a mode switch of 1%
0.038	metric tons/day/project
13.688	metric tons/year/project
0.00001	MMT/year/project
807.563	metric tons/year reduced from those 59 projects
0.001	MMT/year/reduced from those 59 projects
0.004	MMT CO23 reduced 2025-2030
0.020	MMT CO2e reduced 2025-2050
High end estimate (including land use reforms that require a longer runway)	
0.008	MMT CO23 reduced 2025-2030
0.081	MMT CO2e reduced 2025-2050

Electricity

Measure 6: Increase the amount of electricity generated by low and no carbon energy resources in NC.

PCAP Measure Actions	GHG reductions (MMTCO ₂ e), 2025-2030	GHG reductions (MMTCO ₂ e), 2025-2050
Implement residential and community solar through EnergizeNC.	0.015 - 0.15	0.74 - 1.2
Develop programs and incentives to facilitate small scale solar installments by local governments, commercial entities, institutions, and other locations. (\$10,000,000)	0.008	0.04

GHG reduction calculations approach

For the EnergizeNC calculation an assumed 69.5 MW of residential solar will be installed, as this is the lower bound of the program. This value was entered into NREL's PVWatts calculator for an estimated 97,317,336 kWh/year, the lifetime of the panels is assumed to be 25 years, resulting in a total of 2,432,993,400 kWh. To derive the amount of MMTCO₂e, EPA's eGrid Emission Factor that is contained within the NCSEO's Annual E80 report, the current value being 0.000303907 MTCO₂e/kWh, was used. This resulted in 0.74 MMTCO₂e. The 2025-2030 numbers are lower to reflect the rollout of the program, and the 2025-2050 values have a higher range than calculated due to the potential for more installations.

Assumption for solar installments at local governments, commercial entities, institutions, and other locations will be based on \$10,000,000 of funds. Average cost per watt was estimated at 2.62, resulting in 3816 kW of Solar installed. That value was entered into NREL's PVWatts calculator which resulted in an estimated 5,365,539 kWh/year. The lifetime of the panels is assumed to be 25 years, resulting in a total of 134,138,475 kWh. To derive the amount of MMTCO₂e, EPA's eGrid Emission Factor that is contained within the NCSEO's Annual E80 report, the current value being 0.000303907 MTCO₂e/kWh, was used. This resulted in 40766 MTCO₂e over 25 years, or 0.04 MMTCO₂e.

Measure 7: Implement measures to increase energy resiliency in NC communities.

Calculation based on Duke Energy's microgrid project located in Hot Springs, NC, which contains a 2 MW Solar system for a total system cost of \$14.5 million dollars. NREL's PVWatts

Calculator was used to estimate a total annual production of 2,736,046 kWh/year, this assumed optimal shading. The lifetime of the system was assumed to last 25 years. To derive the amount of MMTCO_{2e}, EPA's eGrid Emission Factor that is contained within the NCSEO's Annual E80 report, the current value being 0.000303907 MTCO_{2e}/kWh, was used. This results in 20,788 MTCO_{2e} over 25 years, or 0.2 MMTCO_{2e}. The initial rollout for 2025-2030 would be 5 sites, totaling \$72.5 million, and then 100 sites by 2050, totaling \$1.45 billion.

PCAP Measure	GHG reductions (MMTCO _{2e}), 2025-2030	GHG reductions (MMTCO _{2e}), 2025-2050
Implement measures to increase energy resilience in NC communities.		2.08

Buildings

Measure 8: Reduce per square foot energy usage in buildings in NC.

Reduction calculations approach

According to NCCEP, the state of North Carolina's Electricity Direct Usage was 459 Tbtu/year total in 2016. This usage was split between the commercial and residential sectors (36% and 44%, respectively). Using this information, the respective energy uses for commercial and residential sectors were calculated. From this information, NCDEQ assumed that energy consumption could potentially be reduced by 25% for both residential and commercial buildings for this measure, based on the EPA rule of thumb for energy efficiency projects in buildings which estimates that such projects would save 20-30% energy usage.¹¹¹ The calculated avoided emissions from reduce energy usage was then input into the EPA Simplified GHG Emissions Calculator¹¹² to determine the GHG equivalent.

Measure 9: Decarbonize buildings in NC, through replacement of fossil fuel combustion sources and other greenhouse gas emissions.

Reduction estimates were determined by pulling down the state of North Carolina's entire consumption of natural gas and assuming it could be fully offset by carbon neutral sources over the long term.

¹¹¹ EPA. Rules of Thumb, Energy Efficiency in Buildings. 2016. https://www.epa.gov/sites/default/files/2016-03/documents/table_rules_of_thumb.pdf

¹¹² EPA. Simplified GHG Emissions Calculator. May 2023. <https://www.epa.gov/climateleadership/simplified-ghg-emissions-calculator>

Industry

Measure 10: Develop programs to support or incentivize implementation of energy efficiency and emissions reduction measures in NC industry.

All estimates were based on the DOE Industrial Decarbonization Roadmap^{107F113}, which states that with the implementation of the Decarbonization pillars, up to 87% decarbonization can be expected, including the addition of carbon capture and storage (CCS) technologies, which encompass 40% of the GHG emissions reductions. The range estimates a low of 47%, which excludes the use of CCS technology and the high of 87%, if CCS technology is fully used. Reductions were calculated from the baseline GHG emissions values from the 2022 NC GHG Emission Inventory Report, which totals the GHG emissions from industrial fuel combustion, industrial electricity, and industrial processes as shown in Tables 1-1 and 2-9.

Waste

Measure 11: Reduce food waste.

The diversion of organics from landfills will result in a reduction in emissions produced at these facilities. Our 25-year GHG reduction goal for this measure is 4.45 MMTCO₂e with an additional 3.20 MMTCO₂e that could be avoided for the next 25 years (2050-2075). This GHG reduction goal was determined based on our statewide diversion goal on a weight basis (tons/year) and current waste generation trends. EPA's Waste Reduction Model (WARM) was used to determine the estimated emissions under our BAU scenario (food waste going to a landfill). These emission reductions were determined on an annual basis that accounted for the estimated diversion rate over a 25-year period starting in 2025. In addition, the rate of diversion considered the current capacity of existing NC composting facilities as well as the average daily diversion that could be achieved through either curbside collection or community drop off locations. In our CCAP we will do a detailed breakdown of the alternative management options for these organics and determine the net impacts of diversion from landfills.

Measure 12: Decarbonize waste collection.

The calculation of the GHG reductions from this measure were determined using the Alternative Fuel Life-Cycle Environmental and Economic Transportation (AFLEET) Online tool and the associated default values. The default values included diesel as the business-as-usual fuel (1.7 MPDGE) and average miles traveled was 23,400 per year per truck. The GHG reductions were calculated by

¹¹³ US DOE. "Industrial Decarbonization Roadmap." September 2022.

<https://www.energy.gov/sites/default/files/2022-09/Industrial%20Decarbonization%20Roadmap.pdf>

comparing the use of a diesel refuse truck versus electric vehicles. The reductions account for emissions on a well-to-wheels & vehicle production petroleum use, GHGs, and air pollutants.

Measure 13: Reduce landfill gas emissions.

It is estimated that GHG reduction benefits may be on the order of 300 to 600 tons per year of CO₂e, per acre of transitional cover installed, over a ten-year period (~4500 tons/acre). Considering the decrease in the landfill gas over time the annual GHGs reductions were calculated to be ~4500 tons/acre to account for field conditions. The use of more robust covers, prior to closure, at multiple landfills across NC with a total application of 200 acres over 25 years.

Natural and Working Lands

Measure 14: Protect and restore high-carbon coastal habitats and peatlands.

An estimated 350,000 acres of peatlands in NC are degraded and in need of restoration; of this, approximately 90,000 acres are in LIDAC communities.¹¹⁴ Rewetting drained peatlands creates an expected carbon benefit of 22.7-24.8 mtCO₂e/acre/year.^{115, 116} Restoring 40,000 acres of peatlands within LIDAC communities would achieve estimated GHG emissions reductions of 4.4-4.8 MMTCO₂e by 2030 and 22.4-24.8 MMTCO₂e by 2050. If this restoration work would cost approximately \$4,000/acre for land acquisition and restoration, this would cost approximately \$160 million to achieve.

As discussed above, an estimated 92,000-130,000 acres of coastal marsh in NC is at risk of loss by 2050 given 1.5 ft of SLR. Carbon stored in coastal marsh biomass and the top meter of soil, 415.11 mtCO₂e/acre, is assumed to be emitted when marshes are lost.¹¹⁷ Restoring 120 acres of vulnerable coastal marsh using thin-layer sediment addition and similar projects (e.g., living shorelines) to enhance marsh resilience to SLR would create an expected carbon benefit of 0.403 MMTCO₂e by 2050 at a projected cost of \$10 million.¹¹⁸

¹¹⁴ Duke University. "NC Pocosin Map." <https://dukeuniv.maps.arcgis.com/apps/webappviewer/index.html?id=a52bb5da376f4699adc4f9514a39fb56>

¹¹⁵ Representing 7.8-9.9 mtCO₂e/acre/year from reduced peat oxidation in restored peatlands and 14.9 mtCO₂e/acre/year from avoided deep peat fire emissions due to peat rewetting.

¹¹⁶ Richardson, Curtis J. et al. "Annual carbon sequestration and loss rates under altered hydrology and fire regimes in southeastern USA pocosin peatlands." September 2022. [Global Change Biology | Environmental Change Journal | Wiley Online Library](#)

¹¹⁷ "NC Coastal Habitat GHG Inventory." <https://static1.squarespace.com/static/6171b544d98dde62bfdbcf28/t/63e16e45b8b8ba54dc942711/1675718214856/Interim+Report+on+NC+Coastal+Habitat+Greenhouse+Gas+Inventory+1.12.23.pdf>

¹¹⁸ Assuming coastal marsh restoration via sediment placement is \$83,333/acre.

There are 270,000 acres of marsh migration corridors in NC projected to convert to coastal marsh by 2050.¹¹⁹ Conserving 5,000 acres of these migration corridors so they remain available for coastal marsh migration and managing these areas to minimize carbon emissions during the transitional phase creates an expected carbon benefit of 0.08 MMT by 2050 at a projected cost of \$24 million.¹²⁰

An analysis by NCDEQ of surveys conducted by Albemarle-Pamlico National Estuary Partnership and NCDEQ from 2019-2021 indicated that high-salinity seagrasses only covered 93,520 acres of the 145,645 acres they have historically covered since 1981, representing a net loss of 56,520 acres, or 39% of the historical extent. Restoration of 50,000 acres of high-salinity seagrass in their historic footprint would create an expected carbon benefit of 0.658 MMTCO₂e by 2050 at a cost of \$52.5 million.¹²¹

Measure 15: Protect, use, and develop agricultural and forest land.

North Carolina has more than 15.3 million acres of forests (including forested wetlands) that are not in protected management areas. These ecosystems store approximately 5.6 billion MT CO₂e and sequester an additional 27 MMTCO₂e each year; when converted to other land uses, carbon sequestration stops and some of the stored carbon may be emitted. In addition, about 5.1 million acres of land that is not currently forested or developed could support forests. While about 80% of this land is currently in agriculture (pasture or crops), if all the nonagricultural land and just a small proportion of the agricultural land that is less productive were reforested, that would be 1.1 million additional acres of forest. Reforestation of the 1.1 million acres would sequester 3.4 MMTCO₂e each year (for the first 20 years after restoration).¹²² This would increase NC's annual carbon sequestration by 10% from the estimated 34 MMTCO₂e sequestered in 2017. This is a conservative estimate given that restoration performed through cost-share programs today is expected to sequester more carbon than the forest it replaces due to better genetics in nursery stock and the application of improved silviculture.¹²³

The goal of this measure is to restore 0.5 million acres of forests on private lands across the state through cost-share programs and protect (through acquisition and stewardship) or restore 0.5 million acres of forests in areas that will have resilience and economic benefits to low-

¹¹⁹ NC Coastal Federation, personal communication regarding the draft North Carolina Salt Marsh Action Plan.

¹²⁰ Assuming conservation of marsh migration corridors is \$4,800/acre.

¹²¹ Assuming seagrass restoration is \$1,050/acre and living shoreline installation is \$300/linear foot.

¹²² NCDEQ. "NC Natural and Working Lands Action Plan."

¹²³ Shephard, Noah, Lana Narine, Yucheng Peng, and Adam Maggard. "Climate Smart Forestry in the Southern United States." *Forests* 13, no. 9 (September 11, 2022): 1460. <https://doi.org/10.3390/f13091460>.

income and disadvantaged communities and ecosystem health and increase urban canopy coverage by 10% in LIDAC in urban areas by 2030. Reforestation of 1 million acres will achieve GHG reductions of 15.4 MMTCO₂e by 2030 and 77 MMT by 2050 (increased sequestration).