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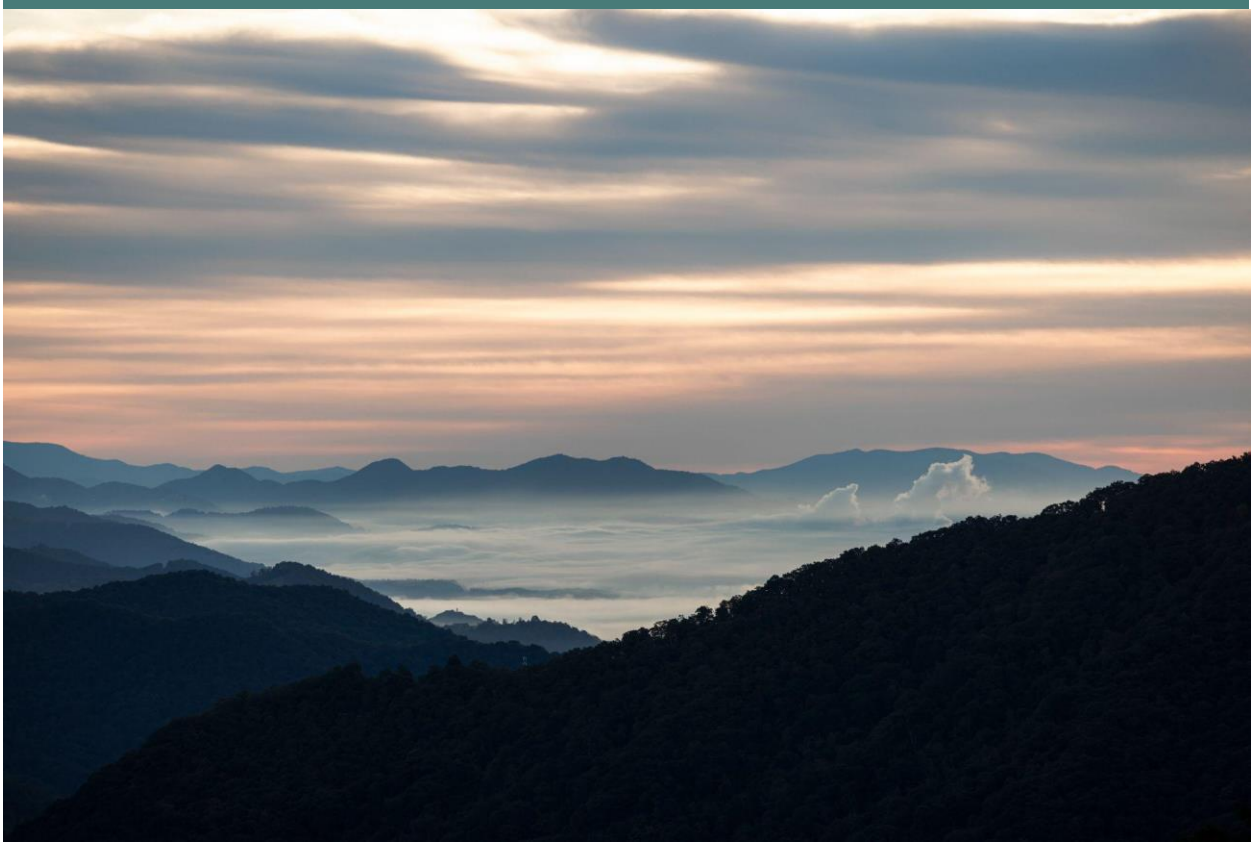
Eastern Band of Cherokee Indians

Priority Climate Action Plan

Prepared by:
Eastern Band of Cherokee Indians Natural Resources Department &
NC State's Carolina Collaborative on Climate, Health, & Equity, a NOAA Climate Adaptation Partnerships team



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Acknowledgements

Our Priority Climate Action Plan (PCAP) was developed with persistent collaborative group across Tribal Government Programs, the Center for Native Health, Eastern Band of Cherokee Indian tribal entities, like the Cherokee Boys Club, Community-based Organizations (Museum of Cherokee People), Cherokee Community Clubs, academic partners from NC State's Carolina Collaborative on Climate, Health, and Equity. We would especially like to thank the Earth Keepers and Angelique Luedeker with the Institute for Tribal Environmental Professionals for all of their time and input into this process. We would also like to express our sincere gratitude to Charlie Reed with the Carolinas Collaborative on Climate, Health, and Equity for his leadership and invaluable project management throughout the PCAP planning process.

We are grateful for the additional funding from the U.S. Environmental Protection Agency through the Climate Pollution Reduction Grant (CPRG) Program to provide the support to achieve community-based and led climate action planning. A notable thanks to the Cherokee Boys Club, Inc. in their continued efforts to reduce the Eastern Band of Cherokee Indians' carbon emissions and improve children's health through electric school buses and other initiatives that have laid the groundwork for alternative energy pathways for the tribe.

Key Definitions and Acronyms

AVoided Emissions and geneRation Tool (AVERT) - an EPA-generated tool that evaluates how energy policies and programs lead to changes in emissions of particulate matter (PM2.5), nitrogen oxides (NOx), sulfur dioxide (SO2), carbon dioxide (CO2), volatile organic compounds (VOCs), and ammonia (NH3) from electric power plants. [10]

Carbon Dioxide Equivalent (CO2e) - number of metric tons of CO2 emissions with the same global warming potential as one metric ton of another greenhouse gas. Greenhouse gases such as SO2, NOx, and CH4 can be converted into CO2e units by multiplying the amount of greenhouse gas by its Global Warming Potential factor. [7]

CO-Benefits Risk Assessment Health Impacts Screening and Mapping Tool (COBRA) - is an EPA screening tool that enables state, local, and tribal government staff and others interested in the effects of air pollution to estimate the air quality and health benefits of different emissions scenarios. [29]

Comprehensive Climate Action Plan (**CCAP**) – a narrative report that provides an overview of the Tribe or Territory's significant greenhouse gas sources/sinks and sectors, establishes near-term and long-term greenhouse gas emission reduction goals, and provides strategies and identifies measures that address the highest priority sectors to help the Tribe or Territory meet those goals.

Criteria Air pollutants and Precursors (CAP) – are air pollutants for which acceptable levels of exposure can be determined and for which an ambient air quality standard has been set. These include, ammonia (NH3), Carbon Monoxide (CO), Nitrous Oxides (NOx), Particulate Matter smaller than 2.5 (PM2.5) and 10 (PM10) micrometers, Sulfur dioxide SO2, and Volatile Organic Compounds (VOCs). [32]

Eastern Band of Cherokee Indians (EBCI) – Located in Cherokee, North Carolina, on the Qualla Boundary, the Eastern Band of Cherokee Indians is a sovereign nation, with its own laws, elections, government, institutions, and the like.

GHG Inventory – a list of emissions sources and the associated emissions quantified using standardized methods. A base year is identified as the starting year for the historic inventory. Emissions data for that year are collected and analyzed, and targets for GHG emissions are often defined in relation to the base year.

Global Horizontal Irradiance (GHI) – is the amount of terrestrial irradiance falling on a surface horizontal to the surface of the earth. If GHI cannot be measured directly, it may be calculated. [8]

Global Warming Potential (GWP) – is a measure of how much energy the emissions of 1 ton of a gas will absorb over a given period of time, relative to the emissions of 1 ton of carbon dioxide (CO2). It was developed to allow comparisons of the global warming impacts of different gases. [31]

Greenhouse Gas (**GHG**) – gases that trap heat in the earth's atmosphere, including carbon dioxide (CO2), methane (CH4), Nitrous oxide (N2O), and fluorinated gases. Carbon dioxide is the primary greenhouse gas emitted through human activities, like the burning of fossil fuels for energy and transportation.

Hazardous Air Pollutants (HAP) – are air pollutants that are known to cause cancer and other serious health impacts. There are a wide variety of HAPs that come from numerous sources. They can have a wide range of health and environmental impacts. [31]

National Emissions Inventory (**NEI**) – a comprehensive and detailed estimate of air emissions of the criteria pollutants, criteria precursors, and hazards air pollutants for air emissions sources. The NEI is released every three years based primarily upon data provided by State, Local, and Tribal air agencies for sources in their jurisdictions and supplemented by data from the EPA. [34]

Natural Resources Department (**NRD**) – a department within the EBCI tribal government. The NRD program's mission is to protect, conserve, and enhance Tribal natural resources for the benefit of the Cherokee community. The NRD works to preserve water, animal, plant, mineral, and forest resources and strives to instill generational stewardship by working with community members who carry traditional ecological knowledge.

Priority Climate Action Plan (**PCAP**) – a narrative report that includes a focused list of near-term, high priority, and implementation-ready measures to reduce greenhouse gas pollution and an analysis of greenhouse gas emissions reductions.

Quality Assurance Project Plan (QAPP) – a document that provides a blueprint for the entire project and each specific task to ensure that the project produces reliable data that can be used to meet the project's overall goals.[6]

1. Introduction

The Cherokee People, or People of Kituwah, have inhabited this land for more than thirteen thousand years. They have been reliant on and mindful of the connection with this place, physically and spiritually, and have developed a language, land practices, and societal organization, reflective of their beliefs and values *grounded* in the cosmography and cosmology of this homeland. The original name Kituwah comes from the term "the dirt that belongs to the

Creator." The Cherokee recognize that they come from the earth. The earth is their mother, their life. (This text is drawn from the "Earth Keepers Mission Statement" and supporting resolution that was passed in the December, 2023 EBCI Council session).

Cherokee People once occupied an area encompassing approximately 140,000 square miles that became parts of North Carolina (NC), Tennessee, South Carolina, Georgia, and Alabama. In 1838-1839, the Cherokee were forcibly removed from their lands, leading them on the infamous Trail of Tears to present-day Oklahoma. Due to the forced relocation, the Cherokee Tribe is divided into what is known today as the Cherokee Nation and United Kituwah Band, located in Oklahoma, and the Eastern Band, made up by those who successfully resisted removal, by claiming NC citizenship and maintaining the right to remain on lands they owned. They and their descendants were recognized in 1868 by the federal government as the Eastern Band of Cherokee Indians (EBCI), with a written language, created by Sequoyah in 1821.

Today, roughly 9,000 of the 16,000 enrolled members of the EBCI, live on the Qualla Boundary (sometimes called the Cherokee Indian Reservation). The Boundary is located in six counties (Cherokee, Graham, Haywood, Jackson, Macon, and Swain) and includes 62,000 acres of largely rural, mountainous land with rivers and forests. These ecosystems are home to countless plants and animals, of which many are culturally significant to the Cherokee, like the white oak tree, rivercane, and hickory tree. There are eight distinct communities on the Qualla Boundary (listed below and mapped on Figure 1). Most of the communities are centered around the town of Cherokee, however, the Boundary land is non-contiguous and some unconnected communities are near Robbinsville and Murphy.

- Big Cove
- Wolftown Big Y
- Wolftown Soco
- Painttown
- Yellowhill
- Birdtown
- Snowbird
- Cherokee County

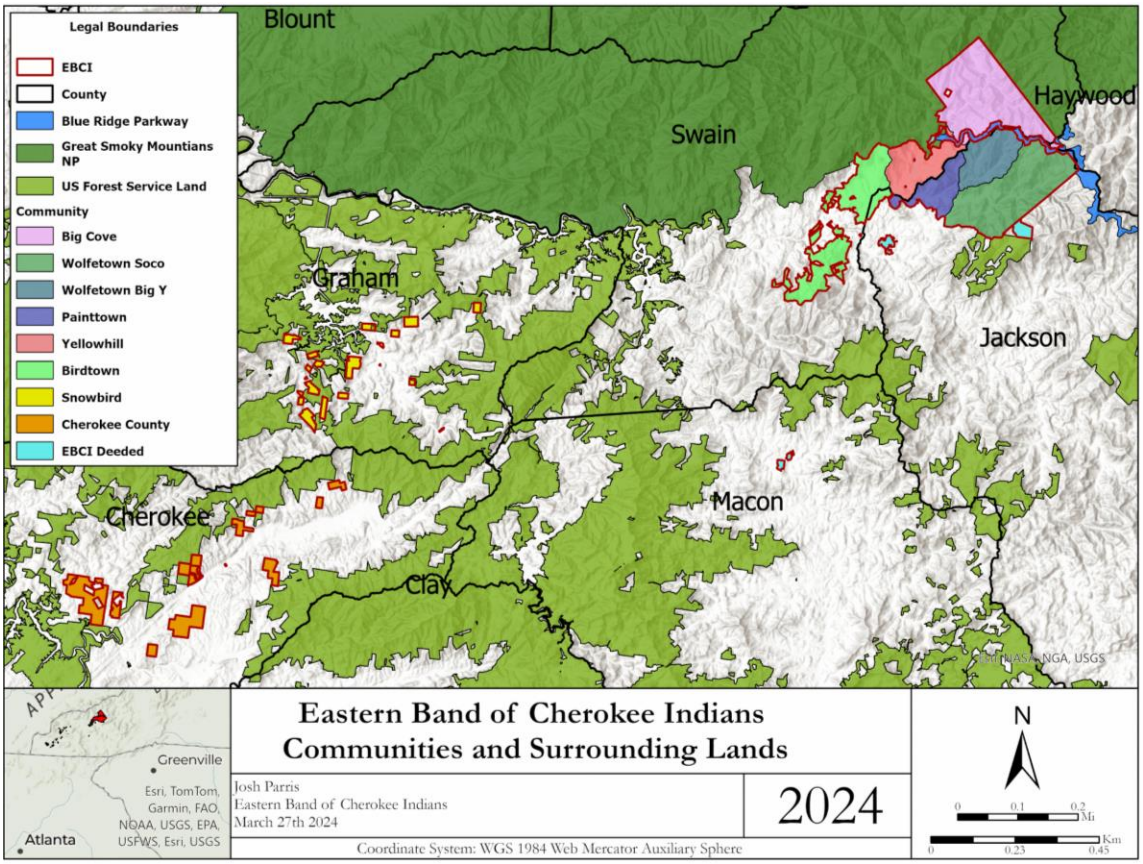


Figure 1. Map showing EBCI territorial lands and individual communities on the Qualla boundary.

The EBCI Qualla Boundary is also surrounded by several Clean Air Act Class 1 Areas, including the Great Smoky Mountains National Park, Shining Rock Wilderness, Joyce Kilmer Memorial Forest and Jonah Bald Wilderness (Figure 2). These Class 1 Areas are required by federal law to have the highest level of protection from air pollution.

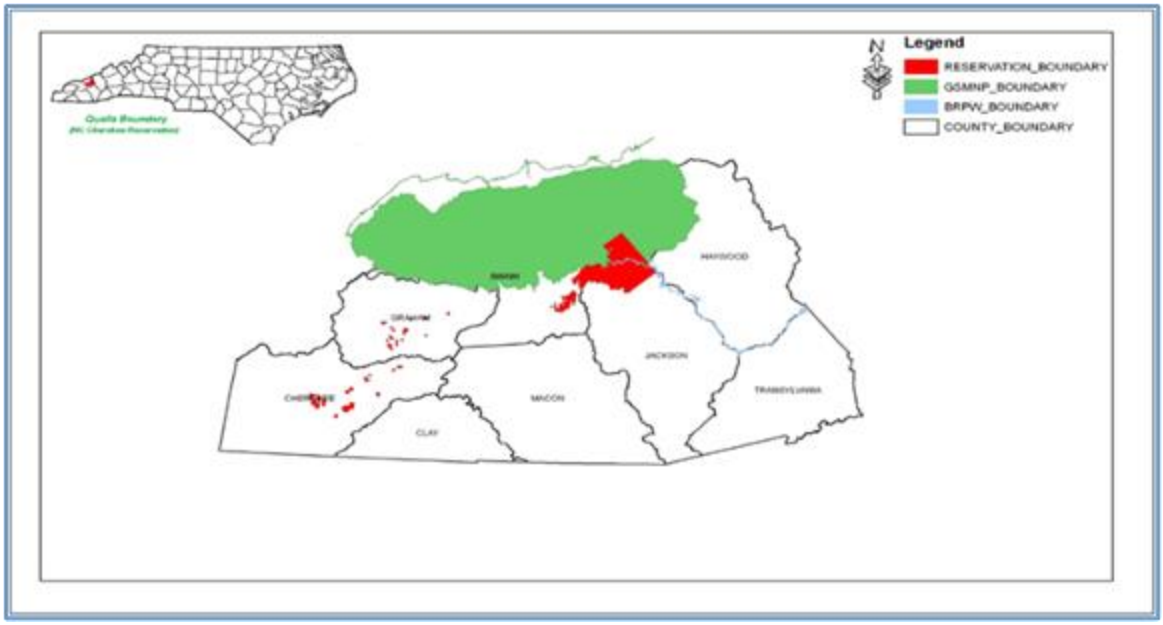


Figure 2. Map of the Qualla Boundary and its location in Western North Carolina next to the Great Smoky Mountains National Park.

Economic opportunities on the Qualla Boundary primarily exist in the public sector (education, health care, social assistance, and public administration) and the service and recreation industries. Proximity to the Great Smoky Mountains National Park, Pisgah National Forest, Fontana Lake and other unique landscapes make Cherokee a popular tourist destination. The Harrah's Cherokee Hotel & Casino Resort, with over 1,000 guest rooms, is another popular attraction and the casino generates a considerable portion of the tribal revenue. Non-government, economic enterprises on the Boundary are categorized as either Gaming and Non-gaming businesses.

Gaming Industries -- Since 1997, EBCI has owned Harrah's Cherokee Casino and Hotel. The resort property is the primary generator of jobs and income on the Qualla Boundary. This property includes a 150,000/sf gaming floor, a four-star luxury hotel with 1,108 guest rooms, a 3,000-seat events center, a 21,000/sf meeting and conference facility, and a new bowling and entertainment center. Caesars Entertainment Corporation (formerly Harrah's Entertainment), the largest gaming company in the world, operates the property under a management agreement. In 2010, EBCI opened Harrah's Cherokee Valley River Casino & Hotel, which added 50,000 sf of gaming space plus 300 guest rooms to the Tribe's gaming enterprises. Lastly, there are approximately 2,971 hotel rooms on the Qualla Boundary, including the Casino property.

Non-Gaming Businesses and Enterprises -- These businesses are largely tourism related enterprises. According to the Census of Employment and Wages for 2014, there were 2,478 businesses operating within Cherokee, Graham, Jackson, Haywood, and Swain Counties. The Qualla Boundary accounted for 13% of the establishments, 26% of the employment, and 29% of the wages and salaries in the region. Moreover, "Food Services & Drinking Places" and "Food & Beverages" represented nearly 35% of all revenues generated within this segment.

Governmental Operations -- As a sovereign nation, Cherokee has its own laws, elections, government, and institutions, serving those that live on the Qualla Boundary. The EBCI Tribal government is headquartered in Cherokee, NC and has three branches: Executive, Legislative and Judicial. The executive branch, currently headed by Principal Chief Michell Hicks and Vice-Chief Alan B. Ensley, are elected by popular vote every four years. These elected officials carry out tribal laws and are responsible for day-to-day operations. The Principal Chief is also the tribe's chief executive officer. The 12-member tribal council constitutes the EBCI's legislative branch that establishes laws governing the tribe. Tribal council members are elected for two-year terms from districts or townships that include: Yellowhill, Big Cove, Birdtown, Wolftown and Painttown. Cherokee and Graham Counties (Snowbird) constitute the remaining township. The EBCI judicial branch consists of the supreme court, tribal criminal court and tribal civil court. Justices are appointed by the Tribal Council upon recommendation of the executive branch. All judges and justices must be members of the North Carolina Bar Association.

Funding for government operations comes from a number of sources including grants, taxable income from a tribal levy, and gaming income. EBCI tribal government provides a variety of services to enrolled members and those living in the region, including education, health care, social services, public safety, housing, recreation, elder services, and environmental protection. In a 2006 proclamation, Eastern Band tribal leaders pledged to take an active role in helping enhance and preserve the natural environment of the western region of North Carolina. Making use of a tribal Integrated Resource Management Plan (IRMP), the EBCI began a focused effort to observe a high standard of resource management and environmental protection. The Natural Resources Department (NRD) is a branch within the government that works to preserve air, water, animal, plant, mineral, and forest resources and strives to instill generational stewardship by working with community members who carry traditional ecological knowledge. The NRD led the development of the 100-year vision to protect, conserve, and enhance the natural environment for the future. Current NRD priorities include air and water quality protection, forest management, wildlife conservation, climate adaptation, and renewable energy development.

To further support the priorities of NRD, a resolution to prepare for the 22nd century was passed by the EBCI Tribal Council in October 2021. The resolution set goals to reduce tribal operations cumulative emissions. The goals listed include: (1) 50% of new fleet purchases must be full electric or hybrid vehicles;(2) installation of twenty electric vehicle charging stations across EBCI lands and tribal buildings; (3) invest in two Motor Pool staff to become certified for maintenance on electric and hybrid vehicles; and (4) assess opportunities for new building construction projects to be designed to maximize energy efficiency and renewable energy applications.

The NRD recognizes the threat that climate change poses to the EBCI and communities across the world. Extreme weather events and gradual changes to climate can ravage health and prosperity, while also broadening existing inequalities. [3] In Western North Carolina, the number of days on which temperatures will reach at least 90F is expected to increase. And

rising humidity levels are expected to make the impacts of heat more pronounced. The average annual precipitation in Western North Carolina is likely to increase. However, the way that precipitation falls is also changing; more rain is falling in fewer events with more frequent dry stretches between those events. These climate conditions are also more conducive to wildfires, which are expected to become more common in the future. [2] The NRD is committed to reducing greenhouse gas (GHG) emissions as such efforts can reduce climate-related risks and provide opportunities to enhance the health and wellbeing, as well as economic and ecological resilience of Indigenous populations.[3]

1.1 CPRG Overview

Purpose and Scope

The primary purpose of our Climate Action Plan is to develop a strategic, coordinated roadmap for reducing greenhouse gas emissions by leveraging this EPA-funded planning process with existing and ongoing efforts already underway within tribal government departments. Ultimately, our hope is not to develop another report to sit on a shelf, but rather take a top-down and bottom-up approach to listening and learning from tribal government, tribal entities, and community members to understand local climate concerns and identify actionable strategies we can take now and in the future for our community. We echo the recent Fifth National Climate Assessment that "self-determination is key to implementing effective resilience strategies that meet the needs of Indigenous communities." [27]

Through the Inflation Reduction Act of 2022, Congress provided for the Climate Pollution Reduction Grants (CPRG) program to support the development and expansion of state, territorial, tribal, and local climate action plans and the expeditious implementation of investment-ready policies, programs, and projects to reduce GHG emissions in the near term. [5] The NRD is leading the development of a climate action plan to enhance tribal capacity to develop climate resilience solutions now and in the future.

This work is currently being carried out in two planned phases supported by the CPRG: *Phase 1*: Planning and developing a Priority Climate Action Plan (PCAP) and *Phase II*: Implementation. The planning grant phase focuses on identifying and outlining immediate and short-term achievable actions to reduce greenhouse emissions, while the implementation grant phase is more comprehensive and covers a greater breadth of time. [5]

The EBCI NRD applied for, and was awarded, a planning grant in August of 2023. This PCAP is the main deliverable of the planning grant phase and will outline the strategic short- and longer-term steps that will be expanded upon in the next phase of the Comprehensive Climate Action Plan.

1.2 PCAP Overview and Definitions

This PCAP describes the tangible steps that the EBCI can take to reduce GHG emissions in the near future. The steps have been evaluated and chosen based on their impacts, benefits, feasibility, and input from tribal government and community members. Progress towards lower emissions can be measured against the baseline data collected for this plan.

The principle components of the PCAP included in this document are: a) a simplified GHG emissions inventory to manage risks and identify reduction opportunities; b) an outline of measures that will be taken to reduce GHG emissions; c) a benefits analysis, estimating the resulting reductions in co-pollutants and potential health impacts of reductions, and d) a review of authority to implement the described measures.

Our two primary objectives in developing the PCAP were to 1) enhance cross-sector/division engagement and prioritization of climate change impacts at the forefront of tribal operations; and 2) enhance tribal community engagement to inform climate change concerns, resilience, and reduction strategies that could be taken now and in the future.

1.3 Approach to Developing the PCAP

The EBCI's NRD is the tribal government division leading the development of the climate action plan and has been working on this effort since 2021 (Figure 3). Following the passing of a Tribal Resolution, the NRD entered into a 5-year partnership with the North Carolina State University's Carolinas Collaborative on Climate, Health, and Equity (C3HE). The partnership was approved by a Tribal Resolution in May 2022 and obtained medical Institutional Review Board approval in September 2022. The partnership is led by NRD and supported by other tribal entities, including the Public Health and Human Services (PHHS). The goal of the partnership was to develop a climate action plan and integrate climate change into all aspects of tribal governance. The C3HE is a new NOAA funded center at North Carolina State University, seeking to advance local decision-making, strengthen local partnerships, and increase the capacity of communities to own and develop their own climate solutions.

This tribal-led community partnership integrates Traditional Ecological Knowledge from Tribal Government and community entities and technical climate, health, and social science expertise from the C3HE team. The main goals of the five-year partnership include: 1) identifying and prioritizing climate and health hazards in collaboration with EBCI Tribal Government leaders and community members; and 2) developing a Tribal Government Climate Action Plan to enhance tribal capacity to develop climate resilience solutions now and in the future.

A large part of what we've set out to accomplish in this first year was to encourage climate risk awareness in Tribal program planning and create shared learning opportunities for government leadership on climate change, risk assessment, and community-informed recommendations for resilience and mitigation strategies. We were intentional in grounding the PCAP in the historical and cultural context of the EBCI. To do so required the collection of different types of data (e.g., surveys, oral histories). We prioritized attending community events, for example the annual Indian Fair and partnering with the EBCI PHHS, and the annual Spring Garden Fair. We also

worked closely with the EBCI's PHHS in incorporating climate concerns in the tri-annual community health assessment survey and attended a community event to help administer surveys. The activities helped to strengthen relationships and build trust with community partners and have laid the foundation for the PCAP. In the past year, we made progress toward the PCAP through the following activities:

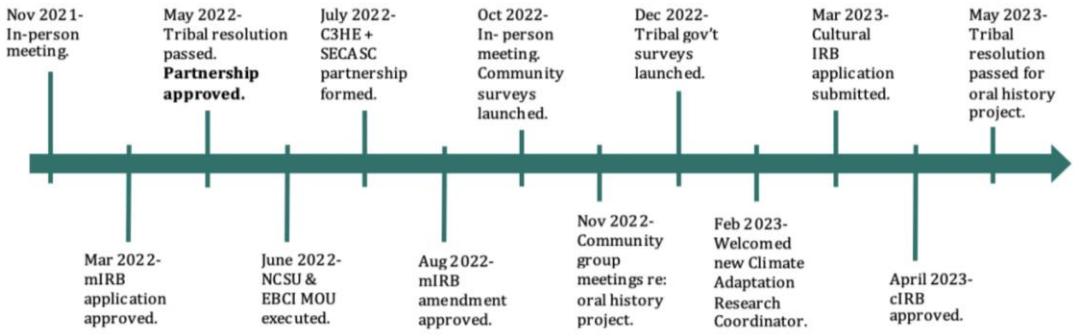


Figure 3. PCAP timeline from 2021 to 2023.

Translation of Climate Change in Cherokee - E-lo-hi-a(d)-ste-da-li-sgv-i: The team worked closely with native speakers to translate "climate change" into a Cherokee phrase with cultural value and importance, which better reflects and honors the relationship to the land. This phrase is E-lo-hi-a(d)-ste-da-li-sgv-i. Through conversations with the Principal Chief, EBCI tribal government officials, and enrolled tribal citizens, we learned that there was a desire to describe the term "climate change" using the Cherokee language in order to reflect the traditional knowledge of a people who have lived with the land for a very long time. Because language is a direct representation of a peoples' perception, knowledge, and relationship to the land, it became a priority to find meaning for this concept in the Cherokee language.

Oral Histories with Tribal Elders: We are recording oral histories to archive the richness of the Cherokee language as a direct expression of the Tribe's traditional knowledge and connection to
place. Documenting the important life stories of EBCI Tribal Elders required working through various levels of Tribal Government to receive the appropriate approvals. We received approval for the oral history collection and archival plan by the Tribal Cultural Institutional Review Board as well as the unanimous approval of the oral history project through a Tribal Council Resolution in May 2023. We have hired and started training a team that includes EBCI members to conduct the interviews in Cherokee. The oral history interviews will include Tribal Elders and a multigenerational sample in collaboration with the Museum of Cherokee People and the Kituwah Adult Language Program, both of which will be involved in the recruiting, interviewing, recording, and archiving process. The stories, perspectives, and words shared by the people participating in this project will directly influence and serve as an important foundation for the EBCI's Climate Action Plan. Tribal Elders are receiving compensation for their participation in this
project.

Climate Risk Assessment Surveys: The team has conducted two surveys targeting (1) EBCI Tribal
Government staff to understand climate concerns, how climate change is currently being considered in divisional/programmatic priorities, and potential barriers to achieving policy change; and (2) EBCI Tribal Community members to understand climate concerns, the importance of the issue of climate change, and valued cultural and community assets that might be impacted by climate change. Results will be incorporated into the Tribe's Climate Action Plan and inform tailored communication strategies to achieve tribal-wide participation and buy-in from all members. In the fall, we piloted a survey targeting youth and their thoughts on clean transportation, air quality, and climate change.

Results from Tribal Government Staff Survey (n=233):

- 7 out of 10 government staff agree that Cherokee, NC is experiencing the effects of climate change now.
- 8 out of 10 government staff agree that Cherokee, NC will experience the effects of climate change.
- The top climate concerns are #1 wildfires, #2 drought, #3 flooding, and #4 extreme heat.
- 72% of government staff agreed that preparing to deal with the effects of climate change should be an important priority for the tribe.
- Only 4 out 10 agree that government staff are knowledgeable about the potential impacts of climate change.
- 47% of government staff agreed that there is a lack of climate information at decision relevant scales.

Results from Tribal Community Member Survey (n=169):

- 8 out of 10 respondents agree that Cherokee, NC is experiencing the effects of climate change now.
- 9 out of 10 agree that Cherokee, NC will experience the effects of climate change.
- The top climate concerns are #1 wildfire, #2 extreme heat, and #3 flooding.
- 3 out of 4 said that E-lo-hi-a(d)-ste-da-li-sgv-i was a personally important issue.
- More than 75% of participants believed that their community is not prepared for the impacts of climate change.
- 3 out of 4 believed that the tribe can act collectively to reduce the negative effects of E-lo-hia(d)-ste-da-li-sgv-i.
- More than half of the participants believe that there are adequate resources to address climate risk in Cherokee.
- The majority of community members believe that now is the time to take strong action on climate change.

Results from pilot Youth survey (n=64):

- 6 out of 10 respondents agreed that electric vehicles are needed to reduce carbon emissions.

- 50% of youth agreed that a) poor air quality will negatively impact my health and b) wildfires negatively impact air quality in my community.
- 7 out of 10 youth were worried about E-lo-hi-a(d)-ste-da-li-sgv-i (climate change).
- 71% of youth respondents were characterized by mild climate change anxiety and 24% by moderate climate change anxiety

Increasing Community Capacity: We welcomed Ms. Trista Welch to the team in early 2023. Ms. Welch is an EBCI member and our new Climate Adaptation Research Coordinator and liaison. She is paid by North Carolina State University. Her position keeps resources in the community, relying on a trusted and known individual to further resilience goals, and share costs across two federally-funded climate centers with complementing missions. In a short time, Ms. Welch has helped to increase the team's capacity to make on the ground connections and coordinate with community clubs and other local community-based organizations to elevate the voice and concerns of local residents in the planning process and final PCAP.

The North Carolina State Climate Office installed a new North Carolina ECONet weather station in Cherokee, NC as a complement for existing air quality monitoring. These data will enhance the Tribe's capacity to measure air quality by providing a means to also capture weather and climate data, and allow them to pursue external funding to alleviate air quality concerns. This station will be integrated into the State Climate Office's full suite of data plotting and access tools.

Developing Climate Summaries for Observed and Future Trends in Heat, Drought, Wildfire, and Extreme Precipitation: The NRD and their partners have developed two-page profiles on historical and projected changes in drought, extreme heat, extreme precipitation, and wildfires for Cherokee and the Qualla Boundary. These will be integral to developing a Climate Action Plan in the next phase of work. These profiles will be also used to start the conversation with community members about climate hazards, leading to the development of a personal solutions guidebook.

Insight from several key stakeholder groups, outlined in ***Section 2,*** was sought as part of this plan, including but not limited to the eight EBCI Community Clubs that meet monthly, the Cherokee Boys Club, the Earth Keepers, and the Tribal Youth Council. Collaboration with these groups will continue in the implementation phase of the CPRG program. Additional technical support was sought and obtained from researchers at the Institute for Tribal Environmental Professionals and North Carolina State University.

To develop the plan, we began by exploring the existing examples of tribal climate adaptation plans. During a meeting with the C3HE team, we decided on an equity-focused climate adaptation framework to inform the PCAP.

Several types of data were collected to develop a climate action plan, including community surveys, oral histories, administrative operations data, and downscaled state-level emissions data. All data were collected in accordance with the Quality Assurance Project Plan (QAPP) that

was developed alongside this plan. The year 2020 was selected as our base year for the GHG Emissions Inventory based on the available data. Different tools were used to analyze segments of the collected data to produce the tables and figures.

The estimated pollutant reductions for each measure were calculated and reported in this plan as well as metrics for tracking the progress of each project. The NRD will continue to extend collaborations to other divisions of the EBCI government and community organizations to ensure that the PCAP is informed by and addresses the needs and concerns of the local community and tribal government staff.

1.4 Scope of the PCAP

This PCAP serves the eight communities on the Qualla Boundary. The GHG inventory estimates the economy-wide anthropogenic emissions of primary GHGs for 2020, including CO2, CH4, N2O, and others on the Qualla Boundary. The measures outlined in the plan are short-term steps that will be taken to reduce GHG emissions.

2. Tribal Organizations and Considerations

2.1 Tribal PCAP Management and Development Team

The NRD is the lead department for developing the climate action plan and has partnered with other tribal government divisions, non-governmental tribal entities, tribal community-based organizations, and academic partners as outlined in Figure 4.

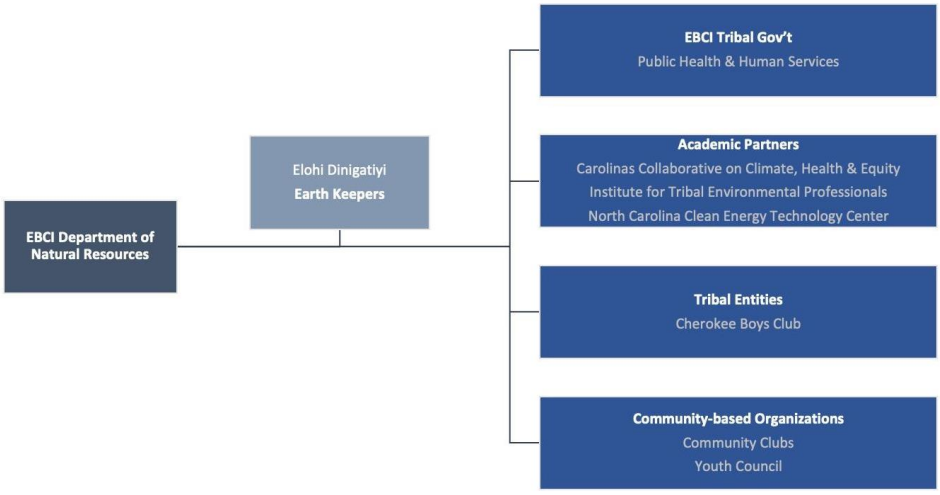


Figure 4. Overview of core structure of the PCAP development team.

Elohi Dinigatiyi (Earth Keepers): The Elohi Dinigatiyi (Earth Keepers) are a small group who have been asked to come together to serve the EBCI by advising those who work for the people and their tribal government to act in the best interest of the earth and her people. They are

Cherokee language speakers, elders, natural resources experts, health advisors and community members. On Nov. 2nd, 2023 The Eastern Band of Cherokee Indians formally recognized the creation of the Elohi Dinigatiyi cultural advisory group. This initiative developed out of collaborative conversations between the Center for Native Health and the NRD. The 10-members group consists of 7 Elders, fluent speakers and culture keepers along with three academic experts in various areas. Elohi Dinigatiyi will assist and support the work of NRD to apply Kituwah science and the language that protects it, to conserve and preserve the mountains, forest, water, and air and all they contain, and to create and insure for the future a healthier environment in which to live.

Eastern Band of Cherokee Indians Public Health & Human Services (PHHS): PHHS programs aim to promote and protect the health of the people and the communities where we live, learn, work, and play. A healthy public gets sick less frequently, and spends less money on health care, increasing economic productivity, and achieving overall improved quality of life. Prevention efforts reduce suffering by impacting lifestyle choices and preparing people for possible effects of catastrophes such as hurricanes and a pandemic. PHHS includes a number of programs: Cherokee Choices, Children's Dental, Environmental Health & Safety, Epidemiology, Home Health, Nurse-Family Partnerships and more. PHHS has incorporated climate change concerns in the most recent tri-annual community health center and recognizes that environmental health is an important driver of population health.

Cherokee Boys Club: The Cherokee Boys Farm Club was established at the Cherokee Boarding School in 1932. Two years later the Cherokee Motor Club was founded. When the Boarding School closed in 1954, the Cherokee Day School continued the two Clubs. The Clubs were combined in 1958 and in 1964 the Eastern Band of Cherokee Indians incorporated the Cherokee Boys Club as a non-profit, self-supporting Tribal Enterprise. The mission of the Boys Club concentrates on the core needs of the Cherokee Community by providing services through the following departments: (1) *Bus and Truck Department:* provides all the school bus and charter bus services for the Cherokee Central School System. Charter bus services are also provided for churches, community organizations, local county schools, Western Carolina University and Southwestern Community College; and (2) *Service Department:* Maintains the Boys Club fleet of 110 buses, trucks and coaches. The technicians provide all services including repairs, maintenance, parts, paint and body work, vehicle inspection and vehicle washing. The CBC also works closely with the Critical Services Microgrids (CSM), a group that provides local electrical power to operate essential services for the community and for public and private operations.

Carolinas Collaborative on Climate, Health, and Equity (C3HE): The C3HE is committed to understanding our changing climate and addressing the impacts in a just and equitable way. The center is housed at North Carolina State University and spans multiple universities and organizations across North and South Carolina. We work together with communities across the Carolinas to help predict and understand their exposure and vulnerability to climate threats, such as fire, flood, and heat. By integrating social science, physical science, and regional knowledge, the C3HE team and participating groups co-produce solutions that are tailored to meet unique local needs and priorities. Our work is funded by the National Oceanic and

Atmospheric Administration's Climate Adaptation Partnerships Program, formerly known as the Regional Integrated Sciences and Assessments Program.

Institute for Tribal Environmental Professionals (ITEP): ITEP was created to act as a catalyst among tribal governments, research and technical resources at Northern Arizona University, various federal, state and local governments, and the private sector, in support of environmental protection of Native American natural resources. Angelique Luedeker at ITEP was an instrumental part of developing the GHG inventory. She helped organize data collection and downscale state-level data to the Qualla Boundary.

N.C. Clean Energy Technology Center (NCCETC): The NCCETC, at N.C. State University, advances a sustainable energy economy by educating, demonstrating, and providing support for clean energy technologies, practices, and policies. It also administers the Database of Incentives for Renewables & Efficiency, a resource providing financial incentives and policies.

Cherokee Community Clubs: Each of the eight communities on the Qualla Boundary has a community club. These clubs are the backbone to community cohesion, innovative ideas, and grassroots solutions informed by local tribal members. Community club programs promote and protect health in the community, including traditional food classes, community gardening, and harm-reduction classes. Each of the community clubs has a small team of elected officials and is responsible for getting neighbors excited and engaged in grassroots efforts to enhance the social, health, and economic well-being of the larger EBCI community. For all stages of the project, the NRD has visited each local community club to obtain input on how to best engage tribal members and identify a path forward for targeted and responsive resilience solutions.

Cherokee Youth Council (CYC): The CYC is a culturally based leadership program striving to empower enrolled tribal youth through the development of cultural identity, leadership skills, and community service. The Ray Kinsland Leadership Institute is the umbrella organization that oversees the Cherokee Youth Council, the Jones-Bowman Leadership Award Program, and the Right Path Adult Leadership Program. All these programs provide culturally based leadership curation, cultivation, and inspiration for Cherokee enrolled members. The program uses the following 7 Cherokee Core Values to guide all activities and community involvement, including:

- ᏄᏩᏙᎯᏴᏓ ᎢᏕᏓᏯᎬᎢ:Group Harmony
- ᎠᏓᏅᏙᎩ ᏄᏓᎴᏅᎯ: Spirituality
- ᏄᏣᏂᎩᏓ ᎠᏓᏅᏖᏗ ᏚᏐᎪᏫᎢ: Strong Individual Character
- ᎪᎵᏰᎯ ᏗᏕᏓᎴᏅᎢ: Sense of Place
- ᏕᎷᏬᏗ ᏄᎶᏐᏅᎯ: Honoring the Past
- ᏂᎦᏣ ᏗᏰᎦᏗ: Educating the Children
- ᏄᎵᏍᎵᏯᏗ ᏃᏪ ᏄᏬᏤᏗ ᎠᏓᏅᏖᏗ: Sense of Humor

The NRD recognizes that Indigenous youth are the future and has been working diligently to elevate and center their unique perspectives and voices in the climate action planning process. The ongoing oral history project will expand to youth in the next phase of work.

2.2 Special Considerations

In 2011, the EBCI, in partnership with ITEP, developed an Air Emissions Inventory of calendar year 2008 emissions on the Qualla Boundary. The Inventory covered stationary combustion from commercial and residential sources; wastewater treatment emissions; on- and off-road mobile combustion; and prescribed burns and campfires. CO2, NOx, PM2.5,10, and CC, SO2, and VOCs were all included. These emissions findings were submitted to the National Emissions Inventory (NEI) database as representative of 2011 emissions.

3. PCAP Elements

3.1 Greenhouse Gas Inventory

3.1.1 Scope

The GHG inventory estimates all primary GHGs emitted from the Tribal government and the eight communities on the Qualla Boundary during the year 2020. Special consideration was given to the base year. Though the COVID-19 pandemic certainly influenced emissions during that time, 2020 was selected because of data availability and its proximity to the present.

The GHG inventory is reported across six different emissions sectors.

1. Electricity Generation and Consumption
2. Mobile Combustion
3. Stationary Combustion
4. Solid Waste and Waste Generation
5. Wastewater Treatment
6. Agriculture and Land Management

3.1.2 Data Collection

Various types of data were collected and analyzed as part of the GHG inventory. Administrative data were gathered from utilities, EBCI motor pool, EBCI entities, and EBCI government departments. Secondary datasets such as the U.S. Census, the NEI, the North Carolina Department of Transportation, and the National Solar Radiation Database were also consulted among others. Each data source will be described in the respective sections below. All data were collected in accordance with the QAPP.

If data were not available for 2020, then 2020 data were imputed based on other years data or prior reports generated by the EBCI. If no data could be retrieved, then state-level data from the NEI, the *North Carolina Greenhouse Gas Inventory 1990-2050*, and the *Draft Inventory U.S. Greenhouse Gas Emissions and Sinks* were downscaled to approximate the Qualla Boundary, using acreage and demographic statistics from the 2020 Census.

In several cases, the collected data were not comprehensive or detailed enough for the purposes of this GHG inventory. In these situations, specific calculations, which are described in their respective sections of the GHG inventory below, were used to estimate population-wide emissions.

3.1.3 GHG accounting method

Collected data, when available, were input into the EPA Tribal Government Greenhouse Gas Inventory Tool, which was designed by the EPA to assess entire tribes or select operations within tribal departments. [12] GHG emissions are reported for all applicable primary GHGs.

Emissions were also converted to metric tons of CO2 equivalent units (CO2e). In most cases, these conversions were done automatically by the EPA Greenhouse Gas Inventory Tool, however, when using down-scaled state data, non-CO2 pollutants were converted into CO2e units by multiplying the amount of pollutant by its Global Warming Potential (GWP). Example 20-year GWPs, derived from the Intergovernmental Panel on Climate Change, can be found in Table 1.

Table 1. Example Global warming potential factors used to convert pollutants into CO2e units.

Greenhouse Gas	20-year Global Warming Potential [11]
SO2	1
N2O	265
CH4	28
CO2	1
CHF3	9,100

3.1.4 GHG emission results by sector and gas

Overall

Table 2 shows the total economy wide GHG emissions for the EBCI in 2020 as well as the sector specific totals of CO2e. Each sector is described in greater detail in their sections below.

Table 2. Total GHG emissions by sector and economy-wide for the EBCI in 2020.

Sector	Emissions (MT CO2e)

Electricity Generation & Consumption	15,272
Mobile Combustion	1,367,404
Stationary Combustion	5,343
Solid Waste and Waste Generation	7,170
Wastewater Treatment	1,944
Agriculture and Land Management	-39,138
Total	**1,357,404**

Electricity Generation and Consumption

Electricity generation and use accounted for 38% of the state of North Carolina's GHG emissions. For the EBCI, it is a scope two emission, meaning that emission impacts are incurred indirectly and come from where the electricity is produced. Currently, the EBCI purchases electricity from the Duke Energy Progress company. According to the EPA Emissions & Generation Resource Integrated Database, Duke Energy Progress produces an annual average of 639.7 lbs of CO2 per Megawatt-hour of electricity generated.

The number of households on the Qualla Boundary were obtained from the 2020 Census and multiplied by average annual electricity usage across the state to calculate residential usage (Table 3). [4,26] 37,671,072 kilowatt hours (kWh) of electricity were used by residents of the Qualla Boundary in 2020. This value was input into the EPA Tribal GHG Inventory Tool to calculate the resulting emissions (Table 5).

Unfortunately, 2020 electricity use for government buildings was not available. Instead 2023 (the only available year) data was used. Individual usage for all government buildings, in kWh, was obtained from the Tribal Finance Department. These were combined into total usage for 2023 (Table 4). Wastewater treatment electricity use data was separated out and will be reported in its respective section of the GHG inventory. After removing the wastewater usage, there were 313 active accounts using electricity. Usage in kWh were summed together for all buildings and input into the Tribal GHG Inventory tool to calculate emissions for CO2, CH4, N20, and total CO2e emissions (Table 5).

Table 3. Data used to calculate residential electricity usage in kWh.

Data Point	Value	Unit
Number of Households	2,174	households

Avg. Electricity Usage	17,328	kWh
Total 2020 Electricity Usage	**37,671,072**	kWh/year

Electricity usage data from 2023 were also obtained for Cherokee Central Schools. This includes Cherokee Elementary, Middle, and High School, as well as the central office building, athletic fields, and the school warehouse (Table 4). The total kWh from all buildings was input into the Tribal GHG Inventory Tool to calculate GHG emissions by type of pollutant (Table 5). The total GHG emissions, in CO2e units, from all electricity use was calculated and is shown in Table 2, with emissions from other sectors.

Table 4. Electricity usage in kWh for the year for government and school buildings

Source	**Electricity Usage** (kWh/year)
Government Buildings	14,414,323
School Buildings	278,677

Table 5. Emissions from electricity use and generation by GHG, reported in MT CO2e.

Source	Emissions (MT CO2e)			
	CO2	**CH4**	**N2O**	**Total**
Residential	10,930	25	32	10,987
Government	4,182	10	12	4,204
School	81	0	0	81
Total Electricity Use	15,193	35	44	**15,272**

Mobile Combustion

Mobile combustion is a scope one emission (direct) and is a significant portion of the GHG inventory. In 2020 in North Carolina, fossil fuel combustion from mobile sources accounted for 51% of GHG emissions.[13,14] After downscaling these data to represent the Qualla Boundary, mobile combustion was approximately 65% of emissions. [13,14]

The mobile combustion sector can be subdivided into on-road and off-road sources.

On-road vehicles -- include anything driving on the roads and highways. Two North Carolina state highways cut through the Qualla Boundary and intersect: Highway 441 and Highway 19. A larger highway, Highway 74, skirts the edge of the boundary, delivering traffic east and west. Thirty-nine percent of the roads in the five counties that overlap with the Boundary are unpaved. [15]

The two state highways have shown to be well trafficked. According to tracking data from the North Carolina Department of Transportation (NCDOT), Highways 19 and 441 average between 10,000 and 19,999 traffic counts a day. [15] In 2021, an average daily traffic count of 15,000 was recorded on Highway 19 approaching the main section of town. [15]

State-level data were combined with NCDOT data to approximate the GHG emissions from on-road mobile combustion (Equation A). First, two specific NCDOT waypoints on Highways 19 and 441 were selected to represent the Qualla Boundary traffic load. These points were specifically selected because they should be comprehensive in their traffic, while minimizing the amount of overlap and therefore duplication that could occur. The average number of daily traffic users (ADT) at each point was multiplied by 365 days to get the total number of vehicles driven on each road in a year. The number of these vehicles that are 1) electric, 2) hybrid, 3) gasoline, and 4) diesel operated was calculated by applying the average percentage of each vehicle type registered in the surrounding counties in 2020. [17] Electric vehicles were removed from the analysis. The average miles per gallon (MPG) of vehicles in rural areas was gathered from the *North Carolina Vehicle Fleet Analysis* and applied as a divisor to calculate the number of gallons used per vehicle. [18] Key data points are shown in Table 6. These data were then input into the EPA Tribal Government Greenhouse Gas Inventory tool to calculate the GHG emissions by source (Table 8).

Equation A. Calculating the approximate 1) miles driven and 2) gallons consumed by vehicles of different fuel types.

1. (ADT) x (365 days) x (Avg. % of vehicle fuel type) x (Avg. rural trip miles) = Annual miles by fuel type

2. (Annual miles by fuel type) / (MPG by fuel type) = Annual gallons of fuel type consumed

Table 6. Important data points for NC vehicles that were used to calculate gallons consumed by type of vehicle.

Data Point	Value			
	Electric	**Hybrid**	**Gas**	**Diesel**
Percent of registered vehicles	2.2%	0.3%	89.4%	8.1%
Number of vehicles	59,951	9,034	2,447,051	221,464

Average trip distance in rural NC	56.81 miles			
Total vehicle miles traveled	3,405,816	513,193	139,016,967	12,581,341
Average NC MPG	-	37.3	20.1	17.7
Number of gallons consumed	-	13,759	6,916,267	710,810

Off-road vehicles -- includes agricultural, construction, logging, lawn and garden, and other miscellaneous vehicles that do not travel on state roads. North Carolina data were downscaled to represent the Qualla Boundary. These data are shown by equipment type in Table 7. Off-road emissions were then combined (Table 8).

Table 7. MT of off-road emissions by equipment type.

Equipment	MT CO2e		
	CO2	**CH4**	**Total**
Agricultural	130.7	0.2	130.9
Commercial	157.3	2.9	160.2
Construction	1,768.3	1.2	1,769.6
Industrial	0	0	0
Lawn & Garden	762.3	16.5	778.8
Logging	0	0	0
Pleasure craft	402.6	9.2	441.8
Railroads	0	0	0
Recreational	661.1	24.1	685.2

Table 8. Emissions from on- and off-road sources in 2020 by GHG, reported in MT CO2e.

Source	Emissions (MT CO2e)			
	CO2	**CH4**	**N2O**	**Total**

On-road emissions	1,362,060	664	744	1,363,469
Off-road emissions	3,882	54	-	3,936
Total Mobile Combustion	1,365,942	718	744	**1,367,404**

Stationary Combustion

Stationary combustion covers fossil fuel combustion, like furnaces, water heaters, and generators, for residential, government, and commercial buildings. It is a scope two emission. Fuels can be in the form of diesel gas, natural gas, or propane. Based on the Inventory of U.S. Greenhouse Gas Emissions and Sinks by State, stationary fossil fuel combustion accounts for roughly 9% of North Carolina's CO2e emissions in 2020. [13,14] The majority of those emissions occur in the form of CO2.

The 2020 Census estimated that there are 2,174 (± 253) households within the Qualla township. [4] However, after downscaling state-level data to the Qualla Boundary, stationary fossil fuel combustion accounted for 11.4% of CO2e emissions in 2020. This 2% discrepancy between state- and community-level is likely due to an absence of other forms of emissions more common across the state. About 4,036 MT CO2e were attributed to residential, stationary heating in 2020 on the Qualla Boundary, the majority of which is from CO2 (Table 9).

Unfortunately, we were not able to obtain stationary combustion data for The Harrah's Cherokee Hotel & Casino Resort. These data are still being pursued and will be added to the comprehensive plan.

Stationary combustion data from 2023 were obtained for Tribal government buildings and will be used to approximate combustion in 2020. There are 48 generators among the government buildings on the boundary, supplying 5,598 kW of total energy, when they are needed. Included are the two generators from the Cherokee Indian Hospital: a CAT 750 kW and a Cummins 440 kW generator. Together they consume 25,000 gallons per year, a significant portion of the government diesel use. The stationary combustion data were separated out into natural gas consumption, purchased from Dominion Energy, and diesel gas for building generators. Natural gas usage was converted to yearly thousand cubic feet (mcf). Diesel data were reported in gallons. These data were input into the Tribal GHG Inventory Tool to calculate GHG emissions (Table 9).

Table 9. Emissions from stationary combustion sources by GHG, reported in MT CO2e.

Source	Emissions (MT CO2e)			
	CO2	**CH4**	**N2O**	**Total**

All residential combustion	4,008	22	6	4,036
Government Natural Gas use	949	1	-	950
Government Diesel use	356	0	1	357
Total Stationary Combustion	5,313	23	7	**5,343**

Solid Waste and Waste Generation

Solid waste is a major source of GHG emissions. [14] In particular, decaying organic waste is a source of CH4 emissions. [21] Additional GHGs are emitted from the transportation and treatment of solid waste. In North Carolina, solid waste accounted for nearly 7% of GHG emissions statewide. [13]

Because there is no landfill on the Qualla Boundary, waste is a scope three emission for the EBCI, accounting the transportation of the waste and emissions incurred by the landfill. The EBCI Solid Waste Department operates a transfer station, where all municipal solid waste that is not recycled is collected and transferred to a landfill in Georgia on a freightliner truck. The truck travels the 210 mile route (round trip) to the landfill six times a week.

Though the transport of waste qualifies as mobile combustion, it was included in the solid waste section because it is directly tied to the amount of waste generated on the Qualla Boundary. Any policies or programs to diminish waste among the communities could impact the number of times the truck makes the trip per week.

Direct mileage and fuel usage data were gathered from the Cherokee Boys Club, who manages the freightliner truck that transports waste. These data were input into the EPA Tribal GHG Inventory Tool to calculate emissions; North Carolina data were downscaled to estimate the emissions from waste and biological treatment of solid waste (Table 10).

Table 10. Emissions from solid waste sources in 2020 by GHG, reported in MT CO2e.

Source	Greenhouse Gas (MT CO2e)			
	CO2	**CH4**	**N20**	**Total**
Solid Waste	-	4,396	-	4,396
Transport	2,730	-	-	2,730
Biological treatment	-	27	17	44

Total	2,730	4,423	17	**7,170**

Wastewater Treatment

Compared to solid waste, wastewater treatment releases a much smaller amount of GHGs. [14] In North Carolina, wastewater treatment and discharge accounted for 1.5% of total GHG emitted in 2020. [13] The treatment of water releases CH4 and N2O. And wastewater operations require electricity.

North Carolina state-level emissions data were downscaled to approximate the Qualla Boundary emissions for treatment and discharge of waste (Table 11). Duke Energy electricity usage, specific to the wastewater facility, was obtained for 2023. These data were not included in the Electricity Generation and Use sector as to avoid duplication. They were input into the EPA Tribal GHG Inventory Tool to calculate emissions from that operation (Table 11).

Table 11. Emissions from wastewater sources in 2020 by GHG, reported in MT CO2e.

Source	Greenhouse Gas (MT CO2e)			
	CO2	**CH4**	**N20**	**Total**
Treatment & Discharge	-	786	505	1,291
Wastewater Electricity	650	1	2	653
Total	650	787	507	**1,944**

Agriculture & Land Management

Forestry and land use can emit GHGs but they may also function as carbon sinks, or entities that absorb more carbon from the atmosphere than they release. [14] When something absorbs more carbon than it releases, the value is reported as a negative.

Whether or not land functions as a sink or source depends upon how the land has been transformed by human activities and what activities are occurring. Forested land, a prominent part of the Qualla Boundary, is a major carbon sink. As are grasslands. However, wetland soils are waterlogged, and release CH4 into the atmosphere as they warm or flood. [19]

Cropland releases CO2. But agriculture activities, such as enteric fermentation, livestock manure, field burning, and liming or fertilization, done on this land can also produce CO2, CH4, and N2O. [14] Livestock are also a major source of CH4.

According to the USDA, there was little large-scale crop farming or livestock raising in the five counties that overlap with the Qualla Boundary in 2020. The average farm size was 73 acres. The counties all ranked in the bottom 20% in North Carolina in livestock production and in the bottom 10% in crop production. [20]

North Carolina data were downscaled to calculate the emissions from Forestry, land use, and agriculture on the Qualla Boundary in 2020. These data are shown in Table 12. Agriculture includes manure management, soil management, enteric fermentation, field burning of agricultural residues, emissions from liming or carbon-containing fertilizers. Emissions from agricultural equipment were not included. They can be found in the mobile combustion sector.

Table 12. GHG emissions from forestry, land use, and agriculture in the Qualla Boundary in 2020.

	Greenhouse Gas (MT CO2e)			
	CO2	**CH4**	**N20**	**Total**
Agriculture	17	11,477	6,084	17,578
Land Use and Forestry	-59,791	3,010	64	-56,716
Total	-59,773	14,487	6,148	**-39,138**

3.4 GHG Reduction Measures

In accordance with the QAPP, GHG reduction measures were evaluated based on the following criteria:

1. Quantity of reductions in emissions.
2. Number of jobs likely to be created by the reduction measure.
3. Environmental justice benefits of the project, including the number of people living in overburdened neighborhoods that will benefit.
4. Quantity of reductions in criteria and toxic air pollutants.
5. Number of people living, working, recreating, and going to school in the area(s) benefiting from the reduction measure.

As a result of the historic attempts of assimilation and eradication of Native people, all American Indian/Alaska Natives can be considered disadvantaged or vulnerable communities. Forced migration, family separation, land appropriation, denial of education, poverty, persistent systemic racism, and more have contributed to adverse health outcomes for over 175 years. The EBCI community has made enormous strides in protecting and rebuilding community and prosperity through homeland, culture, tradition, family, language, and economics, but persistent environmental health disparities remain.[1]

Using the EPA Environmental Justice Screening tool and the Justice40 (CEJST) assessment, both Swain and Jackson counties (Cherokee, NC) are identified as disadvantaged communities. The EBCI lands in Graham and Cherokee counties are also identified as disadvantaged. According to the EJScreen Community Report, the Cherokee, NC area contains "American Indian Reservation Lands", contains a "Justice40 (CEJST)" disadvantaged community, and contains an "EPA IRA" disadvantaged community.

The web edition of the EPA AVoided Emissions and geneRation Tool (AVERT) was used to evaluate the emissions impacts of the GHG reduction measures. [10] The reductions of six pollutants and co-pollutants were calculated: SO2, NOx, CO2, PM2.5, VOCs, and NH3. Quantitative and Qualitative assessments were made with government, academic, and community partners about the environmental justice impacts and the extent to which each possible measure would impact those in the community (data not shown). From the evaluation, five GHG Reduction Measures were selected by the EBCI as part of this plan.

1. Installing solar arrays on Tribal buildings
2. Installing a microgrid to power an electric fleet of school buses and trucks.
3. Expanding community infrastructure for electric vehicles
4. Enacting a policy to electrify the EBCI tribal fleet
5. Hiring a project manager to oversee CPRG activities

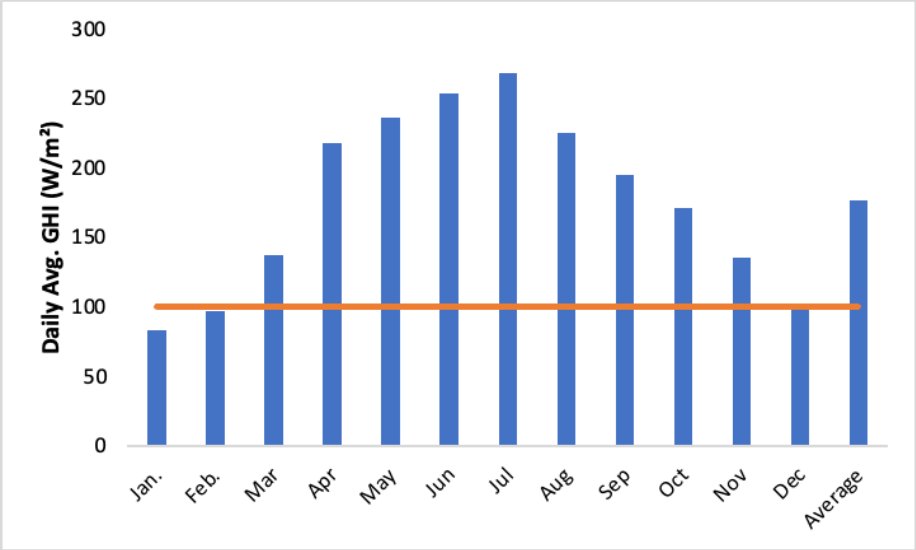
The selected reduction measures were organized into three categories: 1) Solar Energy Generation and Use; 2) Electric Vehicles and Electric Vehicle Infrastructure; and 3) Project Administration. More details about each GHG Reduction Measure are provided below, in their respective sections.

Solar Energy Generation and Use

Solar energy generation is an important consideration for rural communities that want to reduce local pollution. It provides access to clean and renewable energy, addressing energy poverty, and improving quality of life through reduced energy costs. Rural areas, like Cherokee, often lack access to centralized electricity grids. Standalone solar systems offer a reliable and sustainable energy source that can improve a community's resiliency.

Global horizontal irradiance (GHI) is one metric used to evaluate the solar potential of a location. An average hourly GHI value above 100 Watts per square meter (W/m^2) is typically considered suitable for solar energy generation using photovoltaic panels. The National Solar Radiation Database provides hourly measurements of GHI across the United States. These data demonstrate that Cherokee has sufficient radiation for solar energy generation (Figure 5). [9] The average daily GHI in Cherokee in 2020 was 176 (W/m^2). Only December, January, and February did not meet the 100 (W/m^2) threshold for effective solar generation, though December and February were 96 and 98 (W/m^2), respectively.

Figure 5. The average daily GHI (W/m²) across all months in 2020. A total average daily GHI (W/m²) was calculated from these data and is included in the chart. The 100 (W/m²) threshold suitable for solar energy generation is shown with a horizontal line.



To utilize this solar potential, decrease GHG emissions, and improve tribal resiliency the EBCI will build multiple solar energy projects. First, the EBCI plans to install a 52.08 kW solar array on the Tribal Council House (Figure 6). The array will consist of 124 420-watt REC Alpha Pure-R crystalline solar panels. Initially the array will cost $154,900 but by applying grants and tax credits, the array will cost $15,490 total. On average the array will save $7,000 per year and over 20 years will save $170,200.

Figure 6. 124 solar panels, totaling 52.08 kW will be installed on the Tribal Council building on the Qualla Boundary.

The EBCI will also install a 120.96kW solar array on the New Kituwah Academy (Figure 7). The array will consist of 288 420-watt solar panels. After applying grants and tax credits the array will cost $37,975 and will save $13,935 a year. The estimated 20-year savings is $338,600.

Figure 7. 288 solar panels will be installed on the new Kituwah Academy building.

In total, the 173.04 kW solar projects will have a significant impact on GHG emissions. According to the AVERT tool, the arrays will generate 290 MWh annually and decrease emissions by 211.7 MT CO2e. A detailed account of emissions reductions can be found in Table 13.

Table 13. Emissions reduction strategies for Measure 1.

Measure 1: Install Solar Arrays on Tribal Buildings	
Implementing Agency	Eastern Band of Cherokee Indians - Natural Resources Department
Sector(s)	Electricity Generation and Consumption
Milestones	1. Finding contractor to install arrays 2. Installation of solar array on Tribal Council building 3. Installation of solar array on New Kituwah Academy building
Geographic Location(s)	1. 67, 88, & 106 Council House Loop, Cherokee, NC 28719 2. 60 Boundary Rd, Cherokee, NC 28719
Funding sources	CPRG Program
Tracking Metrics	1. Number of solar panels installed 2. kW of energy generated 3. mWh electricity usage 4. Tons of CO2 avoided

Cost	$500,000
Estimated annual GHG reductions	Annual reductions -110 lbs of SO2 -30 lbs of PM2.5 -170 lbs of NOx -20 lbs of VOCs -190 tons of CO2 -10 lbs of NH3
Implementation authority milestones	Tribal Council approval of projects

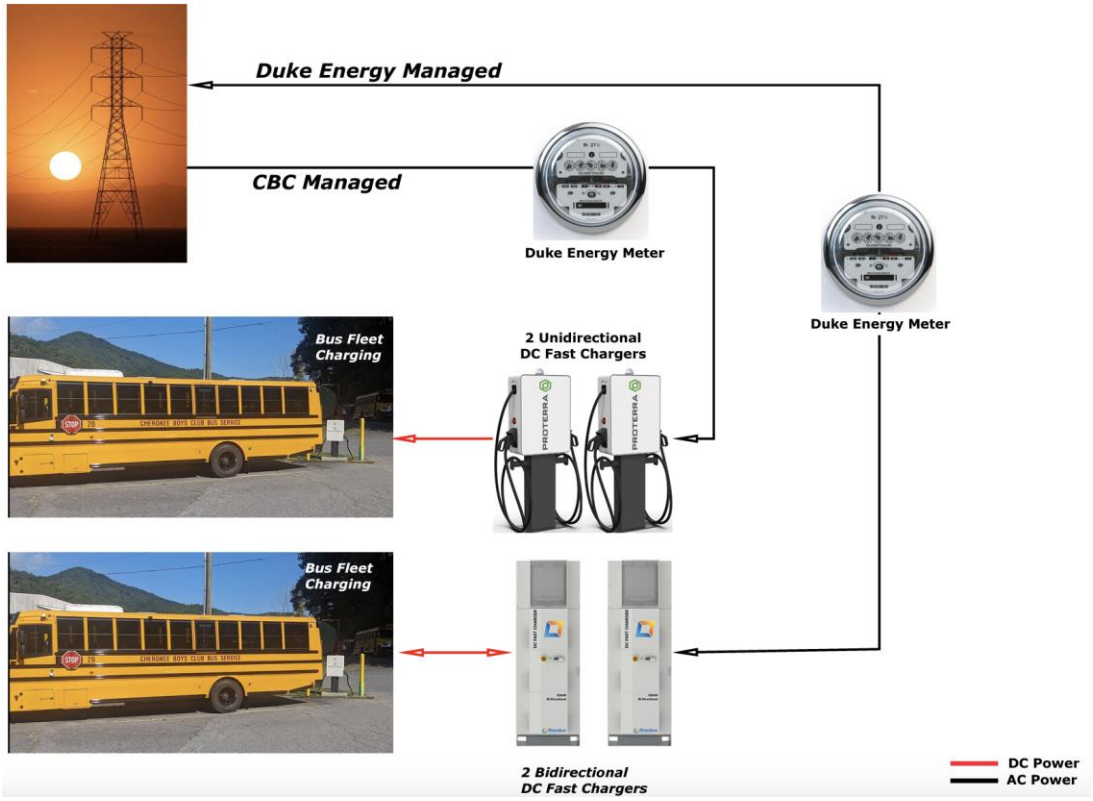
Electric Vehicles and Electric Vehicle Infrastructure

In 2021, the Federal Government has set a goal to make half of all new vehicles sold in the U.S. in 2030 zero-emissions vehicles and to build an equitable network of 500,000 EV charging stations across the United States. [23] However, this transition is happening much faster in urban areas than rural ones. Electric vehicle (EV) adoption is roughly 40% lower in rural communities and EV infrastructure, like charging stations, has been concentrated in cities and along highways. [22]

Yet EVs are still an attractive alternative to conventional gas and diesel vehicles in rural areas. Rural residents drive more, spend more on vehicle fuel and maintenance, and generally have fewer alternative methods of transportation. [18,22] EVs are cheaper to maintain, release less GHGs, and can provide backup power to buildings during power outages.

In 2022 and 2023, the EBCI deployed the 1st Generation Electric Bus Fleet. The fleet included six electric buses, two unidirectional fast charging stations, and two bidirectional fast charging stations (Figure 8). The unidirectional charging stations were managed by the Cherokee Boys Club and the bidirectional charging stations were managed by Duke Energy. All the charging stations pulled energy from the Duke Energy power grid. As of March 2024, the 1st Generation Fleet has saved 13,080 gallons of diesel fuel, which equates to 250,000 lbs of CO2 or 125,000 lbs of CO2 a year.

Figure 8. The 1st Generation Fleet of electric vehicles was put into operation in 2022 and 2023.

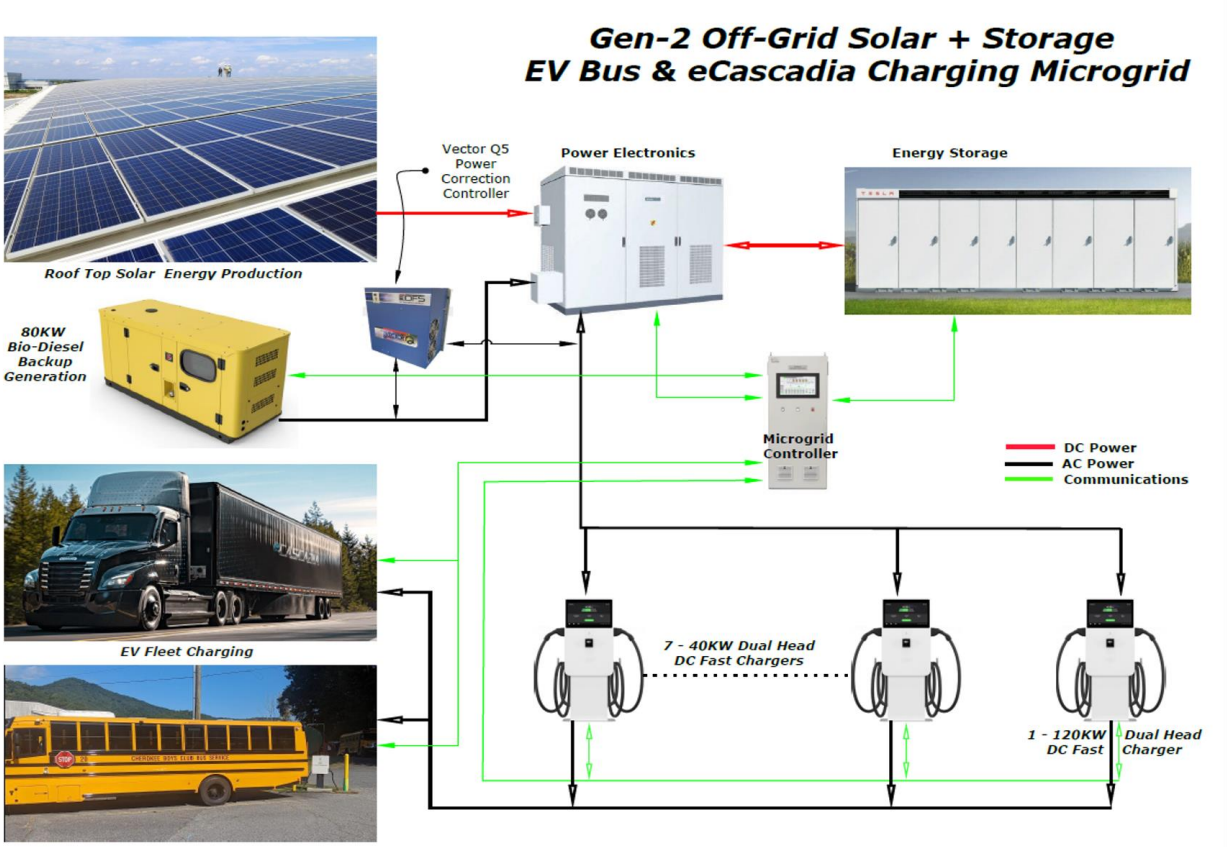


Building upon this successful program, the EBCI plans to deploy a 2nd Generation Electric Bus Fleet, create a microgrid-based charging hub at the Cherokee Boys Club, and electrify one waste hauling freightliner.

A microgrid is a network of connected energy generation resources and energy storage systems that allows for the creation, storage, and distribution of energy on and off the standard electrical grid. [24] They can be powered by wind, solar, biogas, or tidal energy, and are considered one of the best options for electrification in rural communities. [24] Microgrids have many benefits. They diminish the use of fossil-fuel generated electricity, build local wealth, offer workforce development opportunities, and bolster resilience by diverging from the standard electrical grid, which is usually more vulnerable to disaster. [25]

The microgrid at the Cherokee Boys Club will consist of a 400-kW solar array, powering seven 40kW fast charging stations and a 120kW fast charging station. The microgrid will also have the ability to store any generated solar energy. As seasonal load management assurance, a 80kW locally sourced bio-diesel backup generator will be part of the system (Figure 9).

Figure 9. The 400kW solar microgrid at the Cherokee Boys Club will power 21 electric school buses and a freightliner truck, carrying community waste to the landfill off boundary.



There will be 15 new electric school buses in the 2nd Generation electric bus fleet, replacing 15 diesel buses. Currently the diesel buses travel 704 miles a day or 126,720 miles a year. According to calculations from Critical Services Microgrid Group, a pro bono network of energy and engineering professionals hired to help plan and install the microgrid charging infrastructure, electrifying these buses will save 21,095 gallons of diesel a year and avoid 340 tons of CO2 (Table 14).

An electric waste-hauling freightliner will also be purchased as part of the 2nd Generation fleet. This vehicle will replace the current diesel waste-hauling freightliner described in the solid waste section of the GHG inventory. This replacement will save an estimated 13,371 gallons of diesel a year and avoid 125 tons of emitted CO2.

Table 14. Emissions reduction strategies for Measure 2.

Measure 2: Install Microgrid at the Boys Club and Electrify Buses and Freightliner	
Implementing Agency	Cherokee Boys Club
Sector(s)	Mobile Combustion, Electricity Generation and Consumption, and Waste Management
Milestones	1. Finding contractor to install arrays

	2. Creating system to track power and mileage data for microgrid and all vehicles 3. Installing solar array 4. Purchasing and deploying 2nd generation EV fleet
Geographic Location(s)	37 Cherokee Boys Club Loop, Cherokee, NC 28719
Funding sources	EPA School Bus Electrification Grant CPRG Program
Tracking Metrics	1. Electric miles driven 2. Gallons of diesel fuel saved 3. mWh electricity usage 4. Tons of CO2 avoided 5. Number of electric buses 6. Number of electric freightliner trucks 7. Number of diesel buses retired 8. Number of workforce development training performed 9. Attendance at workforce development trainings
Cost	$3,500,000
Estimated annual GHG reductions	Annual reductions: -250 lbs of SO2 -80 lbs of PM2.5 -400 lbs of NOx -40 lbs of VOCs -465 tons of CO2 -20 lbs of NH3
Implementation authority milestones	Tribal Council approval

Preparing for EVs is a community-wide effort. Accessible public charging stations are a crucial piece to the transition to EVs. Many residents and businesses may depend on the charging stations. It's important to ensure that residents have the confidence to recharge as reliably as they can refuel a conventional vehicle. Public charging infrastructure can provide convenience, range, and confidence.

Short surveys have been distributed, and will continue to be distributed, to assess community-member's perceptions of EVs and the Tribal EV infrastructure. From these data it is clear that EVs are considered one of the most important modes of clean transportation, though they are not common on the Qualla Boundary. Most respondents used a gas car or bus to get around.

Nearly 1 in 4 had never seen or traveled in an EV and only 4% of respondents said they owned one or had a family member who owned one.

To drive the transition to EVs the EBCI will install 20 public charging stations. The charging stations will be installed across the Qualla Boundary equitably, with guidance from community stakeholders. Having accessible charging stations in the communities should promote the use of EVs. However, it's too difficult to predict or calculate the extent that they will impact EV purchases and subsequently GHG emissions for this PCAP (Table 15).

Table 15. Emissions reduction strategies for Measure 3.

Measure 3: Expand the Electric Vehicle Infrastructure	
Implementing Agency	Eastern Band of Cherokee Indians - Natural Resources Department
Sector	Mobile Combustion
Milestones	1. Developing equitable installation plan for charging stations with communities 2. Installing charging stations
Geographic Location(s)	Currently not defined
Funding sources	CPRG Program
Tracking Metrics	1. Number of charging stations installed 2. kWH usage per charging station 3. Community perception of electric vehicles 4. Government staff perception of electric vehicles 5. Purpose of use by electric vehicle owners
Cost	$600,000
Estimated annual GHG reductions	Not applicable
Implementation authority milestones	Passing Tribal Resolution to plan new charging stations

In addition to the EV charging stations, the Tribe is also seeking to electrify its fleet by ensuring that 50% of the new vehicles purchased are electric (Table 16). Tribal Government vehicle fleet data were obtained to estimate the GHG reductions that will occur from the adoption of this policy. On average, the Tribal motor pool purchases 73 new vehicles per year. Applying the new policy, means that 36 new electric vehicles will be purchased each year. These vehicles were input into the EPA AVERT tool as half-hybrid and half-EV to calculate GHG emission reductions from the vehicle deployments.

Table 16. Emissions reduction strategies for Measure 4.

Measure 4: Electrifying the Tribal Fleet Policy	
Implementing Agency	Eastern Band of Cherokee Indians - Tribal Fleet Committee
Sector	Mobile Combustion
Milestones	1. 50% of fleet vehicles are electric
Geographic Location(s)	N/A
Funding sources	CPRG Program
Tracking Metrics	1. Number of gasoline vehicles retired 2. Number of diesel vehicles retired 3. Number of electric vehicles deployed 4. Miles traveled by new electric vehicles 5. Electricity usage (kW) of electric vehicles 6. Gallons of fuel saved by electric vehicles
Cost	TBD
Estimated annual GHG reductions	Annual reductions +45 lbs of SO2 -9 lbs of PM2.5 -211 lbs of NOx -307 lbs of VOCs -130 tons of CO2 -48 lbs of NH3
Implementation authority milestones	Passing Tribal Resolution to implement policy

Project Administration

We will hire an experienced Program Manager (PM) to oversee program implementation. The PM will lead the development and management of the proposed program, mentor/coordinate activities among team members, design and implement program strategies, and oversee quality assurance/quality control. The PM responsibilities will include: 1) developing relationships and expanding project partnerships with local and regional partners via in person and virtual interactions; 2) maintaining project tracking and providing overall leadership concerning project updates and deliverables; 3) managing program budgets, reporting, and day-to-day activities of core team members (Table 17).

Table 17. Emissions reduction strategies for Measure 5.

Measure 5: Hire Climate Adaptation Plan Project Manager	
Implementing Agency	Eastern Band of Cherokee Indians - Natural Resources Department
Sector	All sectors
Milestones	1. Posting Project Manager position 2. Hiring Project Manager 3. Year 1-5 goals achieved
Geographic Location(s)	N/A
Funding sources	CPRG Program
Tracking Metrics	Years of employment
Cost	$400,000
Estimated annual GHG reductions	N/A
Implementation authority milestones	Receiving Tribal Council approval

3.5 Benefits Analysis

GHGs contribute to poor air quality and have significant consequences on population health and well-being. Efforts to reduce GHGs therefore not only lessen contributions to climate change, but can also improve the air quality of the surrounding area. [28] Using statistical tools and software, it is possible to estimate the impacts that the GHG reduction measures will have on air pollutants on the Qualla Boundary.

First, a baseline of air quality in 2020 was established (Table 18). Baseline values for CO2, CH4, and N2O were derived from the GHG Inventory in Section 3.1.4, though they do not match the overall GHG inventory values because the estimates were not converted to CO2e. Emissions of criteria air pollutants and precursors (CAPs) and hazardous air pollutants (HAPs) were obtained from the 2020 NEI Database. [34] For these values, total emissions from the five counties that overlap with the Qualla Boundary were calculated for each pollutant using SAS statistical software (SAS Institute Inc. Version 9.4). [33] Then the average across five counties were taken as approximations of the Qualla Boundary.

Second, the impacts for each GHG reduction measured were totaled together, by pollutant and converted into MTs. These are shown in Table 18. For applicable pollutants, reductions were also converted into CO2e MT and a total was calculated.

Table 18. Baseline emissions and projected annual emissions from all GHG Reduction Measures by pollutant.

Pollutant	Baseline (MT)	Annual Reduction from GHG Measures (MT)	Annual Reduction CO2e (MT)
CH4	731	0	0
NOx	28	-1.20 MT	-319
CO2	1,330,055	-927 MT	-927
SO2	7.23	-0.06	-0.06
PM2.5	363	-0.05	-
VOCs	10,523	-0.28	-
NH3	272	-0.05	-
HAPs	788	0	-
Total			**-1,246**

Poor air quality can increase the prevalence of respiratory and cardiovascular illnesses, like asthma, bronchitis, and hypertension. It can even lead to premature death. [28] The health of children and the elderly are especially vulnerable to the adverse impacts of air pollution.

By adopting cleaner policies and using clean sources of energy generation and transportation, communities can reduce emissions and improve the health and wellbeing of the people who live there. Reducing GHG emissions can help people avoid illnesses, businesses prosper, and children miss fewer days of school. [28]

The EPA's CO-Benefits Risk Assessment Health Impacts Screening and Mapping Tool (COBRA) was used to calculate the benefits that may occur from implementing the GHG Reduction Measures on the Qualla Boundary. [29] Total emissions reductions, calculated from with the AVERT tool, were input into the web-based version of the COBRA tool to calculate potential reductions in respiratory and cardiovascular disease prevalence and burden on the Qualla Boundary. These results are shown in Table 19. They show that the Qualla Boundary could see

minor improvements in health due to cleaner air. The GHG Reduction Measures could save $11,616.40 to $26,177.50, most of it derived from avoided mortality.

Table 19. Estimated health impacts from adopting GHG reduction measures on the Qualla Boundary.

Health Endpoint	Reductions in Incidence (cases, annual)		Monetary Value (dollars, annual)	
	Low	High	Low	High
Mortality*	0.001	0.0024	11384.5	25793.6
Nonfatal Heart Attacks*	0.0001	0.001	18.3	170.4
Infant Mortality	0.0	0.0	87.7	87.7
Hospital Admits, All Respiratory	0.0003	0.0003	9	9
Hospital Admits, Cardiovascular**	0.0003	0.0003	13.8	13.8
Acute Bronchitis	0.0015	0.0015	0.9	0.9
Upper Respiratory Symptoms	0.0267	0.0267	1.1	1.1
Lower Respiratory Symptoms	0.0188	0.0188	0.5	0.5
Emergency Room Visits, Asthma	0.0006	0.0006	0.4	0.4
Asthma Exacerbation	0.0281	0.0281	2.1	2.1
Minor Restricted Activity Days	0.8062	0.8062	70.7	70.7
Work Loss Days	0.1365	0.1365	27.3	27.3
Total Health Effects			**$11,616.40**	**$26,177.50**

3.6 Review of Authority to Implement

The Eastern Band of Cherokee Indians is the entity that has the authority to carry out the proposed measures on EBCI lands. The EBCI may be required to get permission for a particular measure, for example, from the building or system owner (e.g., Duke Power, Cherokee Central Schools, Cherokee Boys Club), through a formal agreement such as a Cooperative Project Agreement. Our PCAP is fully endorsed by both the legislative and executive branches of the EBCI government, who has the full authority to implement CPRG work plan deliverables within the implementation grant application.

3.7 Identification of Other Funding Mechanisms

AGENCY: Environmental Protection Agency (EPA)
TITLE: Climate Pollution Reduction Grants Program: Implementation Grants Competition for Tribes and Territories
FUNDING OPPORTUNITY NUMBER: EPA-R-OAR-CPRGT-23-09
Assistance Listing No: 66.046
DUE DATE: May 1, 2024

AGENCY: Department of Energy Office of Indian Energy (DOE-OIE)
TITLE: Clean Energy Technology Deployment on Tribal Lands - 2024
FUNDING OPPORTUNITY NUMBER: DE-FOA-0003298
DUE DATE: May 30, 2024

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