OKLAHOMA
Environmental
Quality

Oklahoma's Priority Action Plan

OKLAHOMA'S PATH TO **POLLUTION REDUCTION** AND **ENERGY GROWTH**

Developed by Oklahoma Department of Environmental Quality (DEQ)
for the Environmental Protection Agency's
Climate Pollution Reduction Grant # 02F36201

Executive Summary

Oklahomans are known for resilience, work ethic, and innovation – they have not only survived but flourished after the dust bowl, the Murrah Federal Building bombing, tornadoes, and most recently COVID. This resilience to tragedy exemplifies the "Oklahoma Standard" of hard work and innovation. This Standard makes Oklahoma a state of outstanding people.

As a state with 39 tribes, the people of Oklahoma believe in protecting the land, air, and water as part of their heritage. A common cultural philosophy that applies to Oklahoma centers around the idea that decisions made today should result in a sustainable world "seven generations" into the future. Through Climate Pollution Reduction Grant (CPRG) funding, Oklahoma has a unique opportunity to further support their Energy and Environmental Plan and build upon this cultural belief.

Oklahoma's path to pollution reduction and energy growth is outlined in this Priority Action Plan (PAP). Over 75% of the state's Greenhouse Gas (GHG) emissions are generated by three sectors: Industry, Transportation and Electric Power Generation. Oklahoma's pathway to GHG emissions reductions will lead to increased renewable energy production and will bring low-carbon hydrogen to market. According to the U.S. Energy Information Administration, Oklahoma only consumes approximately one-third of the energy it produces. This PAP supports the reduction of GHG emissions through priority measures designed to increase energy production – thereby allowing the state to export even more clean energy than it does today. Overall, Oklahoma's PAP will result in three outcomes: increased economic growth, improved environmental and health benefits, and most importantly, social benefits to low-income and disadvantaged communities (LIDAC).

DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ) ROADSHOW:

10 meetings in 9 locations across the state
Outcome: productive and open conversation between DEQ staff and stakeholders including local residents and businesses, tribal members, city and township staff, universities, and metropolitan statistical areas (MSAs)

UNIVERSITY OF OKLAHOMA LIDAC FOCUS GROUPS:

10 focus groups in 10 communities
Outcome: create general themes and specific projects related to the experience of climate impact in LIDAC communities and their priorities for action

OKLAHOMA'S PAP PROCESS

FOCUSED ON **LISTENING AND LEARNING** FROM A **DIVERSE GROUP OF STAKEHOLDERS**

COORDINATION AND OUTREACH EFFORTS IN 6 MONTHS...

- **10** **LIDAC Focus Groups**
- **120** **Tribal Members Contacted**
- **2,500+** **Community Members Contacted**
- **10** **Public Meetings** *Including a Tribal Only Meeting*

RECEIVED INPUT FROM...

- **Municipalities (including ACOG* and INCOG*)**
- **Tribal Nations**
- **Local and State Government**
- **Industry**
- **Community Members**
- **Universities and Colleges**
- **Military Bases**

**ACOG: Association of Central Oklahoma Governments*

**INCOG: Indian Nations Council of Governments*

By understanding what Oklahomans want through this outreach process and comparing these values with the sources of GHG emissions in Oklahoma, priority measures were identified and selected that will have an impact on the lives of Oklahomans.

Oklahoma's Greenhouse Gas (GHG) Emissions by Sector:

Industry, Transportation, *and* ***Electric Power Generation*** *account for* ***more than 75%*** *of Oklahoma's GHG Emissions*

36.34% **INDUSTRY**

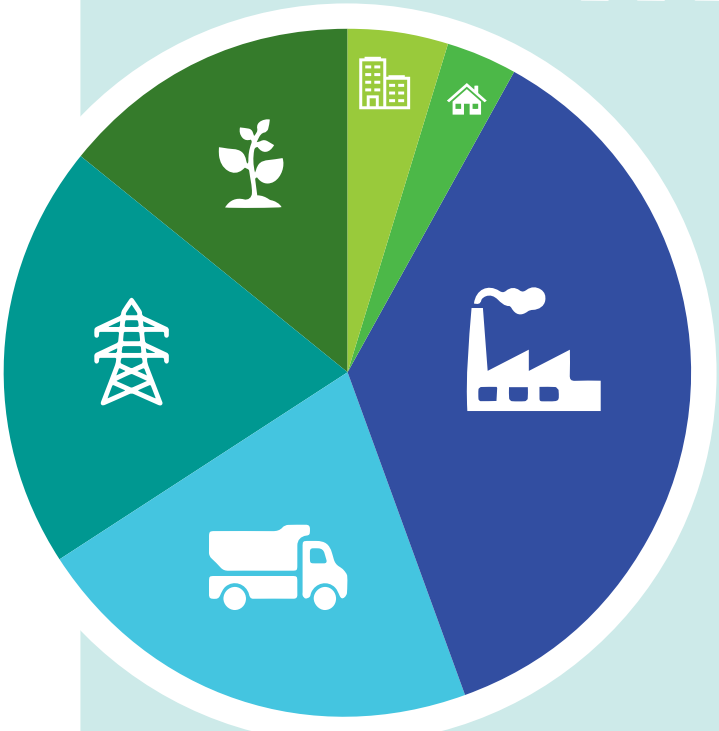
21.57% **TRANSPORTATION**

19.76% **ELECTRIC POWER INDUSTRY**

14.15% **AGRICULTURE**

4.83% **COMMERCIAL**

3.35% **RESIDENTIAL**



PRIORITY MEASURES AND ASSOCIATED SECTORS

Transportation

- Electric Vehicle Charging and Hydrogen Fueling Stations for Medium- and Heavy-Duty Zero Emission Trucks (MHD ZETs)
- Asphalt Technology Advances and Use of Reclaimed Materials

Electric Power Industry

- Solar Farm Development
- Transmission Upgrades

Industry

- Industry Process Upgrades/Retrofit Equipment
- Hydrogen Production
- Lower Carbon Ammonia via Hydrogen
- Decarbonization of the Tire Manufacturing Process
- CO_2 Capture and Storage

Agriculture/Land Use

- Sustainable Farming Practices
- Reforestation, Urban Forestry, and Composting

Commercial, Residential, & Municipal Buildings

- Solar Installation and Incentive Programs
- Energy Efficiency Programs
- LED Lighting Upgrade

Waste & Materials Management

- Landfill Gas Collection and Control
- Municipal Wastewater Facility Anaerobic Digesters and Energy Efficiency Upgrades

SPECIAL THANKS
to these coordinating agencies:

OKLAHOMA Transportation
OKLAHOMA CONSERVATION COMMISSION
OKLAHOMA Corporation Commission
OKLAHOMA Dept. of Agriculture, Food and Forestry
INCOG
OKLAHOMA Commerce
acog ASSOCIATION OF CENTRAL OKLAHOMA GOVERNMENTS
OKLAHOMA Secretary of Energy & Environment

Table of Contents

Tables

Figures

Appendices

Acronyms and Abbreviations

Acronym or Abbreviation	Definition
ACOG	Association of Central Oklahoma Governments
AD	Anaerobic Digestor
ARPA-E	United States Advanced Research Projects Agency- Energy
AVERT	EPA AVoided Emissions and geneRation Tool
BAU	Business as Usual
BENEFIT	Building Energy Efficiency Frontiers and Innovation Technologies
BIL	Bipartisan Infrastructure Law
Btu	British Thermal Units
CAP	Comprehensive Action Plan
CRP	Carbon Reduction PROGRAM
CEJST	Climate and Economic Justice Screening Tool
CH_4	Methane
CMAQ	Congestion Mitigation and Aire Quality
CNG	Compressed Natural Gas
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
COBRA	Co-Benefits Risk Assessment
COPD	Chronic Obstructive Pulmonary Disease
CPRG	Climate Pollutant Reduction Grant
CPRGOK	Oklahoma's Climate Pollution Reduction Grant
DEQ	Oklahoma Department of Environmental Quality
DOE	United States Department of Energy
ECLS	DEQ's Environmental Complaints and Local Services
EECBG	Energy Efficiency and Conservation Block Grant Program
EERE	United States Department of Energy's Office of Energy Efficiency and Renewable Energy
EF	Emissions Factor
EFO	Environmental Federation of Oklahoma
eGRID	EPA's Emissions and Generation Resource Integrated Database
EJ	Environmental Justice
EPA	United States Environmental Protection Agency
EPD	Environmental Product Declaration
ESCO	Department of Energy Qualified Energy Services Company
ESPC	Energy Services Performance Contract
EV	Electric Vehicles
F	Fahrenheit

F-gases	Fluorinated gases
FECM	United States Department of Energy's Office of Fossil Energy and Carbon Management
FLIGHT	EPA's Facility Level Information on GreenHouse gases Tool
FOA	Funding Opportunity Announcement
FTA	Federal Transit Administration
FY	Fiscal Year, e.g., FY23 is fiscal year 2023
g	Grams
GDP	Gross Domestic Product
GHG	Greenhouse Gases
GHGRP	EPA's Greenhouse Gas Reporting Program
H	High
HAP	Hazardous Air Pollutant
HEERA	IRA High Efficiency Electric Home Rebate Program
HFCs	Hydrofluorocarbons
HID	High-Intensity Discharge
HQ	Headquarters
HVAC	Heating, Ventilation, and Air Conditioning
IEDO	United States Department of Energy Industrial Efficiency and Decarbonization Office
IIJA	Infrastructure Investment and Jobs Act
IMPLAN	Impact Analysis for Planning
INCOG	Indian Nations Council of Governments
IRA	Inflation Reduction Act
kg	Kilograms
kW	Kilowatt
kWh	Kilowatt Hour
L	Low
LandGEM	EPA's Landfill Gas Emissions Model
LED	Light-Emitting Diode
LFGE	Landfill Gas Energy
LIDAC	Low-Income and Disadvantaged Communities
LPO	United States Department of Energy's Loan Programs Office
LULUCF	Land Use, Land-Use Change, and Forestry
LUST	Leaking Underground Storage Tanks
MESC	United States Department of Energy's Office of Manufacturing and Energy Supply Chains
MHD ZETs	Medium- and Heavy-Duty Zero Emission Trucks
mt	Metric Tons
MMSFC	Million Standard Cubic Feet
MMT	Million Metric Tons
MSA	Metropolitan Statistical Area

MW	Megawatt
MWh	Megawatt Hours
N_2O	Nitrous Oxide
NAPA	National Asphalt Pavement Association
NE	United States Department of Energy's Office of Nuclear Energy
NEI	EPA's National Emissions Inventory
NEVI	National Electric Vehicle Infrastructure
NF_3	Nitrogen Trifluoride
NO	Not Occurring
NO_x	Nitrogen Oxides
NOFO	Notice of Funding Opportunity
NREL	National Renewable Energy Laboratory
OCED	United States Department of Energy's Office of Clean Energy Demonstrations
ODAFF	Oklahoma Department of Agriculture, Food and Forestry
ODEQ	Oklahoma Department of Environmental Quality
ODOC	Oklahoma Department of Corrections
ODOT	Oklahoma Department of Transportation
ODS	Ozone Depleting Substances
OGE	Oklahoma Gas & Electric Company
OK	Oklahoma
OKC	Oklahoma City
OMAG/OMNGC	Oklahoma Municipal Assurance Group/Oklahoma Municipal Natural Gas Coalition
OMPA	Oklahoma Municipal Power Authority
OSEE	Oklahoma Secretary of Energy & Environment
OSU	Oklahoma State University
OU	University of Oklahoma
PAP	Priority Action Plan
PFAS	Per- and Polyfluoroalkyl Substances
PFCs	Perfluorocarbons
$PM_{2.5}$	Particulate matter with diameters that are generally 2.5 micrometers and smaller
QAPP	Quality Assurance Project Plan
RCPP	Regional Conservation Partnership Program
RIA	Regional Infrastructure Accelerators
RNG	Renewable Natural Gas
RO	Reverse Osmosis
ROW	Right-of-Way
SC	Science

scf	Standard Cubic Foot
SEER	Seasonal Energy Efficiency Ratio
SEP	State Energy Program
SERC	Sustainable Energy Resources for Consumers
SF_6	Sulfur Hexafluoride
SIT	EPA's State Inventory Tool
SNI	Oklahoma City's Strong Neighborhoods Initiative
SO_2	Sulfur Dioxide
SPP	Southwest Power Pool
SWODA	Southwestern Oklahoma Development Authority
TFP	Transmission Facilitation Program
TIEReD	United States Department of Energy's Technologies for Industrial Emissions Reduction Development Program
US	United States
US DOT	United States Department of Transportation
VNP	Vibrant Neighborhoods Partnership
VOC	Volatile Organic Compounds
WAP	Weatherization Assistance Program
WWTP	Wastewater Treatment Plant

Introduction

The Oklahoma Department of Environmental Quality (DEQ) is pleased to present this Priority Action Plan (PAP) to support investment in policies, practices, and technologies that diversify energy, reduce pollution, create high-quality jobs, spur economic growth, enhance the quality of life, and improve overall health outcomes for all Oklahomans. DEQ worked with multiple state and local agencies, municipalities, citizens, Tribal Nations, and industry to create a holistic plan that encompasses current and potential future pollution reduction efforts and priority projects and measures (Priority Measures). These Priority Measures span multiple greenhouse gas (GHG) sectors.

This project has been funded wholly or in part by the United States Environmental Protection Agency (EPA) under assistance agreement 02F36201 to DEQ. The contents of this document do not necessarily reflect the views and policies of the EPA, nor does the EPA endorse trade names or recommend the use of commercial products mentioned in this document.

Oklahoma's Priority Measures provide a short- and long-term approach to greenhouse gas (GHG) and co-pollutant reductions. With an eye to the future, the focus goes beyond pollution reduction. Oklahoma has a strong energy growth path that is supported by the military, industry, higher education, Tribal Nations, and state government. This plan is yet another example of Oklahoma's vision to build a future focused on innovative energy growth and continued engagement with Tribal Nations, municipalities, agencies, industry, and community members. DEQ evaluated nearly 200 projects and policy suggestions during extensive outreach efforts. Oklahomans realize the economic growth potential and the once-in-a-lifetime opportunity that the Climate Pollutant Reduction Grant (CPRG) planning and potential funding could have for transportation, agriculture, industry, commercial hydrogen production, and infrastructure creation. Growth of the hydrogen economy and the significant cumulative GHG reduction potential cannot be ignored.

Oklahoma is poised to take a leadership role in the nation's hydrogen and electrification future. State and industry driven priority measures include, but are not limited to:

- energy transmission infrastructure,
- energy efficiency,
- hydrogen production and utilization, and
- replicable industry innovations to ensure this plan will be successful.

Oklahoma's PAP will stand for years as a holistic guide for Tribal Nations, municipalities, agencies, industry, and community members to reduce pollution and encourage innovative energy growth. The measures contained herein should be construed as broadly available to any entity in the state eligible to receive funding under the EPA's Climate Pollution Reduction Implementation Grants and other funding streams, as applicable.

DEQ contracted with the University of Oklahoma (OU) to assist with the benefits analysis, the low-income and disadvantaged community (LIDAC) analysis, workforce planning analysis, and coordination and outreach to the community. With OU's assistance, DEQ feels that detailed and complete analyses were performed and significant outreach efforts were made.

PAP Greenhouse Gas Emissions Inventory

The DEQ has developed a statewide inventory of major sources of greenhouse gas (GHG) emissions within Oklahoma. This inventory was prepared using the following data resources:

- State-level GHG inventories prepared by the EPA[1]
- EPA's State Inventory Tool (SIT) - utilized for projecting future year emissions[2]
- Data reported to the EPA's Greenhouse Gas Reporting Program[3]

Detailed methodology and quality assurance procedures for preparation of this inventory are contained in the Oklahoma Quality Assurance Project Plan (QAPP) for Greenhouse Gas Emissions Inventory Reporting, included as Appendix A.

The Oklahoma inventory includes the following sectors and gases:

Sectors	***Greenhouse Gases (across all sectors)***
Industry Transportation Electric Power Industry Agriculture Commercial Residential	carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), fluorinated gases (F-gases) including hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6), and nitrogen trifluoride (NF_3)

Oklahoma has selected 2019 as the base year for this PAP, as it is representative of both the total GHG emissions generated annually throughout the state and the portion of those emissions generated by each sector.[4] Figure 1 below shows Oklahoma's 2019 GHG emissions by sector as a percentage of total emissions.

[1] https://www.epa.gov/ghgemissions/state-ghg-emissions-and-removals
[2] https://www.epa.gov/statelocalenergy/state-inventory-and-projection-tool
[3] https://www.epa.gov/ghgreporting/data-sets
[4] https://cfpub.epa.gov/ghgdata/inventoryexplorer/#allsectors/allsectors/allgas/econsect/all

Figure 1. Oklahoma's 2019 GHG Emissions by Sector

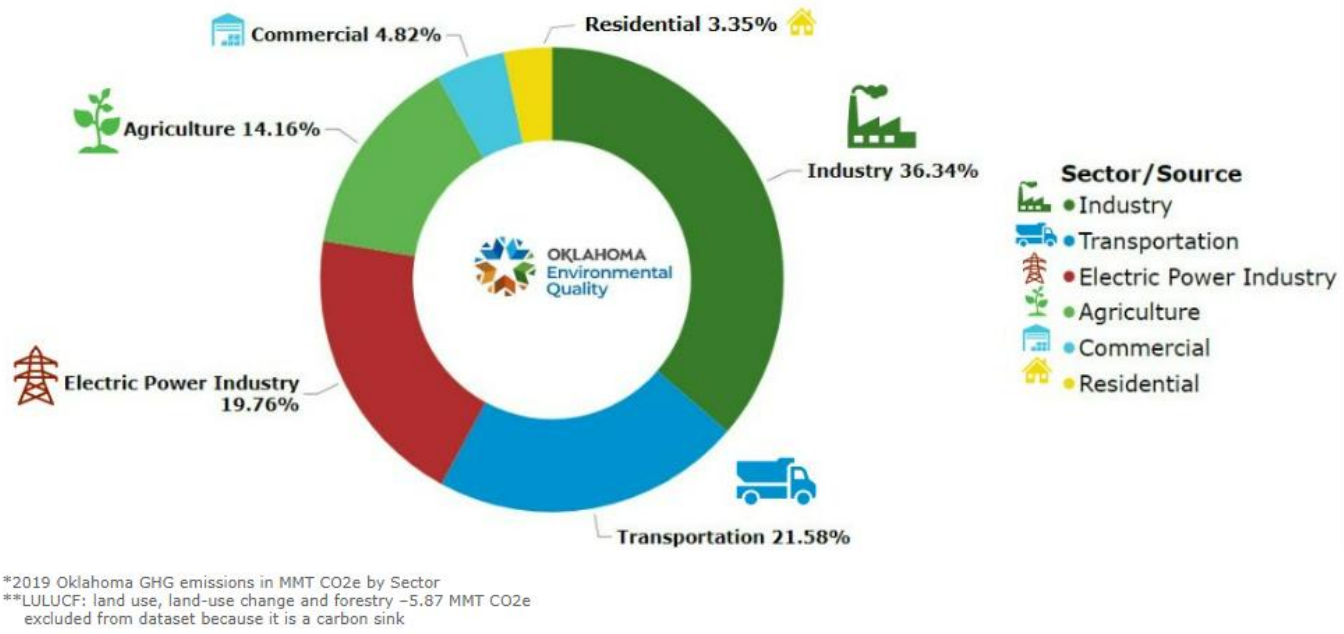


Table 1 and Figure 2 present Oklahoma's total GHG emissions by sector for 2019 in million metric tons (MMT) of carbon dioxide equivalent (CO_2e) for all economic sectors. Detailed emissions categorized per sector are provided in Table 19 of Appendix B- Oklahoma Greenhouse Gas Emissions Inventory.

Table 1. Oklahoma GHG emissions in MMT CO_2e by Sector – Summary [5]

Sector/Source	**2019**
Transportation	30.88
Electric Power Industry	28.28
Industry	52.00
Agriculture	20.26
Commercial	6.91
Residential	4.80
Total Emissions (Sources)	**143.13**
(LULUCF) Sector Net Total	-5.87
Net Emissions (Sources and Sinks)	**137.26**

[5] Data were obtained from EPA's State-level GHG inventories file State-GHG_Trends_Emissions__Sinks_Economic_Sector_08312023.xlsx, which was accessed on January 17, 2024. This data set is available at <https://www.epa.gov/ghgemissions/state-ghg-emissions-and-removals>.

Figure 2. Oklahoma GHG Emissions in MMT CO_2e by Sector

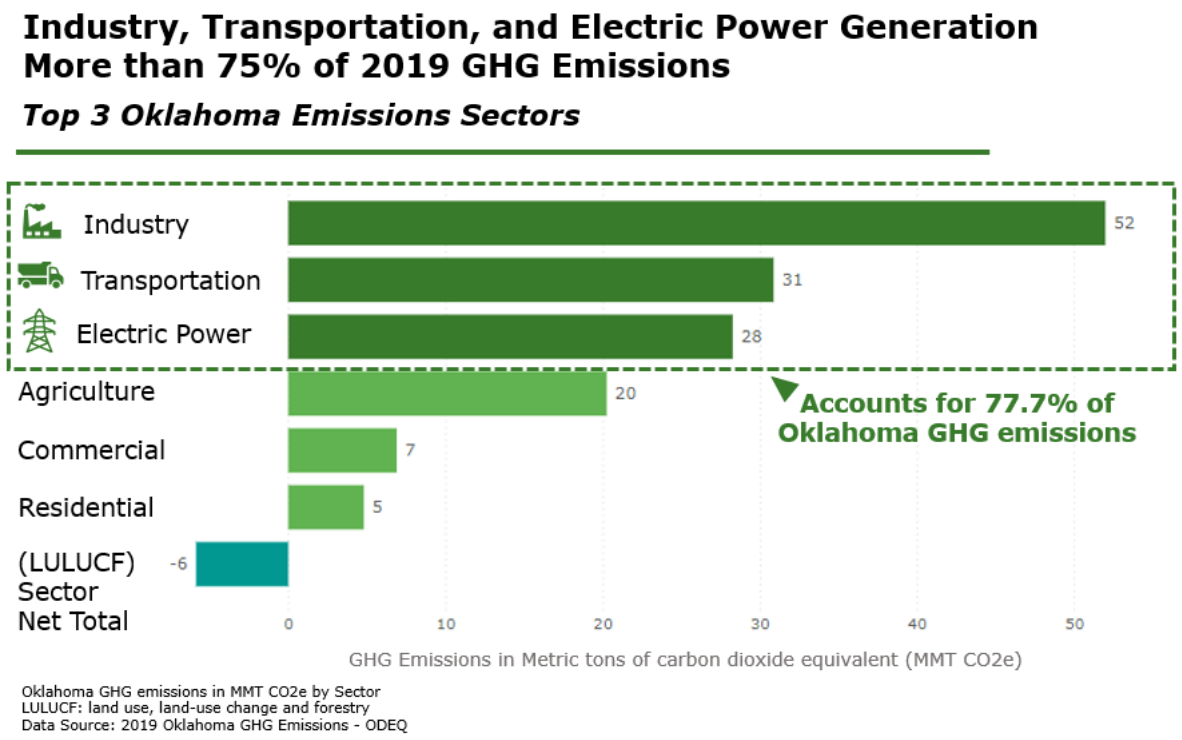


Table 2 provides detail for the emissions of specific GHGs in MMT of CO_2e across all sectors for 2019. Detailed emissions broken down per sector are provided in Table 21 of Appendix B- Oklahoma Greenhouse Gas Emissions Inventory.

Table 2. Oklahoma GHG emissions in MMT CO_2e by Gas[6] - Summary

Gas/Source	2019
CO_2	94.13
CH_4	34.94
N_2O	11.55
HFCs, PFCs, SF_6 and NF_3	2.52
HFCs	2.31
PFCs	+
SF_6	0.21

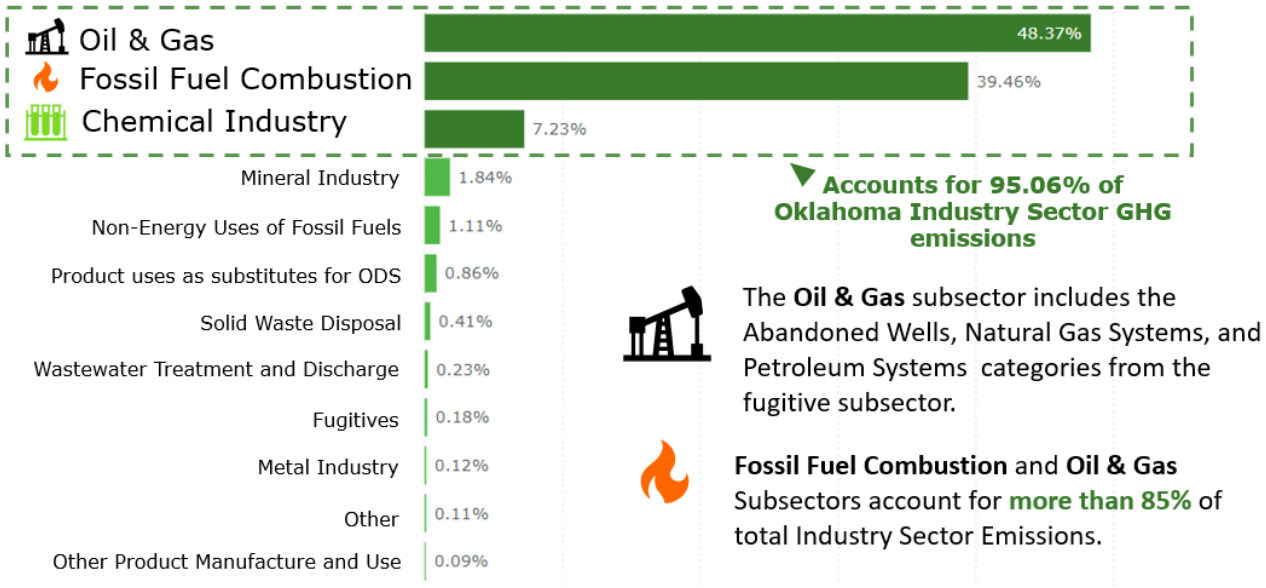
[6] Data were obtained from EPA's State-level GHG inventories file State-GHG_Trends_Emissions__Sinks_By_Gas_08312023.xlsx, which was accessed on January 17, 2024. This data set is available at <https://www.epa.gov/ghgemissions/state-ghg-emissions-and-removals>.
NO = Not occurring
Symbols:
"+" indicates that the value does not exceed 0.005 MMT CO_2e

Gas/Source	2019
NF_3	NO
Total (Sources) Emissions	**143.14**
LULUCF Sector Net Total	-5.87
Net Emissions (Source and Sinks)	**137.24**

Industry

The industry sector generated the largest share of GHG emissions in Oklahoma, accounting for 36.34% of total GHG emissions in 2019. Figure 3 below presents Oklahoma's 2019 GHG emissions by industry subsector and shows the specific percent of emissions from the top three subsectors.

Figure 3. Oklahoma's 2019 Industry Sector GHG Emissions by Subsector



Source: Oklahoma DEQ 2019 GHG Emissions Data
Electronics Industry excluded from chart because category had 0% contribution

There are over 4,200 manufacturing firms operating in Oklahoma and the industrial sector continues to grow. The GHG emissions from industrial sources in Oklahoma come from the burning of fossil fuels and natural gas for energy and chemical reactions necessary for the production of goods. More information on Oklahoma's Industrial Sector can be found at https://www.okcommerce.gov/doing-business/business-relocation-expansion/industry-sectors/.

Transportation

The transportation sector generates the second largest share of GHG emissions in Oklahoma. In 2019, carbon dioxide (CO_2) emission levels that could be attributed to the transportation sector measured 30.88 MMT. These emissions come primarily from the burning of fossil fuels in cars, trucks, trains, and planes. The largest sources of transportation-related GHG emissions being passenger cars, medium- and heavy-duty trucks, and light-duty trucks, including sport utility vehicles, pickup trucks, and minivans.

Oklahomans drive more than the average Americans, with an average of 45 miles per person per day as of 2021. In 2021, Oklahomans commute more than the national average with 82.5% of residents commuting alone and only 9.5% carpooling.[7] More information on Oklahoma's Transportation Sector can be found at https://oklahoma.gov/odot.html.

Electric Power Industry

In 2019, the electric power industry sector (power sector) generated the third largest share of GHG emissions in Oklahoma. These emissions are primarily due to the combustion of coal and natural gas. However, Oklahoma has reduced carbon emissions from the power sector with the increase of renewable energy. According to the U.S. Energy Information Administration, in 2022, Oklahoma was third in the nation for electricity generation by wind.[8] Wind accounted for 93% of the state's total renewable generation.[9] Oklahoma's energy sector plans to continue reducing emissions as seen in their "Oklahoma State Energy & Environment Plan 2021."[10]

Agriculture

The agriculture sector generated the fourth largest share of GHG emissions in Oklahoma in 2019. More than 34 million acres are used for farming and ranching. There are more than 77,200 farms and 129,619 agriculture producers.[11] GHG emissions from agriculture consist predominantly of methane (CH_4) and nitrous oxide (N_2O). These emissions primarily come from livestock, such as cows and pigs, soils, and crop production. Oklahoma ranks 2nd in the nation for beef production and 7th in cotton fiber production.[12] More information on Oklahoma's Agriculture Sector can be found at https://ag.ok.gov/.

Commercial and Residential

In 2019, the residential and commercial sectors generated the smallest share of GHG emissions in Oklahoma. In 2019, the commercial sector made up 4.83% and the residential sector made up 3.35% of Oklahoma's total GHG emissions. The residential and commercial sectors include all homes and commercial business but exclude agricultural and industrial activities. GHG emissions from these sectors are generated from the combustion of fossil fuels for heating and cooking, management of waste and wastewater, and leaks from refrigerants in homes and businesses. Commercial and residential heating systems primarily include furnaces and boilers, fueled by electricity or natural gas. Other sources of GHG emissions include organic waste sent to landfills and wastewater treatment plants. The list below outlines the subsectors within the commercial and residential sector that comprise the total GHG emissions.

- Commercial - Fossil fuel combustion: carbon dioxide
- Commercial - Landfills and waste services
- Commercial - Use of fluorinated gases
- Commercial - Fossil fuel combustion: other greenhouse gases
- Residential - Fossil fuel combustion: carbon dioxide Residential - Use of fluorinated gases
- Residential - Fossil fuel combustion: other greenhouse gases

[7] 2021 data was obtained from the "Oklahoma State Energy & Environmental Plan 2021."
[8] U.S. Energy Information Administration, https://www.eia.gov/state/?sid=OK
[9] U.S. Energy Information Administration, https://www.eia.gov/state/?sid=OK
[10] https://ee.ok.gov/wp-content/uploads/2021/09/FUL-FEP_Final-Draft6-1.pdf
[11] https://ag.ok.gov/about/
[12] https://ag.ok.gov/oklahoma-ag-overview/

Land Use, Land-use Change and Forestry (LULUCF)

Plants absorb carbon dioxide (CO_2) from the atmosphere as they grow, and they store some of this carbon as perennial aboveground and belowground biomass throughout their lifetime. Soils and dead organic matter/litter can also store some of the carbon from these plants depending on how the soil is managed and other environmental conditions. This storage of carbon in plants, dead organic matter/litter, and soils is called biological carbon sequestration. Because biological sequestration takes CO_2 out of the atmosphere and stores it in these carbon pools, it is also called a carbon "sink."

Emissions or sequestration of CO_2, as well as emissions of CH_4 and N_2O, can occur from management of lands in their current use or as lands are converted to other land uses. Carbon dioxide is exchanged between the atmosphere and the plants and soils on land. For example, as cropland is converted into grassland, as lands are cultivated for crops, or as forests grow.

In 2021, the net CO_2 removed from the atmosphere from the LULUCF sector was 12% of total U.S. GHG emissions. Between 1990 and 2021, total carbon sequestration in the LULUCF sector decreased by 14%, primarily due to a decrease in the rate of net carbon accumulation in forests, as well as an increase in CO_2 emissions from urbanization. Additionally, while episodic in nature, increased CO_2, CH_4 and N_2O emissions from forest fires have also occurred over the time series.[13] DEQ's projections using a linear regression analysis of Oklahoma's 1990-2021 LULUCF emissions show the sector to be a net addition for Oklahoma in GHG emissions by 2030.

[13] https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions#land-use-and-forestry

GHG Emissions Projections and Targets

The DEQ has developed near-term (2030) and long-term (2050) projections of GHG emissions that would occur in a "business-as-usual" (BAU) scenario where the PAP measures are not implemented and under a scenario where the measures in this PAP are fully implemented (PAP scenario). Quality assurance procedures and detailed methodologies for preparation of these projections are contained in Appendices A and D. Table 3 lists base year (2019) GHG emissions and near-term and long-term GHG emissions projections by sector for Oklahoma under the BAU and PAP scenarios.

Table 3. Oklahoma GHG baseline and projected emissions in $MMTCO_2e$ by Sector

Sector/Source	2019	BAU[14]		PAP	
		2030	2050	2030	2050
Transportation	30.88	32.85	36.05	32.70	35.96
Electric Power Industry	28.28	22.73	23.05	22.64	22.99
Industry	52.00	52.15	58.27	49.79	56.32
Agriculture	20.26	16.52	14.77	16.33	14.42
Commercial, Residential & Municipal	9.09	7.69	8.04	7.56	7.95
Waste, Water, and Sustainable Material Management	2.95	3.63	3.59	3.06	3.33
Total Emissions (Sources)	**143.13**	**135.57**	**143.77**	**132.08**	**140.95**
LULUCF Sector Net Total	-5.87	0.57	12.13	0.57	12.13
Net Emissions (Sources and Sinks)	**137.26**	**136.14**	**155.9**	**132.65**	**153.08**

During the compilation of data for Table 3, it was noted that the EPA GHG emissions sectors and subsectors did not directly correlate with the sectors in the PAP. For clarification on the baseline and projected emissions, a sector crosswalk for the table is included as Appendix C.

[14] Base year data downloaded from EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks by State, for Oklahoma for 2019: https://www.epa.gov/ghgemissions/state-ghg-emissions-and-removals. The DEQ developed a crosswalk to map from EPA's GHG Inventory sectors to the sectors in this table. All BAU data, except for LULUCF, was compiled from EPA's State Inventory Tool (SIT) utilizing default parameters. LULUCF BAU values were generated by applying a linear regression to LULUCF values from 1990-2021.

Priority Measures

Oklahoma, through participation with Tribal Nations, municipalities, agencies, community members, and industry has determined the measures in Table 4 on the following page to be priorities for the state of Oklahoma. This is not an exhaustive list of Oklahoma's priorities. The priority measures included in this PAP meet the three criteria listed below:

- The measure can be completed in the near-term, meaning that all funds will be obligated within the five-year performance period for the CPRG implementation grants.
- The measure advances the following state priorities:
    - Significant and sustained emission reductions
    - Public health
    - Equity
    - Energy growth and innovation
- The measure advances the following state goals:
    - Remain a top 5 producer of clean renewable energy
    - Partner with new technologies to maximize immense solar potential
    - Foster an environment where new technologies and alternative fuels can drive environmental change while maximizing all of Oklahoma's resources

Oklahoma has designed this PAP to include a broad range of ideas that encourage sustainable economic and energy growth. The PAP incorporates pollution reduction measures focused on improving the health and economic outcomes for all Oklahomans. Oklahoma has chosen to make all CPRG developed measures voluntary. Should Oklahoma be selected to receive CPRG funding, programs would be fast tracked with a goal of implementing actions associated with planned reduction measures in the first year after award. DEQ has already begun working at the Secretary level with state implementing agencies to ensure leadership buy-in and coordination. The implementing agencies listed below are anticipated to apply for funding or have regulatory authority over the priority measures. Other entities, tribes, agencies, or municipalities may choose to implement related priority measures.

Near-term priority measures include industry and municipal focused projects. All are scalable and can be implemented across Oklahoma. The long-term projects promote national goals for innovation in the transportation industry by creating hydrogen production and fueling infrastructure opportunities including fleet replacement in the hydrogen and EV space.

For each priority measure, this PAP provides additional details about the following information:

- An estimate of the cumulative GHG emission reductions from 2025 through 2030
- An estimate of the cumulative GHG emission reductions from 2025 through 2050
- Implementing agencies
- Implementation schedule and milestones
- Geographic scope
- Identification of funding sources (where relevant)
- Metrics for tracking progress
- Co-benefits
- Methods and assumptions

For more information on Oklahoma's plans for reducing GHG emissions, see Oklahoma's Pollution Reduction Plan (CPRG application Workplan) at https://www.deq.ok.gov/wp-content/uploads/air-division/CPRG_Oklahoma_Pollution_Reduction_Plan.pdf and Oklahoma State Energy & Environment Plan 2021 at: https://ee.ok.gov/wp-content/uploads/2021/09/FUL-FEP_Final-Draft6-1.pdf.

Table 4. Oklahoma PAP Priority Measures[15]

Sector	Priority Measure	Cumulative GHG emissions reductions (MMT CO_2e)		Implementing Agency or Agencies	Geographic Scope
		2025-2030	2025-2050		
Transportation	Electric Vehicle Charging and Hydrogen Fueling Stations for Medium- and Heavy-Duty Zero Emission Truck (MHD ZET) Fueling Stations	0.50	2.00	DEQ, Oklahoma Department of Transportation (ODOT), Oklahoma Department of Labor, Oklahoma Corporation Commission	Interstate Highways
	Asphalt Technology Advances and Use of Reclaimed Materials	0.24	1.19	ODOT	Statewide
Electric Power Industry	Solar Farm Development	0.31	1.54	DEQ, Oklahoma Corporation Commission	Statewide
	Transmission Upgrades	0.13	0.63	DEQ, Oklahoma Corporation Commission, Oklahoma Municipal Power Authority	Statewide
Industry[16]	Industry Process Upgrades to Install or Retrofit Equipment (e.g., emission capture systems, switch power source to lower emission fuel, electricity, or solar)	3.12	15.62	DEQ	Statewide
	Hydrogen Production	1.59	7.95	ODEQ, Oklahoma Corporation Commission	Statewide
	Lower Carbon Ammonia via Hydrogen	0.32	3.38	DEQ, Oklahoma Department of Labor, Oklahoma Corporation Commission	Statewide
	Decarbonization of the Tire Manufacturing Process	0.29	1.43	DEQ	Comanche County
	CO_2 Capture and Storage	6.63	40.50	DEQ, Oklahoma Corporation Commission	Statewide

[15] Additional details regarding these calculations can be found in Appendix D.
[16] The emissions reduction estimates for the Industry Sector are based on data obtained through DEQ's online CPRG Project Submission Form. Emissions reduction estimates for specific projects may vary greatly.

Sector	Priority Measure	Cumulative GHG emissions reductions (MMT CO_2e)		Implementing Agency or Agencies	Geographic Scope
		2025-2030	2025-2050		
Agriculture/ Land Use	Sustainable Farming Practices	0.97	12.37	DEQ, Oklahoma Conservation Commission	Statewide
	Reforestation, Urban Forestry, and Composting	4.73E-03	0.03	Oklahoma Department of Agriculture, Food and Forestry (ODAFF)	Statewide
Commercial, Residential & Municipal	Solar Installation and Incentive Programs	0.63	3.18	DEQ, Oklahoma Corporation Commission	Statewide
	Energy Efficiency Programs	0.01	0.05	DEQ, Oklahoma Department of Commerce	Statewide
	LED Lighting Upgrade	0.01	0.06	DEQ, Oklahoma Department of Commerce	Statewide
Waste and Materials Management	Landfill Gas Collection & Control	2.84	9.19	DEQ	Statewide
	Municipal Wastewater Facility Anaerobic Digesters and Energy Efficiency Upgrades	2.02E-03	0.01	DEQ	Statewide
TOTAL		**17.59**	**99.13**		

TRANSPORTATION

PRIORITY MEASURES

Promote Medium- and Heavy-Duty Zero Emission Truck Fueling Stations

This measure will provide electric vehicle charging and hydrogen fueling stations for Medium- and Heavy-Duty Zero Emission Trucks (MHD ZETs) on Oklahoma's highway corridors. This measure proposes to use CPRG funds for:

- Electric vehicle charging stations,
- Stationary and (transitory) mobile hydrogen refueling stations,
- On-site renewable energy generation with energy storage,
- Planning plus implementation for sites in addition to the Regional Infrastructure Accelerators (RIAs), who already received a planning grant and have developed plans, and
- Vehicle transition.

DEQ is actively working with New Mexico and Arizona to form a coalition focused on installing infrastructures that promotes MHD ZETs, along the I-40 corridor. Potential locations could be in Beckham County, Oklahoma County, and McIntosh County based on appropriate spacing for coalition effort. DEQ also proposes to install this measure along highways or interstates that service the northeastern corner of Oklahoma, possibly in coalition with Arkansas, beginning with the Tulsa County airshed to improve air quality in one of the highest traffic areas in the state.

Asphalt Technology Advances and Use of Reclaimed Materials

Support Oklahoma Department of Transportation programs that focus on GHG reduction goals and encourages material reuse.

Methods and Assumptions

Implementation methods and assumptions will be determined during the CAP development process. Should Oklahoma receive funding from the Implementation Phase 2, this effort will be prioritized.

Implementation Schedule and Milestones

This will be defined during the CAP process to ensure continuous meaningful stakeholder engagement.

Low-Income and Disadvantaged Community Analysis

DEQ contractor, OU, is working with DEQ to analyze impacts to the LIDAC. Both DEQ and OU have completed a significant outreach effort associated with the analysis. OU is utilizing EPA tools and process knowledge to perform the detailed analysis. See Low Income/Disadvantaged Communities Benefits Analysis section of this document for a detailed analysis.

Metrics for Tracking Progress

Oklahoma's CAP will clearly define priority project scopes with thoroughly developed metrics for tracking the progress towards achieving the goals for each priority measure. For these measures, Oklahoma will potentially use the following metrics to track progress:

- Is the project on schedule and on budget for completion?
- Were the implemented projects cost efficient (low cost per GHG metric ton reduced)?

- Number of companies transitioning to electric/hydrogen vehicles and the number of electric/hydrogen vehicles per company.
- Amount of energy being generated and stored on site.
- Number of programs advancing asphalt technologies and the amount of reclaimed materials used.

Other Funding

Other funding opportunities that DEQ is looking into are provided on Table 5 below.

Table 5. Other Funding Opportunities for Transportation Related Projects

Funding Opportunity	Description	Current App Status	Next App Milestone	Total Funding FY22-26	Agency
Clean Heavy-Duty Vehicles	Offset the costs of replacing heavy-duty Class 7 and 8 commercial vehicles with zero-emission vehicles; deploying infrastructure needed to charge, fuel, or maintain these zero-emission vehicles; and developing and training the necessary workforce.	FY23 Application to open soon	Expected NOFO in early spring 2024	$1,000,000,000	Environmental Protection Agency
Funding for Department of Energy Loan Programs Office	To support the cost of loans for innovative clean energy technologies. IRA provides $40 billion of loan authority supported by $3.6 billion in credit subsidy for projects eligible for loan guarantees under section 1703 of the Energy Policy Act of 2005. This loan authority is open to all currently eligible Title 17 Innovative Clean Energy technology categories, including fossil energy and nuclear energy, and new categories of activities, including critical minerals processing, manufacturing, and recycling.	Loan Consultation Process	N/A	$3,600,000,000	Department of Energy
2024 Low or No Emission Grant Program (Low-No Program)	Low-No Program funds will be awarded competitively for the purchase or lease of low or no emission vehicles that use advanced technologies for transit revenue operations, including related equipment or facilities.	Application Open at Grants.Gov	Application due by 11:59 pm Eastern on April 25, 2024	$1,103,963,762	Federal Transit Administration (FTA), U.S. DOT
VW Settlement Funding	Reimbursement for purchase of non-road equipment in freight switchers, ferries or tugs, airport ground support equipment, and forklifts and port cargo handling equipment categories	Applications closed. Projects are underway.	Projects expected to complete by June 30, 2026	Projects expected to complete by June 30, 2026	Volkswagen Settlement Trust

Funding Opportunity	Description	Current App Status	Next App Milestone	Total Funding FY22-26	Agency
VW Settlement Funding – Oklahoma Allocation – Alternative Fuel School Bus Program	Reimbursement of school buses replaced with alternatively fueled school buses	Applications closed. Projects are underway.	Projects expected to complete September 1, 2025	$1,000,000	Volkswagen Settlement Trust
VW Settlement Funding – Oklahoma Allocation – On-Road Program, Round 2	Reimbursement for purchase of on-road vehicles in medium and heavy-duty trucks and bus fleets.	Solicitation projected to open before the end of FY26	Solicitation projected to open before the end of FY26	$4,364,000	Volkswagen Settlement Trust
DERA – State Allocation Program (Oklahoma Clean Diesel Program)	EPA allocates DERA funds to the Oklahoma DEQ to support programs that achieve significant reductions in diesel emissions. Oklahoma uses the allocation to run a reimbursement program for school buses that may fund 25% - 45% of a new bus depending on fuel type of replacement vehicle.	Oklahoma is awaiting the award for FY23 to start their application period for FY23.	Open next application period in Spring 2024.	$4,527,031 (Funding amounts for FY25 & 26 are estimates)	Oklahoma DEQ / EPA
DERA – EPA Federal Rebate Program	A federal rebate program to fund vehicle replacement or retrofits for older diesel vehicles. Applicants are selected by a lottery, with at least one selectee from each state/territory represented in the applicant pool. Rebates range from $20,000 to $65,000 per bus depending on fuel type of replacement vehicle.	Closed	Uncertain if future rounds will be available	~$10 million	EPA
DERA – EPA Competitive Program	The Federal DERA program offers funding assistance to accelerate the upgrade, retrofit, and turnover of the legacy diesel fleet.	FY23 Application deadline was December 1, 2023	Anticipated Notification of Selection	$115 million	EPA

Funding Opportunity	Description	Current App Status	Next App Milestone	Total Funding FY22-26	Agency
EPA Clean School Bus Program	A CSB Rebate is a payment from EPA to an eligible entity to subsidize the purchase of a zero-emission (ZE) or clean school bus, eligible infrastructure, and other costs, including workforce training. Rebates allow selectees to receive awarded funds before purchasing the buses and associated infrastructure listed in their application.	Closed	Reviewing applicants and begin selection process.	$5 billion	EPA
National Electric Vehicle Infrastructure (NEVI) Formula Program	From the Infrastructure Investment and Jobs Act (IIJA), Oklahoma was awarded $66.3 million to invest over 5 years, in EV garaging infrastructure	Awarding funding for proposed sites	Site installation and reimbursement	$66.3 million	ODOT
Carbon Reduction Program (CRP)	ODOT is required by the United States Department of Transportation (USDOT) to allocate 65% of the CRP funds to urbanized areas in proportion to their relative share of the state population. The remaining 35% of funds will be allocated at ODOT's discretion in any area of the state.	Awarded	Implementation	$106 million	ODOT
Congestion Mitigation and Air Quality (CMAQ)	The BIL continues the CMAQ to provide a flexible funding source to State and local governments for transportation projects and programs to help meet the requirements of the Clean Air Act. Funding is available to reduce congestion and improve air quality for areas that do not meet the National Ambient Air Quality Standards for ozone, carbon monoxide, or particulate matter (nonattainment areas) and for former nonattainment areas that are now in compliance (maintenance areas).	Awarded	Implementation	$8 million	ODOT

Additional information and notes regarding these fundings opportunities can be found in Appendix E.

ELECTRIC POWER INDUSTRY

PRIORITY MEASURES

Solar Farm Development

Support the development of solar farms to expand clean energy usage by multiple users. This will further increase Oklahoma's solar electric generation while enhancing grid reliability and resilience. Solar farms create jobs during the construction phase and provide long-term employment opportunities for maintenance and operations. This provides revenue to the local economy through the sale of excess electricity to the local utility grid, as negotiated and agreed on with the local power utility.

Transmission Upgrades

Convert distribution system from 4kV to 12kV operation through Oklahoma's Municipal Power Authority in multiple cities across Oklahoma. Increasing the voltage stability will allow the system to support the addition of more renewable capacity and significantly improve efficiency by reducing electrical losses. This in turn requires less power to be produced and therefore results in lower GHG emissions.

Methods and Assumptions

Implementation methods and assumptions will be determined during the CAP development process. Should Oklahoma receive funding from the Implementation Phase 2, this effort will be prioritized.

Implementation Schedule and Milestones

This will be defined during the CAP process to ensure continuous meaningful stakeholder engagement.

Low-Income and Disadvantaged Community Analysis

DEQ contractor, OU, is working with DEQ to do this analysis. DEQ and OU have completed a significant outreach effort. OU is utilizing EPA tools and process knowledge to perform a detailed analysis. See Low Income/Disadvantaged Communities Benefits Analysis section of this document for a detailed analysis.

Metrics for Tracking Progress

Oklahoma's CAP will clearly define priority project scopes with thoroughly developed metrics for tracking the progress towards achieving the goals for each priority measure. For these measures, Oklahoma will potentially use the following metrics to track progress:

- Number of qualified facilities/organizations applying for the funding.
- Amount of GHG reduced at each participating site and within the state, both on an annual basis and over the duration of the program.
- Number of qualified facilities/organizations successfully implementing projects within the given timeline.
- Were the implemented projects cost efficient (low cost per GHG metric ton reduced)?
- Number of LIDAC communities positively impacted.
- Amount of reduction in non-renewable energy usage.

Other Funding

Other funding opportunities that DEQ is looking into are provided on Table 6 below.

Table 6. Other Funding Opportunities for Electric Power Industry Related Projects

Funding Opportunity	Description	Current App Status	Next App Milestone	Total Funding FY22-26	Agency
Preventing Outages and Enhancing the Resilience of the Electric Grid Grant (BIL/IIJA) Grid	For the next 5-years, Bipartisan Infrastructure Law (BIL) will stand up 60 new programs including Preventing Outages and Enhancing the Resilience of the Electric Grid / Hazard Hardening; Programs upgrading electric grid and ensuring reliability and resiliency; Transmission Facilitation Program (TFP), Deployment of Technologies to Enhance Grid Flexibility; etc.	Received	N/A	$7,653,810 (year 1) $7,508,563 (year 2) Additional ~15 million to be allocated later	Oklahoma Department of Commerce

Additional information and notes regarding these fundings opportunities can be found in Appendix E.

INDUSTRY

PRIORITY MEASURES

Process Upgrades

Support process upgrades for the industry sector, including but not limited to eligible oil and gas operations that install or retrofit equipment with emission capture systems or switch energy source to lower emission fuel, electricity, or solar power. In addition to funding, support would include providing industrial and manufacturing facilities technical assistance in assessing the facility to identify cost-savings and innovative measures for emissions reduction.

DEQ is actively working with regional states to form a coalition to implement a grant program supporting investments in innovation at industrial and manufacturing facilities that also reduce air pollution. Projects eligible for this program will demonstrate implementation readiness, innovation, direct air pollutant reductions, co-benefits, benefits to LIDAC, and an ability to be completed within five years. Incentives to cover the costs of installation or upgrades to enhance industrial efficiency and reduce air pollution will be provided in the form of reimbursements to qualified and selected applicants.

Hydrogen Production

Support the generation and transportation of low-carbon hydrogen to create a hydrogen economy that facilitates the usage and consumption of clean fuels. Additionally, support technology to extract green hydrogen from biowaste using fluidized bed reactor technology and from a variety of carbon-hydrogen containing substances such as municipal waste, wood chips, sewage sludge, straw pellets, and agricultural waste.

Lower Carbon Ammonia via Hydrogen

Support increasing ammonia production capacity to receive carbon-free hydrogen to produce clean ammonia from renewable resources.

Decarbonization of the Tire Manufacturing Process

Support the development of electric curing technology in tire manufacturing to allow for the generation of heat to cure tires by using renewable electricity and eliminate the need for fossil fuels.

CO_2 Capture and Storage

Support projects that transport CO_2 via pipeline for subsequent CO_2 storage via enhanced oil recovery or permanent geologic storage. The state of Oklahoma is currently seeking primacy from EPA to regulate Class VI injection wells.

Methods and Assumptions

Implementation methods and assumptions will be determined during the CAP development process. Should Oklahoma receive funding from the Implementation Phase 2, this effort will be prioritized.

Implementation Schedule and Milestones

This will be defined during the CAP process to ensure continuous meaningful stakeholder engagement.

Low-Income and Disadvantaged Community Analysis

DEQ contractor, OU, is working with DEQ to do this analysis. DEQ and OU have completed a significant outreach effort. OU is utilizing EPA tools and process knowledge to perform a detailed analysis. See Low Income/Disadvantaged Communities Benefits Analysis section of this document for a detailed analysis.

Metrics for Tracking Progress

Oklahoma's CAP will clearly define priority project scopes with thoroughly developed metrics for tracking the progress towards achieving the goals for each priority measure. For these measures, Oklahoma will potentially use the following metrics to track progress:

- Number of qualified facilities/organizations applying for the funding.
- Amount of GHG reduced at each participating site and within the state, both on an annual basis and over the duration of the program.
- Number of qualified facilities/organizations successfully implementing projects within the given timeline.
- Were the implemented projects cost efficient (low cost per GHG metric ton reduced)?
- Amount of CO_2 captured or stored.
- Number of LIDAC communities positively impacted.
- Amount of reduction in non-renewable energy usage.

Other Funding

Other funding opportunities that DEQ is looking into are provided on Table 7 below.

Table 7. Other Funding Opportunities for Industry Related Projects

Funding Opportunity	Description	Current App Status	Next App Milestone	Total Funding FY22-26	Agency
Industrial Efficiency and Decarbonization Office (IEDO) Fiscal Year 2024 Cross-Sector Technologies FOA	Industrial Efficiency and Decarbonization Office (IEDO) Fiscal Year 2024 Cross-Sector Technologies FOA This Funding Opportunity Announcement (FOA) is issued by the Industrial Efficiency and Decarbonization Office (IEDO) to advance transformational cross-sector technologies and innovations needed to reduce industrial energy use and GHG emissions through high-impact applied research, development, and pilot-scale technology validation and demonstration projects. The RD&D activities to be funded under this FOA will advance the strategies identified in DOE's Industrial Decarbonization Roadmap and will support the goals of the Industrial Heat Shot, ultimately helping put the nation on a pathway to achieve net-zero carbon emissions by 2050. The Topic Areas included in this FOA are Topic Area 1: Electrification of Industrial Heat, Topic Area 2: Efficient Energy Use in Industrial Systems, and Topic Area 3: Decarbonizing Organic Wastewater and Wet Waste Treatment IEDO expects additional funding opportunities to focus on transformational technologies to address subsector-specific challenges in energy- and emissions-intensive industries. This FOA is part of Department of Energy's (DOE's) Technologies for Industrial Emissions Reduction Development (TIEReD) Program. This program leverages resources across DOE's applied research offices to invest in fundamental science, research, development, initial pilot-scale demonstrations projects, and technical assistance and workforce development. Rooted in the principles identified in the 2022 Industrial Decarbonization Roadmap, DOE is building an innovation pipeline to accelerate the development and adoption of industrial decarbonization technologies. The TIEReD Program	Open – will close March 26, 2024	Open – will close March 26, 2024	Estimated Total Program Funding: $38,000,000 Award Ceiling: $5,000,000 Award Floor: $1,000,000	Department of Energy

Funding Opportunity	Description	Current App Status	Next App Milestone	Total Funding FY22-26	Agency
	leverages resources, expertise, and investments from the Offices of Energy Efficiency and Renewable Energy (EERE), Fossil Energy and Carbon Management (FECM), Nuclear Energy (NE), ARPA-E, and Science (SC) to achieve deep decarbonization across the U.S. industrial sector. The program complements the demonstration and large-scale deployment efforts led by DOE's Office of Clean Energy Demonstrations (OCED) and Manufacturing and Energy Supply Chains (MESC) and the Loan Programs Office (LPO).				

Additional information and notes regarding these fundings opportunities can be found in Appendix E.

AGRICULTURE/LAND USE

PRIORITY MEASURES

Sustainable Farming Practices

Support current Oklahoma Conservation Commission programs which boost activities that promote carbon sequestration through regenerative agriculture practices including cover crop, no-till, and soil amendments. Harness technology and science that brings sustainable farming and value in Oklahoma's agricultural supply chain. This measure will also support industry production and use of biochar.

Reforestation, Urban Forestry, and Composting

Support current programs that promote urban forestry and create a program, with appropriate agency support, that incentivizes reforestation of disturbed lands. Provide funding to set up grants for local tree planting and educational programs statewide. Support and incentivize composting programs that divert food and yard waste and increase beneficial use of organic waste.

Methods and Assumptions

Implementation methods and assumptions will be determined during the CAP development process. Should Oklahoma receive funding from the Implementation Phase 2, this effort will be prioritized.

Implementation Schedule and Milestones

This will be defined during the CAP process to ensure continuous meaningful stakeholder engagement.

Low-Income and Disadvantaged Community Analysis

DEQ contractor, OU, is working with DEQ to do this analysis. DEQ and OU have completed a significant outreach effort. OU is utilizing EPA tools and process knowledge to perform a detailed analysis. See Low Income/Disadvantaged Communities Benefits Analysis section of this document for a detailed analysis.

Metrics for Tracking Progress

Oklahoma's CAP will clearly define priority project scopes with thoroughly developed metrics for tracking the progress towards achieving the goals for each priority measure. For these measures, Oklahoma will potentially use the following metrics to track progress:

- Number of organizations/communities applying for funding.
- Number of acres affected.
- Number of communities affected.
- Number of qualified facilities/organizations successfully implementing projects within the given timeline.
- Number of activities/programs benefited that promote carbon sequestration through regenerative agriculture practices.
- Were the implemented projects cost efficient (low cost per GHG metric ton reduced)?

Other Funding

Other funding opportunities that DEQ is looking into are provided on Table 8 below.

Table 8. Other Funding Opportunities for Agriculture/Land Use Related Projects

Funding Opportunity	Description	Current App Status	Next App Milestone	Total Funding FY22-26	Agency
Environmental and Climate Justice Community Change Grants Program	The Environmental and Climate Justice Community Change Grant program (Community Change Grants), created by the Inflation Reduction Act, offers an unprecedented $2 billion in grants under this Notice of Funding Opportunity (NOFO). The Community Change Grants will fund community-driven projects that address climate challenges and reduce pollution while strengthening communities through thoughtful implementation. This historic level of support will enable communities and their partners to overcome longstanding environmental challenges and implement meaningful solutions to meet community needs now and for generations to come. There will be two tracks of funding under this opportunity. Track I will fund approximately 150 large, transformational, community-driven investment grants of $10 million to $20 million. Track II will fund approximately 20 meaningful engagement grants of $1 million to $3 million. Grants cannot exceed 3-years in duration. Please review the NOFO for further information about the exciting opportunities under the Community Change Grants program and details about the application process.	Open: November 2023	Application Close: November 21, 2024	Estimated Total Program Funding: $2,000,000,000 Award Ceiling: $20,000,000	EPA

Additional information and notes regarding these fundings opportunities can be found in Appendix E.

COMMERCIAL, RESIDENTIAL & MUNICIPAL

PRIORITY MEASURES

Solar Installation and Incentives Programs
Support and incentivize industries, municipalities, and universities to install solar systems including battery storage to support grid resiliency and energy efficiency. Support existing solar panel programs that promote solar energy for municipalities, universities, and industries. These programs are primarily focused on using solar energy for heating and cooling systems.

Support deployment of renewable energy and storage systems for local government buildings to reduce energy costs and provide resilience in case of an electric grid outage. This support will include additional incentives to complement newly available "direct pay" options for local governments to receive energy tax credits and technical assistance for such projects. This measure could be utilized by any sub-state government actor, including without limitation cities, counties, and school districts within Oklahoma. DEQ is actively working with other states to form a coalition to implement a program supporting renewable energy and storage systems for local government buildings.

Energy Efficiency Programs
Support current energy efficiency programs to promote clean energy usage and energy reduction measures. Programs could include equipment upgrades such as more efficient HVAC systems and transitioning from ozone depleting substances (ODS) refrigerants. Programs would support buildings, municipalities, industries, universities, etc. that have projects promoting clean energy usage and energy reduction.

LED Lighting Upgrade
Support the conversion of streetlights in communities and on university campuses to light-emitting diode (LED). Converting to LED lighting will provide cost and energy savings, reduce carbon emissions, reduce light pollution, and provide greater perceived public safety due to the improved visibility.[17]

Methods and Assumptions
Implementation methods and assumptions will be determined during the CAP development process. Should Oklahoma receive funding from the Implementation Phase 2, this effort will be prioritized.

Implementation Schedule and Milestones
This will be defined during the CAP process to ensure continuous meaningful stakeholder engagement.

[17] https://www.energy.gov/scep/slsc/outdoor-lighting

Low-Income and Disadvantaged Community Analysis

DEQ contractor, OU, is working with DEQ to do this analysis. DEQ and OU have completed a significant outreach effort. OU is utilizing EPA tools and process knowledge to perform a detailed analysis. See Low Income/Disadvantaged Communities Benefits Analysis section of this document for a detailed analysis.

Metrics for Tracking Progress

Oklahoma's CAP will clearly define priority project scopes with thoroughly developed metrics for tracking the progress towards achieving the goals for each priority measure. For these measures, Oklahoma will potentially use the following metrics to track progress:

- Amount of GHG reduced at each participating site and within the state, both on an annual basis and over the duration of the program.
- Number of qualified companies, residents, and municipalities that applied for funding.
- Number of successfully implemented projects within the given timeline.
- Were the implemented projects cost efficient (low cost per GHG metric ton reduced)?
- Number of communities positively impacted.
- Number of LIDAC communities positively impacted.
- Number of existing programs benefited from additional funding.
- Number of municipalities, higher education facilities, and industries that replaced their heating and cooling systems with more energy efficient systems.
- Number of communities/neighborhoods/campuses that converted to LED streetlights.
- Amount of reduction in non-renewable energy usage.

Other Funding

Other funding opportunities that DEQ is looking into are provided on Table 9 below.

Table 9. Other Funding Opportunities for Commercial & Municipal Related Projects

Funding Opportunity	Description	Current App Status	Next App Milestone	Total Funding FY22-26	Agency
SEP BIL (IIJA) State Energy Program (SEP)	One time formula to state energy offices to support building two/three state apprenticeship programs, implementation of at least #1 need of Energy Efficiency and Conservation Block Grant (EECBG) local government strategic plans, employment website, workforce Development efforts, extra support to the Rural Water Energy Efficiency Program, and Energy Security Planning	Received	N/A	$6,568,790	Oklahoma Department of Commerce
WAP BIL (IIJA) Weatherization Assistance Program	DHS LIHEAP (WAP) DOE WAP (annual) Funding for residential weatherization for low-income residents.	Received	N/A	$42,330,032	Oklahoma Department of Commerce
Sustainable Energy Resources for Consumers (SERC)	Competitive funding for electrification (residential)/heat pumps/cool roofs for low-income residents.	Pending award as of December 2023	N/A	$563,500	Oklahoma Department of Commerce
IRA Residential Energy Efficiency Rebate Program (HER) 50121	Formula to State Energy Offices for whole home weatherization. Funding will remain available until September 20, 2031. The program will run a maximum of 8 years.	Pending Application Submission	Application due January 2025	$64,388,040	Oklahoma Department of Commerce
IRA High Efficiency Electric Home Rebate Program (HEERA) 50122	Formula to State Energy Offices for energy star appliance rebates up to $14,000 per family for low/moderate income residents.	Pending Application Submission	Application due January 2025	$64,388,040	Oklahoma Department of Commerce
Solar for All (through EPA)	Through this competition, Solar for All will award up to 60 grants to states, territories, Tribal governments, municipalities, and nonprofits to expand the number of low-income and disadvantaged communities (LIDAC) primed for residential solar investment—enabling millions of low-income households to access affordable, resilient, and clean solar energy.	Application submitted	Recipients to be announced March or April 2024	$80,000,000	Oklahoma Department of Commerce
Energy Efficiency and Conservation	To assist states, local governments, and Tribal Nations to reduce energy use, reduce fossil fuel emissions, and improve energy efficiency.	FY23 Application Open	Pre-Application Information	Energy Efficiency and Conservation	Department of Energy

Funding Opportunity	Description	Current App Status	Next App Milestone	Total Funding FY22-26	Agency
Block Grant (EECBG) Program			Sheet due to EECBG Program Inbox ASAP	Block Grant (EECBG) Program	
Buildings Energy Efficiency Frontiers & Innovation Technologies (BENEFIT) – 2024	Buildings Energy Efficiency Frontiers & Innovation Technologies (BENEFIT) – 2024 The Office of Energy Efficiency and Renewable Energy (EERE) is issuing, on behalf of the Building Technologies Office, a Funding Opportunity Announcement (FOA) titled "Buildings Energy Efficiency Frontiers & Innovation Technologies (BENEFIT) – 2024". The 2024 BENEFIT FOA will invest up to $30M (subject to appropriations) across four topic areas: Topic 1: Heating, Ventilation, and Air Conditioning and Water Heating Technologies with improved materials, components, equipment design, and engineering, lower cost manufacturing processes, and easier installation. Topic 2: Innovative, Replicable, and Low-Cost Roof and Attic Retrofits Technologies for affordable and scalable roof and attic retrofits that improve energy efficiency and address air and water infiltration. Topic 3: Building Resilience and Capacity Constraints Novel approaches to maintain essential loads during blackouts and add power capacity to buildings without the need for major infrastructure upgrades; localized thermal management systems and thermally resilient building envelopes to provide cooling and overheating protection against extreme heat events. Topic 4: Commercial Lighting Retrofit Advancements Low-cost, high-quality retrofit solutions for lagging sectors in energy-efficient lighting adoption (schools and certain commercial buildings). DOE is compiling a Teaming Partner List to facilitate the formation of project teams for this FOA. The Teaming Partner List allows organizations that may wish to participate on a project to express their interest to other applicants and explore potential partnerships. Please see the Teaming List section of the FOA document for more information. EERE eXCHANGE is designed to enforce the deadlines specified in this FOA. The "Apply" and "Submit" buttons will automatically disable at the defined submission deadlines. Should applicants experience problems with EERE eXCHANGE, the following information may be helpful. Applicants that experience issues with submission PRIOR to the FOA deadline: In the	Open November 2023	Closing March 5, 2024	Estimated Total Program Funding: $30,000,000 Award Ceiling: $30,000,000 Award Floor: $13,000,000	Department of Energy Golden Field Office

Funding Opportunity	Description	Current App Status	Next App Milestone	Total Funding FY22-26	Agency
	event that an applicant experiences technical difficulties with a submission, the applicant should contact the EERE eXCHANGE helpdesk for assistance (EERE-eXCHANGESupport@hq.doe.gov). The EERE eXCHANGE helpdesk and/or the EERE eXCHANGE system administrators will assist applicants in resolving issues.				

Additional information and notes regarding these fundings opportunities can be found in Appendix E.

WASTE AND MATERIALS MANAGEMENT

PRIORITY MEASURES

Landfill Gas Collection & Control

Create incentive-based program to promote reduction of methane emissions from landfills through installation of gas collection and control systems supporting production of renewable natural gas (RNG) from landfill system or methane destruction (not to include flaring). DEQ hopes to incentivize at least five landfills to join the program and reduce methane emissions.

Municipal Wastewater Facility Anaerobic Digesters and Energy Efficiency Upgrades

Create incentive-based program to encourage system upgrades to digesters (to include digester gas treatment equipment) and energy efficiency improvements. Upgraded or new anaerobic digesters will have a significant reduction in GHG emissions and increase the production of renewable natural gas available to displace fossil fuels. These upgrades coupled with broad facility energy efficiency projects will reduce energy and other utility costs for rural Oklahoma.

Methods and Assumptions

Implementation methods and assumptions will be determined during the CAP development process. Should Oklahoma receive funding from the Implementation Phase 2, this effort will be prioritized.

Implementation Schedule and Milestones

This will be defined during the CAP process to ensure continuous meaningful stakeholder engagement.

Low-Income and Disadvantaged Community Analysis

DEQ contractor, OU, is working with DEQ to do this analysis. DEQ and OU have completed a significant outreach effort. OU is utilizing EPA tools and process knowledge to perform a detailed analysis. See Low Income/Disadvantaged Communities Benefits Analysis section of this document for a detailed analysis.

Metrics for Tracking Progress

Oklahoma's CAP will clearly define priority project scopes with thoroughly developed metrics for tracking the progress towards achieving the goals for each priority measure. For these measures, Oklahoma will potentially use the following metrics to track progress:

- Number of qualified landfills that applied for funding.
- Amount of GHG reduced at each participating site and within the state, on an annual basis.
- Number of landfills impacted.
- Number of successfully implemented projects within the given timeline.
- Were the implemented projects cost efficient (low cost per GHG metric ton reduced)?
- Number of wastewater facilities that participated in the incentive program.
- Amount of reduction in energy usage.

Other Funding

Other funding opportunities that DEQ is looking into are provided on Table 10 below.

Table 10. Other Funding Opportunities for Waste & Material Management Related Projects

Funding Opportunity	Description	Current App Status	Next App Milestone	Total Funding FY22-26	Agency
Bipartisan Infrastructure Law	The Bipartisan Infrastructure Law has injected funds into water infrastructure projects across the state protecting public health, preserving water resources, and creating jobs. In September 2023, EPA awarded funds to create a new iron and manganese water treatment plant in Garfield County.	In September of 2023, EPA awarded Oklahoma $2,240,000	Implementation ongoing	$245,604,000	EPA/Bipartisan Infrastructure Law
Energy Efficiency and Conservation Block Grant (EECBG) Program	To assist states, local governments, and Tribal Nations to reduce energy use, reduce fossil fuel emissions, and improve energy efficiency.	Applications Open	Pre-Application Information Sheet due to EECBG Program Inbox ASAP	$550,000,000	Department of Energy
Drinking Water State Revolving Funds and the Clean Water State Revolving Funds	Funds for critical water infrastructure projects including implement drinking water and clean water infrastructure upgrades and supporting essential water infrastructure that protects public health and treasured water bodies across the state.	Applications open soon	Just announced February 22, 2024 – more information to come	$64,805,000	EPA/ President Biden's Investing in America Agenda

Additional information and notes regarding these fundings opportunities can be found in Appendix E.

Benefits Analysis

The implementation of the measures included in this PAP is anticipated to have a broad range of benefits. This section details the anticipated co-pollutant reductions associated with implementation of the Priority Measures identified in this PAP as well as air quality improvements, improved public health outcomes, economic benefits, increased climate resilience, and other environmental benefits. In addition, this section identifies mechanisms to track, minimize, and mitigate, to the extent possible, any potential disbenefits resulting from implementation of the priority measures.

2020 Inventory for Co-Pollutants

The DEQ obtained emissions data from EPA's 2020 National Emissions Inventory and extracted criteria pollutant and hazardous air pollutant (HAP) emissions data to create a 2020 base county-level inventory for the sectors targeted by the priority measures included in this PAP.[18] DEQ used a base year of 2019 for its GHG inventory, however co-pollutants are calculated by the EPA every 3-years, with the most recent available data calculated for the year 2020. Table 11 presents these nitrogen oxides (NO_x), direct fine particulate matter ($PM_{2.5}$), sulfur dioxide (SO_2), volatile organic compounds (VOCs), and HAP data by sector and pollutant for Oklahoma. Detailed emissions broken down per sector, county, and pollutant are provided in Table 23 in Appendix F- Oklahoma Criteria Pollutants and HAPs Emissions Inventory.

Table 11. 2020 Oklahoma Criteria Pollutant and HAP Emissions Inventory by Sector and Pollutant

Sector(s)	NOx (tons)	$PM_{2.5}$ (tons)	SO_2 (tons)	VOC (tons)	HAPs (tons)	Total Pollutants (tons)
Transportation	77,304.65	25,728.06	452.18	40,879.67	10,430.57	154,795.13
Electricity Generation	16,601.11	1,462.54	7,503.11	486.07	178.1	26,230.93
Industry	98,938.55	12,651.47	20,565.29	227,336.03	17,263.08	376,754.42
Agriculture	1,260.96	37,504.41	325.99	12,353.23	1,378.84	52,819.43
Commercial, Residential, & Municipal	6,247.84	6,928.76	162.65	44,410.71	6,705.92	64,455.88
Waste, Water, & Materials Management	1,222.20	3,586.76	252.95	2,053.03	671.11	7,786.05
Natural and Working Lands	37,769.50	54,521.19	5713.8	826,616.70	94,674.92	1,019,296.11
Total	239,344.81	142,383.19	34,975.97	1,154,135.44	131,302.54	1,702,137.95

[18] https://gaftp.epa.gov/air/nei/2020/data_summaries/2020neiMar_county_tribe_allsector.zip accessed on October 10, 2023.

Figure 4 shows Oklahoma's total 2020 emissions from Criteria Pollutants and Hazardous Air Pollutants (HAPs) in thousands of tons per sector according to EPA's National Emissions Inventory (NEI). The top three sectors contributing to total Criteria Pollutants and HAPs in Oklahoma are the Natural and Working Lands, Industry, and Agriculture sectors, accounting for 85% of total emissions.

Figure 4. Total Criteria Pollutants and HAPs Emissions in Tons Per NEI Economic Sector in 2020

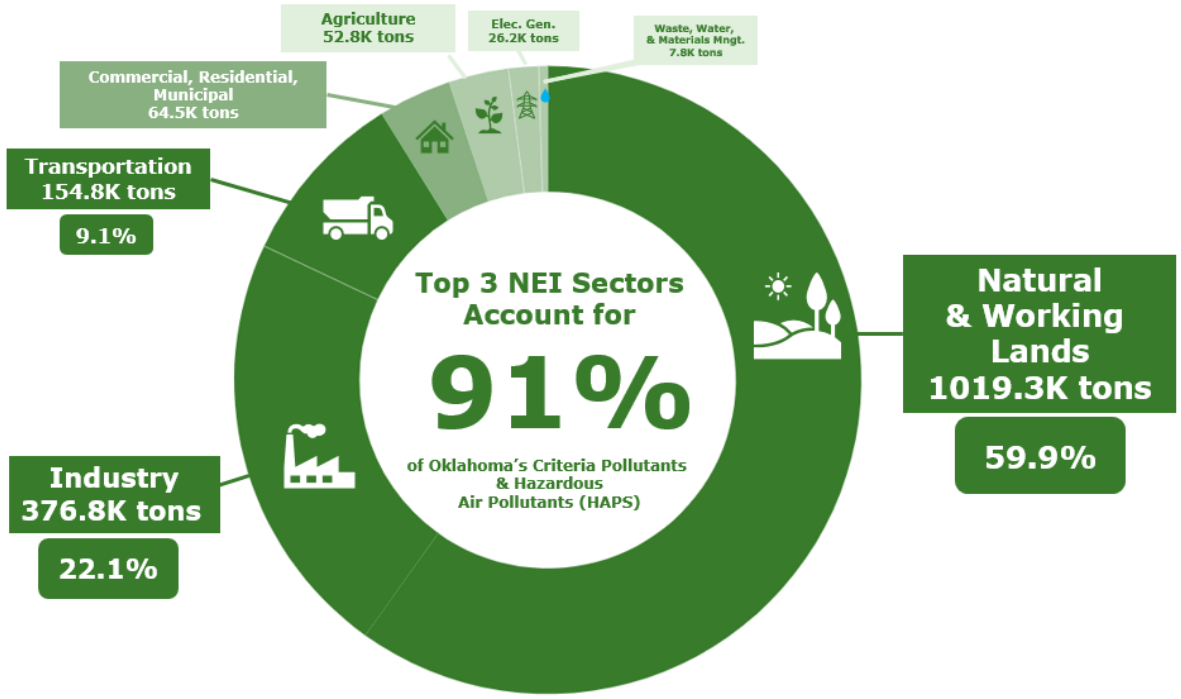
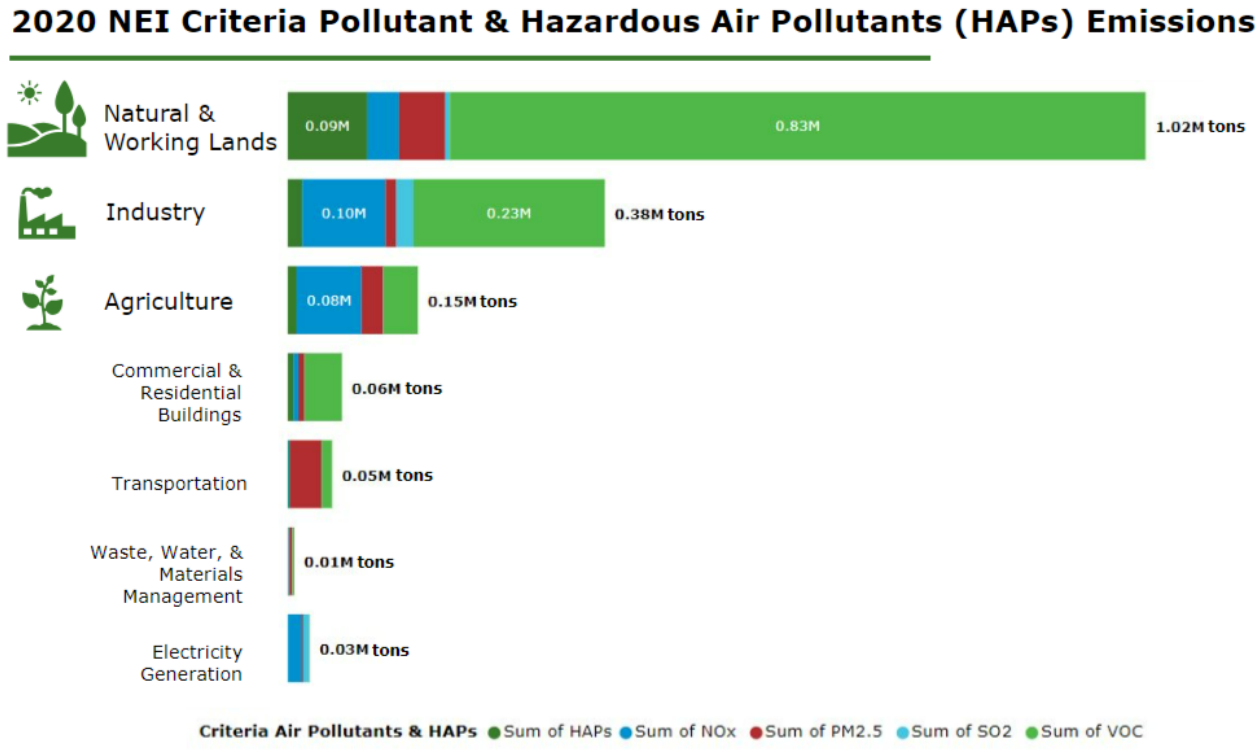


Figure 5 below shows Oklahoma's total 2020 emissions from Criteria Pollutants and HAPs in millions of tons per sector according to the NEI. This figure depicts the contribution of each Criteria Pollutant and total HAPs to the emissions by sector.

Figure 5. 2020 NEI Economic Sector Emissions



Health and Economic Benefit Analysis

To evaluate the potential health and economic benefits of climate pollution reduction measures this analysis uses the Environmental Protection Agency's Co-Benefits Risk Assessment (COBRA),19 which offers a sophisticated framework for analyzing the health and economic implications of emission reduction policies. COBRA assesses how changes in pollutants emissions such as GHGs and co-pollutants, including $PM_{2.5}$, SO_2, NO_x, and VOCs, impact public health and the economy. By integrating data from various sources, including air quality monitoring networks, health studies, and economic indicators, COBRA provides valuable insights into the potential co-benefits associated with climate pollution reduction measures.

Emissions from fossil fuel combustion not only contribute to climate change but also degrades air quality, leading to a range of adverse health outcomes such as respiratory diseases, cardiovascular problems, and premature mortality. Through sophisticated exposure-response functions and well-established relationships between pollution, morbidity, and the concomitant economic impacts, COBRA estimates the changes in health outcomes resulting from reductions in air pollution levels. Translating these health improvements into economic terms allows for an assessment of the value of emission reduction measures in terms of avoided healthcare costs and increased productivity. The COBRA model has been used in numerous studies and policy analyses to inform decision-making at various levels of government. For example, it has been employed to evaluate the health and economic benefits of clean

[19] COBRA; cobra.epa.gov

energy policies,[20] transportation planning initiatives,[21] and air quality regulations,[22] amongst many others.

The results in Table 12, Table 13, and Table 14 below show the COBRA-estimated impacts of a range of representative potential projects associated with the Oklahoma Priority Action Plan. The detailed analysis is provided as Appendix G. The tables in Appendix G show two different types of results. The first series of results, as shown in Tables 12, 13, 25, and 26 are the tax and overall economic impact of the priority pollution reduction projects and the second (shown in Tables 27, 28, 29, and 30) are the health and associated economic impacts associated with the estimated pollution reduction values. Tables 12, 13, 25, and 26 show the overall economic benefits associated with the development of the projects, which is a combination of the direct, indirect, and induced effects of the green infrastructure project. Once the representative projects were selected, the initial cost estimate was used to produce the direct, indirect, and induced economic impact analysis. Direct effects include benefits from a first round of buying and selling within the community. Direct effects include purchases of local goods and services and include income that is earned by workers, landowner purchase payments, if any, and tax revenue. Indirect effects are a secondary addition to the economy that follow from the initial infrastructure project purchases through individual changes to the supply chain via business-to-business purchases within the study region. Thus, indirect effects include increases in sales of other industry sectors within the state. Induced effects refer to changes in household spending of the income from the project and include the amount generated by increased household incomes due to indirect and direct effects and measure the spending within the local and regional employees within the business' supply chain. The total economic impact is the sum of all direct, indirect, and induced factors.

This initial economic analysis was performed via the IMPLAN input-output approach, which uses U.S. Bureau of Economic Analysis benchmarks and can be used to develop estimates of direct, indirect, and induced impacts of various kinds of economic development. The modeling effort relies on multipliers to quantify interactions between industries. Each industry or service activity (e.g., agriculture, manufacturing, etc.) is assigned to a specific sector following the North American Industry Classification System (e.g., grain farming and fruit farming are assigned to agriculture; motor and generator construction are assigned to electrical equipment, etc.) within the economy. Input-output accounting describes commodity flow from the producer to intermediate and final consumers. The multipliers were determined based upon an examination of the scientific literature associated with the specific economic modeling efforts for each sector. Total industry purchases and services, such as employee compensation, value added, and imports are determined. Industries produce a good or service to be purchased by consumers. These industries then purchase items from other producers, who also purchase goods and services. This cycle of buying goods and services (indirect purchases) continues until leakage from the region stops the cycle. Differences in multiplier values reflect the structure of industry sectors, the degree of economic integration, and the mix of supplier industries available to meet local demands. All locally specific values for these multiplier effects are determined based upon the location of the proposed project and will change from location to location.

The variables in Tables 12, 13, 25, and 26 can be identified as follows:

[20] Khosravani, et al., 2023
[21] Thind, Tessum, and J. D. Marshall, 2023
[22] Mailloux, et al., 2022

- Initial cost estimate: This represents the cost estimate of the priority project as identified in the submitted requests of projects.
- Employment: This value is the computed value of the number of people that will be needed to be employed on the project.
- Labor Income: An estimate of the combined total salary of all employees on the project.
- Value Added: In the context of this modeling effort, value added refers to the total value created within a specific industry or sector of the economy. It includes wages, salaries, profits, and other forms of income generated by the production process. Value added can be seen as an approximate measure of the economic contribution of a particular industry or sector to the overall economy.
- Output: This is a measure of the monetary value of the project and is used to assess the size and significance of different industries or sectors within the economy.

The values for the health and associated economic benefits (Tables 14, 27, 28, 29, and 30) were developed based upon the EPA COBRA tool. COBRA is driven by estimates of the amount of reduction of key harmful pollutants (e.g., $PM_{2.5}$, SO_2, NOx, NH_3, and VOC) that will be associated with the priority implementation projects. Where possible, estimates of the pollution reduction for each project were determined by the EPA AVoided Emissions and geneRation Tool (AVERT). In some cases, the nature and specific amount of pollution reduction could not be determined using AVERT due to the limitations in that tool. In those instances, a detailed examination of the referred literature was undertaken to provide pollution reduction estimates for the individual projects. Overall, these series of tables provide estimates of the economic and health benefits of the selected projects as identified in the tables.

Table 12. Summary of the Tax Revenue Estimates from the Priority Measures in US Dollars

Activity	County	State	Federal	Total
Solar	$ 41,656.12	$ 64,672.64	$ 109,665.52	$ 215,994.28
Wastewater	$ 30,967.25	$ 56,108.11	$ 153,873.23	$ 240,948.59
Landfill Gas	$ 63,060.60	$ 114,256.50	$ 313,341.88	$ 490,658.98
Regen Ag	$(581,340.26)	$(660,003.80)	$ 362,976.63	$ (878,367.43)
Hydrogen	$ 229,125.66	$ 393,056.77	$ 825,745.47	$ 1,447,927.90
Tree Planting	$ 19,175.01	$ 42,514.43	$ 170,552.85	$ 232,242.29
Solar	$ 233,930.91	$ 363,186.27	$ 615,855.64	$ 1,212,972.82
Lights	$ 4,324.10	$ 8,813.03	$ 31,566.51	$ 44,703.64
Digester	$ 78,825.73	$ 142,820.63	$ 391,677.34	$ 613,323.70
Hydrogen Boilers	$ 29,502.54	$ 66,984.93	$ 262,407.47	$ 358,894.94
Cement	$ 27,982.17	$ 44,578.78	$ 81,180.15	$ 153,741.10
Overall Total	**$ 177,209.83**	**$ 636,988.29**	**$ 3,318,842.69**	**$ 4,133,040.81**

Table 13. Summary of the Economic Benefit Estimates from the Priority Measures in US Dollars

Activity	Initial Cost Estimate	Employment[23]	Labor Income	Value Added	Output
Solar	$ 2,025,000.00	15	$ 460,832.69	$ 961,254.19	$ 2,139,815.66
Wastewater	$ 1,375,000.00	33	$ 700,294.52	$ 1,122,365.07	$ 2,404,201.40
Landfill Gas	$ 2,800,000.00	67	$ 1,426,054.30	$ 2,285,543.42	$ 4,895,828.29
Regen Ag	$ 4,000,000.00	159	$ 2,030,462.72	$ 1,866,287.03	$ 9,752,765.39
Hydrogen	$ 12,000,000.00	129	$ 3,283,565.10	$ 8,293,980.25	$ 23,412,215.00
Tree Planting	$ 1,000,000.00	54	$ 785,871.27	$ 1,101,980.23	$ 1,700,264.76
Solar	$ 5,700,000.00	85	$ 2,587,927.44	$ 5,398,176.22	$ 12,016,698.74
Lights	$ 340,760.00	6	$ 150,463.38	$ 208,662.17	$ 596,925.47
Digester	$ 3,500,000.00	84	$ 1,782,567.88	$ 2,856,929.29	$ 6,119,785.37
Hydrogen Boilers	$ 3,000,000.00	47	$ 1,187,899.51	$ 1,883,999.30	$ 4,494,871.15
Cement	$ 1,000,000.00	13	$ 418,460.81	$ 662,458.28	$ 2,388,749.29
Overall Total	**$ 36,740,760.00**	**692**	**$ 14,814,399.62**	**$ 26,641,635.45**	**$ 69,922,120.52**

[23] Employment: This value is the computed value of the number of people that will be needed to be employed on the project.

Table 14. Health Benefits Shown in Numbers of Cases in Oklahoma Per Year

Category	Mortality	Nonfatal Heart Attacks	Infant Mortality	Hospital Admits, All Respiratory	Acute Bronchitis	Respiratory Symptoms	Work Loss Days
Transportation	5.42	1.73	0.02	0.78	4.68	143.92	397.64
Electric Power Industry	2.95	0.87	0.01	0.39	2.25	69.18	181.32
Agriculture	2.35	0.70	0.01	0.32	1.94	59.62	155.13
Commercial, Residential & Municipal	1.10	0.33	0.01	0.15	0.98	30.04	77.12
Water, Waste & Material Management	0.13	0.04	0.00	0.02	0.10	2.97	7.66
Overall Total	**11.95**	**3.67**	**0.05**	**1.65**	**9.94**	**305.73**	**818.87**

Review of Authority

DEQ has reviewed existing statutory and regulatory authority to implement each priority measure contained in this PAP. The measures herein constitute a list of voluntary actions, as such, no new regulatory authority is necessary. Each priority measure is achievable and authorized under existing statutory authority. Measures that contemplate the state receiving or needing funding to implement may require implementing agencies to have the requisite budget authority. In that regard, DEQ has the existing authority, pursuant to Okla. Stat. Title 27A § 2-3-202, to enter "into agreements for, accept, administer and use, disburse and administer grants of money, personnel and property from the federal government or any department or agency thereof, or from any state or state agency, or from any other source, to promote and carry on in this state any program relating to environmental services or pollution control grants." Further, the responsibilities and jurisdiction of Oklahoma environmental agencies can be found at 27A O.S. 1-3-101.

Authority to Implement Priority Measures

All priority measures will be implemented under existing Oklahoma statutory authority. The following table lists each priority measure and the implementing agencies that have the existing authority to implement.

Table 15. Authority to Implement Priority Measures

Priority Measure	Implementing Agency or Agencies	Okla. Stat. Authority
Electric Vehicle Charging and Hydrogen Fueling Stations for Medium- and Heavy-Duty Zero Emission Truck (MHD ZET) Fueling Stations	ODEQ, Oklahoma Department of Transportation (ODOT), Oklahoma Department of Labor, Oklahoma Corporation Commission	27A § 2-3-202(A)(7); 69 § 304(d); 69 § 322; 27A § 1-3-101; 40 § 1; 40 § 1.1; 17 §§ 801.1 et seq.
Asphalt Technology Advances and Use of Reclaimed Materials	ODOT	69 § 304(d)
Solar Farm Development	ODEQ, Oklahoma Corporation Commission	27A § 1-3-101; 27A § 2-3-202(A)(7); 17 §§ 801.1 et seq.
Transmission Upgrades	ODEQ, Oklahoma Corporation Commission, Oklahoma Municipal Power Authority	27A § 1-3-101; 17 §§ 801.1 et seq; 27A § 2-3-202(A)(7); 11 § 24-107
Industry Process Upgrades to install or retrofit equipment (e.g., emission capture systems, switch power source to lower emission fuel, electricity, or solar)	ODEQ	27A § 1-3-101; 27A § 2-3-202(A)(7)
Hydrogen Production	ODEQ, Oklahoma Corporation Commission	27A § 1-3-101; 27A § 2-3-202(A)(7); 17 §§ 801.1 et seq.
Lower Carbon Ammonia via Hydrogen	ODEQ, Oklahoma Department of Labor, Oklahoma Corporation Commission	27A § 1-3-101; 27A § 2-3-202(A)(7); 40 § 1; 40 § 1.1; 17 §§ 801.1 et seq.
Decarbonization the tire manufacturing process	ODEQ	27A § 1-3-101; 27A § 2-3-202(A)(7)

Priority Measure	Implementing Agency or Agencies	Okla. Stat. Authority
CO2 Capture and Storage	ODEQ, Oklahoma Corporation Commission	27A § 1-3-101; 27A § 2-3-202(A)(7); 17 §§ 801.1 et seq.
Sustainable Farming Practices	ODEQ, Oklahoma Conservation Commission	27A § 1-3-101; 27A § 2-3-202(A)(7); 27A § 3-2-106
Reforestation, Urban Forestry, and Composting	Oklahoma Department of Agriculture, Food and Forestry (ODAFF), ODEQ, Oklahoma Conservation Commission	2 § 16-55; 27A § 1-3-101; 27A § 2-3-202(A)(7); 27A § 3-4-103; 27A § 3-2-106
Solar Panel Installation with or without Battery Storage	ODEQ, Oklahoma Corporation Commission	27A § 1-3-101; 27A § 2-3-202(A)(7); 17 §§ 801.1 et seq.
Solar Programs and Incentive Programs	ODEQ, Oklahoma Corporation Commission, Oklahoma Department of Commerce	27A § 1-3-101; 27A § 2-3-202(A)(7); 17 §§ 801.1 et seq.; 74 § 5003.10
LED Lighting Upgrade	ODEQ, Oklahoma Department of Commerce	27A § 1-3-101; 27A § 2-3-202(A)(7); 74 § 5003.10
Landfill Gas Collection & Control	ODEQ	27A § 1-3-101; 27A § 2-3-202(A)(7)
Municipal Wastewater Facility Anaerobic Digesters and Energy Efficiency Upgrades	ODEQ	27A § 1-3-101; 27A § 2-3-202(A)(7)

Low-Income and Disadvantaged Community Benefits Analysis

The implementation of the priority measures included in this PAP will benefit low-income and disadvantaged communities (LIDACs). This section identifies each LIDAC within the jurisdiction covered by this PAP, how Oklahoma meaningfully engaged with LIDACs in the development of this PAP, and how DEQ will continue to engage throughout the planning process.

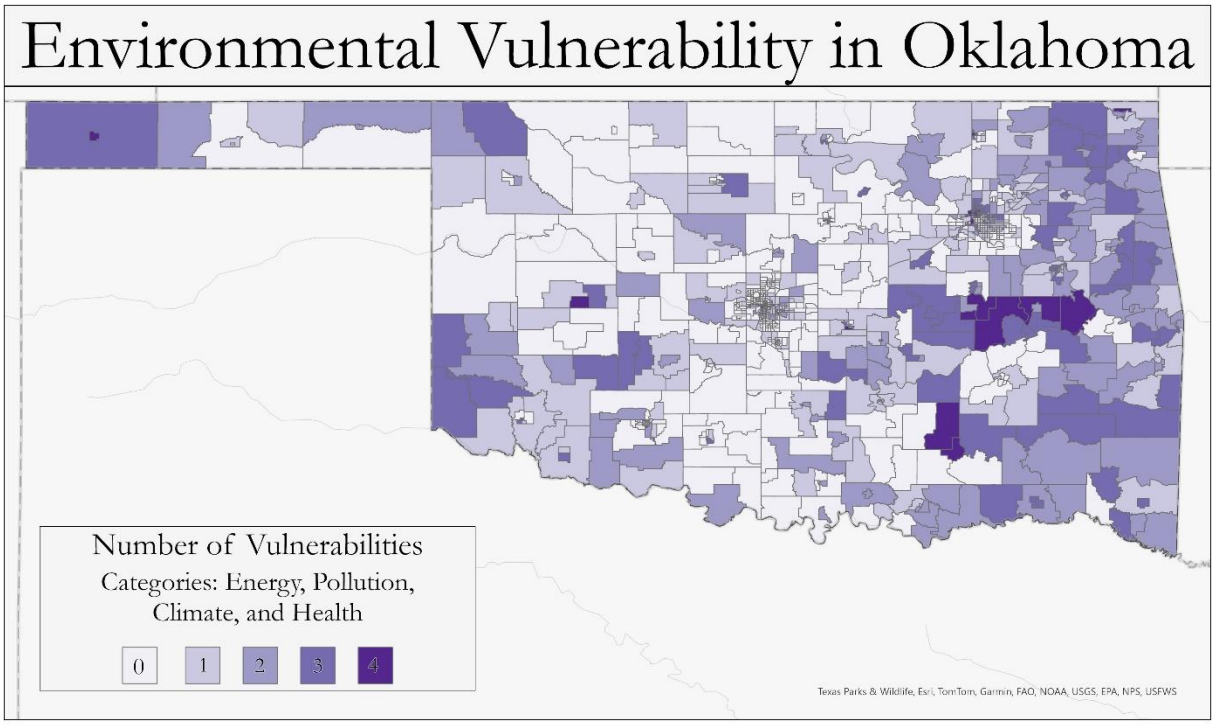
Identification of and Engagement with LIDACs

The University of Oklahoma (OU) has identified all the LIDAC Census tracts in the state and identified them on a scale of vulnerability which uses data from the Climate and Economic Justice Screening Tool (CEJST) and the Census Bureau. OU created an engagement plan for seeking feedback on community priorities during development of this PAP. The Outreach and Coordination Documentation section of this PAP contains additional details for the engagement plan, a record of outreach activities, and a summary of input received during the engagement process. Strategies for engagement with LIDACs are summarized below:

- Targeted emails and phone calls to Oklahoma tribal contacts;
- Tribal only in-person and virtual meetings;
- Targeted focus groups with known community-based organizations;
- Community surveys; and;
- Fielded and deployed utilizing Qualtrics.

The CEJST lists many different potential climate and environmental risks affecting LIDACs. Energy, pollution, climate, and health were selected as the categories most relevant to the climate and environmental risks in Oklahoma for the identification process. Race and ethnicity were also incorporated, since this information is not available in the CEJST data. Figure 6 below presents each census tract's status along the vulnerability scale. Each tract was rated as vulnerable for zero, one, two, three, or four of the vulnerabilities, based on the data available for the tract.

Figure 6. Environmental Vulnerability in Oklahoma



The top 27 most disadvantaged tracts in Oklahoma were categorized as vulnerable for 4 out of 4 climate/environmental risk categories and contained a greater than average proportion of residents of a marginalized race/ethnicity. Out of all the tracts in Oklahoma (n=1,046), 294 have one vulnerability, 191 have two vulnerabilities, 113 have 3 vulnerabilities, and then the 27 listed below have all 4 vulnerabilities. There are 421 tracts with no vulnerabilities of the relevant indicators. The 27 tracts identified in Table 16 are considered to be high priority LIDAC communities, because of their overlapping vulnerabilities. The first ten tracts were rated as most vulnerable based on their population size and proportion of marginalized residents.

Table 16. Most Vulnerable LIDAC Communities

Tract ID	Municipality
40147000200	Bartlesville
40143003000	Tulsa
40111000902	Henryetta
40125500200	Shawnee
40143004900	Tulsa
40143000500	Tulsa
40101001500	Porum, Warner, Webbers Falls
40091779900	Hitchita, Vernon, Hanna
40143004600	Tulsa
40029388100	Coalgate, Phillips, Lehigh
40113940006	Tulsa
40143000600	Tulsa
40115574200	Commerce, Miami
40109105800	Oklahoma City
40143001000	Tulsa
40091779600	Rentiesville, Checotah
40005587700	Atoka
40143000400	Tulsa
40111000800	Schulter, Grayson, Hoffman, Dewar, Henryetta
40143001300	Tulsa
40143002301	Tulsa
40143002700	Tulsa
40143001200	Tulsa
40039950800	Clinton
40143000900	Tulsa
40025950300	Boise City
40143003400	Tulsa

In-depth community engagement was conducted in 5 of these tracts. Profiles for those tracts are included in the Outreach and Coordination Documentation section. Due to time constraints, the other census tracts in the top 10 most vulnerable tracts were not involved in community engagement but will be profiled in the CAP. It is important to note that all the most disadvantaged census tracts were located in eastern Oklahoma, and all of them were in the highest category of prevalence for asthma, chronic obstructive pulmonary disease (COPD), depression, and high blood pressure, with two of them also in the highest category of prevalence for cancer (based on the Centers for Disease Control and Prevention's PLACES dataset). Additionally, the census tracts in the Tulsa area (4 of the top 10; 14 of the top 27) were identified by the Trust for Public Land's ParkServe dataset as high priority areas for parks and green spaces, based on demographics, lack of existing amenities, and climate risk. See the maps below for enhanced detail of the vulnerable tracts for the largest metro areas: Tulsa and Oklahoma City.

Figure 7. Environmental Vulnerability in Tulsa

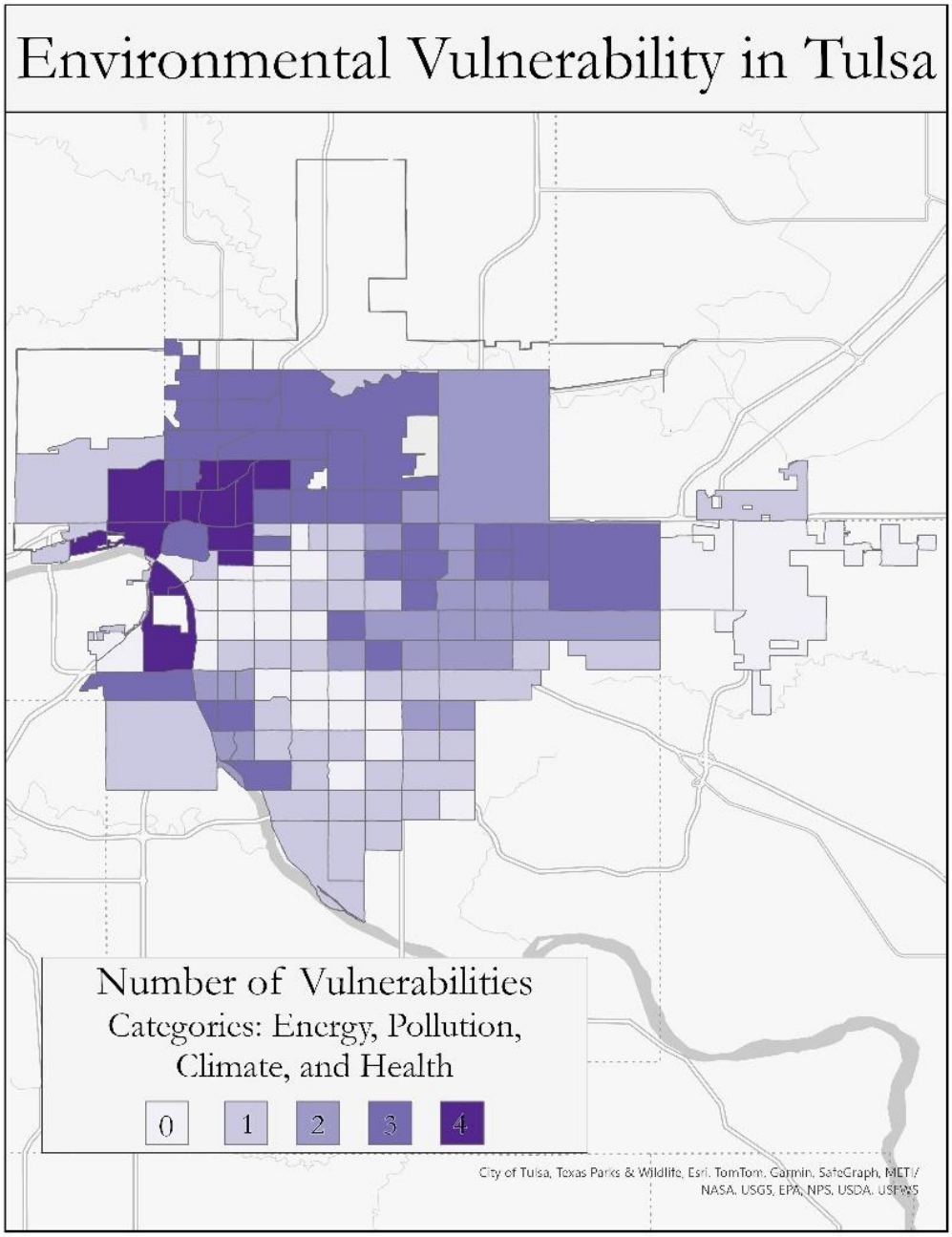
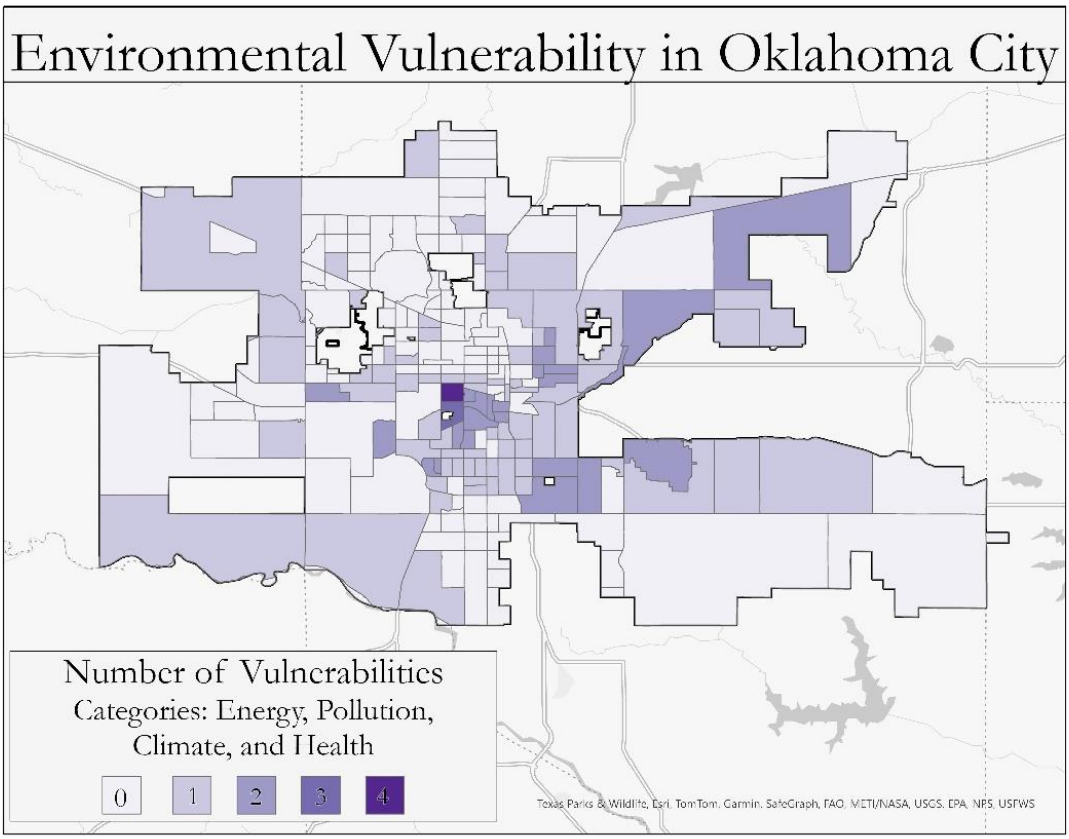


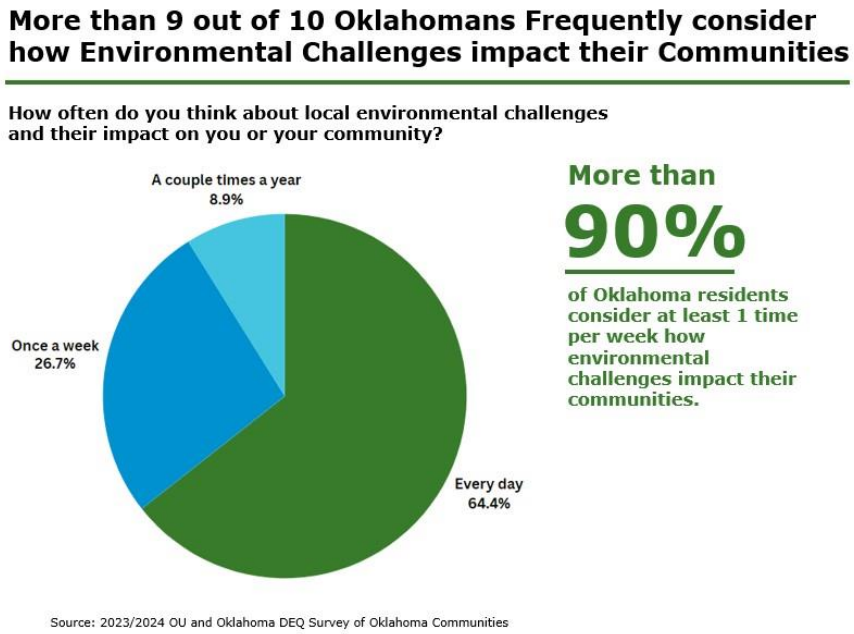
Figure 8. Environmental Vulnerability in Oklahoma City



Oklahoma LIDAC Communities experience climate impacts in serious ways that are negatively impacting everyday life.

It is evident from the focus group sessions and the survey, which are further discussed in the Outreach and Coordination Documentation section, that climate impacts create negative outcomes for Oklahoma LIDAC communities. According to the survey, 91% of respondents think about local environmental challenges and their impact on their community at least daily or weekly. This suggests climate impacts are a significant concern to LIDAC communities. The top ways LIDAC communities in Oklahoma are experiencing climate impacts include extreme heat, severe weather, drought, high energy, or infrastructure costs, and increasing power outages, as well as air quality, flooding, and increasing mosquito threats.

Figure 9. "How Often Do You Think About Environmental Challenges?" Survey Response



Climate Impacts are cross-cutting and emerging problems that interact with or worsen longstanding issues in Oklahoma LIDAC Communities.

Climate impacts cannot be thought of as isolated issues impacting LIDAC communities. In LIDAC communities, climate impacts interact with and exacerbate longstanding issues communities have faced for years. For instance, increasing extreme heat and severe weather make problems with solid waste collection more frustrating. As conditions worsen in neighborhoods, ineffective and inefficient collection systems collide with increasingly hot temperatures and waste is more easily strewn around the community. Further, LIDAC communities often have an older building stock or infrastructure systems that are very expensive to retrofit or revitalize. With increasing energy and materials costs, the resources needed to take advantage of higher efficiency technologies or insulation often seem inaccessible. Additionally, LIDAC communities often struggle to access resources to improve everyday life; climate impacts add additional technical requirements, add costs, and increase reliance on external support mechanisms.

Risks experienced in Oklahoma's LIDAC communities

LIDAC communities in Oklahoma experience higher than average respiratory illnesses, such as asthma and COPD, as well as higher than average rates of cancer, depression, and high blood pressure. Each of these illnesses are associated with extreme heat and disproportionate exposure to air and water pollution, localized flooding, and lack of inclusion in environmental decision-making. Thus, the GHG reduction activities proposed will help shrink this gap between LIDAC communities and the rest of the population. Further, GHG reduction activities, and the workforce development activities associated, will help reduce the prevalence of these illnesses.

There are several specific climate risks experienced disproportionately by LIDAC communities. The chief climate impact experienced in the state of Oklahoma in LIDAC communities is extreme heat and associated heat illnesses. This is due to urban heat island effects being more prevalent in LIDAC communities within metro areas. Extreme heat outside of metro areas results from similar lack of cooling amenities and greater prevalence of comorbidities and exacerbating effects of experiencing high heat.

Flash flooding can damage homes and other buildings due to inadequate stormwater infrastructure, which disproportionately impacts LIDAC communities. Many municipalities in Oklahoma have outdated stormwater infrastructure, built to withstand precipitation levels and storms decades ago. Flooding currently impacts many LIDAC communities and will worsen over time as precipitation events become more voluminous in a different climatic future. LIDAC communities do not have the same resources, political traction, or ability to advocate for infrastructure upgrades. Further, many residents of LIDAC communities rent their homes, precluding them from upgrading their own homes to withstand more precipitation, and leaving them subject to the whims of property owners and landlords.

Poor air quality also disproportionately impacts LIDAC communities. Air pollutants affecting the health and wellbeing of LIDAC residents include increased exposure to $PM_{2.5}$ and other particulates associated with respiratory illnesses. Water quality is a related concern affecting LIDAC communities. Water pollutants harmful to human health and wellbeing include point and nonpoint source contaminants. Other harms to water quality include outdated water treatment facilities and a lack of connection to municipal water supply (e.g., wells and septic tanks).

The current and future cost of meeting the challenges of extreme weather in Oklahoma LIDAC communities are beyond the resources in LIDAC Communities and require dedicated effort from national, state, and local authorities.

LIDAC communities in Oklahoma have significant cultural, economic, social, and physical resources within their communities. However, LIDAC communities often face challenges that have accumulated for decades related to disinvestment, loss of economic or population base, previous industrial activity, and discrimination. It will take an investment of national, state, and local resources to mitigate emissions and adjust to a changing climate. To meet the challenge, outside resource must be added to those already present in Oklahoma LIDAC communities to lower emission rates and raise local quality of life simultaneously.

Oklahoma LIDAC Communities often feel isolated or abandoned by state-wide, municipal, or regional authorities and want a coordinated response where LIDAC communities can access resources and expertise to meet the challenges they face now and in the future.

A common theme raised in focus group meetings were questions about their limited access to information and resources from authorities and the resulting limitation on communities to respond to climate impacts with proactive projects and programs. LIDAC communities often feel left out of decision-making processes in general and felt that this would continue as more attention is given to climate pollution. Cultural, linguistic, income, and racial diversity in LIDAC communities contribute to challenges accessing projects, programs, and decision-making processes. LIDAC communities repeatedly stated the need for an organization or state entity that communities could turn to for information, resources, and accountability. Rural communities note their limited capacity even to take advantage of existing

programs means they miss out and fear this pattern will continue. Tribal Nations in rural LIDAC communities often are the most important resource for technical expertise, social services, as well as physical and monetary resources to respond to climate impacts and other needs. Additionally, programs structured to provide communities with a level of decision-making power, technical expertise, and investment resources, like Tulsa's Vibrant Neighborhoods Partnership (VNP) and Oklahoma City's Strong Neighborhoods Initiative (SNI), mentioned by focus groups as a potential model for the way national, state, and regional initiatives could be structured in LIDAC communities.

Benefits Summary

The main benefits to LIDAC communities from a reduction in GHG emissions is reduced threats to human health. Respiratory illnesses, cancer, high blood pressure, and mental health may all be reduced by decreasing air pollutants, protecting residents from heat, protecting LIDAC communities' property from flooding, and improving water quality. Exposure to environmental contaminants may also decrease as the state increases renewable energy use and production. Indirectly, LIDAC communities may receive benefits from increased employment in new energy sectors, transportation, construction, and other new jobs resulting from CPRG projects. Many harms from climate risk are compounded by poverty, and workforce development initiatives will disproportionately benefit LIDAC communities if employment is targeted in such areas.

Potential Disbenefits

As investments are made in metro areas of Oklahoma, especially in Oklahoma City and Tulsa, concomitant increase in property values may strain LIDAC residents financially. Gentrification is a process in which LIDAC communities receive investments in the housing, infrastructure, and services in their community, sparking a sharp uptick in rent rates and property tax rates. A sharp rise in this rent burden and property tax burden can displace low-income residents. Thus, CPRG projects, depending on how they are implemented, may pose this risk in metro areas of Oklahoma. Oklahoma will strive to minimize any anticipated disbenefits to LIDAC residents.

Other potential disbenefits include exclusion from job transition and training, potential job loss, and potential exclusion from energy saving technologies and services due to cost. Job training and job transition must consider how poverty and low wages are concentrated in communities with other vulnerabilities and marginalized status (e.g., areas with high proportions of Black, Indigenous, Hispanic/Latino, and Asian residents; older adults; children; and outdoor workers), necessitating targeted employment transition opportunities. As GHG reduction activities may dampen the activities of fossil fuel industries, job loss could affect LIDAC communities. Lastly, energy efficiency upgrades, home weatherization, solar technology, and other GHG reduction activities for individual residential use may be inaccessible financially for LIDAC communities. Energy security will be an issue for the entire state, but will disproportionately affect low-income areas, communities of color, and tribal land. Thus, this should be a consideration for those programs.

Depending on local history with planning, LIDAC communities may also resist GHG reduction measures. CPRG projects must prepare themselves for pushback by LIDAC communities and utilize the expertise of community engagement specialists to gain trust and empower such communities.

Specific Oklahoma census tracts may be subject to additional vulnerabilities dependent on the specific project. Until PAP projects are more fully fleshed out in the CAP, and their effects more easily predicted, there is a lack of specificity at this time.

Plan for Continued LIDAC Engagement

DEQ is invested in maintaining meaningful community engagement with LIDAC communities. One way to achieve this is through potentially forming a steering committee consisting of representatives from municipalities, tribal nations, local and state government, industry, community members and local community organizations, and universities and colleges that can speak to the interests of LIDAC communities.

This also would include "Community Benefits Planning for Location Specific Projects" where projects included in the implementation plan will have location specific impacts, both positive and negative. This is especially true for interventions with industry, solid waste/wastewater, or any other kind of point source investments. While there will be clear benefits (health, quality job creation, reducing energy burdens) to communities from these projects there will also be great need for community information sharing, continual community benefits' analysis, and mitigation planning for potential negative local impacts. In partnership with DEQ, OU institutes can work with local communities, industry partners, and local governments to ensure LIDAC community concerns are prioritized and addressed in the implementation phase.

Another crucial element of this planning development is "Community Outreach for General Community and/or LIDAC focused projects." The CPRG Implementation phase will have non-location specific projects, as well as location-specific ones, aimed at municipalities, business owners, homeowners, and everyday residents of Oklahoma. These projects anticipate individuals or community groups applying for services or funding opportunities. To be successful, LIDAC communities will require specific outreach to learn about and access these resources. Along with the DEQ, ACOG, and INCOG, OU's institutes, state-wide technology centers, and other community-based outreach groups and leaders can conduct community forums to ensure LIDAC communities do not miss out on these resources.

Workforce Planning Analysis

Introduction

The projects included in this study represent a wide range of efforts designed to decrease climate pollution. In addition to the benefits of reducing climate warming greenhouse gasses, these projects provide additional economic benefits. The economic benefits include both short-term and long-term employment during different phases of development, including, for example, expanded construction efforts. In addition, the local tax base increases as these infrastructure developments improve the existing facilities within the location associated with the infrastructure construction efforts. The economic benefit is not limited to employment and tax payments, as green energy infrastructure and energy efficiency can provide other impacts throughout the community. Local economies benefit the most when the community provides a wide range of goods and services that can be used during the construction phase of the infrastructure improvement. The extent to which the local economy offers goods and services will determine how significant the ultimate impact will be on the local economy from this initial round of spending.

Background of Economic Modeling approach

The computations and analysis performed for this plan follow existing standards for economic impact analysis. Greene and Geisken (2013) and Avalos and Alley (2012) provide a structure for the development of the economic impact based upon established principles in input-output modeling. Electricity infrastructure and energy efficiency projects produce economic impacts to local communities during two different and distinct phases. The construction phase creates a one-time surge in economic activity. The operation and maintenance phase produces an ongoing economic impact by creating long-term jobs as well as associated ancillary induced and indirect costs such as cost avoidance and increased tax revenue.

For each of these phases the required inputs must be identified. To fully understand the impact of the construction phase, one must identify the necessary inputs that are required to construct the infrastructure and energy efficiency improvements. These inputs to the economic model include construction and equipment costs, project planning and development, annual operating and maintenance costs, personnel, and materials and services. After those inputs are identified, there must also be a distinction between locally sourced and externally sourced inputs. Many inputs that are needed for energy infrastructure projects are brought in from outside the local area. For example, wind turbines manufactured in Europe or towers manufactured in Louisiana for a wind farm project in Oklahoma will have a smaller impact on the local economy. Inputs from local sources will have the greatest effect on the local economy. These inputs will be applied to the input-output model to estimate economic activity and associated impacts on local gross domestic product (GDP), jobs, tax revenue, and income.

There have been numerous examples of the use of input-output modeling in determining the economic impact of green infrastructure and sustainability projects. For example, the World Employment and Social Outlook Report by the International Labor Organization used an input-output model to determine

the job and fiscal impacts of sustainability.[24] Similarly, input-output modeling has been used to investigate the net implications of expanded investments in clean energy and energy efficiency.[25] For example, Brown, et al. (2020) used input-output modeling to show that commercial energy efficiency is the most effective way to produce the highest increase in number of jobs within the renewable energy and energy efficiency arena. Numerous studies have identified the Impact analysis for Planning[26] model as an effective way to determine the economic impact of green energy infrastructure projects. IMPLAN has been used by over 500 private organizations, universities, and government agencies and is considered the standard for investigating direct, indirect, and induced economic and fiscal impacts.[27]

This project therefore uses the IMPLAN model to assess additional industry output, employment, and income for direct, indirect, and induced multipliers to determine estimates of economic impacts. The most updated model, which includes IMPLAN and government data and parameterizations as inputs into the model for 546 industries was used. IMPLAN models the framework of the local economy based upon the transactions between industries, employees, households, and government institutions.[28] Inputs to the modeling effort were derived from a variety of sources, including, for example, formal federal and state economic reports, the quarterly census of employment and wages, state and national GDP and personal income statistics, the economic census, and the census of agriculture. All these government-produced inputs follow established scientific methods for the values they produce via, for example, adjustment for non-responding firms and published statistical confidence parameters.

As previously discussed, the IMPLAN input-output system uses U.S. Bureau of Economic Analysis benchmarks and can be used to develop estimates of direct, indirect, and induced impacts of various kinds of economic development.

Summary

This study provides estimates of the direct, indirect, and induced economic and fiscal impact of a range of representative climate pollution and green energy infrastructure projects with an initial cost of approximately $36,000,000 to be located in Oklahoma. All of these projects can be scaled to multiply the potential impacts to the state. The overall analysis illustrates that due to the multiplier impact associated with the initial capital and labor investment, the overall magnitude of the increase in economic activity associated with this representative project is approximately $70,000,000 to the local communities, representing an approximate doubled increase from the initial investment as the money circulates through the local economy in terms of state, local, and federal taxes, and impact to ancillary businesses such as services and wholesale and retail. The approach taken here was to generate an estimate of the economic and fiscal impacts. These impacts can be applied to any local, state, or regional area around the country given the nature of input-output economic impact modeling and the characteristics of the proposed representative climate pollution and green infrastructure projects. While there are regional differences in the initial data inputs, the multipliers themselves, and the specific nature of the changes to the direct, indirect, and induced values, the modeled estimated impact of the

[24] ILO, 2018
[25] Pullin, et al. 2021, 2020, and many others
[26] Lindall et al. 2004; IMPLAN, 2022
[27] Greene and Geisken, 2013; Council, 2013; Brown et al., 2012
[28] Greene and Geisken, 2013; Mulkey 2004, Shakya and Ahiablame, 2021, Bae and Dall'erba, 2016; Hall, 2021; Miller and Blair 2009

green infrastructure project will be approximately the same for any location with a similar population distribution, industry composition, and salary and wage structure.

The priority measures included in this PAP will create high-quality jobs for Oklahomans. This section details Oklahoma's strategies and commitments to ensure job quality, strong labor standards, and a diverse, highly skilled workforce to implement the priority measures. DEQ has coordinated with OU, career techs, and ODOC for this effort. That effort will be continued during the CAP development process to ensure a robust and implementable plan to build Oklahoma's workforce. The goal includes keeping Oklahomans safe and prosperous within the state. Oklahoma's strong economy, business friendly government, and central location promotes future industry investment in many areas but specifically centered around energy resiliency and renewable energy business growth.

The CPRG planning process will minimize workforce reduction risks as advanced planning will provide a path forward for agencies and industry. DEQ will utilize federal resources such as Map a Career in Clean Energy, Department of Energy and US Department of Labor. The CAP will analyze workforce aspects of the Priority Measures and their impact on Oklahoma.

Coordination and Outreach

DEQ conducted extensive coordination and outreach with Tribal Nations, municipalities, agencies, industry, ACOG, INCOG and community members in the development of this PAP. This section describes the framework DEQ used to support robust and meaningful engagement strategies to ensure comprehensive stakeholder representation and overcome obstacles to engagement, including linguistic, cultural, institutional, geographic, and other barriers.

Identification of Stakeholders

DEQ identified stakeholders representative of the entities, groups, and individuals who may be impacted by implementation of this PAP. Below is a non-exhaustive list illustrating the wide range of stakeholders who were part of the PAP process:

- Residents of Oklahoma
- Metropolitan planning organizations
- Economic development organizations
- Environmental advocates
- Industrial associations
- Utilities
- Agricultural associations
- Waste management organizations
- Industrial organizations
- Local elected officials
- Community-based organizations
- Chambers of commerce
- Other interested organizations
- Other state agencies

The list of identified stakeholders as of the publication of this PAP is included in Appendix I. The DEQ will update this list of stakeholders as needed.

Interagency and Intergovernmental Coordination

Throughout the CPRGOK development process, DEQ coordinated with other entities such as Metropolitan Statistical Areas (MSAs), relevant state, regional, and tribal government representatives. Strong coordination was made possible during virtual meetings and in person meetings, such as a three-day long leadership stakeholder meeting held at DEQ headquarters. Other coordination methods included video-call, phone-call, and email correspondence.

DEQ anticipates that MSAs and Tribal Nations in Oklahoma may apply for CPRG grants independently of DEQ's priority measures that may be contrasting, but complimentary in nature. Each group aims to tackle specific projects that are realistically attainable, based on resource availability, project size, and project benefits. For example, DEQ may have the opportunity to partner with MSAs to provide energy audits, weatherization upgrades, or upgraded LED lighting fixtures in city owned facilities. As well, this type of coordination could support the implementation of K-12 climate pollution education. DEQ may coordinate with Tribal Nations to supplement projects they have outlined in their plan, such as large scale solar and composting projects.

Community Outreach Plan

One of the main actors in DEQ's outreach plan, was the CPRGOK roadshow. The roadshow consisted of 10 meetings in 9 locations across the state. Each meeting contributed to productive and open conversation between DEQ staff and stakeholders including local residents and businesses, tribal members, city and township staff, universities, and MSAs. DEQ has coordinated with OU to continue engagement with LIDAC communities in addition to engagement efforts since December 2023. OU has conducted several public meetings separate from those held by DEQ, as well as administered a survey to collect contact information and input from stakeholders.

Strategies to Overcome Linguistic, Cultural, Institutional, Geographic, and Other Barriers to Participation

DEQ is invested in maintaining meaningful community engagement with LIDAC communities. During the focus group studies it was noted that rural communities feel they have limited capacity to take advantages of existing programs and fear this pattern will continue. This feeling of exclusion comes primarily around communication challenges revolving around linguistic, cultural, institutional, geographic, and other barriers. LIDAC representatives stated that Tribal Nations in rural LIDAC communities are often the most important resource for technical expertise, social services, physical and monetary resources to respond to climate impacts and other needs. Additionally, some LIDAC representatives mentioned they would like to see programs be structured to provide a level of decision-making power, technical expertise, and investment resources similar to VNP and SNI.

DEQ has reviewed comments from the LIDAC representatives and focus groups. As a next step, DEQ is evaluating resources and services to prioritize programs and strategies to overcome linguistic, cultural, and other barriers within the state of Oklahoma.

Outreach and Coordination Documentation

DEQ and OU contacted more than 2,500 community members and 120 tribal members, held 10 public meetings including a tribal only meeting, and worked with 10 LIDAC focus groups. Through these communications DEQ received input from tribal nations, local and state government, industries, community members including LIDAC community members, universities and colleges, municipalities, and military bases. The DEQ and OU Outreach and Coordination logs are included as Table 18 and 19 below, respectively.

Table 17. DEQ Outreach and Coordination Log

Date	Topic	Organizations Involved	Coordination/ Outreach Method	Location	Outcome(s) and Next Steps	Notes/Links
8/1/2023	DEQ GovDelivery Email Blast	ODEQ	GovDelivery email blast to addresses signed up for CPRGOK updates. All addresses in comprehensive contact list were included.	n/a	CPRGOK first public meeting announced with location, date, and time.	Email included zoom registration link for November 28 meeting as well as link to DEQ's CPRGOK webpage.
8/24/2023	DEQ GovDelivery Email Blast	ODEQ	GovDelivery email blast to addresses signed up for CPRGOK updates. All addresses in comprehensive contact list were included.	n/a	Reminder for August 30 public meeting	Email included zoom registration link for November 28 meeting as well as a link to DEQ's CPRGOK webpage, meeting agenda, and CPRGOK@deq.ok.gov email address for questions and comments
8/30/2023	CPRGOK First Public Meeting	ODEQ	Public Informational Meeting held at HQ open to taking comments and questions from the public, Tribal Nations, industry, and stakeholders.	DEQ HQ (OKC)		See CPRGOK webpage for all official documents and recordings from meeting.
11/3/2023	EFO News Update	EFO and ODEQ	Environmental Federation of Oklahoma (EFO) sent out monthly news article on November 3, featuring the announcement of DEQ's CPRGOK public meeting series.	n/a		News article included link to DEQ's CPRGOK webpage with important dates for public meetings.

Date	Topic	Organizations Involved	Coordination/ Outreach Method	Location	Outcome(s) and Next Steps	Notes/Links
11/9/2023	CPRGOK - Public Meeting in Woodward	ODEQ	In-person public meeting	Woodward	Participant survey completed	- Transportation questions should be adapted to include questions relevant to rural Oklahoma communities. - It was recommended that DEQ contact Farm Bureau. - It was noted that there is an issue with accumulation of white goods in the area - A local Facebook community group was suggested for future outreach
11/13/2023	Ponca City - push for public meeting notice	ODEQ and Ponca City Chamber of Commerce	Phone call and follow up email	n/a	Information on Ponca City public meeting shared with Ponca City Chamber of Commerce to send to local business and potential stakeholders	
11/13/2023	Ponca City - push for public meeting notice	ODEQ and City of Ponca City	Phone call and follow up email	n/a	Information on Ponca City public meeting shared with City of Ponca City to send to local news outlets and potential stakeholders - pushed to City of Ponca City official Facebook page	
11/14/2023	CPRGOK - Public Meeting in Ponca City	ODEQ	In-person public meeting	Ponca City	Participants and affiliations represented: DEQ, Transit (Cimmaron), City of Ponca City, Ponca Tribe, United CAP, Ponca Mayor, Schneider Electric, Phillips 66	-Ponca City receives power from Oklahoma Municipal Power Authority (OMPA) and Sand Springs Landfill (Ponca Refinery - OG&E) -Project idea: methane collection from landfill -Ponca Tribe environmental staff in transition -PICK local rideshare program (21 communities) -Project idea: train diesel mechanics for EV (technology center initiatives toward renewables) -Major issues with compressed natural gas (CNG) charging

Date	Topic	Organizations Involved	Coordination/ Outreach Method	Location	Outcome(s) and Next Steps	Notes/Links
						-Project idea: important to include tech and infrastructure for rural communities (workforce development) -Project idea: microgrid (energy resiliency and independency in emergency)
11/16/2023	CPRGOK - Public Meeting in Ardmore	ODEQ	In-person public meeting	Ardmore	Participants and affiliations represented: DEQ, Valero, Oklahoma Conservation Commission	-Waste water PFAS testing assistance -Strong interest in residential solar installation -Project idea: co-op with Solar for All (large and small scale solar initiatives, farming and residential) -50% coverage on solar projects for residential installation requested -Project idea: collab with local farmers for regenerative farming (suggest speaking with Farmers Bureau for best practices) -Nearby G6 refineries (including new in Cushing) to use Reverse Osmosis (RO) to conserve water -Project Idea: Cover costs to retrofit/upgrade burners like the 20 at Valero
11/16/2023	Angela Hughes email blast invitation to Tribal Nations Only Meeting	ODEQ and Tribal Nations	Angela Hughes invitation to all tribal contacts for Nov 28 Tribal Nations Only Meeting			
11/16/2023	Angela Hughes email blast invitation to DEQ CPRG list for Nov 28 Public Meeting	ODEQ and DEQ CPRGOK email list	Angela Hughes email blast to CPRGOK email to announce the Nov 28 public meeting held at DEQ HQ.			

Date	Topic	Organizations Involved	Coordination/ Outreach Method	Location	Outcome(s) and Next Steps	Notes/Links
11/20/2023	DEQ GovDelivery Email Blast	ODEQ	GovDelivery email blast to addresses signed up for CPRGOK updates. All addresses in comprehensive contact list were included.	n/a	CPRGOK public meetings dates and locations though January pushed.	Email included zoom registration for November 28 meeting as well as link to DEQ's CPRGOK webpage.
11/22/2023	Angela Hughes Reminder Email Blast to Tribal Partners	ODEQ and Tribal Nations	Angela Hughes reminder email blast to tribal contact list for Nov 28 Tribal Nations meeting at DEQ HQ			
11/27/2023	DEQ GovDelivery Email Blast	ODEQ	GovDelivery email blast to CPRGOK reminder for Nov 28 Public Meeting at DEQ HQ			Email included zoom registration for Nov 28 meeting as well as link to DEQ's CPRGOK webpage. Also included schedule for upcoming public meetings through December.
11/28/2023	CPRGOK Tribal Nations Only Meeting	ODEQ and Tribal Nations	Meeting for tribal partners only held at DEQ HQ from 2pm-4pm with a Zoom option also available.	DEQ HQ (OKC)	Interested Tribal Nations to report back to leadership and continue discourse soon	
11/28/2023	CPRGOK - Public Meeting in OKC	ODEQ	In-person public meeting with a Zoom online option	DEQ HQ (OKC)		
11/30/2023	CPRGOK - Public Meeting in Lawton	ODEQ	In person public meeting	Lawton, OK	Parties represented: OU Polytech, Ethos Energy, THG Energy Solutions, INCOG, OK Sustainability Alliance, Hydrogen Technologies, OSU Environmental Management Master's Program	
12/4/2023	CPRGOK - Public Meeting in Poteau	ODEQ	In person public meeting	Poteau, OK	Parties represented: Poteau Daily News, ECLS retiree and local, local veteran	

Date	Topic	Organizations Involved	Coordination/ Outreach Method	Location	Outcome(s) and Next Steps	Notes/Links
12/5/2023	CPRGOK - Public Meeting in Burns-Flat	ODEQ	In person public meeting	Burns-Flat, OK	Parties represented: SWODA, City of Cordell, ECLS DEQ	
12/7/2023	CPRGOK - Public Meeting in Tulsa	ODEQ	In person public meeting	Tulsa, OK		
12/12/2023	CPRGOK - Public Meeting in Miami	ODEQ	In person public meeting	Miami, OK	Parties represented: Tribal Nations, oil and gas, local business, city	
12/15/2023	DEQ GovDelivery Email Blast	ODEQ	GovDelivery email blast to stakeholders	n/a	DEQ sought additional input to identify implementation-ready projects to include in the PAP for Oklahoma's Climate Pollution Reduction Grant (CPRGOK). Deadline to respond was Friday, January 12, 2024.	Email included link to electronic form, which is now closed.

Table 18. OU Outreach and Coordination Log

Date	Organizations Involved	Location
11/12/2023	Black Towns Municipal Management; Black Towns Revival Weekend	Clearview
12/13/2023	Crosby Heights Neighborhood Association	Crosby Heights, Tulsa
12/14/2023	Eugene Fields Neighborhood Crime Watch	via zoom
12/19/2023	The Phoenix Development Council	Phoenix District, Tulsa
1/4/2024	Capitol Hill Civic Group	South OKC/Capitol Hill, Oklahoma City
1/5/2024	Restore OKC	via zoom
1/11/2024	Northeast Oklahoma City Neighborhood Coalition	via zoom
1/25/2024	Charles Page Community Action Group	Charles Page, Tulsa
1/30/2024	Atoka City Industrial Development Authority	Atoka
2/2/2024	El Centro Community Center	East Tulsa

LIDAC Engagement Strategy

DEQ representatives identified over 120 tribal contacts for the 39 federally recognized Oklahoma Tribes. Targeted emails and phone calls were the primary communication method. DEQ hosted a Tribes Only meeting in person and virtually. This outreach helped inform the PAP on current tribal concerns including workforce, environmental, cultural, and social issues.

The LIDAC engagement strategy used a combination of focus group-style workshops and a community survey targeting members of LIDAC communities. In total, 10 focus groups were conducted and 45 individuals completed the survey between November 2023 (Fall Semester 2023) and February 2024 (Spring Semester 2024). Focus groups were conducted with established groups and organizations with a history of LIDAC community embeddedness and representation. The goal of the engagement strategy was to create a general sense of the experience of LIDAC communities with climate impacts and their priorities for action aimed at strengthening their communities. Focus groups with underrepresented communities such as Black, Hispanic, rural communities, and Tribal Nations were deliberately targeted to ensure representation. Of the 10 focus groups, 3 were in predominantly Black communities, 2 in predominantly Hispanic communities, including a focus group conducted solely in Spanish and survey materials made available in Spanish, and 2 were conducted in rural areas outside the largest metropolitan regions that host the vast majority of the population of the state, Oklahoma City and Tulsa.

Focus group meetings ranged from 30 to 90 minutes depending on how much time was available. Typically, 10-15 individuals were in attendance in each meeting. As a result, the focus group design was intended to be flexible so that the core of the question set could be asked in a group setting in the span of 20 minutes to 2 hrs. The focus group style interaction had a facilitator follow an outline of questions as a starting point, from there the discussion was intended to flow organically. OU personnel asked follow-up questions as the conversation evolved. These questions were asked following a basic introduction to the CPRG program:

- Let's discuss your community's experience with the impacts of climate pollution.
- When you think about these things, how does it connect to the unique history of your community (Question can be contextualized to the group identity)?
- What kinds of local investments would you prioritize to help with these things?
- As projects like this, or future ones if these aren't funded, move forward, how might the state or other entities best interact with your community in the future?

Notes and key take aways from each of the meetings are provided in Appendix H.

Additionally, graduate students in the University of Oklahoma's Regional & City Planning program worked to conduct focus groups and field a community survey. The survey was created and deployed using Qualtrics. The survey aimed to gauge community members' experiences and perceptions of severe climate conditions and events. The questions pertained to several aspects of climate pollution and extreme climate events and how they affect the lives of respondents and their communities. These questions were created by analyzing the goals of the CPRG program and similar surveys from prior climate impact studies. The survey was open November 2023 to February 2024. 45 individuals completed the survey.

Community Profiles

Community profiles summarizing the focus groups and surveys are below:

COMMUNITY: Atoka				
Atoka is a community in Southeast Oklahoma. It is the seat of Atoka County. Atoka City Industrial Development Authority is the area's economic development authority. (Tract 40005587700)				
Disadvantaged Categories by Tract				
Tract	**Climate Change**	**Energy**	**Health**	**Legacy Pollution**
40005587700	Expected population, building, and agricultural loss	Significant energy burden on the local population	High prevalence of diabetes, asthma, and coronary heart disease among adults	High exposure rates to $PM_{2.5}$ and diesel particulate matter
Community Concerns				
Silting in local waterways has caused significant issues resulting in increased flood risk. Local water quality and mineral content/hardness has increased costs of infrastructure and building maintenance. Water/stormwater collection/distribution infrastructure is composed of clay pipes which constrain their ability to expand these systems. The community is bisected by the Highway 69/75 corridor, which contributes to air quality concerns. The growing community is beginning to face constraints of existing infrastructure and the need to expand to accommodate the growth but lacks viable/affordable planning services. Infrastructure and technical costs of building housing are cost prohibitive. The community relies on Tribal Nations rather than the state for assistance.				
Community Experience, Priorities, and Engagement				
Community concerns include the threat of significant floods and drought, the ability to increase efforts and/or access resources, and with engagement staying relevant to small communities' aspirations and needs. The priorities of the community include the improvement of waterways to prevent erosion/silting, improvement of water/stormwater collection/distribution systems, water conservation and sourcing as populations increase, demand for housing, and the monitoring and improvement of local air quality.				

COMMUNITY: Historic Black Towns (Clearview, Tatums, Grayson, Rentiesville)

Oklahoma's Historically All-Black towns have a unique history where African Americans founded a series of communities from 1865-1920 for self-governance and economic prosperity. Four of the 13 remaining Historic Black Towns were represented. Black Towns Municipal Management and Black Towns Revival Weekend are involved organizations. (Tracts: 40091779600, Rentiesville, 40107081000, Clearview, 40019892100, Tatums, and 40111000800, Grayson)

Disadvantaged Categories by Tract

Tract	Climate Change	Energy	Health	Legacy Pollution	Transportation
Rentiesville	Expected population, building, fire risk, agricultural loss	Significant energy burden on the local population	High prevalence of diabetes, coronary heart disease, low life expectancy among adults	High exposure rates to $PM_{2.5}$	None
Clearview	Fire risk	Significant energy burden on the local population	High prevalence of diabetes, asthma, and coronary heart disease among adults	None	None
Tatums	None	None	None	None	None
Grayson	Expected agricultural loss, hazard risk, population loss	Significant energy burden on the local population	High prevalence of diabetes, asthma, and coronary heart disease among adults	High exposure rates to $PM_{2.5}$	ODOT Travel Barriers

Community Concerns

The community has faced loss of electricity for weeks at a time due to severe weather, causing issues with pump stations, sewage stations, and the rural water district. Additionally, drought is an issue for those with wells or within rural water districts. Flash flooding occurs in the

community due to the drainage infrastructure clogging with sediment and/or failure of old or underperforming drainage infrastructure. Additionally, lack of funding, level of density, and the struggle to get/maintain a wastewater facility, cause threats to wastewater infrastructure. There is no funding or support in the community to mitigate the threats posed by fires such as lightning strikes on dead trees. The community has experienced population loss due to Jim Crow laws that led people to leave the community for other cities or states. The current population is older in age. The community relies on volunteer mayors and on tight operating budgets, generally less than $15k annually. Relationships with the county or neighboring cities can be strained due to discrimination. Land in the community is not abundantly available due to land locks, refusal to sell, or family maintained.
Community Experience, Priorities, and Engagement
Community concerns include the threat of extreme heat, high energy costs, threat of fires, and extended energy loss. Priorities of the community include storm shelters, wildfire management plans, green infrastructure, improved water/stormwater drainage infrastructure, improved solid waste management, solar energy to back up municipal services, and high efficiency HVAC systems. The community struggles with communication with the county. The application process for grants from the state is prohibitive to the community due to its complexity and their limited resources such as volunteer hours and available funds.

COMMUNITY: Capitol Hill / South Oklahoma City

South Oklahoma City is historic enclave of the Hispanic community of Oklahoma City. Capitol Hill Civic Group is a longstanding network of organizations and community leaders concerned with South Oklahoma City and Capitol Hill. (Tracts 40109104700, 40109104100, 40109104600, and 40109104900)

Disadvantaged Categories by Tract

Tract	Climate Change	Health	Legacy Pollution	Workforce Development	Housing
40109104700	None	High prevalence of diabetes, low life expectancy	None	Population with less than high school degree	Housing burden
40109104100	Low income, building loss rate, population loss rate	High prevalence of diabetes, asthma, low life expectancy	None	High unemployment, high poverty rates	High housing burden, homes without kitchens or plumbing
40109104600	None	High prevalence of asthma, low life expectancy	None	Linguistic isolation, low income	Lead paint
40109104900	None	High prevalence of asthma, low life expectancy	$PM_{2.5}$	Linguistic isolation, high poverty rates, low high school attainment	Leaking underground storage tanks (LUSTs)

Community Concerns

This community struggles with solid waste and septic systems in neighborhoods. Reliance on septic systems cause degradation of the water table. The community also struggles with high energy costs and transportation/mobility issues, including a lack of walkable sidewalks. These issues are all compounded by extreme heat and extreme weather events. The community values parks and open community spaces. Citizenship status and language barriers cause a lack of programing in neighborhoods that require them. Buildings in the area are old and it would be expensive to rehabilitate or retrofit these buildings with efficient systems.

Community Experience, Priorities, and Engagement

Community concerns include the threat of extreme heat, extreme weather, and the maintenance of their parks and open spaces as climate impacts worsen. The priorities of the community include energy audits, weatherization/building efficiency upgrades, tree planting programs, investments and maintenance in parks and amenities, grants to help move away from a reliance on septic systems, recycling programs, and investment in infrastructure. Engagement with the community will require dissolving language barriers and a need to approach the community with citizenship issues in mind.

COMMUNITY: Charles Page

Charles Page is a neighborhood in Tulsa. It is part of the Vibrant Neighborhoods Partnership (VPN) that targets public support and service delivery through community driven processes. Charles Page Community Action Group is the organization involved with this community. (Tracts 40143003000 and 40143008800)

Disadvantaged Categories by Tract

Tract	Climate Change	Energy	Health	Housing	Legacy Population	Workforce Development
40143003000	Population loss, poverty rates	High energy burden	Asthma and coronary heart disease, low life expectancy	Lead paint, proximity to risks, proximity to hazardous waste	$PM_{2.5}$	None
40143008800	Population loss, poverty rates	High energy burden	Asthma rates, low life expectancy	Homes without kitchen or indoor plumbing	$PM_{2.5}$	High unemployment

Community Concerns

This community struggles with solid waste issues in neighborhoods, which are made worse by extreme heat and weather. High energy costs and frequent power outages are present in the community. Maintenance of amenities, vegetation, and drainage systems are poor. Mosquitos are a hazard and nuisance to the community. No grocery stores are available within the community. Developments or funds are not assigned to Charles Page.

Community Experience, Priorities, and Engagement

Community concerns include the threat of extreme heat, extreme weather, and the feeling that they are abandoned or forgotten. The priorities of the community include tree planting programs, investments in park amenities and maintenance, improved solid waste collection, improved drainage systems, removal of the mosquito hazards, and the improvement of electrical infrastructure to reduce power loss. Engagement with the community will require developments or funds to be assigned to Charles Page.

COMMUNITY: Crosby Heights

Crosby Heights is a neighborhood in Tulsa. It is part of the Vibrant Neighborhoods Partnership (VPN) that targets public support and service delivery through community driven processes. Crosby Heights Neighborhood Association is the organization associated with this community. (Tract 40143002700)

Disadvantaged Categories by Tract

Tract	Climate Change	Health	Housing	Legacy Pollution	Transportation
40143002700	Population loss	Low life expectancy	Lead paint, proximity to risk	$PM_{2.5}$	Traffic proximity

Community Concerns

This community struggles with high energy costs exacerbated by old homes with poor insulation. Due to the construction of the old houses, insulation is difficult. Solid waste collection is lacking causing waste pile ups and overwhelmed collection sites. Air quality and water quality impacts from local refineries, highways, and railroad are impacting revitalization efforts. Housing and trees are impacted by high winds.

Community Experience, Priorities, and Engagement

Community concerns include the threat of extreme heat, extreme weather, and air and water pollution from sources near the community. The priorities of the community include energy audits, effective insulation in homes and businesses, solar infrastructure for key neighborhood services, and a citizen science program that would train residents to understand and monitor air and water quality.

COMMUNITY: Eugene Fields

Eugene Fields is a neighborhood in Tulsa. It is part of the city's Choice Neighborhood initiative that works with the federal government to use public housing revitalization as a catalyst for wider neighborhood investment. Eugene Fields Neighborhood Crime Watch is the organization associated with this community. (Tract 40143004600)

Disadvantaged Categories by Tract

Tract	Climate Change	Health	Housing	Legacy Pollution	Workforce Development
40143004600	Expected population loss, high poverty levels	Asthma rates	Proximity to risk, proximity to hazardous waste	$PM_{2.5}$	High unemployment

Community Concerns

This community is struggling with population loss as residence move out and public housing is being replaced. The community is located close to the river and refineries.

Community Experience, Priorities, and Engagement

Community concerns include flood threats and air pollution from sources near the community. The priorities of the community include robust air monitoring and flood risk mitigation strategies.

COMMUNITY: Northeast Oklahoma City

Northeast Oklahoma City is the historic Black enclave of Oklahoma City. Northeast Oklahoma City Neighborhood Coalition is the organization associated with this community. (Tracts 40109101400 and 40109102800)

Disadvantaged Categories by Tract

Tract	Energy	Heath	Housing	Workforce Development
40109101400 and 40109102800	High energy burden	High rates of diabetes, coronary heart disease, and asthma, low life expectancy	Lead paint	High poverty rates, high unemployment

Community Concerns Meeting 1

This community is struggling with frequent and prolonged power outages. Power restoration times seem to take longer than neighboring areas and are exacerbated by a lack of emergency generators in the area. Community awareness of available programs and resources is low, and the programs are difficult to access. Community member[s] expressed concern that air quality in the community is low due to local oil and gas operations. Environmentally burdening sites are proposed for the community such as medical waste facilities, a county jail, etc.

Community Concerns Meeting 2

This community is struggling with high utility costs exacerbated by extreme heat, poor insulation in older homes, and power outages caused by extreme weather. There is a lack of community gathering spaces and streets/sidewalks are unsafe due to poor lighting. A lack of access to food has created food insecurities in the community. Industrial operations and brownfields in the area require environmental remediation.

Community Experience, Priorities, and Engagement Meeting 1

Community concerns include extreme heat and air pollution from sources near the community. The priorities of the community include air quality monitoring, weatherization/building efficiency upgrades, the addition of storm shelters, efficient street lighting, grants for solar energy, solar powered back-ups for community centers, and more funding for tree planting programs.

Community Experience, Priorities, and Engagement Meeting 2

Community concerns include extreme heat, safety and accessibility of streets/sidewalks, and food security. The priorities of the community include expansion of Restore OKC's 'Restore Homes' program to upgrade older homes, expansion of safe streets program, composting and urban agricultural, and weatherization/insulation of homes.

COMMUNITY: Phoenix District

Phoenix District is a neighborhood in north Tulsa. North Tulsa is an historic enclave of the African American community. It is part of the Vibrant Neighborhoods Partnership (VPN) that targets public support and service delivery through community driven processes. The Phoenix Development Council is the organization associated with this community. (Tracts 40143008002 and 40143006200)

Disadvantaged Categories by Tract

Tract	Climate Change	Energy	Health	Workforce Development
40143008002 and 40143006200	Population loss, high poverty rates	High energy burden	High rates of diabetes, coronary heart disease, asthma, and low life expectancy	High unemployment

Community Concerns

This community is struggling with extreme heat especially since there is a lack of adequate shading from trees, high energy bills, and older buildings have insufficient insulation. Older buildings have high rates of lead paint and issues with mold. The drainage infrastructure in the community is poor leading to flash flooding and mosquito hazards. Solid waste collection is also limited by a shortage of bins. Community member[s] expressed the streets in the community are not well lit at night and the air quality is poor.

Community Experience, Priorities, and Engagement

Community concerns include extreme heat, poor air quality, and lack of lighting at night. The priorities of the community include tree planting programs, solar powered lighting for streets and trails, grants for insulating older homes, improvements to drainage infrastructure, window and HVAC replacement grants, air quality improvement programs, and improvements to solid waste collection. The VNP program is bringing fresh resources and investment, but there is skepticism within the community that projects and investment from the CPRG program will be impactful for their neighborhood.

COMMUNITY: East Tulsa

East Tulsa is the historic enclave of the Hispanic community in Tulsa. El Centro Community Center is an organization associated with this community. (Tracts 40143002301, 40143003400, and 40143001200)

Disadvantaged Categories by Tract

Tract	Climate Change	Energy	Health	Housing	Legacy Pollution	Workforce Development
40143002301 and 40143003400	Expected loss of population, high poverty rates	High energy burden	Low life expectancy	Rate without kitchens or indoor plumbing, proximity to risk	$PM_{2.5}$	None
40143001200	Expected loss of population, high poverty rates	High energy burden	Low life expectancy	Proximity to risk, lead paint	$PM_{2.5}$	Linguistic isolation

Community Concerns

This community is struggling with extreme heat exacerbated by older homes, with poor insulation and air conditioning, and lack of personal vehicles. Immigration status causes issues within the community by losing eligibility for programs, not being able to get a driver's license, etc. The community has seen storm water issues and flooding arise (specifically, behind plaza sentence Cecilia and Dolores Huerta elementary). Many community members walk or bicycle due to lack of personal vehicles.

Community Experience, Priorities, and Engagement

Community concerns include extreme heat, extreme weather, floodings, and immigration status. Priorities of the community include eligibility of Taxpayer Identification Number holders in community programs, addressing storm water/drainage infrastructure, tree planting programs, solar street lighting, walkable and accessible sidewalks, investments in parks and amenities, composting and community gardens, investments in road repairs, community shelters, bicycling facilities, and improved electrical infrastructure. Engagement with the community will require dissolving language barriers by providing information to the community in Spanish, having Spanish speakers on programs, etc. Additionally, allowing Individual Taxpayer Identification Number holders to be eligible for programs would reduce complications with immigration status.

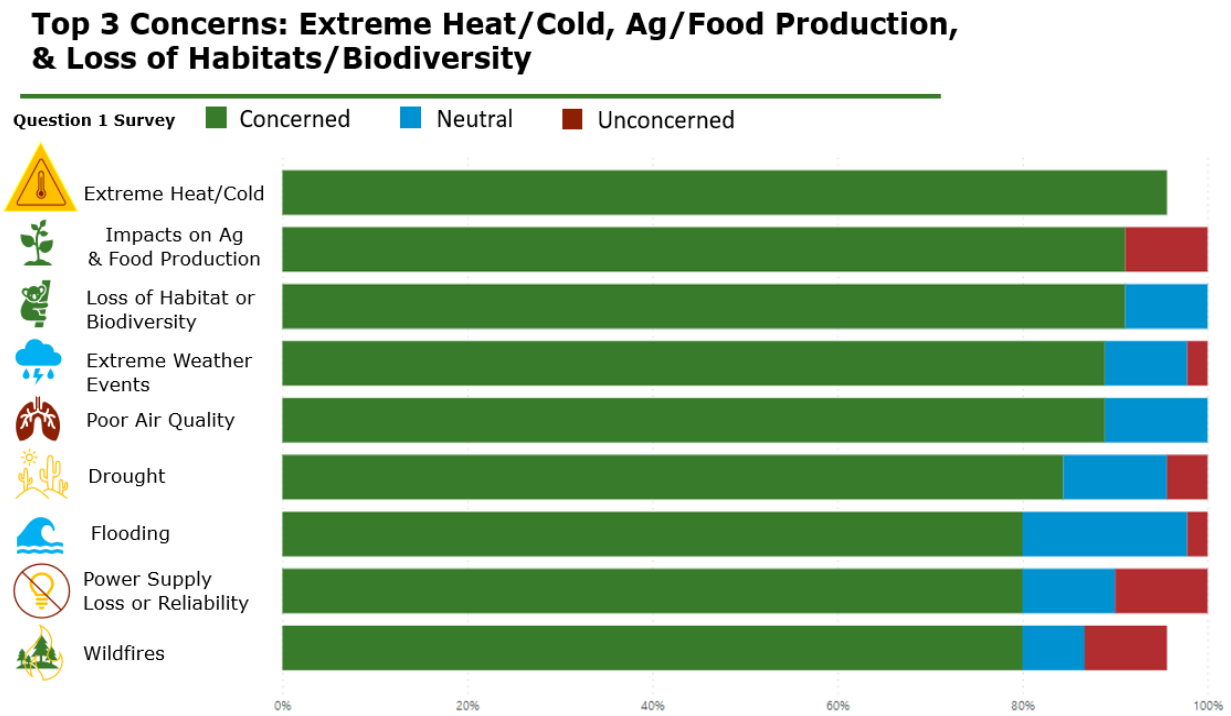
Community Response

Based on responses, there is evidence that community residents support a variety of climate pollution interventions. Responses suggest that environmental concerns are frequent and diverse among respondents. Environmental concerns include extreme temperatures, wildfires, loss of habitat, power supply loss, drought, and poor air quality were among the listed concerns. Most respondents answered that they would be more likely to participate in pollution reduction activities if it took place in their neighborhood, saved them money, or if they had a better understanding of the environmental impacts. Educational institutions and government programs ranked favorably among sources that respondents would feel comfortable receiving climate information. Most respondents supported a wide variety of activities to lessen the impact of climate pollution, including more walkable areas, more efficient water, and waste infrastructure, and utilizing native plants for carbon capture, to name a few.

Walkability and pedestrian amenities ranked highly among changes that would make respondents consider modes of transportation other than personal vehicles. Financial constraints presented to be the most common barrier to adopting a more environmentally friendly lifestyle among respondents.

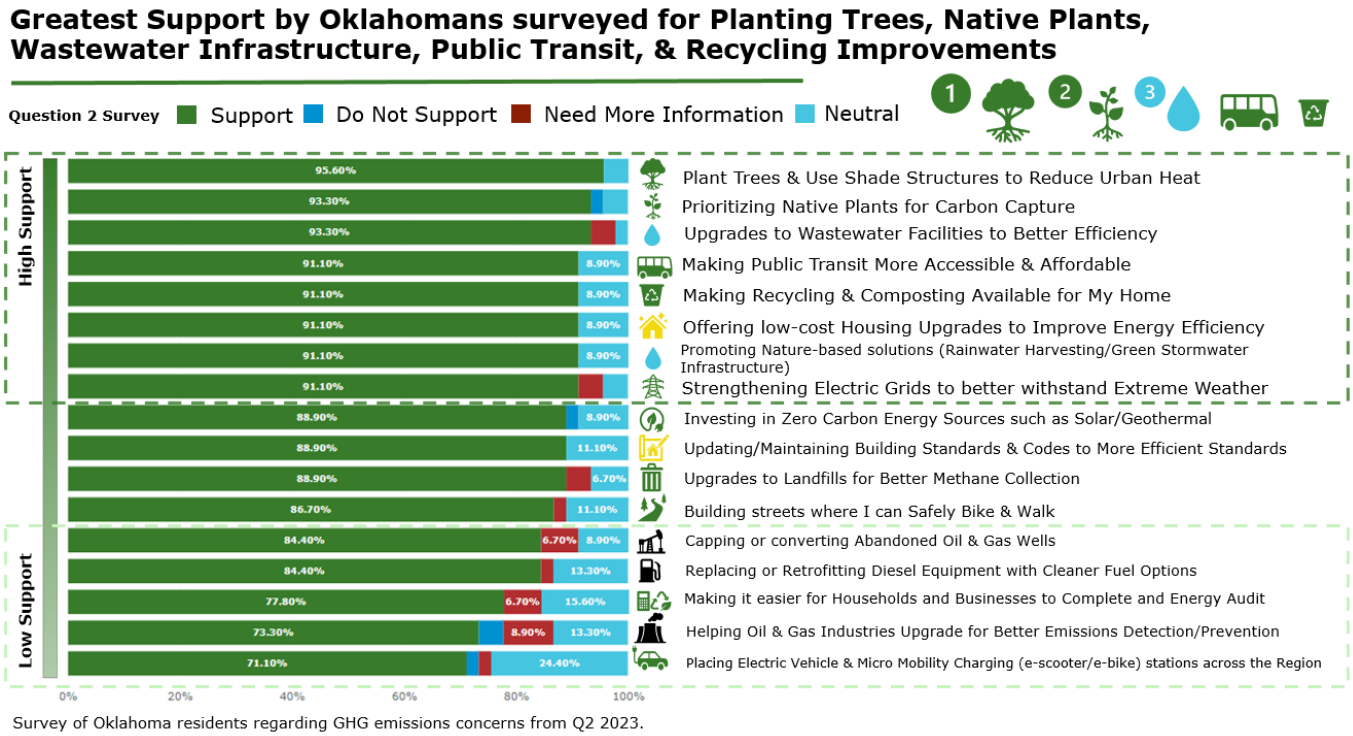
The following figures display some of the most salient responses. An expanded list of community priorities is listed in Appendix H.

Figure 10. "How Concerned are You About the Following Weather-Related Hazardous?" Survey Responses



Survey of Oklahoma residents regarding GHG emissions concerns from Q1 2023 survey.
Some survey results do not add up to 100% based on unanswered portions of the survey.

Figure 11. "Which Municipal or Regional Activities Do You Support to Lessen the Impact of Climate Pollution?" Survey Response



Survey of Oklahoma residents regarding GHG emissions concerns from Q2 2023.

Conclusion

This PAP is the first major deliverable under the CPRG planning grant awarded to DEQ. DEQ and its partners will continue planning, engagement, and actions to reduce emissions; invest in sustainable infrastructure, technologies, and practices; build Oklahoma's economy; and enhance the quality of life for all Oklahomans. In 2025, DEQ will publish the CAP that establishes equitable and sustainable economic development strategies that reduce emissions across all sectors. The CAP will include near- and long-term emissions projections, a suite of emission reduction measures, a robust analysis of priority measure benefits, plans to leverage federal funding, and a workforce planning analysis. In 2027, DEQ will publish a status report that details implementation progress for measures included in the PAP and CAP, any relevant updates to PAP and CAP analyses, and next steps and future budget and staffing needs to continue implementation of CAP measures.

If you have questions about this PAP or suggestions for the upcoming CAP and status report, contact Angela Hughes at Angela.Hughes@deq.ok.gov.

Appendix A State of Oklahoma Quality Assurance Project Plan (QAPP) for Greenhouse Gas Emissions Inventory Reporting

December 12, 2023

Mary Hogan
Air Quality Division – Quality Assurance
Oklahoma Department of Environmental Quality
707 N. Robinson, P.O. Box 1677
Oklahoma City, OK 73101-1677

Dear Ms. Hogan:

The Environmental Protection Agency (EPA), Region 6 has approved the ODEQ Quality Assurance Project Plan for Greenhouse Gas Emissions Inventory Reporting As Part of the Climate Pollution Reduction Grants s Air Pollutants.

The QAPP has been assigned EPA QTRAK number 24-058 and will expire November 16, 2025. Please submit a statement listing any significant variations to the QAPP by September 16, 2025. EPA Region 6 will review and extend the expiration date according to our Quality Management Plan QAPP review procedures.

The signed QAPP page files have been included with the emailed version of this notification.

Please contact me with any questions at (214) 665-7418.

Sincerely,

12/12/2023

X /s/ Donnett Patterson

Donnett Patterson

Signed by: Patterson, Donnett

Donnett Patterson,
Project Officer, Air Monitoring
And Grants Section

cc: Carrie Schroeder, ODEQ
Angela Hughes, ODEQ
Tiffany Schwimmer, ODEQ
Beverly Botchlet-Smith, ODEQ
Brenton Gildner, EPA

A. Project Management and Information/Data Quality Objectives (Group A)

A.1. Title Page

State of Oklahoma
Quality Assurance Project Plan for
Greenhouse Gas Emissions Inventory Reporting
As Part of the
Climate Pollution Reduction Grant

EPA Assistance 5D-02F36201

Prepared by/Entity Conducting Environmental Information Operations:
Oklahoma Department of Environmental Quality
Air Quality Division
Emissions Inventory Section
707 North Robinson Avenue
P.O. Box 1677
Oklahoma City, Oklahoma 73101-1677
Phone: (405) 702-4100

Prepared for:
US EPA Region 6
1201 Elm Street, Suite 500
Dallas, Texas 75270

Prepared on: October 27, 2023

Period of Applicability: Three Years after EPA Approval

A.2. Approval Page

APPROVING OFFICIALS:
Oklahoma Department of Environmental Quality

Date 11/7/2023

Kendal Stegmann, Director, Air Quality Division
Phone: 405-702-4154
Email: kendal.stegmann@deq.ok.gov

Date 11-6-2023

Carrie Schroeder, Program Manager, Emissions Inventory Section, Air Quality Division
Phone: 405-702-4179
Email: carrie.schroeder@deq.ok.gov

Date 11-2-2023

Angela Hughes, Program Manager, Administrative Division
Phone: 405-702-0108
Email: angela.hughes@deq.ok.gov

Date 11-6-2023

Beverly Botchlet-Smith, Assistant Director, Air Quality Division in lieu of
Vacant, Program Manager, Quality Assurance Section, Air Quality Division
Phone: 405-702-4156
Email: beverly.botchlet-smith@deq.ok.gov

Date 11-2-23

Heather Mallory, Quality Assurance Officer, Oklahoma DEQ
Phone: 405-702-5135
Email: heather.mallory@deq.ok.gov

APPROVING OFFICIALS:
U.S. Environmental Protection Agency, Region 6

MICHAEL GILDNER Digitally signed by MICHAEL GILDNER
Date: 2023.12.12 05:35:44 -06'00'

Date

Document Reviewer

DONNETT PATTERSON Digitally signed by DONNETT PATTERSON Date: 2023.11.28 06:45:59 -06'00' Date_____

Donnett Patterson, Regional Air Grants Coordinator

ELIZABETH WARREN Digitally signed by ELIZABETH WARREN Date: 2023.11.28 13:31:00 -06'00' Date_____

Christy Warren,
Acting Regional Quality Assurance Manager

QAPP Revision History

Revision No.	Description	Author	Date
0	Original Version	Carrie Schroeder	10/27/2023

A.3. Table of Contents, Document Format, and Document Control

A.3.1. Table of Contents

List of Tables

List of Exhibits

A.3.2. Document Format

This document adheres to format and section headings in the most recent and current Quality Assurance Project Plan Standard outlined in EPA IT/IM Directive No: CIO 2105-S-02.0 which replaces EPA Requirements for Quality Assurance Project Plan (QA/R-5).

A.3.3. Document Control

Document control throughout this Quality Assurance Project Plan (QAPP) consists of a header on the top of each document page containing an abbreviated version of the title of the document, document section, document revision number, version date, and page number in relation to the total number of pages.

Abbreviations

CAA	Clean Air Act
CCAP	Comprehensive Climate Action Plan
CFR	Code of Federal Regulations
CH_4	Methane
CO_2	Carbon dioxide
CPRG	Climate Pollution Reduction Grant
DASC	Data Assessment Statistical Calculator
DMV	Department of Motor Vehicles
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
F-gases	Fluorinated gases
GHG	Greenhouse Gas
GHGRP	Greenhouse Gas Reporting Program (40 CFR Part 98)
GWP	Global warming potentials
HFCs	Hydrofluorocarbons
ICR	Information Collection Request
IM	Information Management
IQR	Interquartile range
IT	Information Technology
MPG	Miles per gallon
NF_3	Nitrogen trifluoride
N_2O	Nitrous oxide
OAR	EPA Office of Air and Radiation
Oklahoma DEQ	Oklahoma Department of Environmental Quality
PFCs	Perfluorocarbons
PII	Personally identifiable information
PM	Project Manager
PO	EPA Project Officer for Grant
POP	Period of Performance
POR	EPA Project Officer's Representative

PWP	Project Work Plan
PCAP	Priority Climate Action Plan
QA	Quality Assurance
QAM	Quality Assurance Manager
QAMD	Quality Assurance Manager Delegate
QAPP	Quality Assurance Project Plan
QC	Quality Control
QCC	Quality Control Coordinator
QMP	Quality Management Plan
SF_6	Sulfur hexafluoride
SIT	State Inventory Tool (provided by the EPA)
TL	Task Leader
VMT	Vehicle miles traveled

A.4. Project Purpose, Problem Definition, and Background

Under this project, Oklahoma DEQ will identify, evaluate, and utilize existing data resources[1] to develop a statewide inventory of the major sources of greenhouse gas (GHG) emissions within Oklahoma and use that inventory data to develop a climate action plan. This QAPP has been developed in accordance with the Oklahoma DEQ agency Quality Management Plan (QMP). This QAPP focuses on the handling of environmental information under sector-specific tasks by technical staff charged with completing the following subtasks in a future planning project implemented in accordance with this QAPP:

1. Develop a comprehensive GHG inventory for the largest sources within each sector,
2. Develop options for reducing emissions within selected sectors,
3. Develop estimates or ranges of estimates for the reductions achievable under selected options,
4. Present the inventory, options listing, and associated analyses in a technical report for consideration by state policymakers with the authority to approve the deliverables under the CPRG planning grants.

The GHG inventory may utilize the EPA's State Inventory Tool (SIT),[2] state-level GHG inventories prepared by the EPA,[3] and data reported to the EPA's Greenhouse Gas Reporting Program (GHGRP)[4] together with any independent, sector-specific estimates prepared by the state. Any state estimates will be compared to corresponding federal estimates for validation. The statewide inventory will include the following sectors and gases:

Sectors	*Greenhouse Gases (across all sectors)*
1. Transportation 2. Electricity generation and/or use 3. Natural and working lands 4. Industry 5. Agriculture 6. Commercial and residential buildings 7. Waste and materials management 8. Wastewater	carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), fluorinated gases (F-gases) including hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6), and nitrogen trifluoride (NF_3)

A.4.1. Rationale for Selection of Sectors

For each sector included in the statewide inventory **Table A4.1** briefly describes why the sector was included in the inventory and the relative significance of the sector in terms of the magnitude of air emissions from existing inventories, the associated geographic distribution of the sources, and recent trends in readily available activity data for the source category.

---

[1] EPA, *Environmental Information Quality Policy*, CIO 2105.3, 03/07/2023 (p. 8) provides common examples of environmental information used to support the EPA's mission at https://www.epa.gov/system/files/documents/2023-04/environmental_information_quality_policy.pdf.

[2] https://www.epa.gov/statelocalenergy/state-inventory-and-projection-tool

[3] https://www.epa.gov/ghgemissions/state-ghg-emissions-and-removals

[4] https://www.epa.gov/ghgreporting/data-sets

Table A4.1 Rationale for Sector Selection

Sectors Included in Inventory	**Rationale for Including in GHG Inventory**
Transportation	Transportation activities were the largest source (29 percent) of total U.S. greenhouse gas emissions in 2021. From 1990 to 2021, transportation CO_2 emissions from fossil fuel combustion increased by 19 percent. Transportation activities occur across all states.
Electric power generation	The electric power sector accounted for 25 percent of total U.S. greenhouse gas emissions in 2021. Power generation and/or consumption occurs across all states.
Industry	The industrial sector accounted for 24 percent of U.S. greenhouse gas emissions in 2021. Since 1990, industrial sector emissions have declined by 11 percent. In 2021, total energy use in the industrial sector increased by 2 percent due to an increase in total industrial production and manufacturing output. EPA's GHGRP data provide additional insights into underlying trends in the industrial sector.
Natural and working lands[5]	Natural and working lands include fluxes of carbon from activities such as converting forests to agricultural use and practices that remove CO_2 from the atmosphere and store it in long-term carbon sinks like forests. In 2021, the net CO_2 removed from the atmosphere by natural and working lands was 12% of total U.S. greenhouse gas emissions. Between 1990 and 2021, total carbon sequestration in this sector decreased by 14%, primarily due to a decrease in the rate of net carbon accumulation in forests, as well as an increase in CO_2 emissions from urbanization.
Agriculture	Agriculture accounted for about 10 percent of U.S. greenhouse gas emissions in 2021, and agricultural soil management was the largest source of N_2O emissions. Enteric fermentation was the largest source of CH_4 emissions.
Commercial and residential buildings	In 2021, the commercial and residential sectors accounted for 7 and 6 percent of total U.S. greenhouse gas emissions, respectively. Emissions from the commercial and residential sectors have increased since 1990. Total residential and commercial greenhouse gas emissions, including direct and indirect emissions, in 2021 have increased by 2% since 1990. In 2021, an increase in heating degree days (0.5 percent) increased energy demand for heating in the residential and commercial sectors, however, a 1.8 percent decrease in cooling degree days compared to 2020 reduced demand for air conditioning in the residential and commercial sectors.
Waste and materials management	This sector includes landfills, composting, and anaerobic digestion. Landfills were the third largest source of anthropogenic methane emissions in 2021, and landfills accounted for 1.9 percent of total U.S. greenhouse gas emissions.
Wastewater	Wastewater treatment, both domestic and industrial, was the third largest anthropogenic source of N_2O emissions in 2021, accounting for 5.2 percent of national N_2O emissions and 0.3 percent of total U.S. greenhouse gas emissions.

[5] Under international GHG inventory protocols this category is called "Land use, land-use change, and forestry."

Table A4.1 Rationale for Sector Selection

Sectors Included in Inventory	Rationale for Including in GHG Inventory
	Emissions from wastewater treatment increased by 6.1 MMT CO_2e (41.6 percent) since 1990 as a result of growing U.S. population and protein consumption.

A.4.2. Decisions to be Made

Existing EPA datasets and the SIT cover categories of GHG emissions by sector and by activity or segment (e.g., electric utility combustion of natural gas). The SIT provides many default values to facilitate developing statewide estimates that are consistent with the National Inventory of GHG Emissions.[6] The Task Leader will be charged with three primary decisions under this project:

1. Determine (for each major activity estimate) if existing EPA data or the SIT default estimate for the sector/activity should be used for the statewide, baseline estimate, or should the state's estimate be derived from existing information available to the state (including other EPA datasets, state inventories, or GHGRP publications).
2. Select the baseline year for Oklahoma's statewide inventory greenhouse gas (GHG) inventory.

The project manager and state policymakers will be charged with:

3. Determine the best options for reducing emissions of air pollution and achieving the following objectives[7] under the Inflation Reduction Act:
   a. Reduce climate pollution, create good jobs, and lower energy costs for families.
   b. Accelerate work addressing environmental injustice and empowering community driven solutions in overburdened neighborhoods.
   c. Deliver cleaner air by reducing harmful air pollution in places where people live, work, play, and go to school.

A.4.3. Actions to be Taken, Action Limits, and Expected Outcomes

Existing state-level estimates prepared by the EPA, the SIT tool or MOVES 4.0 will be utilized with federal default values for each sector/activity relevant to GHG-emitting activities within the state. Actions will be limited to the GHG-emitting activities defined in the SIT or in the existing EPA estimates used by the state. Oklahoma may elect to prepare separate, independent estimates for the state's major sector/activities based on the state's existing resources to include the Oklahoma DEQ methane study data. Oklahoma DEQ expects that sectors that include major stationary sources under CAA Title V with longstanding requirements for submission of activity data and emissions estimates may be better represented in the GHG inventory based on existing data.

A.4.4. Reason for Project

[6] https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2021
[7] CPRG Program Guidance, page 4. Available at https://www.epa.gov/inflation-reduction-act/climate-pollution-reduction-grants#CPRGProgramGuidance.

The baseline GHG inventory and options analyses developed under this project will be utilized by Oklahoma DEQ and the Secretary of Energy and Environment for planning purposes to support Oklahoma's development of the following three deliverables under the CPRG Program:

- Oklahoma's **Priority Climate Action Plan** (PCAP), which is due on March 1, 2024. This plan will include near-term, implementation-ready, priority GHG reduction measures and is a prerequisite for any implementation grant.
- Oklahoma's **Comprehensive Climate Action Plan** (CCAP), which is due in 2025 (later for tribes and territories). This plan will review all sectors that are significant GHG sources or sinks and include both near- and long-term GHG emission reduction goals and strategies.
- Oklahoma's **Status Report** on progress towards goal, which is due in 2027 (not applicable to tribes or territories). This progress report will include updated analyses, plans, and next steps for key metrics.

This QAPP describes the necessary QA and QC requirements and technical activities that will be implemented to ensure the baseline GHG inventory and the sector-specific emissions reduction options are reliable for the PCAP and CCAP. As necessary, revisions to the QA and QC requirements defined in this QAPP will be updated in the 2027 Status Report.

A.4.5. Relevant Clean Air Act Mandates and Authorizations

The inventory and options analyses produced under this project will support a grant application authorized under 42 U.S.C.A. § 7437 for *Greenhouse Gas Air Pollution Plans and Implementation Grants*. The inventory and options analyses will be used to evaluate opportunities for reducing GHG emissions from all major-emitting sources including both mobile source categories and stationary source categories. This project will include the fundamental research necessary to evaluate and plan new programs (and amendments to existing Clean Air Act [CAA] programs) for reducing emissions from fossil fuel combustion activities. Many sectors and activities that will be included in the GHG inventory (and subsequent emissions reductions options analyses) include major sources of criteria and toxic pollutants. Accordingly, the purpose of this project (to evaluate and plan for reductions in GHG emissions, including reductions from usage or production of fossil fuels) is also consistent with the following statutory mandates and authorizations under Clean Air Act Title I:

- ***§ 7403. Research, investigation, training, and other activities***
  (a) Research and development program for prevention and control of air pollution
  The Administrator shall establish a national research and development program for the prevention and control of air pollution ….
    (1) conduct, and promote the coordination and acceleration of, research, investigations ... and studies related to the causes ... extent, prevention, and control of air pollution.
    (2) encourage, cooperate with, and render technical services and provide financial assistance to air pollution control agencies and other appropriate public or private agencies, institutions, and organizations, and individuals in the conduct of such activities ….
  (b) Authorized activities of Administrator in establishing research and development program
  In carrying out the provisions of [paragraph (a)] the Administrator is authorized to–
    (1) collect and make available, through publications and other appropriate means, the results of and other information, including appropriate recommendations by him in connection therewith, pertaining to such research and other activities.
    (2) make grants to air pollution control agencies ... for purposes ... in subsection (a)(1) ….

- ***§ 7404. Research related to fuels and vehicles***
  (a) Research programs; grants; ....
  The Administrator shall give special emphasis to research and development into new and improved methods, having industry-wide application, for the prevention and control of air pollution and control of air pollution resulting from the combustion of fuels... he shall–
  (1) conduct and accelerate research programs directed toward development of improved, cost-effective techniques for–
  (A) control of combustion byproducts of fuels, ...
  (B) improving efficiency of fuels combustion to decrease atmospheric emissions ....

- ***§ 7405. Grants for support of air pollution planning and control programs***
  (a) Amounts; limitations; assurances of plan development capability.
  (1)(A) The Administrator may make grants to air pollution control agencies ... in an amount up to three-fifths of the cost of implementing programs for the prevention and control of air pollution .... For the purpose of this section, "implementing" means any activity related to the planning, developing, establishing, carrying out, improving, or maintaining of such programs....
  (C) With respect to any air quality control region or portion thereof for which there is an applicable implementation plan under section 7410 ... grants under subparagraph (A) may be made only to air pollution control agencies which have substantial responsibilities for carrying out such applicable implementation plan.

A.4.6. Information Provided by the EPA under § 7403(b)(1)

Under authority of CAA § 7403(b)(1) the EPA has provided the following resources to states to ensure reliable air emissions inventories are produced to support plans for reducing emissions.:

- Agency-wide Quality Program Documents
- Quality Assurance-specific Directives
  - CIO 2105.3 – *Environmental Information Quality Policy*, April 10, 2023
  - CIO 2105-P-01.3 – *Environmental Information Quality Procedure*, March 7, 2023
  - CIO 2105-S-02.0 – EPA's Environmental Information QA Project Plan (QAPP) Standard
  - EPA Regional Sites for Quality Management Plans and Guidance:
    - Region 6
- QA Guidance
  - EPA QA/G-4 – *Guidance on Systematic Planning Using Data Quality Objectives Process*
  - EPA QA/G-5 – *Guidance for Quality Assurance Project Plans*

Oklahoma DEQ will utilize these resources, as applicable, to ensure evaluation of existing data and utilization of those data are consistent with the EPA's relevant directives and guidance.

A.5. Project Task Description

The work to be performed under this project by Oklahoma DEQ involves preparing a statewide GHG emissions inventory. Work on this task will begin within 90 days of QAPP approval by EPA. Oklahoma DEQ will download the EPA's state-level GHG data to use as the baseline GHG inventory for the state. This will serve as preliminary data for each sector. Oklahoma DEQ will review the accuracy of the data and, if necessary, recalculate and update inputs where needed. This review work and input updates will start within 120 days of QAPP approval by EPA. Oklahoma DEQ may use additional resources to complete the applicable tasks. Additional resources may include:

- EPA's State Inventory and Projection Tools (SITs)
- MOVES
- AVERT
- FLIGHT
- Oil and Gas Emissions Tool
- OK Methane Study
- EPA's Quantified Climate Action Measures Directory

As data is analyzed across all 8 sectors, the TL will monitor for key areas to focus on. After review, the inventory will be presented to the PM and used as a guide to inform emission reduction strategy decisions.

Table A5.1

Possible tasks utilizing additional resources to identify possible reduction strategies.
1. Produce a profile of mobile source emissions MOVES is a tool provided by EPA to create mobile source emission estimates for each county in the nation using county-specific input parameters. The MOVES County database contains the most recent information (e.g., fuel parameters, registration data, temperatures, etc.) for each county. Where resources permit, AQD staff may attempt to review the default estimates for MOVES inputs utilizing local (city) traffic models, and Oklahoma Department of Transportation (ODOT) traffic models and data for comparison of Vehicle Miles Traveled (VMT). Oklahoma DEQ may utilize the MOVES 4.0 emission modeling system to estimate emissions for mobile sources for CAPS, greenhouse gases, and air toxics.

2. Use the EPA's State Inventory and Projection Tool (SIT)
   at https://www.epa.gov/statelocalenergy/state-inventory-and-projection-tool. Utilize the [co2ffc-module.xlsm] for the electric power sector. Review the user's manual available using the "Consult User's Guide" button on the [Control] sheet. This tool produces GHG estimates through 2020 for the state selected on row 3 of the [Control] sheet.

3. Utilize the AVERT (Avoided Emissions and Generation Tool)
   to evaluate county, state, and regional changes in emissions from electric power plants and displaced fuel-burning vehicles resulting from energy policies and programs such as energy efficiency, renewable energy, and electric vehicles. AVERT is designed to use public data that are accessible and auditable. For the electric power sector, AVERT can help state air quality planners calculate the emissions benefits of energy policies and programs so that these emission reductions can be incorporated in Clean Air Act plans to meet National Ambient Air Quality Standards (NAAQS) and other clean air goals.

4. OK Methane Rule
   As part of the CPRG Planning Grant, DEQ plans to purchase two methane drones to conduct a study in the oil and gas sector. The data obtained from the study may be utilized as inputs into SIT and/or the National Oil and Gas Emissions Estimation Tool, and recommendations for EPA to update emission factors in GHGRP.

A.6. Information/Data Quality Objectives and Performance/Acceptance Criteria

The primary objectives for this project are to develop reliable inventories for each of the primary GHG-emitting sectors in Oklahoma and to identify options for reducing emissions from those sectors. Accordingly, all quality objectives and criteria are aligned with these primary objectives. The quality system used for this project is the joint responsibility of the Oklahoma DEQ Project Manager (PM), Task Leader (TL), and QC Coordinator. QC functions will be carried out by technical staff and will be carefully monitored by the responsible Task Leader, who will work with the QA Manager to identify and implement quality improvements. All activities performed under this project will conform to this QAPP.

A.6.1. Data Quality, Management, and Analyses

For this project, Oklahoma DEQ will use a variety of QC techniques and criteria to ensure the quality of data and analyses. Data of known and documented quality are essential components for the success of the project, as these data will be used to inform the decision-making process for Oklahoma's PCAP and CCAP as discussed in Section A.4.4 of this QAPP.

The data quality objectives and criteria for this project are accuracy, precision, bias, completeness, representativeness, and comparability. Accuracy is a measure of the overall agreement of a measurement to a known value. It includes a combination of random error (precision) and systematic error (bias). Precision is a measure of how reproducible a measurement is or how close a calculated estimate is to the actual value. Bias is a systematic error in the method of measurement or calculation. If the calculated value is consistently high or consistently low, the value is said to be biased. Our goal is to ensure that information and data generated and collected are as accurate, precise, and unbiased as possible within project constraints. Oklahoma DEQ will verify the accuracy of all data by checking for logical consistency among datasets. All existing environmental data shall meet the applicable criteria defined in CFR and associated guidance, such as the validation templates provided in the *EPA QA Handbook Volume II*.

When available, data originally gathered using published methods whose applicability, sensitivity, accuracy, and precision have been fully assessed, such as EPA reference methods, will be preferred and considered to be of acceptable quality.

For the data analysis completed under this project, analytical methods will be reviewed to ensure the approach is appropriate and calculations are accurate. Spreadsheets or Access databases will be used to store data and complete necessary analyses. Hand-entered or electronically transferred data will be checked to ensure the data are accurately transcribed and transferred.

The draft inventory will be evaluated for GHG-emitting-sector and geographic completeness. Oklahoma DEQ will utilize the framework of sectors in the EPA's SIT tool or the EPA's state-level GHG inventories to ensure that the inventory prepared under this project includes all major GHG-emitting sectors.

Representativeness is a qualitative term that expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Oklahoma DEQ will use the most complete and accurate information available to compile representative data for this project.

Data *comparability* is a qualitative term that expresses the measure of confidence that one dataset can be compared to another and can be combined for the decision(s) to be made. Oklahoma DEQ will compare datasets when available from different sources to check for the quality of the data. This QA step

will also ensure that any highly correlated datasets or indicators are identified. Supporting data, such as information on test methods used and complete test reports, are important to ensure the comparability of emissions data.

A.6.2. Document Preparation

All documents produced under this project will undergo internal QC review, as well as an editorial review, prior to submission to the EPA PO.

An editorial review of all final documents will be performed. Editors will verify clarity, spelling, and grammatical correctness, and ensure documents are free of typographical errors. Editors will verify that references are cited correctly.

A.7. Distribution List

This section presents the primary staff who will be working on the project. This section presents specific staff members who will be identifying existing[8] data resources for evaluation and potential use under the project. This section also includes all other staff who will be serving in project-specific roles for implementing the Quality Assurance Project Plan.

This QAPP will be distributed to the staff presented. Additionally, this QAPP will be provided to any unlisted staff who are assigned to perform work under this project. The signed hardcopy is maintained by the Quality Assurance Manager. Electronic copies are available to all Air Quality Division personnel at H:\AQD-QA\QAPPS\CPRG QAPP.

Oklahoma Department of Environmental Quality Personnel

Kendal Stegmann, Division Director, AQD

Angela Hughes, Program Manager, ASD

Beverly Botchlet-Smith, Assistant Director, ASD

Carrie Schroeder, Program Manager, Emissions Inventory Section, AQD

Vacant, Program Manager, Quality Assurance Section, AQD

Heather Mallory, Quality Assurance Officer, Oklahoma DEQ

[8] The term "existing data" is defined by the EPA's *Environmental Information Quality Policy* (CIO 2105.3) as "… data that have been collected, derived, stored, or reported in the past or by other parties (for a different purpose and/or using different methods and quality criteria). Sometimes referred to as data from other sources." The term "secondary data" may also be used to describe "existing data" in historical EPA quality-related documents.

A.8. Project Organization

The primary personnel responsible for implementation of this project are the Oklahoma DEQ Project Manager (PM), Quality Assurance Manager (QAM), Quality Control Coordinator (QC Coordinator or QCC), and a Task Leader (TL). Their duties are outlined briefly in this section.

Angela Hughes is the Oklahoma DEQ PM and will provide senior-level oversight as needed. The PM is responsible for Oklahoma DEQ's technical and financial performance as well as maintaining communications with the EPA to ensure mutual understanding of grant requirements, EPA expectations, and conformity with EPA quality procedures; managing oversight and conduct of project activities including allocation of resources to specific tasks; ensuring that quality procedures are incorporated into all aspects of the project; developing, conducting, and/or overseeing QA plans as necessary; ensuring that any corrective actions are implemented; operating project activities within the documented and approved Quality Assurance Project Plan; and ensuring that all products delivered to the EPA are of specified type, quantity, and quality.

The Oklahoma DEQ PM will assign a TL, as listed on **Exhibit 1.1,** to oversee all the technical tasks with instructions to complete a baseline emissions inventory for the sector(s) and to develop select sector-specific options for potential emissions reduction projects including estimates of the potential reductions under each selected option. The TL will be responsible for day-to-day task-level activities including planning, reporting, and controlling of technical and financial resources allocated to the task by the PM. Accordingly, the TL is primarily responsible for implementing the Quality Program and this Quality Assurance Project Plan on task-level assignments.

Task-level management system. For all major tasks, the assigned TL will review all QA-related plans and reports. The TL will discuss any concerns about quality or any proposed revisions to task-level QAPP content with the QA Manager to identify, resolve, or preclude problems or to amend task-level plans, if necessary. The TL is responsible for overseeing task-level work performed by technical staff and providing assurance that all required QA/QC procedures are being implemented.

Project-level management system. The PM will maintain close communications with the TL and ensure any difficulties encountered or proposed changes at the task level are reviewed for implications on other similar or related tasks. The PM is also responsible for communicating progress or difficulties encountered (across all tasks) to the EPA PO or POR, who provides EPA's primary oversight function for this project at EPA OAR/ EPA Region Six and is responsible for review and approval of this QAPP and any future revisions.

The Oklahoma DEQ Quality Assurance Officer, Heather Mallory, is responsible for approving this QAPP, overseeing the program quality system, monitoring, and facilitating QA activities on tasks, and generally helping the Oklahoma DEQ PM and TLs understand and comply with EPA QA requirements.

The QA Manager is responsible for overseeing the program quality system, monitoring, and facilitating QA activities on tasks, and generally helping the Oklahoma DEQ PM and TL understand and comply with EPA QA requirements. For each task under this project, the QAM is supported by the QC Coordinator, who will assist in the implementation of the quality system. The QAM will work closely with the PM and QCC to improve any deficiencies identified during the project. The QA Manager has authority to access and discuss quality-related issues with their organization's senior manager as needed.

The QC Coordinator (QCC), Michelle Horn, is responsible for assisting the PM and TL in planning, documenting, and implementing the QA requirements for this project and preparing this QAPP for approval. The QCC will report to the TL and the QAM, as needed, on quality issues.

Additionally, QC functions will be carried out by other technical staff and monitored by the TL, who will work with the QA Manager and QCC to oversee this plan and implement quality improvements. The TL will ensure that technical staff do not review work in a QA capacity for which they were a primary or contributing author.

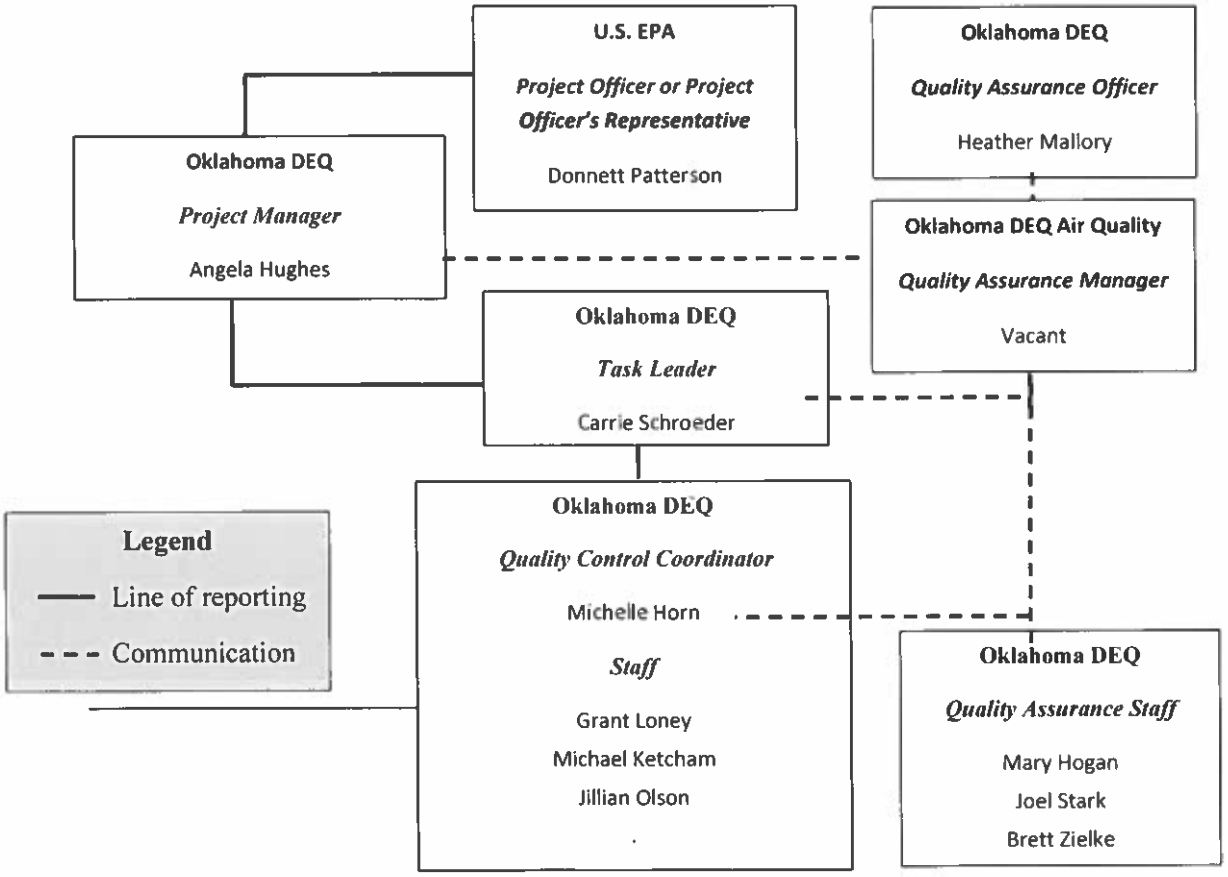
A.9. Project Quality Assurance Manager Independence

The Quality Assurance Manager is employed in Oklahoma DEQ's Quality Assurance Section, which is in a separate section from Oklahoma DEQ's Emissions Inventory Section. The project QAM and Quality Assurance section is independent of the unit generating the data and remains outside of any sub-group that collects and/or uses environmental data directly. The project QAM reports directly to the Oklahoma DEQ Air Quality Division Assistant Division Director, who is not functionally involved in environmental information operations. The Project Manager or designee will not have authority to sign QAPPs for the QAM or designee, nor will the QAM or designee have authority to sign QAPPs for the Operations Manager or designee.

A.10. Project Organization Chart and Communications

Exhibit 1.1 presents the organizational chart.

Exhibit 1.1 Oklahoma DEQ Project Organization[9]



A.11. Personnel Training / Certifications

All Oklahoma DEQ staff assigned to work on this project shall have appropriate technical and QA training to properly perform their assignments. Oklahoma DEQ staff serving in QAM or QCC roles under this project will have completed a training course on QA/QC activities similar to the course available at https://www.epa.gov/quality/training-courses-quality-assurance-and-quality-control-activities. The TL, technical staff, and quality assurance staff under this project will have completed an online training course on air emissions inventory on the Air Knowledge website at https://airknowledge.gov/EMIS-SI.html. All Quality Assurance section staff members have completed the online EPA Region 6 Quality Assurance training as of 2023. Quality Assurance staff training is documented through completion certificates from the EPA Region 6 Quality Assurance training and Air Knowledge courses. All completed quality assurance section training records are documented and maintained in H:\AQD-QA\Training Documents\QA Staff Training Records. The EI section staff's completed training records will be maintained by the individuals within Workday and available to management upon request. Staff viewed the CPRG Training Webinars at https://www.epa.gov/inflation-reduction-act/cprg-training-tools-and-technical-assistance. If resources allow, technical staff will participate in the CPRG Technical Assistance Forum(s). Technical staff utilizing MOVES 4.0, will complete MOVES 4.0 training.

If training is required for new staff for segments of the GHG inventory, the TL will identify available training resources for the inventory segment, verify completeness and incorporate the required training into the project schedule.

A.12. Documents and Records

Oklahoma DEQ will document QC activities for this project in an electronic format which is under development. The TL is responsible for ensuring that any future copies of completed QC documentation records, along with other QA records (including this QAPP), will be maintained in the project files.

The types of documents and activities for which QC will be conducted and documented may include raw data, data from other sources such as data bases or literature, data entry into the SIT tool, calculations necessary to transform raw data into forms required for SIT entry, and comparisons of primary estimates with QC estimates.

Tables of electronically submitted data, as well as associated instructions, interfaces and metadata are electronically archived and maintained for a minimum of 5 years.

Oklahoma DEQ has developed and instituted document control mechanisms for the review, revision, and distribution of QAPPs. Each QAPP has a signed approval form, title page, table of contents, and a document control format that conforms to EPA's Environmental Information QAPP Standard; see header at top of the page. During the project, any revision to the QAPP will be circulated to everyone on the distribution list, as well as to any additional staff supporting this project. Any revision to the QAPP will be documented in a QAPP addendum, approved by the same signatories to this QAPP, and circulated to everyone on the distribution list by the QAM.

B. Implementing Environmental Information Operations (Group B)

B.1. Identification of Project Environmental Information Operation

This QAPP was developed utilizing the Climate Pollution Reduction Grants Program: Optional Template for QA Project Plans provided by the EPA Office of Air and Radiation. Existing data will be utilized to develop a GHG inventory.

B.1.1. Need and Intended Use of Data Used

A wide range of data for a diverse set of GHG-emitting activities is necessary to prepare a statewide inventory. Existing data resource may include sector-specific or facility-specific GHG emissions estimates, emissions factors, or activity data for use with emissions factors. The experimental design for this inventory project relies on the EPA's State Inventory Tool (SIT) together with independent estimates prepared by Oklahoma DEQ. The SIT allows for expedited estimates for many sectors with default entries included in the tool. Existing data resources from previously completed inventories -may be utilized to develop GHG emissions estimates that are comparable to the SIT estimates. Subsequently, the SIT estimates for each sector would be compared to any independent state estimate utilized for the statewide inventory if created.

B.1.2. Identification of Data Sources and Acquisition

In addition to the data integrated into the EPA's SIT tool, the following data sources may be utilized to develop estimates for the major-emitting sectors in Oklahoma:

- Activity data for electricity generators published by the U.S. Department of Energy (DOE) under EIA Form 923.
- Data published by the EPA under the Greenhouse Gas Reporting Program.
- The EPA's SIT tool is expected to be the primary source for this task.
- The EPA's National Emissions Inventory (NEI)
- OK Methane Study – intended for refining estimates
- Emissions inventories collected directly from the reporting facility.

<u>Area Sources</u>

- Oklahoma Corporation Commission reports on oil and gas production, and gasoline sales tax receipts for use in estimating fueling emissions and UST breathing losses
- Census Bureau statistics for use with per capita emission factors
- Toxic Release Inventory Data for compilation of inventory sources
- State and County Highway Department Records on lane painting and asphalting operations
- Airport aviation fuel sales reports for estimating emissions from aircraft refueling
- RCRA source lists on municipal waste landfills
- U.S. Forest Service and Oklahoma Department of Wildlife documents on wildfire statistics and prescribed burns
- U.S. Bureau of Alcohol, Tobacco and Firearms production data for breweries, wineries, and distilleries
- U.S. and Oklahoma Department of Agriculture reports for estimating agricultural emissions (pesticides, ammonia fertilizer, etc.)
- Accidental Release Reports from other media at Oklahoma DEQ
- Labor Department for employment statistics for emission factors
- CenSARA (Central States Air Resource Agencies) engaged contractors.

On-Road Mobile Sources

- Federal Highway Administration Highway Performance Monitoring System Vehicular Miles Traveled Data
- Oklahoma Department of Transportation link-level activity and speed data
- Local (city and county) traffic counts and models
- National Institute of Petroleum and Energy Research (NIPER) reports on fuel volatility (RVP)

Non-Road Mobile Sources

- Federal Aviation Administration (FAA) Air Traffic Activity Data Systems reports
- Bureau of Transportation Statistics reports for taxi/idle times
- U.S. Air Force activity and emissions data (military aircraft)
- U.S. Department of Transportation Maritime Administration (MARAD) statistics
- McClellan-Kerr Arkansas River Navigation System tonnage and river mileage reports
- Association of American Railroads (AAR) data and statistics

In addition to the above data sources, additional data (notably, meteorological data) may be acquired from EPA approved sources, or other reputable governmental or commercial sources.

B.2. Methods for Environmental Information Acquisition

All environmental information operations conducted on this project will involve existing, non-direct measurement data. All existing data received will be reviewed by a technical member to assess data quality and completeness before their use.

Consistent with the EPA's QA requirements, this QAPP describes the procedures that will be used to ensure the selection of appropriate data and information to support the goals and objectives of this project. Specific elements addressed by this QAPP include:

- Identifying the sources of existing data,
- Presenting the hierarchy for data selection,
- Describing the review process and data quality criteria,
- Discussing quality checks and procedures should errors be identified
- **Table B2** presents an example hierarchy for data quality when identifying and reviewing available sources of data and information.

Secondary data must be reliable and suitable for the purpose of developing inventories. If reliable and suitable data is unavailable, national, or approved model defaults may be used. When resources permit, sources of secondary data to be used may include the following:

Table B2 Existing Data Quality Ranking Hierarchy

Quality Rank	Source Type
Highest	Federal, state, and local government agencies
Second	Consultant reports for state and local government agencies
Third	NGO studies; peer-reviewed journal articles; trade journal articles; conference proceedings
Fourth	Conference proceedings and other trade literature: non-peer-reviewed
Fifth	Individual estimates (e.g., via personal communication with vendors)

B.2.1. Criteria for Accepting Existing Data for Intended Use

Under this project, Oklahoma DEQ will identify, evaluate, and utilize existing data resources[10] to develop a statewide inventory of the major sources of greenhouse gas (GHG) emissions within Oklahoma. If additional, new data is obtained, the criteria for determining whether additional data are acceptable for use in developing the statewide inventory will be based on a comparison of the associated emissions estimate to the default emissions estimate produced using the EPA's SIT. While some

[10] EPA, *Environmental Information Quality Policy*, CIO 2105.3, 03/07/2023 (p. 8) provides common examples of environmental information used to support the EPA's mission at https://www.epa.gov/system/files/documents/2023-04/environmental_information_quality_policy.pdf.

differences between the state's calculations and SIT calculations are expected, differences of more than 20 % must be accompanied by an explanation subject to approval by the EPA prior to using the state's estimate in lieu of the SIT estimate.

B.2.2. Criteria for Options Identification in Planning Phase

The criteria for reviewing all activities under each task and identifying the best options for emissions reductions will be based on the following criteria[11] in the EPA's CPRG program guidance:

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

[11] CPRG Program Guidance, page 4. Available at https://www.epa.gov/inflation-reduction-act/climate-pollution-reduction-grants#CPRGProgramGuidance.

B.3. Integrity of Environmental Information

The approved Emissions Inventory QAPP included in Appendix B, approved on May 15, 2023, covers the QA details related to collecting and managing emission inventories. Data handling procedures and programs utilized are outlined in Section 6.2 of the included Emissions Inventory QAPP.

B.4. Quality Control

All environmental information operations conducted for this project will involve existing, non-direct measurement data. All data received will be reviewed by a technical staff member on a quarterly schedule to assess data quality and completeness before their use. The reviewer will evaluate the approach to ensure the methods are appropriate and have been applied correctly to the analysis. Any data entry and calculation errors will be identified and corrected. Data tables prepared for the draft and final reports will be checked against the spreadsheets used to store the data and complete the analysis.

Detailed documentation of QC activities for a specific task or subtask will be maintained using a spreadsheet form. This form will document the completion of the QC techniques planned for use on this project as determined. One or more completed versions of these forms, as necessary, will be maintained in the project files. The types of documents and activities for which QC will be conducted and documented may include raw data, data from other sources such as data bases or literature, data entry into the SIT tool, calculations necessary to transform raw data into forms required for SIT entry, and comparisons of primary estimates with QC estimates.

Where calculations are required to assess the data/datasets, calculations will be performed using computer spreadsheets and calculators to reduce typographical or translation errors–mathematical/ statistical calculations are performed using spreadsheets or software programs with predefined formulas and functions. Oklahoma DEQ will ensure that any manipulations performed on the data/dataset were done correctly.

B.5. Instrument/Equipment Calibration, Testing, Inspection, and Maintenance

All environmental information operations conducted on this project will involve existing, non-direct measurement data so no equipment calibration, testing, inspection, or maintenance operations apply to this project Quality Assurance Project Plan.

B.6. Inspection/Acceptance of Supplies and Services

All environmental information operations conducted on this project will involve existing, non-direct measurement data so no supplies or contract services will be utilized in this project Quality Assurance Project Plan.

B.7. Environmental Information Management

Data management procedures include file storage and file transfer. All CPRG project and data files will be stored on agency drives which are maintained by the Oklahoma Office of Management and Enterprise Services. Files will be organized and maintained by the TL in folders, including a system of file labeling to ensure version control. Any files containing confidential business information will be stored on paper by Central Records or the Emissions Inventory CBI file storage.

The Quality Assurance Section provides quality assurance guidance and oversight of the QAPP.

All files will be backed up regularly to avoid loss of data. Data are stored in various formats that correspond to the software being used. Record retention times will follow Oklahoma DEQ practices for storing materials at least 5 years after the end of the period of performance. Should the grant specify a specific method of disposition (e.g., transfer to the client), Oklahoma DEQ will comply with that directive. As noted above, Oklahoma DEQ has developed a file naming convention/nomenclature for electronic file tracking and record keeping. For those records and files gathered or provided to Oklahoma DEQ, the filename may include the identification of "original" in its filename.

Filenames of draft versions will follow an incremental numbering system. More specifically, each successive draft of a document is numbered sequentially from version 1, 2, 3… until a final version is complete.

In the event data retrieval is requested and to prevent loss of data, all draft and final file versions will be retained electronically—that is, superseded versions will not be deleted.

For this project, it is not anticipated that any special data validation software will be required. General software used by the emissions inventory staff are the Microsoft Office Suite including Excel, PowerPoint, Power BI, Access, and Word, and Tableau, which will be sufficient to perform the work as described in Section A.5 for this project.

C. Assessment, Response Actions and Oversight (Group C)

Oklahoma DEQ is committed to preparing a comprehensive and reliable inventory of GHG emissions from Oklahoma. Under this project our senior management team has dedicated the necessary resources to ensure we deliver an inventory that can be relied upon for future policy decisions. Accordingly, under this project, we will concurrently implement existing quality management systems that Oklahoma DEQ has previously utilized for submissions to the EPA under Title I of the Act where task-level deliverables will be subjected to regular reviews to ensure that technical, financial, and schedule requirements of this project are consistent with the EPA PO's and QAM's expectations. This section discusses Elements C.1 (assessments and response actions) and C.2 (reporting) applicable to this project.

C.1. Assessments and Response Actions

The QA program includes periodic review of data files and draft deliverables. The essential steps in the QA program are as follows:

1. Identify and define the problem
2. Assign responsibility for investigating the problem
3. Investigate and determine the cause of the problem
4. Assign and accept responsibility for implementing appropriate corrective actions
5. Establish the effectiveness of and implement the corrective action
6. Verify that the corrective action has eliminated the problem.

The TL will provide day-to-day oversight of the quality system. Complex emission estimation calculations may be referred to the AQD Engineering staff for review and verification. The QC Coordinator can carry out file reviews to verify that required records, documentation, and technical review information are maintained in the files. The QC Coordinator will ensure that problems found during the review are brought to the attention of the Task Leader and are corrected immediately. All nonconforming data will be noted, and corrective measures to bring nonconforming data into conformance will be recorded.

The TLs and QA Manager are responsible for determining whether the quality system established for the project is appropriate and functioning in a manner that ensures the integrity of all work products. All technical staff have roles and will participate in the corrective action process. Corrective actions for errors found during QC checks will be determined by the TL and, if necessary, with the QA Manager. The originator of the work will make the corrections. Deficiencies identified and their resolution will be documented in periodic project reports, as applicable. The QA Manager and TL will comply and respond to all internal and EPA audits on the project, as needed.

C.2. Oversight and Reports to Management

The periodic progress reports (to the EPA PO) required in the grant agreement will be reviewed by the PM to ensure the project is meeting milestones and that the resources committed to the project are sufficient to meet project objectives. These periodic progress reports will describe the status of the project, accomplishments during the reporting period, activities planned for the next period, and any special problems or events including any QA/QC issues. Any QC issues impacting the quality of a deliverable, the project budget, or schedule will be identified and promptly discussed with the TL and the PM or QCC as appropriate. Reports to the EPA will be drafted by the TL or other project staff familiar with project activities during the reporting period and submitted through the PM for submission. Most reports will be electronically transmitted to EPA, and if necessary, submitted through the mail.

D. Environmental Information Review and Usability Determination (Group D)

D.1. Environmental Information Review

All work conducted under this project will be subject to technical and editorial review. When existing data for the same GHG-emitting activity are available from multiple sources, the background information documents will be reviewed for all sources to determine the dataset that is the most representative of operations in the state. Additionally, the inventory report will include the vintage of the existing data resource and preference will be given to the most recent dataset that is representative of similar GHG-emitting activities in the state. The quality of data used and generated for the project will be conducted by the Oklahoma DEQ technical staff with specific, applicable expertise. All original and modified data files will be reviewed for input, handling, and calculation errors. Additionally, all units of measure will be checked for consistency. Any potential issues identified through this review process will be evaluated and, if necessary, data will be corrected, and analysis will be revised as necessary, using corrected data. These corrections will be documented in project records.

D1.1 Verification and Validation Methods

As a standard operating procedure, all data (retrieved and generated) will be verified and validated through a review of data files by the Oklahoma DEQ TL and technical staff.

The technical staff is responsible for day-to-day technical activities of tasks, including planning, data gathering, documentation, and reporting, The TL is the primary person responsible for quality of work on tasks under this project and will approve all-related plans and reports.

Source data will be verified and validated through a review of data files by the technical staff. Reviews of analyses will include a thorough evaluation of content and calculated values. Any potential issues identified through this review process will be evaluated, errors corrected, and analysis repeated using the corrected data.

Typical data verification reviews can include checks of the following:

- Data sources are clearly documented,
- Calculations are appropriately documented,
- All relevant assumptions are clearly documented,
- Conclusions are relevant and supported by results, and
- Text is well-written and easy to understand.

As discussed in Section A.6, QC objectives include verification that data in database tables are stored and transferred correctly, algorithms call data correctly, units are internally consistent, and reports pull the required data. These data management issues will be addressed as part of the QC checks of data acquisition and document preparation.

For this project, it is not anticipated that any special data validation software will be required. General software used by the emissions inventory staff are the Microsoft Office Suite including Excel, PowerPoint, Power BI, Access, and Word, and Tableau, which will be sufficient to perform the work as described in Section A.5 for this project.

D.2. Useability Determination

All data (retrieved and generated) and deliverables in this project will be analyzed and reconciled with project data quality requirements. To ensure deliverables meet user requirements, the TL will review all data and deliverables throughout the project to ensure that the data, methodologies, and tools used meet data quality objectives, are clearly conveyed, and represent sound and established science.

The TL will evaluate data continuously during the life term of the project to ensure they are of sufficient quality and quantity to meet the project goals. Data that is found to be insufficient for use will be transferred and stored in files designated as such. Usable, quality data will be included the greenhouse gas emissions calculation tool files. Prior to submission of draft and final products, the TL will make a final assessment to determine whether the objectives have been fulfilled in a technically sound manner. Assumptions made in preparing project analyses will be clearly specified in the inventory.

E. References

EIA, Form 923 at https://www.eia.gov/electricity/data/eia923/. Accessed on 7/26/2023.

EPA, *Chief Information Officer's Policy Directive on Information Technology / Information Management: Quality Assurance Project Plan (QAPP) Standard*, Directive # CIO 2105-S-02.0. Available at https://www.epa.gov/irmpoli8/quality-assurance-project-plan-qapp-standard. Accessed on 7/24/2023.

EPA, EPA-454/B-17-001, *Quality Assurance Handbook for Air Pollution Measurement Systems, Ambient Air Quality Monitoring Program, Volume II*. Available at https://www3.epa.gov/ttnamti1/files/ambient/pm25/qa/Final%20Handbook%20Document%201_17.pdf. Accessed on 6/23/2023.

EPA, *GHGRP State and Tribal Fact Sheet*. Available at https://www.epa.gov/ghgreporting/ghgrp-state-and-tribal-fact-sheet. Accessed on 6/23/2023.

EPA, *Chief Information Officer's Policy Directive on Environmental Information Quality Policy* available at EPA IT/IM Directive: Environmental Information Quality Policy, Directive # CIO 2105.3. Accessed on 7/26/2023.

EPA, *State GHG Emissions and Removals*. Available at https://www.epa.gov/ghgemissions/state-ghg-emissions-and-removals. Accessed on 6/23/2023.

EPA, *State Inventory and Projection Tool* at https://www.epa.gov/statelocalenergy/state-inventory-and-projection-tool. Accessed on 7/26/2023.

EPA, Greenhouse Gas Reporting Program (GHGRP) at https://www.epa.gov/ghgreporting/data-sets. Accessed on 7/26/2023.

EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2021* at https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2021. Accessed on 7/26/2023.

EPA, *State and Tribal Greenhouse Gas Data and Resources* at https://www.epa.gov/ghgemissions/state-and-tribal-greenhouse-gas-data-and-resources. Accessed on 7/26/2023.

EPA, Fuel heating values and CO2 emission factors at eCFR :: 40 CFR Part 98 -- Mandatory Greenhouse Gas Reporting. Accessed on 7/26/2023.

EPA, Global warming potentials at https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-98/subpart-A?toc=1. Accessed on 7/26/2023.

USDA Forest Service, *Greenhouse gas emissions and removals from forest land, woodlands, and urban trees in the United States, 1990-2019* at https://www.fs.usda.gov/research/treesearch/62418. Accessed on 7/26/2023.

US DOT, *Highway Statistics Series* at https://www.fhwa.dot.gov/policyinformation/statistics/2021/vm1.cfm . Accessed on 7/26/2023.

Appendix A: Check Lists of Quality Control Activities for Deliverables

<table>
<tr><th>Tasks and Deliverables</th><th>Quality Control Procedures</th></tr>
<tr><td colspan="2">Transportation Sector GHG Inventory (Mobile Sources)</td></tr>
<tr><td>Statewide tabular inventory of GHG emissions from mobile sources with narrative report describing data sources, methodology, and documentation of QAPP implementation.</td><td>1. Comparison of (a) statewide inventory versus (b) statewide inventory developed using the EPA's State Inventory Tool (SIT).
2. For any values used in state inventory inconsistent with values calculated using the SIT, the table below will be utilized to assess precision and bias of the statewide inventory versus SIT estimates:
<table><tr><th>Transportation Fuel</th><th>State Estimate</th><th>Federal Estimate</th><th>Statistics*</th></tr><tr><td>Aviation Gasoline</td><td></td><td></td><td rowspan="11"></td></tr><tr><td>Distillate Fuel</td><td></td><td></td></tr><tr><td>Ethanol</td><td></td><td></td></tr><tr><td>Jet Fuel, Kerosene</td><td></td><td></td></tr><tr><td>Jet Fuel, Naphtha</td><td></td><td></td></tr><tr><td>Hydrocarbon Gas Liquids</td><td></td><td></td></tr><tr><td>Lubricants</td><td></td><td></td></tr><tr><td>Motor Gasoline</td><td></td><td></td></tr><tr><td>Natural Gas</td><td></td><td></td></tr><tr><td>Residual Fuel</td><td></td><td></td></tr><tr><td>Other</td><td></td><td></td></tr></table>* Precision and bias calculations will be in accordance with the EPA's Data Assessment Statistical Calculator (DASC) Tool available at https://www.epa.gov/sites/default/files/2020-10/dasc_11_3_17.xls with the state's estimate taken as the measured value and the SIT value taken as the audit value.
3. Review by TL—analytical methods and results are explained clearly, technical terms are defined, conclusions are reasonable based on information presented, and level of technical detail is appropriate.
4. Editor review—writing is clear, free of grammatical and typographical errors.</td></tr>
</table>

<table>
<tr><th>Tasks and Deliverables</th><th>Quality Control Procedures</th></tr>
<tr><td colspan="2">Electric Power Generation and Consumption</td></tr>
<tr><td>Statewide tabular inventory of GHG emissions from electric power generation with narrative report describing data sources, methodology, and documentation of QAPP implementation.</td><td>
1. Comparison of (a) statewide inventory versus (b) statewide federal estimate developed by the EPA.

2. For any values in the state inventory that are significantly different from federal estimates, the table below will be utilized to assess precision and bias of the state's estimate versus the federal estimate:

<table>
<tr><th>Electric Power Fuel</th><th>State Estimate</th><th>Federal Estimate</th><th>Statistics*</th></tr>
<tr><td>Coal</td><td></td><td></td><td rowspan="7"></td></tr>
<tr><td>Distillate Fuel</td><td></td><td></td></tr>
<tr><td>Natural Gas</td><td></td><td></td></tr>
<tr><td>Petroleum Coke</td><td></td><td></td></tr>
<tr><td>Residual Fuel</td><td></td><td></td></tr>
<tr><td>Wood</td><td></td><td></td></tr>
<tr><td>Other</td><td></td><td></td></tr>
</table>
* Precision and bias calculations will be in accordance with the EPA's Data Assessment Statistical Calculator (DASC) Tool available at https://www.epa.gov/sites/default/files/2020-10/dasc_11_3_17.xls with the state's estimate taken as the measured value and the SIT value taken as the audit value.

Ensure the GWPs used for the state estimate and the federal estimate are on the same basis. For example, the SIT tool uses AR5 GWP (e.g., methane GWP = 28).

3. Technical review of methods, calculations, and underlying datasets—data are appropriate for intended use, data are complete and representative and current, data sources documented, analytical methods are appropriate, and calculations are accurate.

4. Review by TL—analytical methods and results are explained clearly, technical terms are defined, conclusions are reasonable based on information presented, and level of technical detail is appropriate)

5. Editor review—writing is clear, free of grammatical and typographical errors.
</td></tr>
</table>

<table>
<tr><th>Tasks and Deliverables</th><th>Quality Control Procedures</th></tr>
<tr><td colspan="2">Natural and Working Lands and Forestry</td></tr>
<tr><td>Statewide tabular inventory of GHG emissions and sinks from natural and working lands and forestry with narrative report describing data sources, methodology, and documentation of QAPP implementation.</td><td>
1. Comparison of (a) statewide inventory versus (b) statewide inventory developed using the EPA's State Inventory Tool (SIT).

2. For any values used in state inventory inconsistent with values calculated using the SIT, the table below will be utilized to assess precision and bias of the statewide inventory versus SIT estimates:
<table>
<tr><th>Natural and Working Lands and Forestry Component</th><th>State Estimate</th><th>SIT Estimate</th><th>Statistics*</th></tr>
<tr><td>Net Forest Carbon Flux</td><td></td><td></td><td rowspan="7"></td></tr>
<tr><td>Urban Trees</td><td></td><td></td></tr>
<tr><td>Landfilled Yard Trimmings Food Scraps</td><td></td><td></td></tr>
<tr><td>Forest Fires</td><td></td><td></td></tr>
<tr><td>N_2O from Settlement Soils</td><td></td><td></td></tr>
<tr><td>Agricultural Soil Carbon Flux</td><td></td><td></td></tr>
<tr><td>Other</td><td></td><td></td></tr>
</table>
* Precision and bias calculations will be in accordance with the EPA's Data Assessment Statistical Calculator (DASC) Tool available at https://www.epa.gov/sites/default/files/2020-10/dasc_11_3_17.xls with the state's estimate taken as the measured value and the SIT value taken as the audit value.

3. Technical review of methods, calculations, and underlying datasets—data are appropriate for intended use, data are complete and representative and current, data sources documented, analytical methods are appropriate, and calculations are accurate.

4. Review by TL—analytical methods and results are explained clearly, technical terms are defined, conclusions are reasonable based on information presented, and level of technical detail is appropriate)

5. Editor review—writing is clear, free of grammatical and typographical errors.
</td></tr>
</table>

Tasks and Deliverables	Quality Control Procedures
State Inventory of GHG Emissions from Other Major Sectors	
Statewide tabular inventory of GHG emissions from the state's major industrial, sources with narrative report describing data sources, methodology, and documentation of QAPP implementation.	1. Comparison of (a) statewide inventory *versus* (b) statewide inventory developed using the EPA's State Inventory Tool (SIT). 2. For any values used in state inventory inconsistent with values calculated using the SIT, the table below will be utilized to assess precision and bias of the statewide inventory versus SIT estimates:

Fuels and Feedstocks for Other Major Sectors	State Estimate	SIT Estimate	Statistics*
Asphalt and Road Oil			
Aviation Gasoline Blending Components			
Coal			
Coking Coal			
Crude Oil			
Distillate Fuel			
Feedstocks, Naphtha less than 401 F			
Feedstocks, Other Oils greater than 401 F			
Hydrocarbon Gas Liquids			
Kerosene			
Lubricants			
Misc. Petro Products			
Motor Gasoline			
Motor Gasoline Blending Components			
Natural Gas			
Pentanes Plus			
Petroleum Coke			
Residual Fuel			
Special Naphthas			
Still Gas			
Unfinished Oils			
Waxes			
Wood			
Other			

*** Precision and bias calculations will be in accordance with the EPA's Data Assessment Statistical Calculator (DASC) Tool available at https://www.epa.gov/sites/default/files/2020-10/dasc_11_3_17.xls with the state's estimate taken as the measured value and the SIT value taken as the audit value.**

3. Technical review of methods, calculations, and underlying datasets—data are appropriate for intended use, data are complete and representative and current, data sources documented, analytical methods are appropriate, and calculations are accurate.
4. Review by TL—analytical methods and results are explained clearly, technical terms are defined, conclusions are reasonable based on information presented, and level of detail appropriate.
5. Editor review: writing is clear, free of grammatical and typographical errors.

Tasks and Deliverables	Quality Control Procedures
State Inventory of GHG Emissions from Minor Sectors	
Statewide tabular inventory of GHG emissions from the state's minor sectors with narrative report describing data sources, methodology, and documentation of QAPP implementation.	1. Comparison of (a) statewide inventory *versus* (b) statewide inventory developed using the EPA's State Inventory Tool (SIT). 2. For any values used in state inventory inconsistent with values calculated using the SIT, the table below will be utilized to assess precision and bias of the statewide inventory for minor sectors versus SIT estimates:

Fuels and Feedstocks for Other Major Sectors	State Estimate	SIT Estimate	Statistics*
Asphalt and Road Oil			
Aviation Gasoline Blending Components			
Coal			
Coking Coal			
Crude Oil			
Distillate Fuel			
Feedstocks, Naphtha less than 401 F			
Feedstocks, Other Oils greater than 401 F			
Hydrocarbon Gas Liquids			
Kerosene			
Lubricants			
Misc. Petro Products			
Motor Gasoline			
Motor Gasoline Blending Components			
Natural Gas			
Pentanes Plus			
Petroleum Coke			
Residual Fuel			
Special Naphthas			
Still Gas			
Unfinished Oils			
Waxes			
Wood			
Other			

*** Precision and bias calculations will be in accordance with the EPA's Data Assessment Statistical Calculator (DASC) Tool available at https://www.epa.gov/sites/default/files/2020-10/dasc_11_3_17.xls with the state's estimate taken as the measured value and the SIT value taken as the audit value.**

3. Technical review of methods, calculations, and underlying datasets—data are appropriate for intended use, data are complete and representative and current, data sources documented, analytical methods are appropriate, and calculations are accurate.
4. Review by TL—analytical methods and results are explained clearly, technical terms are defined, conclusions are reasonable based on information presented, and level of detail appropriate.
5. Editor review: writing is clear, free of grammatical and typographical errors.

Appendix B: Oklahoma DEQ EI QAPP 2023

Attachment 1: Example Electric Power Generation Calculations

A	B	C	D	E	F	G	H	I
Fuel Type Code (EIA 923 RY2020)	**Fuel Description (EIA 923 - RY2020)**	**Example Totals for <State> (million Btu) (EIA 923 - RY2020)**	**CO_2 Emission Factors from 40 CFR Part 98 Table C-1 (kg CO2/MMBtu)**	**CO_2 Emission Factors from 40 CFR Part 98 Table C-1 (kg CH4/MMBtu) (GWP = 25)**	**CO_2 Emission Factors from 40 CFR Part 98 Table C-1 (kg N2O/MMBtu) (GWP = 298)**	**Million Metric Tons CO2e (C x D/1E09) + (C x E/1E09 x 25) + (C x F/1E09 x 298)**	**Biogenic Fraction**	**Million Metric Tons CO2e (Fossil Fuels) (G x (1 - H))**
RC	Refined Coal	242,793,769	97.72	1.10E-02	1.60E-03	23.9	0.0	23.9
WND	Wind	119,527,994	0	0	0	-	0.0	-
LIG	Lignite Coal	34,262,743	97.72	1.10E-02	1.60E-03	3.37	0.0	3.37
WAT	Water at a Conventional Hydroelectric Turbine and …	21,482,613	0	0	0	-	0.0	-
NG	Natural Gas	19,013,998	53.06	1.00E-03	1.00E-04	1.01	0.0	1.01
OG	Other Gas	4,806,398	59.00	3.00E-03	6.00E-04	0.285	0.0	0.285
SUB	Subbituminous Coal	4,022,998	97.17	1.10E-02	1.60E-03	0.394	0.0	0.394
DFO	Distillate Fuel Oil. Including diesel, No. 1, No. 2, and No. 4	359,607	73.96	3.00E-03	6.00E-04	0.0267	0.0	0.0267
WH	Waste Heat not directly attributed to fuel	260,390	0	0	0	-	0.0	-
TDF	Tire-derived Fuels	111,264	85.97	1.10E-02	1.60E-03	0.00965	0.24	0.00733
AB	Agricultural By-Products	36,456	118.17	3.20E-02	4.20E-03	0.00438	1.000	
PG	Gaseous Propane	4,438	61.46	3.00E-03	6.00E-04	0.000274	0.0	0.000274
RFO	Residual Fuel Oil Includes No. 5 & 6 and bunker C…	-	75.1	3.00E-03	6.00E-04	-	0.0	-
WO	Waste/Other Oil. Including crude oil, liquid butane, liquid propane, naphtha, oil waste …	-	74	3.00E-03	6.00E-04	-	0.0	-

A	B	C	D	E	F	G	H	I
Fuel Type Code (EIA 923 RY2020)	**Fuel Description (EIA 923 - RY2020)**	**Example Totals for <State> (million Btu) (EIA 923 - RY2020)**	**CO_2 Emission Factors from 40 CFR Part 98 Table C-1 (kg CO2/MMBtu)**	**CO_2 Emission Factors from 40 CFR Part 98 Table C-1 (kg CH4/MMBtu) (GWP = 25)**	**CO_2 Emission Factors from 40 CFR Part 98 Table C-1 (kg N2O/MMBtu) (GWP = 298)**	**Million Metric Tons CO2e (C x D/1E09) + (C x E/1E09 x 25) + (C x F/1E09 x 298)**	**Biogenic Fraction**	**Million Metric Tons CO2e (Fossil Fuels) (G x (1 - H))**
Fossil Fuel Total								**29.0**

Appendix B Oklahoma Greenhouse Gas Emissions Inventory

Table 19. Oklahoma GHG Emissions in MMT CO_2e by Sector - Full Data

Sector/Source	2019
Transportation	**30.88**
CO_2 from Fossil Fuel Combustion	30.05
Substitution of Ozone Depleting Substances	0.48
Mobile Combustion	0.20
Non-Energy Use of Fuels	0.15
Electric Power Industry	**28.28**
CO_2 from Fossil Fuel Combustion	27.58
Stationary Combustion	0.29
Incineration of Waste	0.15
Electrical Equipment	0.21
Other Process Uses of Carbonates	0.05
Industry	**52.00**
CO_2 from Fossil Fuel Combustion	20.36
Natural Gas Systems	19.47
Non-Energy Use of Fuels	0.58
Petroleum Systems	5.19
Coal Mining	0.06
Iron and Steel Production	0.06
Cement Production	0.69
Substitution of Ozone Depleting Substances	0.45
Petrochemical Production	0.26
Lime Production	0.09
Ammonia Production	1.87
Nitric Acid Production	1.56
Abandoned Oil and Gas Wells	0.49
Wastewater Treatment	0.12
Urea Consumption for Non-Agricultural Purposes	0.07
Mobile Combustion	0.09
Abandoned Underground Coal Mines	0.03
Adipic Acid Production	NO[29]
Carbon Dioxide Consumption	0.06
Electronics Industry	0.00
N_2O from Product Uses	0.04
Stationary Combustion	0.07
Other Process Uses of Carbonates	0.05
Fluorochemical Production	NO

[29] NO = Not occurring

Sector/Source	2019
Aluminum Production	NO
Soda Ash Production	NO
Ferroalloy Production	NO
Titanium Dioxide Production	NO
Caprolactam, Glyoxal, and Glyoxylic Acid Production	NO
Glass Production	0.13
Magnesium Production and Processing	NO
Zinc Production	NO
Phosphoric Acid Production	NO
Lead Production	NO
Landfills (Industrial)	0.21
Carbide Production and Consumption	+[30]
Agriculture	**20.26**
N_2O from Agricultural Soil Management	8.79
Enteric Fermentation	9.06
Manure Management	1.87
CO_2 from Fossil Fuel Combustion	0.33
Rice Cultivation	NO
Urea Fertilization	0.18
Liming	NO
Mobile Combustion	0.01
Field Burning of Agricultural Residues	0.02
Stationary Combustion	+
Commercial	**6.91**
CO_2 from Fossil Fuel Combustion	3.4
Landfills (Municipal)	2.21
Substitution of Ozone Depleting Substances	0.87
Wastewater Treatment	0.41
Composting	+
Stationary Combustion	0.02
Anaerobic Digestion at Biogas Facilities	NO
Residential	**4.8**
CO_2 from Fossil Fuel Combustion	4.23
Substitution of Ozone Depleting Substances	0.52
Stationary Combustion	0.05
Total Emissions (Sources)	**143.13**
Land-Use, Land-Use Change, and Forestry	-7.31

[30] "+" indicates that the value does not exceed 0.005 MMT CO2e

Sector/Source	2019
(LULUCF) Sector Net Total	-5.87
Net Emissions (Sources and Sinks)	**137.26**

Table 20. Oklahoma GHG Emissions in MMT CO_2e by Gas - Full Data[31]

Gas/Source	2019
CO_2	**94.13**
Fossil Fuel Combustion	85.95
Electric Power Sector	27.58
Transportation	30.05
Industrial	20.69
Residential	4.23
Commercial	3.40
Non-Energy Use of Fuels	0.73
Natural Gas Systems	2.99
Cement Production	0.69
Lime Production	0.09
Other Process Uses of Carbonates	0.10
Glass Production	0.13
Soda Ash Production	NO
Carbon Dioxide Consumption	0.06
Incineration of Waste	0.15
Titanium Dioxide Production	NO
Aluminum Production	NO
Iron and Steel Production & Metallurgical Coke Production	0.06
Ferroalloy Production	NO
Ammonia Production	1.87
Urea Consumption for Non-Agricultural Purposes	0.07
Phosphoric Acid Production	NO
Petrochemical Production	0.26
Carbide Production and Consumption	+
Lead Production	NO
Zinc Production	NO
Petroleum Systems	0.80
Abandoned Oil and Gas Wells	+
Magnesium Production and Processing	NO
Coal Mining	+

[31] Data were obtained from EPA's State-level GHG inventories file State-GHG_Trends_Emissions__Sinks_By_Gas_08312023.xlsx, which was accessed on January 17, 2024 This data set is available at <https://www.epa.gov/ghgemissions/state-ghg-emissions-and-removals>.

Gas/Source	2019
Liming	NO
Urea Fertilization	0.18
Substitution of Ozone Depleting Substances	+
International Bunker Fuels[32]	0.87
Wood Biomass, Ethanol, and Biodiesel Consumption[33]	4.36
CH_4	**34.94**
Stationary Combustion	0.13
Mobile Combustion	0.04
Coal Mining	0.06
Abandoned Underground Coal Mines	0.03
Natural Gas Systems	16.48
Petroleum Systems	4.39
Abandoned Oil and Gas Wells	0.49
Petrochemical Production	NO
Carbide Production and Consumption	NO
Iron and Steel Production & Metallurgical Coke Production	NO
Ferroalloy Production	NO
Enteric Fermentation	9.06
Manure Management	1.57
Rice Cultivation	NO
Field Burning of Agricultural Residues	0.02
Landfills	2.42
Wastewater Treatment	0.25
Composting	+
Anaerobic Digestion at Biogas Facilities	NO
Incineration of Waste	+
International Bunker Fuels	+
N_2O	**11.55**
Stationary Combustion	0.30
Mobile Combustion	0.26
Adipic Acid Production	NO
Nitric Acid Production	1.56
Manure Management	0.30
Agricultural Soil Management	8.79
Field Burning of Agricultural Residues	0.01
Wastewater Treatment	0.28

[32] Emissions from International Bunker Fuels are not included in totals.
[33] Emissions from Wood Biomass, Ethanol, and Biodiesel Consumption are not included specifically in summing Energy sector totals.

Gas/Source	2019
N_2O from Product Uses	*0.04*
Caprolactam, Glyoxal, and Glyoxylic Acid Production	NO
Incineration of Waste	+
Composting	+
Electronics Industry	NO
Natural Gas Systems	+
Petroleum Systems	+
International Bunker Fuels	*0.01*
HFCs, PFCs, SF_6 and NF_3	**2.52**
HFCs	**2.31**
Substitution of Ozone Depleting Substances	2.31
Fluorochemical Production	NO
Electronics Industry	NO
Magnesium Production	NO
PFCs	**+**
Aluminum Production	NO
Electronics Industry	NO
Electrical Equipment	NO
Substitution of Ozone Depleting Substances[34]	*+*
SF_6	**0.21**
Electrical Equipment	0.21
Electronics Industry	NO
Magnesium Production	NO
NF_3	**NO**
Electronics Industry	NO
Total (Sources) Emissions	**143.14**
LULUCF Emissions[35]	**1.44**
LULUCF CH_4 Emissions	1.39
LULUCF N_2O Emissions	0.05
LULUCF Carbon Stock Change[36]	-7.31

[34] Small amounts of PFC emissions also result from this source.

[35] LULUCF emissions of CH_4 and N_2O are reported separately from gross emissions totals. LULUCF emissions include the CH_4, and N_2O emissions from Peatlands Remaining Peatlands; CH_4 and N_2O emissions reported for Non-CO2 Emissions from Forest Fires, Non-CO_2 Emissions from Grassland Fires, and Coastal Wetlands Remaining Coastal Wetlands; CH_4 emissions from Land Converted to Coastal Wetlands; Flooded Land Remaining Flooded Land, and Land Converted to Flooded Land; and N_2O emissions from Forest Soils and Settlement Soils.

[36] LULUCF Carbon Stock Change is the net C stock change from the following categories: Forest Land Remaining Forest Land, Land Converted to Forest Land, Cropland Remaining Cropland, Land Converted to Cropland, Grassland Remaining Grassland, Land Converted to Grassland, Wetlands Remaining Wetlands, Land Converted to Wetlands, Settlements Remaining Settlements, and Land Converted to Settlements.

Gas/Source	2019
LULUCF Sector Net Total[37]	-5.87
Net Emissions (Source and Sinks)	**137.27**

[37] The LULUCF Sector Net Total is the net sum of all CH_4 and N_2O emissions to the atmosphere plus net carbon stock changes.

Appendix C Sector Crosswalk for Table 3. Oklahoma GHG Baseline and Projected Emissions by Sector

Table 21. Table 3 Sector Crosswalk

EPA's U.S. Greenhouse Gas Emissions and Sinks emissions sectors	EPA's U.S. Greenhouse Gas Emissions and Sinks emissions sector subsectors	PAP Sectors
Transportation	CO_2 from Fossil Fuel Combustion	Transportation
Transportation	Substitution of Ozone Depleting Substances	Transportation
Transportation	Mobile Combustion	Transportation
Transportation	Non-Energy Use of Fuels	Transportation
Electric Power Industry	CO_2 from Fossil Fuel Combustion	Electric Power Industry
Electric Power Industry	Stationary Combustion	Electric Power Industry
Electric Power Industry	Incineration of Waste	Electric Power Industry
Electric Power Industry	Electrical Equipment	Electric Power Industry
Electric Power Industry	Other Process Uses of Carbonates	Electric Power Industry
Industry	CO_2 from Fossil Fuel Combustion	Industry
Industry	Natural Gas Systems	Industry
Industry	Non-Energy Use of Fuels	Industry
Industry	Petroleum Systems	Industry
Industry	Coal Mining	Industry
Industry	Iron and Steel Production	Industry
Industry	Cement Production	Industry
Industry	Substitution of Ozone Depleting Substances	Industry
Industry	Petrochemical Production	Industry
Industry	Lime Production	Industry
Industry	Ammonia Production	Industry
Industry	Nitric Acid Production	Industry
Industry	Abandoned Oil and Gas Wells	Industry
Industry	Wastewater Treatment	Waste, Water, and Sustainable Materials Management
Industry	Urea Consumption for Non-Agricultural Purposes	Industry
Industry	Mobile Combustion	Industry
Industry	Abandoned Underground Coal Mines	Industry

EPA's U.S. Greenhouse Gas Emissions and Sinks emissions sectors	EPA's U.S. Greenhouse Gas Emissions and Sinks emissions sector subsectors	PAP Sectors
Industry	Adipic Acid Production	Industry
Industry	Carbon Dioxide Consumption	Industry
Industry	Electronics Industry	Industry
Industry	N_2O from Product Uses	Industry
Industry	Stationary Combustion	Industry
Industry	Other Process Uses of Carbonates	Industry
Industry	Fluorochemical Production	Industry
Industry	Aluminum Production	Industry
Industry	Soda Ash Production	Industry
Industry	Ferroalloy Production	Industry
Industry	Titanium Dioxide Production	Industry
Industry	Caprolactam, Glyoxal, and Glyoxylic Acid Production	Industry
Industry	Glass Production	Industry
Industry	Magnesium Production and Processing	Industry
Industry	Zinc Production	Industry
Industry	Phosphoric Acid Production	Industry
Industry	Lead Production	Industry
Industry	Landfills (Industrial)	Waste, Water, and Sustainable Materials Management
Industry	Carbide Production and Consumption	Industry
Agriculture	N_2O from Agricultural Soil Management1,2	Agriculture
Agriculture	Enteric Fermentation	Agriculture
Agriculture	Manure Management	Agriculture
Agriculture	CO_2 from Fossil Fuel Combustion	Agriculture
Agriculture	Rice Cultivation	Agriculture
Agriculture	Urea Fertilization	Agriculture
Agriculture	Liming	Agriculture
Agriculture	Mobile Combustion	Agriculture

EPA's U.S. Greenhouse Gas Emissions and Sinks emissions sectors	EPA's U.S. Greenhouse Gas Emissions and Sinks emissions sector subsectors	PAP Sectors
Agriculture	Field Burning of Agricultural Residues1,2	Agriculture
Agriculture	Stationary Combustion	Agriculture
Commercial	CO_2 from Fossil Fuel Combustion	Commercial and Residential Buildings
Commercial	Landfills (Municipal)	Waste, Water, and Sustainable Materials Management
Commercial	Substitution of Ozone Depleting Substances	Commercial and Residential Buildings
Commercial	Wastewater Treatment	Waste, Water, and Sustainable Materials Management
Commercial	Composting	Waste, Water, and Sustainable Materials Management
Commercial	Stationary Combustion	Commercial and Residential Buildings
Commercial	Anaerobic Digestion at Biogas Facilities	Waste, Water, and Sustainable Materials Management
Residential	CO_2 from Fossil Fuel Combustion	Commercial and Residential Buildings
Residential	Substitution of Ozone Depleting Substances	Commercial and Residential Buildings
Residential	Stationary Combustion	Commercial and Residential Buildings

Appendix D Methodologies, Data, and Sources for Emissions Calculations

Emission reduction calculations estimated using the following EPA tools:

- EPA's Avoided Emissions and Generation Tool (AVERT) Web Edition
- EPA's Landfill Gas Emissions Model (LandGEM)
- EPA's Landfill Gas Energy Benefits Calculator (LFGE Benefits Calculator)
- EPA's Emissions & Generation Resource Integrated Database (eGRID) data summary tables
- EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2021
- EPA's Greenhouse Gases Equivalencies Calculator - Calculations and References
- Facility Level Information on GreenHouse gases Tool (FLIGHT)
- EPA's MOtor Vehicle Emission Simulator (MOVES)

Notes:

- All reductions are listed as the total reduction in 5 years (2025-2030) or 25 years (2025-2050) and not listed as a per year reduction.
- Some projects listed below will not get emissions reductions immediately.
- Total reduction for 2030 was determined by taking the total 5-year emission reduction and diving by the 5-year period to determine an approximate per year reduction. This number was subtracted by the BAU emissions for 2030 years. The same process was done to determine the PAP estimated emissions in 2050.

TRANSPORTATION

Promote Medium-and Heavy-Duty Zero Emissions Truck Fueling Stations

- Outputs from Planning Team
  - Provide electric vehicle charging and hydrogen fueling stations for Medium- and Heavy-Duty Zero Emission Trucks (MHD ZETs) on Oklahoma's highway corridors

- Methods and Assumptions
  - Assumes that a total of 5 fueling stations will be developed

- Results

Potential Reductions	
	mt CO_2e (total)
2025-2030	250,000.00
2025-2050	1,000,000.00

- Limitations and Conclusions
  - These emissions reduction estimates are based on information and methodologies relied upon during a collaboration to establish a coalition focused on reducing emissions from medium- and heavy-duty trucks.

Asphalt

- Outputs from Planning Team
  - Program that supports Oklahoma Department of Transportation GHG reduction goals and encourages material reuse.
- Methods and Assumptions
  - The National Asphalt Pavement Association (NAPA) described the methodology and assumptions used to calculate the GHG emissions reductions from production of warm mix asphalt (WMA) at reduced temperature, with reclaimed asphalt payment (RAP) in new asphalt mixes. These calculations are based on publicly available data. The most recent and comprehensive data sources were selected for this purpose.
  - Current Scenario:
    - Hot mix asphalt (HMA) and WMA production in Oklahoma = 5.1 million tons
    - RAP stockpile = 1.21 million tons
    - Average RAP usage = 19%
    - Total tonnage of chemical WMA produced currently = 2.1 million tons
    - Amount of WMA as a % of total asphalt mix production = 42%
  - Assumptions:
    - Amount of WMA as a % of total asphalt mix production by 2030 = 75%
    - Average RAP usage (%) by 2030 = 30%
    - Expected reduction of production temperature for WMA = 40^{o} F

- Estimated energy savings of WMA = 1,100 British thermal units (Btu)/°F per ton
- CO_2 emission from production of WMA additive = 5.99 kilograms (kg) CO_2e/kg
- CO_2 reduction from replacing virgin binder = 577.9 kg CO_2e /ton
- CO_2 emission from aggregate extraction and processing = 1.76 kg CO_2e/ton
- Average hauling distance for virgin asphalt binder = 3.9 ton·miles/ton of mix produced
- Average hauling distance for virgin aggregate = 21.5 ton·miles/ton of mix produced
- CO_2 emission from transportation by diesel powered truck = 0.185465 kg CO_2e /ton·mile
- CO_2 emission from processing RAP = 1.225 kg CO_2e /ton

- Results[38]

Potential Reductions	
	mt CO_2e (total)
2025-2030	237,000
2025-2050	1,188,000

- Limitations and Conclusions
  - These emissions reduction estimates are based on the information provided in DEQ's online project submission website. Emissions reduction estimates for similar projects may vary greatly.

[38] Calculations were provided by the project submission from the Oklahoma Department of Transportation and University of Oklahoma, Asphalt Pavement Association.

Community Solar – 9.9 MW Solar Facility

- Outputs from Planning Team
  - 9.9 megawatt (MW) solar facility

- Methods and Assumptions
  - Method:
    - High Reductions Estimate: Used EPA's AVERT to calculate megawatt hours (MWh) and annual emissions reductions.
    - Low Reductions Estimate: Used EPA's AVERT to calculate MWh and used the emission rate for the Southwest Power Pool (SPP) South subregion in EPA's eGRID2022 data summary tables to calculate avoided emissions.

- Results

Emissions Reductions Per 9.9 MW Solar Facility				
	Low Estimate		High Estimate	
	mt CO_2e/year	mt CO_2e (total)	mt CO_2e/year	mt CO_2e (total)
2025-2030	9,733	48,663	16,710	83,552
2025-2050		243,314		417,759

Potential Reductions	
	Average mt CO_2e (total)
2025-2030	66,107.50
2025-2050	330,536.50

- Limitations and Conclusions
  - These emissions reduction estimates are based on one community solar project. Emissions reduction estimates for other projects may vary greatly.

Community Solar – 36 MW Solar Farm

- Outputs from Planning Team
  - 36 MW solar farm: The solar panels would be installed using a ground-mounted system and would be connected to the grid through a substation or ran directly to the facilities and homes. The solar farm would have a capacity of 36 MW and would generate approximately 55,000 MWh of electricity per year. The electricity generated by the solar farm would primarily power facilities and homes including a learning center, elders center, museum, and elderly and single-family homes.

- Methods and Assumptions
  - Method:
    - High Reductions Estimate: Used EPA's AVERT to calculate megawatt hours (MWh) and annual emissions reductions.
    - Low Reductions Estimate: Used EPA's AVERT to calculate MWh and used the emission rate for the Southwest Power Pool (SPP) South subregion in EPA's eGRID2022 data summary tables to calculate avoided emissions.

- Results

Emissions Reductions Per 36 MW Solar Farm				
	Low Estimate		High Estimate	
	mt CO_2e/year	mt CO_2e (total)	mt CO_2e/year	mt CO_2e (total)
2025-2030	35,833.48	179,167.40	60,736.02	303,680.10
2025-2050		895,837.00		1,518,400.50

Potential Reductions	
	Average mt CO_2e (total)
2025-2030	241,423.75
2025-2050	1,207,118.75

- Limitations and Conclusions
  - These emissions reduction estimates are based on one community solar project. Emissions reduction estimates for other projects may vary greatly.

Transmission Upgrades

- Outputs from Planning Team
  - Convert electric distribution systems from 4kV to 12kV

- Methods and Assumptions
  - Since the US Census was performed in 2020. The 2020 data was used to determine the electricity in megawatt hours (MWh) per capita.
    - Oklahoma population[39] was 3,959,353 people
    - Total Electric Retail Sales[40] was 62,299,305 MWh
  - 2020 Emissions Data from the US Energy Information Administration (EIA)
    - Emissions from the energy sector was 150,000 million metric tons (MT) of CO_2e.

[39] Data from the US Census for the state of Oklahoma: https://www.census.gov/search-results.html?q=Oklahoma&page=1&stateGeo=none&searchtype=web&cssp=SERP&_charset_=UTF-8
[40] Electrical use data from EIA for the state of Oklahoma: https://www.eia.gov/electricity/state/archive/2020/oklahoma/

        - The CO_2e Emissions per MWh[41] was 0.8 MT CO_2e/MWh
    - Assuming 28,000 people will be affected by the conversion.
    - Assuming a 5% reduction in transmission energy losses due to the higher voltage, from the GHG Equivalence Calculator.
    - Calculations

$$Reduction\ in\ CO2e\ Emissions = 2020\ emissions\ \times CO2e\ emissions\ per\ MWh$$

$$Electricity\ Saved\ by\ Conversion = Total\ Electricity\ Transmitted \times\ Reductin\ in\ Electricity\ Losses$$

$$Energy\ Saved\ Emission\ Reduction = Electricity\ Saved\ by\ Conversaion\ \times CO2e\ Emissions\ per\ MWh$$

$$Total\ Emission\ Reduction = Reduction\ in\ CO2e\ Emissions\ \times Energy\ Saved\ Emission\ Reduction$$

- Results

Electricity per Capita	15.73 MWh
Total Electricity Transmitted for 28,000 people	440,572 MWh
Reduction in CO2e Emissions	7,500 MT CO2e
Electricity Saved by Conversion	22,029 MWh/year
Emissions Reduction due to Energy Saved	17,623 MT CO2e
Total Emissions Reduced	**25,123 MT CO2e per year**

Potential Reductions	
	mt CO_2e (total)
2025-2030	125,614.42
2025-2050	628,072.12

- Limitations and Conclusions
    - Calculations do not account for potential changes in energy demand.
    - Calculations are all based on average values and may vary depending on the specific power plants and advancing technologies.

[41] Electrical use data from EIA for the state of Oklahoma: https://www.eia.gov/electricity/state/archive/2020/oklahoma/

INDUSTRY

The emission reductions for industry will be site specific and projects under this priority measure will have to be applied for and approved by DEQ. Individual projects under the Industry Priority Measure will be further developed with the Implementation Application and CCAP.

Chiller, Boiler, and Air Handler Replacement

- Outputs from Planning Team
  - Municipal Building – Upgrading very old chillers, boilers, and air handlers at a large municipal building.

- Methods and Assumptions
  - A building size of 8,500 square feet was estimated.
  - Assume air cooling for 6 months of year, and heating runs for 5 months of year.
  - Assume the size of the HVAC system is 400 square feet per ton of cooling, based on a rule of thumb provided by the US Department of Energy.
  - The Seasonal energy efficiency ratio (SEER) rating of the current HVAC system is assumed to be 6.5 BTU/(Watt*hour).
  - The SEER rating of the new HVAC system is assumed to be 15 BTU/(Watt*hour).
  - Avoided emissions from upgrading the air conditioning units were calculated using the emission rate for the SPP South subregion in EPA's eGRID2022 data summary tables.
  - It was assumed the building is heated with a natural gas-heated boiler. The natural gas consumption was estimated using the natural gas energy intensity provided by the US Energy Information Administration. [42]
  - Avoided emissions from natural gas combustion were estimated using 40 C.F.R. 98 Subpart C Tables C-1 and C-2 emission factors.

- Results

Potential Reductions	
	mt CO_2e (total)
2025-2030	311.80
2025-2050	1,559.00

- Limitations and Conclusions
  - This is a theoretical project and no facilities have been chosen for upgrades and therefore specifics on the actual cooling capacity of chillers, current efficiency of boilers, and SEER of air handlers are unknown. Additionally, the actual heating and cooling times are also unknown.

[42] Data from https://www.eia.gov/consumption/commercial/data/2018/ce/pdf/e7.pdf
https://www.eia.gov/consumption/commercial/data/2018/ce/pdf/e7.pdf

- Some emissions reduction estimates are based on the information provided in DEQ's online project submission website. Emissions reduction estimates for similar projects may vary greatly.

Renewable Energy at Manufacturing Plant

- Outputs from Planning Team
  - Introducing pozzolan to the cement production to increase durability of the concrete product and reduce carbon emissions.

- Methods and Assumptions
  - Reduction calculations are based on information provided in DEQ's online project submission website.

- Results

Potential Reductions	
	mt CO_2e (total)
2025-2030	0.00
2025-2050	1,890,000.00

- Limitations and Conclusions
  - This is a theoretical project and no facilities have been chosen for upgrades and therefore specifics on the production volumes by product type and the current breakdown of energy source are unknown.
  - These emissions reduction estimates are based on the information provided in DEQ's online project submission website. Emissions reduction estimates for similar projects may vary greatly.

Renewable Energy at Manufacturing Plant

- Outputs from Planning Team
  - Manufacturer – Upgrading manufacturing plant to run on alternative energy sources.

- Methods and Assumptions
  - Energy consumption was calculated by the company as part of an environmental product declaration (EPD) per metric ton of product.
  - A production value was found from the Internet. The EPD had five product types. Therefore, assume each of the five product types are produced in equal volumes
  - Assume current plant energy sources are approximately 40% electricity and 60% natural gas.
  - Greenhouse gas emission factors for natural gas and electricity components were pulled from the National Renewable Energy Laboratory (NREL). For renewable energy, a value of 50 gCO_2e / kilowatt hour (kWh) was used.

- Based on statement from manufacturing plant, they are targeting powering they're facility 100% with renewable energy within 10 years of project implementation.

- Results
  - Emissions reductions from switching to alternative energy sources are 541,127 mt CO_2e / year, at 100% implementation.

Potential Reductions	
	mt CO_2e (total)
2025-2030	2,705,635.00
2025-2050	13,528,175.00

- Limitations and Conclusions
  - This is a theoretical project and no facilities have been chosen for upgrades and therefore specifics on the production volumes by product type and the current breakdown of energy source are unknown.
  - These emissions reduction estimates are based on the information provided in DEQ's online project submission website. Emissions reduction estimates for similar projects may vary greatly.

Boiler at Universities

- Outputs from Planning Team
  - Replace aging fossil fuel boilers at universities.

- Methods and Assumptions
  - Reduction calculations are based on information provided in DEQ's online project submission website.

- Results

Potential Reductions	
	mt CO_2e (total)
2025-2030	9,500.00
2025-2050	47,500.00

- Limitations and Conclusions
  - Some emissions reduction estimates are based on the information provided in DEQ's online project submission website. Emissions reduction estimates for similar projects may vary greatly.

Boiler Upgrades at a Military Base

- Outputs from Planning Team
  - Upgrade natural gas fired hot water boilers that to boilers utilizing hydrogen blended natural gas fuel.
- Methods and Assumptions
  - Assume 14 natural gas fire hot water boilers
  - Reduction calculations are based on information provided in DEQ's online project submission website.

- Results

Potential Reductions	
	mt CO_2e (total)
2025-2030	7,250.00
2025-2050	36,250.00

- Limitations and Conclusions
  - Some emissions reduction estimates are based on the information provided in DEQ's online project submission website. Emissions reduction estimates for similar projects may vary greatly.

Install Vapor Recovery Unit on Low Pressure Storage Tanks

- Outputs from Planning Team
  - Install vapor recovery units (VRU) to reduce methane emissions from low pressure storage tanks.

- Methods and Assumptions
  - Sage Power and Reliability Company (SPARC) has previously designed and installed VRUs on low pressure storage tanks in Texas. The methods submitted to DEQ via the online project submission website stated they used information from the SPARC Texas facility to predict their emission reductions.

- Results

Potential Reductions	
	mt CO_2e (total)
2025-2030	250,000.00
2025-2050	1,250,000.00

- Limitations and Conclusions
    - These emissions reduction estimates are based on the information provided in DEQ's online project submission website. Emissions reduction estimates for similar projects may vary greatly.

Hydrogen Production

- Outputs from Planning Team
    - Centralize a 100 MW green hydrogen plant with multiple industrial offtake and a direct electrical connection to a utility scale wind farm.

- Methods and Assumptions
    - Reduction calculations are based on information provided in DEQ's online project submission website.

- Results

Potential Reductions	
	mt CO_2e (total)
2025-2030	530,000.00
2025-2050	2,650,00.00

- Limitations and Conclusions
    - These emissions reduction estimates are based on the information provided in DEQ's online project submission website. Emissions reduction estimates for similar projects may vary greatly.

Low Carbon Ammonia via Hydrogen

- Outputs from Planning Team
    - Update the ammonia process/technology to make approximately 86,000 metric tons annum (235 tons per day) of carbon-free ammonia.
    - Produce clean ammonia from renewable sources.

- Methods and Assumptions
    - Assume the carbon-free ammonia is via electrolysis.

- Results

Potential Reductions	
	mt CO_2e (total)
2025-2030	322,000.00
2025-2050	3,381,000.00

- Limitations and Conclusions
    - These emissions reduction estimates are based on the information provided in DEQ's online project submission website. Emissions reduction estimates for similar projects may vary greatly.

Decarbonization of the Tire Manufacturing Process

- Outputs from Planning Team
    - Traditional curing presses utilize steam generated from fossil fuels. Developing electric curing technology will allow for the generation of heat to cure tires by using renewable electricity and eliminate the need for fossil fuels. Implementing a pilot electric curing project will support the development of this technology at a tire manufacturing facility, including the increased electricity demand needed to operate this technology.
    - Implement a pilot scale hydrogen boiler to test the use of green hydrogen for the generation of steam at the facility. This will prepare our operations to further transition to green hydrogen as markets develop.
    - This would be a pilot program with the goal of being able to include these technologies to an additional 38 tire manufacturing facilities across the nation.

- Methods and Assumptions
    - Reduction calculations are based on information provided in DEQ's online project submission website.

- Results
    - Potential CO2e removed is 57,000 tons per year

Potential Reductions	
	mt CO_2e (total)
2025-2030	285,000.00
2025-2050	1,425,000.00

- Limitations and Conclusions
    - These emissions reduction estimates are based on the information provided in DEQ's online project submission website. Emissions reduction estimates for similar projects may vary greatly.
    - This is a pilot program, and all reduction calculations are theoretical.

CO_2 Capture and Sequestration

- Outputs from Planning Team
    - Utilize an existing CO2 distribution pipeline system and expand to collect captures CO2 from Gas Processing Acid Gas and sequester into existing and new Class II wells.
    - Future expansion of this system would capture other CO2 emissions and sequester into Class VI wells.

- Methods and Assumptions
  - Reduction calculations are based on information provided in DEQ's online project submission website.

- Results

Potential Reductions	
	mt CO_2e (total)
2025-2030	628,000.00
2025-2050	10,500,000.00

- Limitations and Conclusions
  - These emissions reduction estimates are based on the information provided in DEQ's online project submission website. Emissions reduction estimates for similar projects may vary greatly.

CO_2 Capture and Storage

- Outputs from Planning Team
  - Installation of CO2 compression and dehydration equipment at a manufacturing site where CO2 is a product of ammonia production and is currently vented.
  - The CO2 will be prepared for transportation via pipeline and subsequent CO2 storage via enhanced oil recovery (EOR) or permanent geologic storage.

- Methods and Assumptions
  - Reduction calculations are based on information provided in DEQ's online project submission website.

- Results

Potential Reductions	
	mt CO_2e (total)
2025-2030	3,000,000.00
2025-2050	15,000,000.00

- Limitations and Conclusions
  - These emissions reduction estimates are based on the information provided in DEQ's online project submission website. Emissions reduction estimates for similar projects may vary greatly.

AGRICULTURE/LAND USE

Cover crops

- Outputs from Planning Team
  - Focusing on 70,000 acres, carbon sequestration will be enhanced, and financial incentives will be offered to farmers adopting cover crops.

- Methods and Assumptions
  - These calculations are based on an emissions factor (EF) provided a CPRG stakeholder via an online DEQ website (0.4 mtCO2/ acre/ year). From a literature review, this EF appears to be reasonable but on the high end of the amount of CO_2e than can be sequestered per acre per year by cover crops.[43]

- Results
  - Potential CO_2e removed = 1,200 mt CO_2 per year

Potential Reductions	
	mt CO_2e (total)
2025-2030	6,000.00
2025-2050	30,000.00

- Limitations and Conclusions
  - The actual emissions reductions may vary depending on site-specific factors, including cover crop selection, soil characteristics, and regional weather conditions.

Biochar Production

- Outputs from Planning Team
  - Open 3 additional pyrolysis facilities: 2 stationary systems in Oklahoma.

- Methods and Assumptions
  - The Puro Method for calculating CO_2e reduction at a ratio of 1.8. https://puro.earth/carbon-removal-methods/. It was estimated that 10% growth year over year would occur based on experience with wood recycling and composting facilities.
  - Based on extensive experience, an annual inbounding of 40,000 tons of green material was estimated from Ardmore, 40,000 tons of green material from East of Durant, and

[43] https://extension.psu.edu/carbon-sequestration-and-credits-for-pennsylvania

40,000 tons of industrial wood waste from Tulsa. Combined, this will total 120,000 tons of wood material diverted from the Municipal Solid Waste stream annually, ground at the individual sites and processed into biochar. Of the inbounded 120,000 tons of material, an industrial standard of 26% is used to determine the amount of biochar produced.
    - Additionally, 70 percent of the fuel used to run the equipment will be recycled back to the grid with the biochar equipment.

- Results[44]

Potential Reductions	
	mt CO_2e (total)
2025-2030	483,347
2025-2050	6,169,739

- Limitations and Conclusions
    - These emissions reduction estimates are based on specific projects. Emissions reduction estimates for similar projects may vary greatly.

Reforestation

- Outputs from Planning Team
    - Reforesting 200-acres of land with a mix of native trees in Picher, Oklahoma.

- Methods and Assumptions
    - Calculations were performed using an emission factor (EF) of 0.265 kg of carbon sequestered per square meter of tree cover per year.[45]

- Results
    - Potential CO_2e removed = 58.54 mt CO_2/year

Potential Reductions	
	mt CO_2e (total)
2025-2030	292.70
2025-2050	1,463.50

- Limitations and Conclusions

[44] Calculations were provided by the project submission from the Elm Creek Gravel, LLC, dba Sustainable Biochar.
[45] Table 6-119 of EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2021 (Oklahoma's Net Annual Sequestration per Area of Tree Cover was provided by Table 6-119 in this report. This sequestration rate was used to calculate potential CO_2 removal as a result of reforestation)

- Actual emissions reductions may vary depending on the species of trees planted, the density of plant spacing, and the occurrence of natural disasters such as forest fires.

Urban Forestry

- Outputs from Planning Team
  - Planting of relatively mature trees with 2-3" trunk diameters in urban areas.

- Methods and Assumptions
  - Assumes 10,000 trees planted
  - Emission Factor = 0.060 metric ton CO_2 per urban tree planted[46]

- Results
  - Potential CO2e removed = 600 mt CO2/year

Potential Reductions	
	mt CO_2e (total)
2025-2030	3,000
2025-2050	15,000

- Limitations and Conclusions
  - Limitations from EPA's Greenhouse Gases Equivalencies Calculator - Calculations and References
    - While most trees take 1 year in a nursery to reach the seedling stage, trees grown under different conditions and trees of certain species may take longer: up to 6 years.
    - Average survival rates in urban areas are based on broad assumptions, and the rates will vary significantly depending upon site conditions.
    - Carbon sequestration is dependent on growth rate, which varies by location and other conditions.
    - This method estimates only direct sequestration of carbon and does not include the energy savings that result from buildings being shaded by urban tree cover.
    - This method is best used as an estimation for suburban/urban areas (i.e., parks, along sidewalks, yards) with highly dispersed tree plantings and is not appropriate for reforestation projects.
  - The EPA's emission factor was based on 10 years of growth of trees starting with a trunk diameter of 1". The planting of trees with a 2"-3" diameter trunk may result in greater or less reductions than the EPA's estimate.

[46] Source: EPA's Greenhouse Gases Equivalencies Calculator - Calculations and References https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references

Composting at Schools

- Outputs from Planning Team
  - Expand current school compost programs in area schools.

- Methods and Assumptions
  - Inputs: 5 area schools generate 3,200 pounds of food, paper, and yard waste each semester.
  - Method: LandGEM was used to estimate avoided landfill emissions.

- Results

Potential Reductions		
	mt CO_2e/year	mt CO_2e (total)
2025-2030	9.59	47.94
2025-2050	23.97	599.28

- Limitations and Conclusions
  - These emissions reduction estimates are based on one compost program consisting of 5 schools. Emissions reduction estimates for other compost programs may vary greatly.

Community Solar – 1MW with 1 MW/2MWh Battery Storage

- Outputs from Planning Team
  - 1 MW solar installation paired with 1MW/2MWh battery systems that is estimated to generate 2.1 million kWhs annually.

- Methods and Assumptions
  - Assumption for the battery system:
    - A solar battery system emits 162 kg CO2 per kWh[47]
    - The battery cycles once daily, meaning it drains and recharges daily and therefore has a yearly usage of 730 MWh/year.
  - Method:
    - Emissions reduction is based on the energy saved by the solar energy minus the emissions from the battery.
    - High Reductions Estimate: Used EPA's AVERT to calculate MWh and annual emissions reductions.
    - Low Reductions Estimate: Used EPA's AVERT to calculate MWh and used the emission rate for the SPP South subregion in EPA's eGRID2022 data summary tables to calculate avoided emissions.
- Results

Emissions Reductions Per 1MW with 1MW/2MWh Battery Storage				
	Low Estimate		High Estimate	
	mt CO_2e/year	mt CO_2e (total)	mt CO_2e/year	mt CO_2e (total)
2025-2030	35,510.54	178,576.10	60,440.37	303,088.79
2025-2050		892,880.49		1,515,443.96

Potential Reductions	
	Average mt CO_2e (total)
2025-2030	239,877.26
2025-2050	1,207,000.47

- Limitations and Conclusions
  - These emissions reduction estimates are based on one community solar project. Emissions reduction estimates for other projects may vary greatly.

[47] Data from the National Library of Medicine, National Center for Biotechnology Information. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8654984/#:~:text=For%20solar%20PV%2C%20the%20unit,total%20output%20of%20the%20sampled

- This calculation assumes a consistent daily cycling pattern throughout the year and does not account for seasonal variations in energy demand or solar generation.
- The emission factor used for battery production may vary based on the specific type of battery technology (e.g., lithium-ion, lead-acid).
- This calculation does not account for wear and tear on the battery and assumes that the battery operates at full capacity throughout its lifespan.

Rooftop Solar on Commercial Buildings without Battery Storage

- Outputs from Planning Team
  - Installing a 5 MW solar rooftop on an industrial facility

- Methods and Assumptions
  - Method:
    - High Reductions Estimate: Used EPA's AVERT to calculate MWh and annual emissions reductions.
    - Low Reductions Estimate: Used EPA's AVERT to calculate MWh and used the emission rate for the SPP South subregion in EPA's eGRID2022 data summary tables to calculate avoided emissions.

- Results

Emissions Reductions Per 5 MW of Rooftop Solar				
	Low Estimate		High Estimate	
	mt CO_2e/year	mt CO_2e (total)	mt CO_2e/year	mt CO_2e (total)
2025-2030	4,424	22,119	7,140	35,698
2025-2050		110,597		178,489

Potential Reductions	
	Average mt CO_2e (total)
2025-2030	28,908.50
2025-2050	144,543.00

- Limitations and Conclusions
  - These emissions reduction estimates are based on rooftop solar for one facility. Emissions reduction estimates for other rooftop solar projects may vary greatly.

Solar for Heating and Cooling Systems in Government Building

- Outputs from Planning Team
  - Installing solar panels on state buildings to provide power for the heating and cooling systems.

- This project will most likely be implemented after the 20+ year old HVAC systems have been upgraded to more efficient systems.

- Methods and Assumptions
  - Assume the size of the HVAC system is 400 square feet per ton of cooling, based on a rule of thumb provided by the US Department of Energy.[48]
  - Used the emission rate for the SPP South subregion in EPA's eGRID2022 data summary tables to calculate avoided emissions.
  - The Seasonal energy efficiency ratio (SEER) rating of the current HVAC system is assumed to be 10 BTU/(Watt*hour).
  - It was assumed that the solar energy generated by this program would be used to power the HVAC systems for the buildings owned by the Oklahoma (73 buildings – 3.5 million square feet of floor space).

- Results
  - Emissions reductions from installing rooftop solar panels on Oklahoma government buildings is approximately 24,867 mtCO_2e per year.

Potential Reductions	
	Average mt CO_2e (total)
2025-2030	124,333
2025-2050	621,667

- Limitations and Conclusions
  - Actual emissions reductions may vary based on site-specific factors such as solar panel specifications, solar angle of rooftops, size of HVAC systems, and regional weather conditions.

Lighting at Sports Complexes and Window Replacement at Public Library

- Outputs from Planning Team
  - Facilities and Parks– Outdated lighting at three baseball field complexes will be replaced, and new windows will be installed at public library.

- Methods and Assumptions
  - Assume baseball season runs from April to June, which is information provided by City
  - The average sunset time during this period is 8:30 PM. Assume baseball is played 4 nights per week, and the lights are on for an average of 3 hours per night.
  - Based on a review of baseball fields in Miami, OK using Google Earth, 52 bulbs per field were estimated.

[48] Data from the US Department of Energy: https://www.energy.gov/sites/prod/files/guide_to_home_heating_cooling.pdf

- Assume a savings of 1,125 watts per bulb, which is arrived at by assuming an average of 75% savings of wattage between LED bulbs and high-intensity discharge (HID) bulbs intended for sports field illumination.
- Used the emission rate for the SPP South subregion in EPA's eGRID2022 data summary tables to calculate avoided emissions.
- Assume energy savings from installing new windows is 23% (based on the range provided by the US Department of Energy)[49]. Assume air cooling for 6 months of year, and heating runs for 5 months of year.
- Assume the size of the HVAC system is 400 square feet per ton of cooling, based on a rule of thumb provided by the US Department of Energy.[50]
- Building area estimated to be 12,000 square feet.
- The Seasonal energy efficiency ratio (SEER) rating of the current HVAC system is assumed to be 6.5 BTU/(Watt*hour).
- Avoided emissions were calculated using the emission rate for the SPP South subregion in EPA's eGRID2022 data summary tables.

- Results
  - Emissions reductions from replacing lighting at baseball fields and installing new windows at a public library are 41.51 mt CO_2e / year.

Potential Reductions	
	mt CO_2e (total)
2025-2030	208
2025-2050	1,038

- Limitations and Conclusions
  - Actual library electricity consumption, operating hours at baseball fields, current electrical consumption of light fixtures at baseball fields may vary.
  - The actual size of the HVAC system may vary depending on the regional weather conditions, the air tightness, and the insulation of the building.
  - The actual SEER ratings of the HVAC system may vary.
  - The energy savings from upgrading the library windows may vary depending on window specifications.

HVAC and LED Lighting – Library

- Outputs from Planning Team
  - HVAC and LED Lighting Upgrade – Upgrading HVAC system and replacing incandescent light fixtures with LED fixtures at library.

- Methods and Assumptions

[49] Data from the US Department of Energy: https://www.energy.gov/energysaver/windows-doors-and-skylights
[50] Data from the US Department of Energy: https://www.energy.gov/sites/prod/files/guide_to_home_heating_cooling.pdf

- An area of 45,000 square feet requiring coverage was estimated.
- Assume 500 Lux is an appropriate figure for library stacks and study spaces.
- Library is open 60 hours per week. Assume lights are kept on 100% of the time the buildings are open.
- The estimated savings from switching from incandescent light fixture to LED light fixtures is 123 watts per fixture, which is gathered by assuming the fixtures provide 2,600 lumens.
- Assume air cooling for 6 months of year, and heating runs for 5 months of year.
- Assume the size of the HVAC system is 400 square feet per ton of cooling, based on a rule of thumb provided by the US Department of Energy.
- The Seasonal energy efficiency ratio (SEER) rating of the current HVAC system is assumed to be 6.5 BTU/(Watt*hour).
- The SEER rating of the new HVAC system is assumed to be 15 BTU/(Watt*hour).
- Avoided emissions from upgrading the air conditioning units were calculated using the emission rate for the SPP South subregion in EPA's eGRID2022 data summary tables.
- It was assumed the building is heated with a natural gas furnace. The natural gas consumption was estimated using the natural gas energy intensity provided by the US Energy Information Administration. [51]
- Avoided emissions from natural gas combustion were estimated using 40 C.F.R. 98 Subpart C Tables C-1 and C-2 emission factors.

- Results
  - Emissions reductions from upgrading HVAC system and replacing incandescent lighting with LED lighting fixtures at a library are 260.08 mt CO_2e / year.

Potential Reductions	
	mt CO_2e (total)
2025-2030	1,300
2025-2050	6,502

- Limitations and Conclusions
  - Actual emissions reductions for lighting upgrades may vary depending on actual building square footage and current bulb wattage.
  - The actual size of the HVAC system may vary depending on the regional weather conditions, the air tightness, and the insulation of the building.
  - The actual SEER ratings of the old and new HVAC systems may vary.

[51] Data from https://www.eia.gov/consumption/commercial/data/2018/ce/pdf/e7.pdf
https://www.eia.gov/consumption/commercial/data/2018/ce/pdf/e7.pdf

LED Lighting – University Buildings

- Outputs from Planning Team
  - LED Lighting Upgrade- Across a university campus, close to 100 buildings have T8 lighting fixtures which can be upgraded to LED.

- Methods and Assumptions
  - Project submitter indicated that one light fixture can illuminate 56 square feet, and that there is 1 million square feet requiring coverage.
  - The T8 fixtures were assumed to be 4' x 2' with 2 lamps per fixture.
  - Light fixtures were assumed to be operating for an average of 4 hours per day.
  - The current lamps were assumed to be 32W fluorescent lamps[52]. The wattage of the upgraded LED lamps was assumed to be half that of the fluorescent lamps.[53]
  - The assumed energy savings from switching from T8 fluorescent light fixture to LED light fixture are 16 watts per lamp.
  - Avoided emissions were calculated using the emission rate for the SPP South subregion in EPA's eGRID2022 data summary tables.

- Results
  - Estimated emissions reductions from replacing T8 lighting fixtures with LED lighting fixtures at a university are 368.93 mt CO_2e / year.

Potential Reductions	
	mt CO_2e (total)
2025-2030	1,845
2025-2050	9,223

- Limitations and Conclusions
  - 56 square feet of illumination per light fixture was arrived at by university during performance of previous projects. Actual lux, lumens, and wattage per fixture may vary. These emissions reduction estimates are based on light fixture upgrades at one university. Emissions reduction estimates for other universities may vary greatly.

LED Lighting – Street Poles

- Outputs from Planning Team
  - LED Lighting Upgrade- Across a university campus, close to 850 street poles needing to be upgraded to LED.

- Methods and Assumptions
  - The street pole lights were estimated to operate an average of 12 hours a day.

[52] Data from the National Lighting Product Information Program, T8 Fluorescent Lamps, Volume 1 Number 1: https://www.lrc.rpi.edu/programs/NLPIP/lightinganswers/pdf/view/LAT8.pdf
[53] Data from Project Drawdown: https://drawdown.org/solutions/led-lighting

- The conversion of light fixtures from incandescent to LED was estimated to reduce the electricity demand by 75%[54] (225 watts per fixture).
- Avoided emissions were calculated using the emission rate for the SPP South subregion in EPA's eGRID2022 data summary tables.

- Results
  - Emissions reductions from replacing street poles with LED lighting at a university are 370.58 mt CO_2e / year.

Potential Reductions	
	mt CO_2e (total)
2025-2030	1,853
2025-2050	9,264

- Limitations and Conclusions
  - These emissions reduction estimates are based on light fixture upgrades at one university. Emissions reduction estimates for other universities may vary greatly.

LED Lighting – Commercial and Residential Buildings – Energy Savings Performance Contract (ESPC)

- Outputs from Planning Team
  - LED Lighting Upgrade – A possible ESPC with a Department of Energy Qualified Energy Services Company (ESCO) to replace older lighting fixtures with LED lighting fixtures

- Methods and Assumptions
  - To estimate emissions reductions, the average contract price for contracts previously awarded to the ESCO (outliers excluded) was compared to the funding requested for LED lighting at University Buildings. The emissions reductions from the University Buildings, slightly modified, were multiplied by the ratio of the average actual investment by the ESCO to the midpoint between the low- and mid-funding requested amounts for the University Buildings.
  - Assumption that one light fixture can illuminate 56 square feet, and there is 1 million square feet requiring coverage
  - Assume 500 Lux is an appropriate figure for commercial and residential activity.
  - Assume light fixtures are on for an average of 2 hours per day, instead of 4 from the University Buildings.
  - Assume savings from switching from T8 fluorescent light fixture to LED light fixture are 18 watts per fixture
  - Assume savings from switching from incandescent light fixture to LED light fixture are 50 watts per fixture.
  - Assume 80% of light fixtures to be upgraded are fluorescent, and 20% of light fixtures to be upgraded are incandescent.

[54] Data from Project Drawdown: https://drawdown.org/solutions/led-lighting

- Avoided emissions were calculated using the emission rate for the SPP South subregion in EPA's eGRID2022 data summary tables.

- Results
  - Emissions reductions from replacing light fixtures with LED lighting at commercial and residential buildings are 1,708.4 mt CO_2e / year.

Potential Reductions	
	mt CO_2e (total)
2025-2030	8,542.00
2025-2050	42,710.00

- Limitations and Conclusions
  - These emissions reduction estimates are based on light fixture upgrades at commercial and residential buildings without having actual data from commercial and residential building light fixture upgrades. In addition, a project scope was not provided.

LED Lighting – Recreation Centers and Cemetery

- Outputs from Planning Team
  - LED Lighting Upgrade – Replacing incandescent light fixtures with LED light fixtures at four recreation centers and the local cemetery.

- Methods and Assumptions
  - Approximately 7,500 square feet requiring coverage was estimated.
  - Assume 500 Lux is an appropriate figure for recreation center.
  - Recreation centers are open 45 hours per week. Assume lights are kept on 100% of the time the buildings are open.
  - Assume that the fixtures provide 2,600 lumens each. Based on this, energy savings from switching from incandescent to LED light fixtures are 123 watts per fixture.
  - Avoided emissions were calculated using the emission rate for the SPP South subregion in EPA's eGRID2022 data summary tables.

- Results
  - Emissions reductions from replacing incandescent fixtures with LED lighting fixtures at a university are 17.06 mt CO_2e / year.

Potential Reductions	
	mt CO_2e (total)
2025-2030	85.31
2025-2050	426.53

- Limitations and Conclusions

- Any changes in actual square foot coverage would increase the number of fixtures required, but decrease the wattage savings per fixture, yielding similar emissions reductions results. Actual lux, lumens, and wattage per fixture may vary.

HVAC Upgrades

- Outputs from Planning Team
  - Replacing 20-year-old HVAC units at the city hall and community buildings.

- Methods and Assumptions
  - Assume 4,135 square feet
  - 400 square feet per 1 ton of heating/cooling
  - Assume 6 months of cooling and 5 months of heating.
  - Assume that the HVAC system is off 33% of the time the unit is in operation.
  - Cooling
    - Assume 6.5 BTU/W*h SEEr rating of OLD HVAC system[55]
    - Assume 15 BTU/W*h SEEr rating of New HVAC system[56]
  - Heating
    - Assume 27.1 MBTU/year of natural gas consumption per square feet for building built in the 1970[57]
    - Assume 25.4 MBTU/year of natural gas consumption per square feet for building built after 2010[58]
    - Assume 63% efficiency for old boilers and 94% efficiency for new boilers[59]
  - Method – Emissions Factors
    - 975.3 lb/MWh[60]
    - 53.06 kgCO2/mmBTU[61]
    - 0.001 kg CH4/mmBtu[25]
    - 0.00001 kg N2O/mmBtu[25]

- Results
  - Cooling
    - 31.58 MWh saved by upgrading HVAC system
    - 13.97 mt CO2 emissions averted
  - Heating
    - 0.37 mt CO2 emissions averted

---

[55] Assumption based on a HVAC unit built prior to 1980 https://www.tdhca.state.tx.us/community-affairs/wap/docs/WAP-BP-SEERandEERDetermination.pdf
[56] assumption based on a HVAC unit built prior to 1980 https://www.tdhca.state.tx.us/community-affairs/wap/docs/WAP-BP-SEERandEERDetermination.pdf
[57] Assumption for building built in 1970s region https://www.eia.gov/consumption/commercial/data/2018/ce/pdf/e7.pdf
[58] Assumption for building built after 2010 region https://www.eia.gov/consumption/commercial/data/2018/ce/pdf/e7.pdf
[59] https://www.energy.gov/energysaver/furnaces-and-boilers
[60] from eGRID SPSO Subregion
[61] Default CO2 EF for Nat Gas -Table C-1 to Subpart C

- 112.06 MMBTU/year of natural gas combustion per year - old boiler
- 105.03 MMBTU/year of natural gas combustion per year - new boiler
- 7 MMBTU/year of natural gas consumption averted

Potential Reductions	
	mt CO_2e (total)
2025-2030	71.72
2025-2050	358.59

- Limitations and Conclusions
  - These emissions reduction estimates are based on the information provided in DEQ's online project submission website. Emissions reduction estimates for similar projects may vary greatly.

Control Ventilation System

- Outputs from Planning Team
  - Install control ventilation systems, such as Aircuity[62], that monitor critical indoor air parameters. The system has a demand control that adjusts both air supply and exhaust based on the indoor contaminants levels and thermal load.
  - The installation of demand control systems would eliminate the need for constant, 100% outside air delivery.

- Methods and Assumptions
  - Assume the average demand control system would reduce the ventilation electricity consumption by 36%.
  - Assume a building size of 160,000 square-feet.

- Results

Potential Reductions	
	mt CO_2e (total)
2025-2030	3,773.83
2025-2050	16,353.26

- Limitations and Conclusions
  - These emissions reduction estimates are based on the information provided in DEQ's online project submission website. Emissions reduction estimates for similar projects may vary greatly.

Windows Upgrades

[62] https://www.aircuity.com/wp-content/uploads/Aircuity-Lab-ROI-Sample-1-SST.pdf

- Outputs from Planning Team
  - Replace old windows in municipal offices and commercial buildings.
    The reduction of energy costs due to the energy efficient window replacements with have a positive effect on operations and reduce carbon footprint. Additionally, according to the ENERGY STAR program, a savings of up to 15% on energy costs can be realized annually with energy efficient window replacements.

- Methods and Assumptions
  - Assume 7,850 square feet floor space.
  - Assume 400 square feet per 1 ton of heating and cooling.[63]
  - Assume 6 months of cooling and 5 months of heating.
  - Assume that the HVAC system is off 33% of the time the unit is in operation.
  - Assume 23% of the energy from the HVAC systems are saved after the window upgrades.[64]

- Results
  - 43.64 MWh saved by upgrading windows
  - 19.31 mt CO2e emission per year is reduced

Potential Reductions	
	mt CO_2e (total)
2025-2030	96.53
2025-2050	482.65

- Limitations and Conclusions
  - These emissions reduction estimates are based on the information provided in DEQ's online project submission website. Emissions reduction estimates for similar projects may vary greatly.
  - This is a theoretical project and no facilities have been chosen for upgraded energy efficient windows and therefore specifics on building size, number of windows, energy consumed and saved are unknown.
  - Energy efficiency of new windows, electrical consumption is assumed, actual savings would depend on climate, building orientation, and occupancy patterns.

[63] https://www.energy.gov/sites/prod/files/guide_to_home_heating_cooling.pdf
[64] https://www.energy.gov/energysaver/windows-doors-and-skylights

Landfill Gas Collection & Control

- Outputs from Planning Team
  - Create incentive-based program to promote reduction of methane emissions from landfills through installation of collection system and/or use of methane destruction (not to include flaring). Based on the project submittal, Garvin County was used as representative county for to develop emissions calculations for five similar projects.

- Methods and Assumptions
  - Method
    - LandGEM: EPA's LandGEM was used to estimate the unmitigated landfill gas emissions per year using site specific data from a landfill that could design and implement an emissions reduction project. The annual volumes of landfill gas emissions for years 2025-2050 were averaged.
    - LFGE Benefits Calculator: This average emissions rate was input into the LFGE Benefits Calculator to estimate the potential emissions reduction.
  - Site Specific Data:

Landfill Name	Redacted
Landfill Open Year	1991
Estimated Landfill Closure	2026
Waste Design Capacity	1,209,507

Reporting Year	Total Annual Waste Disposal Quantity (Metric Tons (mt))
1991	8,557
1992	8,557
1993	8,557
1994	8,557
1995	8,557
1996	8,557
1997	10,800
1998	11,378
1999	15,298
2000	15,388
2001	15,950
2002	16,645
2003	14,904
2004	15,924
2005	7,919
2006	12,418
2007	15,667
2008	19,645
2009	19,144
2010	18,643
2011	29,527
2012	43,360
2013	48,556
2014	61,682
2015	61,047
2016	50,347
2017	58,991
2018	89,965
2019	83,453
2020	106,722
2021	107,973
2022	97,340

- Data Source: EPA's Facility Level Information on GreenHouse gases Tool (FLIGHT), Data Year: 2022.[65]

[65] https://ghgdata.epa.gov/ghgp/service/facilityDetail/2022?id=1013807&ds=E&et=&popup=true

- Results
  - Results from LandGEM:

Unmitigated Emissions Per Landfill				
	MMSCF/year	scf/min	mt CO_2e/year	mt CO_2e (total)
2025-2030	423	804	122,817	736,902
2025-2050	274	521	79,551	2,068,328

scf: standard cubic foot

  - Results from LFGE Benefits Calculator

Emissions Reductions Per Landfill		
	mt CO_2e/year	mt CO_2e (total)
2025-2030	113,530	567,652
2025-2050	73,536	1,838,399

- Limitations and Conclusions
  - These emissions reduction estimates are based on site-specific data from one landfill. Emissions reduction estimates for other landfills may vary greatly.

Municipal Wastewater Facility Anaerobic Digesters

- Outputs from Planning Team
  - Municipal Wastewater Facility Anaerobic Digesters (ADs) and Energy Efficiency Upgrades by create incentive-based program to encourage system upgrades to digesters and energy efficiency improvements. Upgraded or new anaerobic digesters will have a significant reduction in GHG emissions coupled with facility energy efficiency projects that will reduce energy cost for rural Oklahoma. Use Payne County, Oklahoma based on communication with Oklahoma's Water Quality Division (WQD), for a city that is a good example (size and need) of a community that could be funded.

- Methods and Assumptions
  - The range of emissions for ADs at Wastewater Treatment Plants (WWTPs) is (162 ± 87 grams (g) CH_4/(population equivalent (PE) x year (y)))[66]
  - Since the proposed upgrades would be compared to existing ADs, the potential emissions reductions were calculated by assuming that existing systems emit at the high end of the provided range, and that the new AD systems would emit at the low end of the range.

[66] Data from IWA Publishing, Water Science & Technology: https://doi.org/10.2166/wst.2019.415.

- The population of Payne County, OK in 2022 was used in these calculations (82,794 people).[67]

- Results
  - Emissions reductions from upgrading existing AD system for Payne County = 403.37 mt CO_2e /year

Potential Reductions	
	mt CO_2e (total)
2025-2030	2,016.85
2025-2050	10,084.25

- Limitations and Conclusions
  - These calculations include emissions from residual gas production in sludge storage tanks, methane slip of combined heat and power plants, and dissolved methane in the digested sludge. They do not include leak emissions from manholes, concrete cracks, and the sludge riser's top end at the digesters head. Since older AD systems may have significant sources of leaks, emissions reductions may be greater than the above estimate.

[67]Data from Data Commons
https://datacommons.org/place/geoId/40119?utm_medium=explore&mprop=count&popt=Person&hl=en

Appendix E Additional Information on Other Funding Opportunities

Table 22. Additional Information on Other Funding Opportunities

Funding Opportunity	Additional Info
Clean Heavy-Duty Vehicles	Program covers up to 100 percent of costs for (1) incremental cost of replacing an existing heavy-duty vehicle with a zero-emission vehicle; (2) purchasing and operating associated infrastructure; (3) workforce development and training; (4) planning and technical activities.
Energy Efficiency and Conservation Block Grant (EECBG) Program	(1) Development and implementation of an energy efficiency and conservation strategy (2) retaining technical consultant services to assist the eligible entity in the development of such a strategy, including— (3) conducting residential and commercial building energy audits; (4) establishment of financial incentive programs for energy efficiency improvements; (5) the provision of grants to nonprofit organizations and governmental agencies for the purpose of performing energy efficiency retrofits; (6) development and implementation of energy efficiency and conservation programs for buildings and facilities within the jurisdiction of the eligible entity, including— (A)design and operation of the programs; (B)identifying the most effective methods for achieving maximum participation and efficiency rates; (C)public education; (D)measurement and verification protocols; and (E)identification of energy efficient technologies; (7) development and implementation of programs to conserve energy used in transportation, including— (A) use of flex time by employers; (B) satellite work centers; (C) development and promotion of zoning guidelines or requirements that promote energy efficient development; (D) development of infrastructure, such as bike lanes and pathways and pedestrian walkways; (E) synchronization of traffic signals; and (F) other measures that increase energy efficiency and decrease energy consumption; (8) development and implementation of building codes and inspection services to promote building energy efficiency; (9) application and implementation of energy distribution technologies that significantly increase energy efficiency, including— (A) distributed resources; and (B) district heating and cooling systems; (10) activities to increase participation and efficiency rates for material conservation programs, including source reduction, recycling, and recycled content procurement programs that lead to increases in energy efficiency; (11) the purchase and implementation of technologies to reduce, capture, and, to the maximum extent practicable, use methane and other greenhouse gases generated by landfills or similar sources; (12) replacement of traffic signals and street lighting with energy efficient lighting technologies, including— (A) light emitting diodes; and (B) any other technology of equal or greater energy efficiency; (13) development, implementation, and installation on or in any government building of the eligible entity of onsite renewable energy technology that generates electricity from renewable resources, including— (A) solar energy; (B) wind energy; (C) fuel cells; and (D) biomass; (14) programs for financing energy efficiency, renewable energy, and zero-emission transportation (and associated infrastructure), capital investments, projects, and programs, which may include loan programs and performance contracting programs, for leveraging of additional public and private sector funds, and programs that allow rebates, grants, or other incentives for the purchase and installation of energy efficiency, renewable energy, and zero-emission transportation (and associated infrastructure) measures.
GHG Reduction Fund—Zero Emission Technologies Grant Program. "Solar For All"	Grant recipients will provide financial and technical assistance for zero-emission technology and qualified projects. The term 'zero-emission technology' means any technology that produces zero emissions of any air pollutant that is listed pursuant to section 108(a) of the Clean Air Act (or any precursor to such an air pollutant); and any greenhouse gas.' The term 'qualified project' includes any project, activity, or technology that— (A) reduces or avoids greenhouse gas emissions and other forms of air pollution in partnership with, and by leveraging investment from, the private sector; or (B) assists communities in the efforts of

Funding Opportunity	Additional Info
	those communities to reduce or avoid greenhouse gas emissions and other forms of air pollution
Conservation Technical Assistance—Equity in Conservation Outreach	NRCS offers this assistance at no cost to the producers we serve. The goal is to give farmers, ranchers, and forestland owners personalized advice and information, based on the latest science and research, to help them make informed decisions.
Conservation Technical Assistance - Greenhouse Gas Emission Quantification Program	To carry out a program to quantify carbon sequestration and carbon dioxide, methane, and nitrous oxide emissions, through which the Natural Resources Conservation Service shall collect field-based data to assess carbon sequestration and reduction in carbon dioxide, methane, and nitrous oxide emissions outcomes and use the data to monitor and track those carbon sequestration and emissions trends through the Greenhouse Gas Inventory and Assessment Program of the Department of Agriculture.
Environmental and Climate Justice Community Change Grants Program	Grants.gov number EPA-R-OEJECR-OCS-23-04 Funds can be used for composting among many other things
Energy Efficiency and Conservation Block Grant (EECBG) Program	(1) Development and implementation of an energy efficiency and conservation strategy (2) retaining technical consultant services to assist the eligible entity in the development of such a strategy, including— (3) conducting residential and commercial building energy audits; (4) establishment of financial incentive programs for energy efficiency improvements; (5) the provision of grants to nonprofit organizations and governmental agencies for the purpose of performing energy efficiency retrofits; (6) development and implementation of energy efficiency and conservation programs for buildings and facilities within the jurisdiction of the eligible entity, including— (A)design and operation of the programs; (B)identifying the most effective methods for achieving maximum participation and efficiency rates; (C)public education; (D)measurement and verification protocols; and (E)identification of energy efficient technologies; (7) development and implementation of programs to conserve energy used in transportation, including— (A) use of flex time by employers; (B) satellite work centers; (C) development and promotion of zoning guidelines or requirements that promote energy efficient development; (D) development of infrastructure, such as bike lanes and pathways and pedestrian walkways; (E) synchronization of traffic signals; and (F) other measures that increase energy efficiency and decrease energy consumption; (8) development and implementation of building codes and inspection services to promote building energy efficiency; (9) application and implementation of energy distribution technologies that significantly increase energy efficiency, including— (A) distributed resources; and (B) district heating and cooling systems; (10) activities to increase participation and efficiency rates for material conservation programs, including source reduction, recycling, and recycled content procurement programs that lead to increases in energy efficiency; (11) the purchase and implementation of technologies to reduce, capture, and, to the maximum extent practicable, use methane and other greenhouse gases generated by landfills or similar sources; (12) replacement of traffic signals and street lighting with energy efficient lighting technologies, including— (A) light emitting diodes; and (B) any other technology of equal or greater energy efficiency; (13) development, implementation, and installation on or in any government building of the eligible entity of onsite renewable energy technology that generates electricity from renewable resources, including— (A) solar energy; (B) wind energy; (C) fuel cells; and (D) biomass; (14) programs for financing energy efficiency, renewable energy, and zero-emission transportation (and associated infrastructure), capital investments, projects, and programs, which may include loan programs and performance

Funding Opportunity	Additional Info
	contracting programs, for leveraging of additional public and private sector funds, and programs that allow rebates, grants, or other incentives for the purchase and installation of energy efficiency, renewable energy, and zero-emission transportation (and associated infrastructure) measures.
Buildings Energy Efficiency Frontiers & Innovation Technologies (BENEFIT) – 2024	Grants.gov funding number - DE-FOA-0003158
Energy Efficiency and Conservation Block Grant (EECBG) Program	(1) Development and implementation of an energy efficiency and conservation strategy (2) retaining technical consultant services to assist the eligible entity in the development of such a strategy, including— (3) conducting residential and commercial building energy audits; (4) establishment of financial incentive programs for energy efficiency improvements; (5) the provision of grants to nonprofit organizations and governmental agencies for the purpose of performing energy efficiency retrofits; (6) development and implementation of energy efficiency and conservation programs for buildings and facilities within the jurisdiction of the eligible entity, including— (A)design and operation of the programs; (B)identifying the most effective methods for achieving maximum participation and efficiency rates; (C)public education; (D)measurement and verification protocols; and (E)identification of energy efficient technologies; (7) development and implementation of programs to conserve energy used in transportation, including— (A) use of flex time by employers; (B) satellite work centers; (C) development and promotion of zoning guidelines or requirements that promote energy efficient development; (D) development of infrastructure, such as bike lanes and pathways and pedestrian walkways; (E) synchronization of traffic signals; and (F) other measures that increase energy efficiency and decrease energy consumption; (8) development and implementation of building codes and inspection services to promote building energy efficiency; (9) application and implementation of energy distribution technologies that significantly increase energy efficiency, including— (A) distributed resources; and (B) district heating and cooling systems; (10) activities to increase participation and efficiency rates for material conservation programs, including source reduction, recycling, and recycled content procurement programs that lead to increases in energy efficiency; (11) the purchase and implementation of technologies to reduce, capture, and, to the maximum extent practicable, use methane and other greenhouse gases generated by landfills or similar sources; (12) replacement of traffic signals and street lighting with energy efficient lighting technologies, including— (A) light emitting diodes; and (B) any other technology of equal or greater energy efficiency; (13) development, implementation, and installation on or in any government building of the eligible entity of onsite renewable energy technology that generates electricity from renewable resources, including— (A) solar energy; (B) wind energy; (C) fuel cells; and (D) biomass; (14) programs for financing energy efficiency, renewable energy, and zero-emission transportation (and associated infrastructure), capital investments, projects, and programs, which may include loan programs and performance contracting programs, for leveraging of additional public and private sector funds, and programs that allow rebates, grants, or other incentives for the purchase and installation of

Funding Opportunity	Additional Info
	energy efficiency, renewable energy, and zero-emission transportation (and associated infrastructure) measures.
Funding to Address Air Pollution: Methane Monitoring	To enhance and expand the method development of new technologies capable of real time flare measurement and monitoring; to develop methods to measure fugitive sources of methane (e.g., landfills); to provide grants to state, local, and Tribal air agencies to develop methane monitoring capabilities to determine effectiveness of emission mitigation efforts.

Appendix F Oklahoma Criteria Pollutants and HAPs Emissions Inventory

Table 23: 2020 Oklahoma Criteria Pollutant and HAP Emissions Inventory by Sector, County, and Pollutants[68]

TRANSPORTATION

County[69]	NOx (tons)	$PM_{2.5}$ (tons)	SO_2 (tons)	VOC (tons)	HAP (tons)	Total (tons)
Adair	530.16	287.14	0.76	137.33	34.74	990.13
Alfalfa	388.77	77.59	1.05	155.36	39.87	662.64
Atoka	768.55	688.45	1.56	223.79	51.98	1,734.33
Beaver	245.73	122.25	0.51	93.38	22.70	484.57
Beckham	678.53	119.02	1.66	327.07	81.01	1,207.29
Blaine	403.53	249.78	1.33	171.88	42.17	868.69
Bryan	928.71	591.19	2.87	522.82	130.00	2,175.59
Caddo	750.88	245.80	1.67	298.83	69.69	1,366.87
Canadian	2,075.38	494.17	6.35	985.17	221.79	3,782.86
Carter	1,088.11	390.56	4.57	454.64	106.67	2,044.55
Cherokee	466.24	361.46	1.44	416.77	112.49	1,358.40
Choctaw	372.99	281.19	0.89	231.40	61.03	947.50
Cimarron	586.42	98.82	0.65	130.62	37.18	853.69
Cleveland	2,846.61	682.17	8.29	1,946.70	504.85	5,988.62
Coal	114.29	106.47	0.26	56.12	13.81	290.95
Comanche	1,232.38	379.76	11.71	761.45	191.47	2,576.77
Cotton	239.16	68.00	0.50	89.79	21.25	418.70
Craig	951.60	196.02	1.69	226.64	54.88	1,430.83
Creek	1,592.84	542.30	3.61	703.63	168.32	3,010.70
Custer	900.95	159.29	2.21	332.34	75.97	1,470.76
Delaware	639.20	515.24	1.98	631.90	174.09	1,962.41
Dewey	233.40	133.40	0.50	106.71	26.54	500.55
Ellis	867.90	98.86	0.91	98.24	29.68	1,095.59
Garfield	1,858.54	363.72	73.08	837.30	225.08	3,357.72
Garvin	1,010.41	295.41	2.47	357.93	81.58	1,747.80
Grady	1,262.28	464.07	3.07	533.81	126.33	2,389.56
Grant	268.66	102.63	0.43	80.38	21.12	473.22
Greer	99.73	46.33	0.22	56.07	14.58	216.93
Harmon	69.78	23.08	0.12	31.60	8.58	133.16
Harper	174.61	66.18	0.28	64.56	15.93	321.56
Haskell	257.37	170.78	0.57	261.11	73.64	763.47

[38] Zero emissions values, represented by a hyphen, indicate the sector pollutant emissions for the county are either zero emissions or emissions less than 0.005 tons. Null emissions values indicate there are no sector pollutant emissions for the county. Counties with no sector pollutant emissions for all the pollutants are omitted from the table.

County[69]	NOx (tons)	$PM_{2.5}$ (tons)	SO_2 (tons)	VOC (tons)	HAP (tons)	Total (tons)
Hughes	314.42	186.31	0.62	132.35	34.01	667.71
Jackson	711.72	152.40	36.93	354.07	94.02	1,349.14
Jefferson	220.64	86.83	0.35	107.55	29.89	445.26
Johnston	264.65	217.02	0.55	138.92	36.63	657.77
Kay	1,145.39	277.85	5.33	526.76	130.04	2,085.37
Kingfisher	430.84	234.81	0.91	155.97	38.49	861.02
Kiowa	297.91	119.49	0.63	151.30	41.55	610.88
Latimer	181.56	186.13	0.38	99.77	25.68	493.52
Le Flore	946.27	643.60	2.16	431.11	110.74	2,133.88
Lincoln	897.82	394.21	2.17	346.70	75.87	1,716.77
Logan	963.05	284.55	2.23	362.88	86.30	1,699.01
Love	787.22	146.07	1.45	254.37	61.57	1,250.68
Major	315.03	174.25	0.66	104.15	24.39	618.48
Marshall	384.84	215.17	0.73	378.92	109.29	1,088.95
Mayes	1,195.53	700.82	2.65	472.84	115.75	2,487.59
McClain	1,477.35	459.43	3.52	464.32	97.67	2,502.29
McCurtain	690.45	639.02	1.54	474.16	127.29	1,932.46
McIntosh	1,082.20	450.88	2.07	690.91	189.67	2,415.73
Murray	587.65	217.74	1.10	215.94	56.25	1,078.68
Muskogee	1,398.99	586.98	3.94	653.57	165.19	2,808.67
Noble	1,222.04	234.88	10.00	326.18	78.83	1,871.93
Nowata	329.46	160.22	0.51	141.62	37.78	669.59
Okfuskee	366.99	112.35	0.79	126.12	27.98	634.23
Oklahoma	10,947.58	1,753.66	100.85	6,687.86	1,675.06	21,165.01
Okmulgee	724.92	458.59	1.90	337.31	80.35	1,603.07
Osage	554.01	391.22	1.78	504.26	133.76	1,585.03
Ottawa	1,062.58	288.29	2.22	388.55	95.51	1,837.15
Pawnee	605.81	345.46	1.11	233.65	61.50	1,247.53
Payne	931.99	497.34	5.37	528.35	122.99	2,086.04
Pittsburg	1,195.95	782.31	2.64	655.80	171.64	2,808.34
Pontotoc	498.07	381.32	1.52	264.52	63.94	1,209.37
Pottawatomie	1,071.11	433.55	2.85	521.39	120.44	2,149.34
Pushmataha	255.97	300.43	0.61	189.13	50.36	796.50
Roger Mills	102.91	37.91	0.19	53.89	14.32	209.22
Rogers	2,048.99	650.94	4.58	867.09	213.64	3,785.24
Seminole	579.22	316.22	1.62	246.50	55.57	1,199.13
Sequoyah	1,265.59	325.21	2.52	502.78	126.37	2,222.47
Stephens	586.15	265.83	1.47	384.47	98.95	1,336.87
Texas	920.17	261.86	1.70	286.08	73.81	1,543.62

[38] Zero emissions values, represented by a hyphen, indicate the sector pollutant emissions for the county are either zero emissions or emissions less than 0.005 tons. Null emissions values indicate there are no sector pollutant emissions for the county. Counties with no sector pollutant emissions for all the pollutants are omitted from the table.

County[69]	NOx (tons)	$PM_{2.5}$ (tons)	SO_2 (tons)	VOC (tons)	HAP (tons)	Total (tons)
Tillman	547.21	97.85	33.86	264.23	72.90	1,016.05
Tulsa	8,612.34	1,588.20	41.65	7,884.64	2,126.94	20,253.77
Wagoner	1,050.64	529.80	3.04	612.25	156.74	2,352.47
Washington	543.30	317.50	1.44	357.81	90.78	1,310.83
Washita	625.68	117.28	17.88	266.92	69.87	1,097.63
Woods	1,159.19	104.47	1.21	163.16	50.49	1,478.52
Woodward	1,299.51	180.68	1.73	243.19	66.80	1,791.91
Multiple (portable facilities)					3.94	3.94
Transportation Total	**77,304.62**	**25,728.06**	**452.17**	**40,879.65**	**10,426.63**	**154,791.13**

ELECTRIC POWER INDUSTRY

County	NOx (tons)	$PM_{2.5}$ (tons)	SO_2 (tons)	VOC (tons)	HAP (tons)	Total (tons)
Beaver	0.01	-	-	0.01	0.02	0.04
Caddo	810.34	31.53	3.32	17.55	3.98	866.72
Canadian	425.84	20.56	18.93	30.29	5.92	501.54
Carter	0.04	-	-	-	-	0.04
Choctaw	242.80	7.84	569.63	9.92	2.54	832.73
Cleveland	3.12	0.05	-	0.09	-	3.26
Coal	0.16	-		0.01	-	0.17
Comanche	42.06	7.59	0.60	2.44	0.59	53.28
Creek	0.06			0.07	-	0.13
Custer	3.75	0.20	0.10	0.42	0.05	4.52
Kay	4.91	0.41	0.03	0.13	0.06	5.54
Latimer	0.02	-	-	-	-	0.02
Le Flore	1,321.74	78.23	366.96	2.87	10.40	1,780.20
Lincoln	0.13	-	-	-	-	0.13
Logan	10.42	1.24	0.25	0.13	-	12.04
Marshall	0.30	0.02	-	0.02	-	0.34
Mayes	682.40	172.87	247.11	69.90	13.52	1,185.80
McClain	305.28	104.19	6.22	16.99	10.67	443.35
McCurtain	0.64	0.04	0.04	0.05	-	0.77
Muskogee	3,414.40	269.24	3,580.47	69.01	17.87	7,350.99
Noble	1,679.27	299.66	356.70	45.07	14.68	2,395.38
Okfuskee	16.31	0.12	0.15	0.06	0.02	16.66

[38] Zero emissions values, represented by a hyphen, indicate the sector pollutant emissions for the county are either zero emissions or emissions less than 0.005 tons. Null emissions values indicate there are no sector pollutant emissions for the county. Counties with no sector pollutant emissions for all the pollutants are omitted from the table.

County	NOx (tons)	$PM_{2.5}$ (tons)	SO_2 (tons)	VOC (tons)	HAP (tons)	Total (tons)
Oklahoma	1,595.83	119.52	18.28	59.37	18.21	1,811.21
Osage	5.97	0.03	-	0.08	0.08	6.16
Payne	22.65	1.48	0.71	1.16	0.36	26.36
Pittsburg	642.30	49.19	12.50	5.89	9.62	719.50
Pontotoc	0.14	-		0.01	-	0.15
Pottawatomie	0.03	-	-	-	-	0.03
Rogers	1,470.86	89.64	2,286.59	34.56	17.06	3,898.71
Seminole	1,682.93	74.60	8.47	75.72	25.81	1,867.53
Sequoyah	0.01	-	-	0.01	-	0.02
Texas	0.13				-	0.13
Tulsa	1,408.34	58.54	11.86	26.61	12.41	1,517.76
Wagoner	778.60	74.07	14.07	16.41	13.84	896.99
Woodward	29.35	1.67	0.14	1.21	0.41	32.78
Electric Power Industry Total	**16,601.14**	**1,462.53**	**7,503.13**	**486.06**	**178.12**	**26,230.98**

INDUSTRY

County	NOx (tons)	$PM_{2.5}$ (tons)	SO_2 (tons)	VOC (tons)	HAP (tons)	Total (tons)
Adair	10.69	30.22	1.92	61.26	4.78	108.87
Alfalfa	2,303.96	73.84	6.93	3,718.63	613.57	6,716.93
Atoka	182.77	24.58	0.71	313.19	23.66	544.91
Beaver	5,063.62	102.49	2.92	7,569.31	178.74	12,917.08
Beckham	1,597.45	80.53	6.03	2,332.14	253.44	4,269.59
Blaine	3,546.45	166.00	5.16	4,956.82	753.71	9,428.14
Bryan	305.92	77.55	136.72	390.72	50.82	961.73
Caddo	1,795.02	66.47	2.31	2,403.56	187.53	4,454.89
Canadian	5,431.71	326.50	103.25	16,951.09	875.03	23,687.58
Carter	2,662.25	281.81	235.32	12,769.27	343.02	16,291.67
Cherokee	4.65	18.40	0.84	86.61	8.66	119.16
Choctaw	2.63	25.64	0.47	54.90	4.07	87.71
Cimarron	243.27	4.52	2.81	163.58	12.05	426.23
Cleveland	177.33	326.68	15.56	409.24	53.28	982.09
Coal	1,354.31	57.77	6.60	1,808.82	164.49	3,391.99
Comanche	300.10	188.28	10.00	694.96	98.41	1,291.75
Cotton	59.39	4.68	0.21	221.28	2.22	287.78

[38] Zero emissions values, represented by a hyphen, indicate the sector pollutant emissions for the county are either zero emissions or emissions less than 0.005 tons. Null emissions values indicate there are no sector pollutant emissions for the county. Counties with no sector pollutant emissions for all the pollutants are omitted from the table.

County	NOx (tons)	$PM_{2.5}$ (tons)	SO_2 (tons)	VOC (tons)	HAP (tons)	Total (tons)
Craig	8.22	6.54	0.70	31.40	3.70	50.56
Creek	1,351.32	280.31	263.50	2,662.88	74.94	4,632.95
Custer	1,430.38	103.40	7.61	3,240.50	304.40	5,086.29
Delaware	11.18	41.91	2.01	28.01	5.50	88.61
Dewey	1,316.39	54.62	42.83	3,336.44	268.67	5,018.95
Ellis	2,103.21	53.23	1.23	3,554.39	415.79	6,127.85
Garfield	2,633.71	296.14	13,669.68	2,690.51	238.68	19,528.72
Garvin	3,019.56	205.55	229.08	8,418.91	501.56	12,374.66
Grady	6,746.89	322.67	44.12	9,543.93	947.89	17,605.50
Grant	551.46	43.93	0.80	1,514.33	96.28	2,206.80
Greer	5.34	1.61	0.13	16.48	0.61	24.17
Harmon	1.09	0.69	0.13	7.03	0.35	9.29
Harper	400.95	14.51	0.54	1,574.07	34.73	2,024.80
Haskell	1,068.84	59.23	1.50	741.83	64.58	1,935.98
Hughes	2,280.55	60.71	5.01	2,758.65	310.15	5,415.07
Jackson	176.23	53.18	270.19	94.68	6.65	600.93
Jefferson	63.22	3.02	0.45	344.56	8.89	420.14
Johnston	92.92	115.18	1.59	349.44	29.00	588.13
Kay	2,035.65	460.33	1,873.77	2,684.56	214.63	7,268.94
Kingfisher	7,247.23	269.18	33.50	48,392.64	1,237.91	57,180.46
Kiowa	51.64	29.06	0.27	105.48	14.13	200.58
Latimer	1,787.27	59.62	2.00	1,056.04	181.00	3,085.93
Le Flore	929.80	120.82	2.18	637.93	65.09	1,755.82
Lincoln	600.61	44.29	22.11	2,242.79	132.10	3,041.90
Logan	1,355.57	78.73	3.52	1,674.92	192.05	3,304.79
Love	214.87	18.18	3.06	1,732.04	60.60	2,028.75
Major	1,696.35	69.23	2.32	3,955.50	244.73	5,968.13
Marshall	769.82	87.96	110.04	1,370.96	94.28	2,433.06
Mayes	2,204.19	492.65	1,354.87	523.58	102.32	4,677.61
McClain	945.94	77.62	3.57	2,266.98	323.36	3,617.47
McCurtain	2,521.39	778.04	106.46	4,601.53	2,791.32	10,798.74
McIntosh	230.52	8.24	0.43	262.17	30.78	532.14
Murray	21.59	97.22	2.10	250.34	4.58	375.83
Muskogee	865.91	429.89	542.69	735.03	64.61	2,638.13
Noble	237.26	49.59	4.00	757.10	42.04	1,089.99
Nowata	315.93	13.83	3.16	750.24	16.42	1,099.58
Okfuskee	572.31	29.26	10.47	747.44	51.32	1,410.80
Oklahoma	1,119.53	1,697.97	88.37	3,826.90	404.31	7,137.08

[38] Zero emissions values, represented by a hyphen, indicate the sector pollutant emissions for the county are either zero emissions or emissions less than 0.005 tons. Null emissions values indicate there are no sector pollutant emissions for the county. Counties with no sector pollutant emissions for all the pollutants are omitted from the table.

County	NOx (tons)	$PM_{2.5}$ (tons)	SO_2 (tons)	VOC (tons)	HAP (tons)	Total (tons)
Okmulgee	515.26	181.05	156.21	1,263.82	28.08	2,144.42
Osage	888.46	51.90	131.61	3,054.09	463.34	4,589.40
Ottawa	17.88	64.83	3.12	187.57	109.41	382.81
Pawnee	146.79	25.75	17.59	371.32	11.50	572.95
Payne	192.36	136.39	30.81	2,171.89	95.26	2,626.71
Pittsburg	3,952.09	189.06	8.44	2,425.88	384.73	6,960.20
Pontotoc	660.20	179.59	144.88	3,671.65	82.74	4,739.06
Pottawatomie	549.83	119.12	41.75	1,189.50	92.93	1,993.13
Pushmataha	51.23	28.25	1.96	417.11	26.11	524.66
Roger Mills	2,576.04	72.72	1.82	5,614.94	571.19	8,836.71
Rogers	2,543.87	513.51	72.94	601.83	140.45	3,872.60
Seminole	668.36	72.56	335.27	2,488.09	137.36	3,701.64
Sequoyah	81.94	54.45	23.14	168.64	13.28	341.45
Stephens	2,547.17	174.01	73.83	10,826.90	382.67	14,004.58
Texas	1,959.49	157.87	16.51	5,186.83	134.78	7,455.48
Tillman	9.30	5.14	3.77	119.63	2.59	140.43
Tulsa	1,690.11	1,723.51	216.06	4,296.05	502.82	8,428.55
Wagoner	43.84	100.50	6.08	95.62	11.83	257.87
Washington	410.44	45.09	8.84	876.89	30.37	1,371.63
Washita	968.98	30.30	1.39	2,280.46	180.47	3,461.60
Woods	2,957.76	104.72	4.75	3,100.61	515.79	6,683.63
Woodward	1,480.83	137.06	16.74	2,539.14	137.92	4,311.69
Industry Total	**98,938.59**	**12,651.48**	**20,565.26**	**227,336.05**	**17,263.05**	**376,754.43**

AGRICULTURE/LAND USE

County	NOx (tons)	$PM_{2.5}$ (tons)	SO_2 (tons)	VOC (tons)	HAP (tons)	Total (tons)
Adair	1.39	243.64	0.56	136.23	19.59	401.41
Alfalfa	32.95	1,196.45	7.96	278.16	29.93	1,545.45
Atoka	1.05	289.52	0.53	52.17	2.65	345.92
Beaver	7.12	561.63	1.87	176.75	10.02	757.39
Beckham	32.23	446.96	7.95	171.42	28.50	687.06
Blaine	66.85	1,066.52	12.39	338.91	52.35	1,537.02
Bryan	12.56	417.92	3.62	128.05	14.55	576.70
Caddo	45.97	917.17	9.86	349.20	40.03	1,362.23
Canadian	44.37	870.05	8.62	253.41	39.09	1,215.54

[38] Zero emissions values, represented by a hyphen, indicate the sector pollutant emissions for the county are either zero emissions or emissions less than 0.005 tons. Null emissions values indicate there are no sector pollutant emissions for the county. Counties with no sector pollutant emissions for all the pollutants are omitted from the table.

County	NOx (tons)	$PM_{2.5}$ (tons)	SO_2 (tons)	VOC (tons)	HAP (tons)	Total (tons)
Carter	7.51	236.46	1.97	76.86	7.56	330.36
Cherokee	1.98	217.49	0.93	57.05	7.57	285.02
Choctaw	1.47	279.08	0.66	56.42	2.54	340.17
Cimarron	2.92	543.67	0.70	100.54	9.00	656.83
Cleveland	5.81	187.66	1.49	63.44	10.00	268.40
Coal	0.61	195.33	0.11	66.91	3.82	266.78
Comanche	8.67	653.47	2.07	89.41	11.90	765.52
Cotton	11.21	593.05	2.29	94.87	9.87	711.29
Craig	4.94	494.82	2.21	109.69	8.03	619.69
Creek	1.70	179.78	0.46	44.45	3.85	230.24
Custer	22.01	810.88	5.27	148.21	18.30	1,004.67
Delaware	8.10	371.99	3.89	207.19	26.99	618.16
Dewey	24.49	504.93	4.54	137.79	19.26	691.01
Ellis	11.80	264.29	2.53	184.73	17.19	480.54
Garfield	124.03	1,785.45	28.44	551.30	97.00	2,586.22
Garvin	9.93	350.56	2.76	102.09	10.32	475.66
Grady	22.60	569.71	4.89	245.64	26.44	869.28
Grant	177.10	1,750.34	45.69	701.16	125.29	2,799.58
Greer	5.69	378.93	1.68	56.74	8.60	451.64
Harmon	1.09	317.02	0.41	30.45	1.40	350.37
Harper	8.62	372.92	1.83	143.43	11.14	537.94
Haskell	1.69	249.99	0.62	98.18	6.83	357.31
Hughes	6.87	260.91	2.26	376.49	18.46	664.99
Jackson	13.97	1,121.86	3.96	82.12	10.26	1,232.17
Jefferson	9.82	328.53	1.82	109.02	9.35	458.54
Johnston	1.81	187.59	0.34	51.60	3.42	244.76
Kay	86.22	1,118.07	29.64	343.33	60.01	1,637.27
Kingfisher	66.67	1,083.24	13.24	441.29	60.12	1,664.56
Kiowa	16.29	1,058.75	3.96	208.56	16.98	1,304.54
Latimer	0.58	173.73	0.30	31.49	1.36	207.46
Le Flore	6.64	416.44	3.19	305.71	28.50	760.48
Lincoln	6.66	285.73	1.43	92.48	10.97	397.27
Logan	11.62	17.85	2.49	99.95	14.22	546.13
Love	1.81	137.29	0.34	38.42	2.80	180.66
Major	43.24	836.25	10.39	324.34	39.13	1,253.35
Marshall	2.37	104.62	0.44	29.52	2.39	139.34
Mayes	1.39	368.83	0.41	88.33	13.86	472.82
McClain	2.87	344.93	0.68	58.36	5.27	412.11

[38] Zero emissions values, represented by a hyphen, indicate the sector pollutant emissions for the county are either zero emissions or emissions less than 0.005 tons. Null emissions values indicate there are no sector pollutant emissions for the county. Counties with no sector pollutant emissions for all the pollutants are omitted from the table.

County	NOx (tons)	$PM_{2.5}$ (tons)	SO_2 (tons)	VOC (tons)	HAP (tons)	Total (tons)
McCurtain	12.03	373.75	5.30	210.20	26.28	627.56
McIntosh	3.18	225.23	1.15	50.87	3.67	284.10
Murray	2.62	139.04	0.63	48.26	6.97	197.52
Muskogee	7.31	433.29	3.39	88.63	6.65	539.27
Noble	41.38	636.01	10.97	204.17	34.74	927.27
Nowata	6.81	287.98	2.94	79.19	10.18	387.10
Okfuskee	2.53	252.48	0.81	55.87	3.42	315.11
Oklahoma	2.82	179.81	0.63	47.46	7.30	238.02
Okmulgee	2.77	287.06	1.22	47.10	3.18	341.33
Osage	18.20	527.07	6.62	188.72	15.90	756.51
Ottawa	10.70	361.01	5.29	102.80	12.50	492.30
Pawnee	5.33	266.74	1.13	62.85	8.88	344.93
Payne	6.30	244.91	1.61	75.88	9.32	338.02
Pittsburg	3.34	280.44	1.30	66.17	8.27	359.52
Pontotoc	2.15	228.71	0.40	53.92	3.40	288.58
Pottawatomie	4.17	209.77	1.35	72.65	9.99	297.93
Pushmataha		143.30		31.28	1.65	176.23
Roger Mills	8.99	317.90	1.74	168.55	15.27	512.45
Rogers	7.02	337.46	3.07	81.86	8.16	437.57
Seminole	0.89	175.84	0.17	47.51	2.25	226.66
Sequoyah	4.58	263.03	1.82	55.73	4.66	329.82
Stephens	6.66	354.12	1.24	92.66	6.89	461.57
Texas	7.00	1,548.44	2.27	1,638.78	67.59	3,264.08
Tillman	24.70	1,033.42	6.24	170.52	43.96	1,278.84
Tulsa	1.90	100.27	0.94	21.52	2.41	127.04
Wagoner	10.48	291.70	5.02	68.14	9.09	384.43
Washington	5.15	196.81	2.14	45.78	4.58	254.46
Washita	29.92	1,108.73	6.37	193.02	24.22	1,362.26
Woods	22.93	679.66	4.33	162.62	22.99	892.53
Woodward	11.75	458.16	2.26	188.62	13.78	674.57
Agriculture Total	**1,260.90**	**37,504.44**	**326.04**	**12,353.19**	**1,374.86**	**52,819.43**

[38] Zero emissions values, represented by a hyphen, indicate the sector pollutant emissions for the county are either zero emissions or emissions less than 0.005 tons. Null emissions values indicate there are no sector pollutant emissions for the county. Counties with no sector pollutant emissions for all the pollutants are omitted from the table.

COMMERCIAL, RESIDENTIAL & MUNICIPAL

County	NOx (tons)	$PM_{2.5}$ (tons)	SO_2 (tons)	VOC (tons)	HAP (tons)	Total (tons)
Adair	23.02	45.75	1.16	287.88	47.75	405.56
Alfalfa	7.05	9.89	0.25	193.88	21.20	232.27
Atoka	16.15	35.81	0.81	235.58	33.21	321.56
Beaver	9.06	8.97	0.26	189.96	22.78	231.03
Beckham	37.94	40.30	0.79	324.54	40.29	443.86
Blaine	13.99	18.67	0.47	203.58	23.41	260.12
Bryan	47.77	90.58	1.95	561.91	86.48	788.69
Caddo	34.61	49.18	1.22	451.21	61.49	597.71
Canadian	169.76	162.88	3.61	1,420.65	208.33	1,965.23
Carter	66.05	98.40	2.51	557.14	85.39	809.49
Cherokee	57.07	95.29	2.24	494.00	87.95	736.55
Choctaw	17.21	30.45	0.74	210.58	31.81	290.79
Cimarron	6.55	4.43	0.13	270.67	31.63	313.41
Cleveland	482.92	469.55	10.55	2,472.82	416.79	3,852.63
Coal	9.14	13.56	0.62	104.28	14.65	142.25
Comanche	139.28	173.85	3.72	1,102.04	175.81	1,594.70
Cotton	7.31	8.07	0.24	147.67	15.03	178.32
Craig	19.35	30.87	0.71	278.36	32.47	361.76
Creek	95.31	131.60	3.22	773.01	126.36	1,129.50
Custer	37.28	44.65	0.93	397.90	51.53	532.29
Delaware	53.22	102.32	2.55	503.11	87.22	748.42
Dewey	6.55	9.67	0.24	114.63	12.71	143.80
Ellis	6.27	7.77	0.24	133.57	13.64	161.49
Garfield	140.69	93.03	3.02	709.30	97.13	1,043.17
Garvin	31.36	51.38	1.24	422.47	58.68	565.13
Grady	66.23	93.86	2.22	663.26	102.59	928.16
Grant	7.61	10.85	0.26	215.08	21.26	255.06
Greer	8.10	8.50	0.18	123.40	13.77	153.95
Harmon	4.63	4.40	0.11	83.70	9.73	102.57
Harper	4.74	5.89	0.17	131.38	13.89	156.07
Haskell	18.25	27.47	0.68	184.10	30.09	260.59
Hughes	11.44	25.44	0.57	203.58	34.46	275.49
Jackson	40.04	38.65	0.89	368.25	50.35	498.18
Jefferson	7.09	10.26	0.26	144.20	16.73	178.54
Johnston	11.37	24.62	0.58	150.61	23.47	210.65

[38] Zero emissions values, represented by a hyphen, indicate the sector pollutant emissions for the county are either zero emissions or emissions less than 0.005 tons. Null emissions values indicate there are no sector pollutant emissions for the county. Counties with no sector pollutant emissions for all the pollutants are omitted from the table.

County	NOx (tons)	$PM_{2.5}$ (tons)	SO_2 (tons)	VOC (tons)	HAP (tons)	Total (tons)
Kay	75.98	67.72	1.67	615.22	78.68	839.27
Kingfisher	26.28	26.64	0.70	308.60	36.00	398.22
Kiowa	12.65	15.20	0.34	204.39	23.96	256.54
Latimer	16.34	25.23	0.68	138.45	23.16	203.86
Le Flore	54.65	108.92	2.56	558.45	97.91	822.49
Lincoln	52.47	75.01	2.11	486.01	74.89	690.49
Logan	53.67	80.13	1.73	537.84	82.66	756.03
Love	14.51	22.94	0.62	198.48	23.51	260.06
Major	13.05	18.23	0.43	220.98	24.78	277.47
Marshall	14.56	31.79	0.71	179.41	30.34	256.81
Mayes	64.12	89.95	2.27	542.36	82.07	780.77
McClain	53.53	83.03	1.84	541.69	80.02	760.11
McCurtain	33.24	144.63	1.80	412.22	68.96	660.85
McIntosh	27.93	44.72	1.01	294.71	44.27	412.64
Murray	15.21	30.15	0.57	211.60	27.56	285.09
Muskogee	90.00	119.25	2.87	719.81	116.77	1,048.70
Noble	15.77	19.01	0.45	292.74	32.21	360.18
Nowata	12.61	16.18	0.41	174.11	21.89	225.20
Okfuskee	14.84	23.48	0.54	187.52	28.00	254.38
Oklahoma	1,498.00	1,294.84	30.69	7,173.33	1,115.12	11,111.98
Okmulgee	61.89	75.01	1.70	422.35	70.96	631.91
Osage	64.32	84.00	2.13	572.45	91.66	814.56
Ottawa	42.46	56.07	1.43	390.89	56.19	547.04
Pawnee	24.22	33.35	0.83	234.28	34.53	327.21
Payne	113.23	130.69	2.87	774.42	123.73	1,144.94
Pittsburg	60.18	97.66	2.28	556.49	93.60	810.21
Pontotoc	61.38	70.58	1.80	397.91	64.89	596.56
Pottawatomie	97.58	139.07	3.08	760.05	124.35	1,124.13
Pushmataha	14.63	32.67	0.77	157.56	27.27	232.90
Roger Mills	5.15	7.66	0.19	117.07	13.59	143.66
Rogers	145.53	158.93	4.08	943.20	151.74	1,403.48
Seminole	31.62	49.47	1.20	297.99	47.89	428.17
Sequoyah	45.35	82.35	2.02	486.76	82.10	698.58
Stephens	62.36	84.71	1.82	464.87	74.53	688.29
Texas	30.35	26.87	0.70	857.04	89.03	1,003.99
Tillman	9.64	10.65	0.23	351.78	35.82	408.12
Tulsa	1,250.92	1,095.17	25.68	5,805.23	914.04	9,091.04
Wagoner	98.90	125.62	2.81	784.65	128.81	1,140.79
Washington	92.50	89.33	2.14	472.66	78.61	735.24

[38] Zero emissions values, represented by a hyphen, indicate the sector pollutant emissions for the county are either zero emissions or emissions less than 0.005 tons. Null emissions values indicate there are no sector pollutant emissions for the county. Counties with no sector pollutant emissions for all the pollutants are omitted from the table.

County	NOx (tons)	$PM_{2.5}$ (tons)	SO_2 (tons)	VOC (tons)	HAP (tons)	Total (tons)
Washita	15.73	16.43	0.45	265.88	31.47	329.96
Woods	14.05	13.02	0.31	203.25	22.05	252.68
Woodward	32.04	35.53	0.81	267.70	36.20	372.28
Commercial & Residential Buildings Total	**6,247.85**	**6,928.75**	**162.67**	**44,410.70**	**6,705.90**	**64,455.87**

WASTE AND MATERIALS MANAGEMENT

County	NOx (tons)	$PM_{2.5}$ (tons)	SO_2 (tons)	VOC (tons)	HAP (tons)	Total (tons)
Adair	8.50	40.55	2.05	14.68	7.22	73.00
Alfalfa	1.74	8.47	0.29	2.07	2.10	14.67
Atoka	4.91	23.64	0.93	6.81	5.30	41.59
Beaver	1.68	8.24	0.28	1.80	2.09	14.09
Beckham	2.72	13.17	0.59	4.06	2.75	23.29
Blaine	2.12	10.38	0.37	2.47	2.57	17.91
Bryan	12.41	59.39	3.17	21.99	10.02	106.98
Caddo	7.17	35.08	1.22	8.12	8.85	60.44
Canadian	11.65	55.84	2.85	20.66	14.79	105.79
Carter	11.60	55.66	2.78	105.73	25.40	201.17
Cherokee	12.91	61.57	3.15	22.60	10.81	111.04
Choctaw	3.42	16.55	0.64	18.91	5.75	45.27
Cimarron	0.74	3.63	0.12	0.80	0.92	6.21
Cleveland	44.28	208.69	15.09	106.49	18.84	393.39
Coal	2.17	10.47	0.45	3.10	2.23	18.42
Comanche	10.11	49.00	2.19	15.77	16.28	93.35
Cotton	1.10	5.41	0.19	1.23	1.38	9.31
Craig	3.06	14.73	0.56	4.33	3.40	26.08
Creek	21.92	104.01	6.14	43.59	14.82	190.48
Custer	3.23	15.63	0.72	5.08	3.20	27.86
Delaware	15.41	73.53	3.76	26.87	12.87	132.44
Dewey	1.44	7.03	0.24	1.54	1.79	12.04
Ellis	1.31	6.40	0.24	1.53	1.55	11.03
Garfield	4.42	21.26	0.82	7.37	10.01	43.88
Garvin	6.53	31.42	1.23	23.56	9.04	71.78
Grady	17.56	84.12	4.80	32.16	15.37	154.01
Grant	1.46	7.03	0.25	1.90	1.69	12.33

[38] Zero emissions values, represented by a hyphen, indicate the sector pollutant emissions for the county are either zero emissions or emissions less than 0.005 tons. Null emissions values indicate there are no sector pollutant emissions for the county. Counties with no sector pollutant emissions for all the pollutants are omitted from the table.

County	NOx (tons)	$PM_{2.5}$ (tons)	SO_2 (tons)	VOC (tons)	HAP (tons)	Total (tons)
Greer	0.99	4.83	0.17	1.14	1.23	8.36
Harmon	0.87	4.27	0.15	0.95	1.09	7.33
Harper	1.14	5.59	0.20	1.31	1.37	9.61
Haskell	4.82	22.96	1.22	8.69	3.81	41.50
Hughes	2.69	12.95	0.47	3.56	3.08	22.75
Jackson	2.15	10.49	0.41	3.22	2.54	18.81
Jefferson	1.93	9.46	0.32	2.06	2.40	16.17
Johnston	3.77	18.13	0.71	5.24	4.10	31.95
Kay	4.59	22.10	1.04	22.28	6.37	56.38
Kingfisher	3.63	17.66	0.70	4.64	4.09	30.72
Kiowa	1.85	9.04	0.34	2.24	2.18	15.65
Latimer	4.46	21.21	1.21	8.58	3.18	38.64
Le Flore	14.29	68.48	3.05	22.22	13.87	121.91
Lincoln	11.60	55.67	2.34	17.22	11.88	98.71
Logan	10.40	49.85	2.55	17.69	8.87	89.36
Love	3.05	14.71	0.53	3.92	3.51	25.72
Major	2.48	12.08	0.47	3.05	2.81	20.89
Marshall	4.04	19.52	0.81	5.61	4.29	34.27
Mayes	17.89	85.23	4.99	48.64	14.38	171.13
McClain	16.91	80.37	4.99	34.30	10.54	147.11
McCurtain	11.60	61.85	3.02	21.70	8.91	107.08
McIntosh	5.54	26.91	0.95	6.60	6.58	46.58
Murray	3.33	15.84	0.90	6.47	2.41	28.95
Muskogee	11.21	54.02	2.43	36.41	17.52	121.59
Noble	2.15	10.43	0.40	2.81	2.44	18.23
Nowata	2.18	10.46	0.43	3.18	2.30	18.55
Okfuskee	4.68	22.27	1.23	8.78	3.50	40.46
Oklahoma	94.26	441.21	35.68	358.62	57.99	987.76
Okmulgee	9.31	37.90	6.90	13.13	9.16	76.40
Osage	11.75	56.18	2.66	105.31	35.17	211.07
Ottawa	5.43	26.25	1.06	7.54	5.92	46.20
Pawnee	4.55	21.88	0.83	6.20	5.03	38.49
Payne	12.67	60.60	3.27	23.65	10.23	110.42
Pittsburg	27.11	192.09	10.50	54.17	24.06	307.93
Pontotoc	13.59	78.76	4.06	28.67	8.03	133.11
Pottawatomie	16.23	77.39	3.98	43.09	15.45	156.14
Pushmataha	4.10	19.68	0.79	5.84	4.34	34.75
Roger Mills	1.09	5.33	0.18	15.50	3.28	25.38
Rogers	25.19	119.56	7.03	64.04	19.03	234.85

[38] Zero emissions values, represented by a hyphen, indicate the sector pollutant emissions for the county are either zero emissions or emissions less than 0.005 tons. Null emissions values indicate there are no sector pollutant emissions for the county. Counties with no sector pollutant emissions for all the pollutants are omitted from the table.

County	NOx (tons)	$PM_{2.5}$ (tons)	SO_2 (tons)	VOC (tons)	HAP (tons)	Total (tons)
Seminole	5.29	25.53	0.91	6.87	6.15	44.75
Sequoyah	13.45	64.08	3.37	24.07	10.85	115.82
Stephens	12.51	43.31	2.28	15.00	7.52	80.62
Texas	3.53	17.10	0.78	5.78	3.63	30.82
Tillman	1.22	5.98	0.20	15.74	3.46	26.60
Tulsa	560.10	368.85	69.11	307.65	44.65	1,350.36
Wagoner	19.33	91.40	5.88	41.19	12.71	170.51
Washington	4.93	23.60	1.09	8.68	4.74	43.04
Washita	2.66	13.02	0.46	2.99	3.26	22.39
Woods	1.14	5.52	0.23	87.70	12.80	107.39
Woodward	2.93	14.28	0.57	3.88	3.30	24.96
Waste, Water & Sustainable Materials Management	**1,222.18**	**3,586.78**	**252.97**	**2,053.04**	**671.05**	**7,786.02**

NATURAL AND WORKING LANDS

County	NOx (tons)	$PM_{2.5}$ (tons)	SO_2 (tons)	VOC (tons)	HAP (tons)	Total (tons)
Adair	433.00	909.03	86.61	17,356.00	1,217.52	20,002.16
Alfalfa	568.58	228.04	19.19	4,906.77	888.62	6,611.20
Atoka	791.34	1,550.05	145.62	23,801.85	2,037.28	28,326.14
Beaver	422.04	176.23	16.49	5,536.44	1,143.31	7,294.51
Beckham	259.61	236.05	21.50	3,138.32	665.20	4,320.68
Blaine	369.36	277.89	28.11	4,420.10	763.53	5,858.99
Bryan	558.36	673.75	76.65	17,931.65	1,593.48	20,833.89
Caddo	520.35	402.10	45.72	9,690.36	1,285.51	11,944.04
Canadian	505.74	318.39	33.69	4,906.06	924.46	6,688.34
Carter	589.23	1,303.29	154.13	17,188.17	1,721.20	20,956.02
Cherokee	658.42	2,161.51	196.24	23,631.88	1,906.46	28,554.51
Choctaw	614.61	736.49	75.50	22,568.96	1,739.66	25,735.22
Cimarron	474.76	1.94	0.20	3,823.28	1,067.58	5,367.76
Cleveland	308.81	426.11	48.55	9,611.64	813.47	11,208.58
Coal	490.61	878.09	101.02	10,968.43	1,094.92	13,533.07
Comanche	500.92	888.55	104.30	5,791.60	1,217.83	8,503.20
Cotton	221.45	24.74	2.76	2,072.60	492.77	2,814.32
Craig	412.24	746.91	88.27	7,686.37	1,047.02	9,980.81

[38] Zero emissions values, represented by a hyphen, indicate the sector pollutant emissions for the county are either zero emissions or emissions less than 0.005 tons. Null emissions values indicate there are no sector pollutant emissions for the county. Counties with no sector pollutant emissions for all the pollutants are omitted from the table.

County	NOx (tons)	$PM_{2.5}$ (tons)	SO_2 (tons)	VOC (tons)	HAP (tons)	Total (tons)
Creek	654.28	1,103.34	130.03	21,317.44	1,696.70	24,901.79
Custer	334.30	218.46	20.68	3,314.07	730.20	4,617.71
Delaware	531.50	1,372.28	127.12	19,931.84	1,546.72	23,509.46
Dewey	324.13	466.35	44.97	5,519.70	860.83	7,215.98
Ellis	301.69	152.06	16.96	5,232.54	896.39	6,599.64
Garfield	790.96	351.04	37.95	6,386.00	1,145.12	8,711.07
Garvin	333.15	498.80	58.84	9,819.36	1,030.69	11,740.84
Grady	424.11	459.27	53.41	9,678.24	1,183.74	11,798.77
Grant	800.06	761.18	64.26	7,740.64	1,277.52	10,643.66
Greer	265.68	404.13	38.81	2,935.45	657.28	4,301.35
Harmon	172.91	4.20	0.50	1,586.21	420.01	2,183.83
Harper	245.50	119.95	9.55	2,940.31	595.80	3,911.11
Haskell	536.37	1,019.57	99.37	13,392.82	1,268.43	16,316.56
Hughes	789.37	1,672.51	188.43	18,578.18	1,806.46	23,034.95
Jackson	328.64	12.30	1.47	2,433.08	646.69	3,422.18
Jefferson	286.82	261.43	29.57	4,460.65	760.33	5,798.80
Johnston	424.91	557.69	65.60	15,392.81	1,185.13	17,626.14
Kay	631.46	627.72	63.39	7,468.86	1,288.92	10,080.35
Kingfisher	547.00	150.22	16.06	4,383.13	857.94	5,954.35
Kiowa	280.00	37.16	3.28	2,544.26	660.76	3,525.46
Latimer	791.08	1,789.80	181.74	20,188.58	1,932.24	24,883.44
Le Flore	847.44	1,321.50	131.26	31,482.55	2,636.54	36,419.29
Lincoln	481.91	800.83	92.59	16,475.71	1,420.54	19,271.58
Logan	310.87	330.91	38.97	7,934.49	823.18	9,438.42
Love	320.57	371.30	42.44	11,302.88	911.76	12,948.95
Major	482.47	562.21	66.53	6,005.13	979.87	8,096.21
Marshall	272.06	305.11	36.30	9,932.71	782.49	11,328.67
Mayes	325.00	327.42	32.22	11,282.70	904.41	12,871.75
McClain	228.96	251.34	29.43	5,310.07	644.88	6,464.68
McCurtain	1,622.50	4,356.93	439.39	52,208.82	5,079.03	63,706.67
McIntosh	493.20	730.39	82.60	13,362.57	1,192.66	15,861.42
Murray	351.15	712.09	84.60	10,460.31	1,003.51	12,611.66
Muskogee	431.19	518.76	52.10	10,576.38	1,053.78	12,632.21
Noble	407.92	424.66	49.01	5,708.71	854.57	7,444.87
Nowata	453.70	1,098.69	109.71	6,236.34	1,285.63	9,184.07
Okfuskee	413.24	578.64	68.02	15,106.51	1,102.27	17,268.68
Oklahoma	245.07	201.78	22.11	10,289.04	797.16	11,555.16
Okmulgee	480.59	756.41	89.23	13,531.37	1,191.21	16,048.81
Osage	1,887.82	5,013.01	523.17	29,756.59	4,919.17	42,099.76

[38] Zero emissions values, represented by a hyphen, indicate the sector pollutant emissions for the county are either zero emissions or emissions less than 0.005 tons. Null emissions values indicate there are no sector pollutant emissions for the county. Counties with no sector pollutant emissions for all the pollutants are omitted from the table.

County	NOx (tons)	$PM_{2.5}$ (tons)	SO_2 (tons)	VOC (tons)	HAP (tons)	Total (tons)
Ottawa	312.76	219.18	21.36	8,046.82	705.16	9,305.28
Pawnee	366.77	522.67	62.01	8,326.90	963.23	10,241.58
Payne	418.69	787.55	92.54	7,063.00	1,009.25	9,371.03
Pittsburg	1,214.98	2,851.56	278.87	28,103.05	2,799.66	35,248.12
Pontotoc	503.91	856.01	101.74	14,757.83	1,277.68	17,497.17
Pottawatomie	380.33	481.69	55.09	16,078.53	1,178.56	18,174.20
Pushmataha	841.78	1,261.00	125.05	30,889.40	2,609.85	35,727.08
Roger Mills	293.77	325.32	27.11	4,082.30	777.87	5,506.37
Rogers	319.71	265.57	31.02	8,501.94	867.35	9,985.59
Seminole	455.90	693.98	80.70	15,313.65	1,178.91	17,723.14
Sequoyah	632.34	1,402.06	127.29	18,716.74	1,571.74	22,450.17
Stephens	329.86	398.77	47.33	12,969.27	1,195.98	14,941.21
Texas	692.99	34.87	2.86	4,839.66	1,247.52	6,817.90
Tillman	404.02	28.34	2.70	2,653.09	710.86	3,799.01
Tulsa	251.40	77.10	8.79	8,022.43	711.51	9,071.23
Wagoner	297.04	145.63	14.80	7,106.06	742.93	8,306.46
Washington	307.10	605.53	61.09	5,478.41	869.71	7,321.84
Washita	388.23	30.21	3.21	2,719.44	730.59	3,871.68
Woods	468.30	432.89	44.83	5,458.86	984.22	7,389.10
Woodward	340.60	460.61	39.21	6,251.83	891.99	7,984.24
Natural and Working Lands Total	**37,769.49**	**54,521.14**	**5,713.82**	**862,616.74**	**94,674.95**	**1,055,296.14**

[38] Zero emissions values, represented by a hyphen, indicate the sector pollutant emissions for the county are either zero emissions or emissions less than 0.005 tons. Null emissions values indicate there are no sector pollutant emissions for the county. Counties with no sector pollutant emissions for all the pollutants are omitted from the table.

Table 24: Sector Crosswalk to demonstrate how Oklahoma cross-walked emissions from the NEI categories to the PAP sectors.

	PAP Sectors						
NEI Sector	**Agriculture**	**Transportation**	**Electricity Generation**	**Natural & Working Lands**	**Industry**	**Commercial & Residential Buildings**	**Waste, Water, & Materials Management**
Agriculture - Crops & Livestock Dust	X						
Agriculture - Fertilizer Application	X						
Agriculture - Livestock Waste	X						
Biogenics - Vegetation and Soil				X			
Bulk Gasoline Terminals					X		
Commercial Cooking						X	
Dust - Construction Dust					X		
Dust - Paved Road Dust		X					
Dust - Unpaved Road Dust		X					
Fires - Agricultural Field Burning	X						
Fires - Prescribed Fires				X			
Fires - Wildfires				X			
Fuel Comb - Comm/Institutional - Biomass						X	
Fuel Comb - Comm/Institutional - Coal						X	
Fuel Comb - Comm/Institutional - Natural Gas						X	
Fuel Comb - Comm/Institutional - Oil						X	
Fuel Comb - Comm/Institutional - Other						X	
Fuel Comb - Electric Generation - Coal			X				
Fuel Comb - Electric Generation - Natural Gas			X				
Fuel Comb - Electric Generation - Oil			X				

	PAP Sectors						
NEI Sector	**Agriculture**	**Transportation**	**Electricity Generation**	**Natural & Working Lands**	**Industry**	**Commercial & Residential Buildings**	**Waste, Water, & Materials Management**
Fuel Comb - Industrial Boilers, ICEs - Biomass					X		
Fuel Comb - Industrial Boilers, ICEs - Coal					X		
Fuel Comb - Industrial Boilers, ICEs - Natural Gas					X		
Fuel Comb - Industrial Boilers, ICEs - Oil					X		
Fuel Comb - Industrial Boilers, ICEs - Other					X		
Fuel Comb - Residential - Natural Gas						X	
Fuel Comb - Residential - Oil						X	
Fuel Comb - Residential - Other						X	
Fuel Comb - Residential - Wood						X	
Gas Stations		X					
Industrial Processes - Cement Manuf.					X		
Industrial Processes - Chemical Manuf.					X		
Industrial Processes - Ferrous Metals					X		
Industrial Processes - Mining					X		
Industrial Processes - NEC					X		
Industrial Processes - Non-ferrous Metals					X		
Industrial Processes - Oil & Gas Production					X		
Industrial Processes - Petroleum Refineries					X		
Industrial Processes - Pulp & Paper					X		
Industrial Processes - Storage and Transfer					X		

	PAP Sectors						
NEI Sector	**Agriculture**	**Transportation**	**Electricity Generation**	**Natural & Working Lands**	**Industry**	**Commercial & Residential Buildings**	**Waste, Water, & Materials Management**
Miscellaneous Non-Industrial NEC						X	
Mobile - Aircraft		X					
Mobile - Commercial Marine Vessels		X					
Mobile - Locomotives		X					
Mobile - Non-Road Equipment - Diesel		X					
Mobile - Non-Road Equipment - Gasoline		X					
Mobile - Non-Road Equipment - Other		X					
Mobile - On-Road Diesel Heavy Duty Vehicles		X					
Mobile - On-Road Diesel Light Duty Vehicles		X					
Mobile - On-Road non-Diesel Heavy Duty Vehicles		X					
Mobile - On-Road non-Diesel Light Duty Vehicles		X					
Solvent - Consumer & Commercial Solvent Use						X	
Solvent - Degreasing					X		
Solvent - Dry Cleaning					X		
Solvent - Graphic Arts					X		
Solvent - Industrial Surface Coating & Solvent Use					X		
Solvent - Non-Industrial Surface Coating						X	
Waste Disposal							X

Appendix G Health and Economic Benefits of Priority Measures

Table 25: Tax Revenue Estimate in US Dollars

Activity	Impact	County	State	Federal	Total
Solar	Direct	$ 23,131.19	$ 34,838.71	$ 54,589.01	$ 112,558.91
	Indirect	$ 12,761.17	$ 20,424.04	$ 36,094.16	$ 69,279.37
	Induced	$ 5,763.76	$ 9,409.89	$ 18,982.35	$ 34,156.00
	Total	**$ 41,656.12**	**$ 64,672.64**	**$ 109,665.52**	**$ 215,994.28**
Wastewater	Direct	$ 13,367.26	$ 26,289.49	$ 85,202.19	$ 124,858.94
	Indirect	$ 8,724.39	$ 15,328.54	$ 39,442.09	$ 63,495.02
	Induced	$ 8,875.60	$ 14,490.08	$ 29,228.95	$ 52,594.63
	Total	**$ 30,967.25**	**$ 56,108.11**	**$ 153,873.23**	**$ 240,948.59**
Landfill Gas	Direct	$ 27,220.61	$ 53,534.96	$ 173,502.65	$ 254,258.22
	Indirect	$ 17,766.04	$ 31,214.48	$ 80,318.45	$ 129,298.97
	Induced	$ 18,073.95	$ 29,507.06	$ 59,520.78	$ 107,101.79
	Total	**$ 63,060.60**	**$ 114,256.50**	**$ 313,341.88**	**$ 490,658.98**
Regen Ag	Direct	$ (636,804.68)	$ (768,402.43)	$ 40,078.53	$ (1,365,128.58)
	Indirect	$ 30,256.64	$ 67,250.43	$ 239,936.55	$ 337,443.62
	Induced	$ 25,207.78	$ 41,148.20	$ 82,961.55	$ 149,317.53
	Total	**$ (581,340.26)**	**$ (660,003.80)**	**$ 362,976.63**	**$ (878,367.43)**
Hydrogen	Direct	$ 40,620.00	$ 94,713.58	$ 296,951.92	$ 432,285.50
	Indirect	$ 147,829.52	$ 231,937.19	$ 394,847.63	$ 774,614.34
	Induced	$ 40,676.14	$ 66,406.00	$ 133,945.92	$ 241,028.06
	Total	**$ 229,125.66**	**$ 393,056.77**	**$ 825,745.47**	**$ 1,447,927.90**
Tree Planting	Direct	$ 6,911.75	$ 20,581.63	$ 112,285.80	$ 139,779.18
	Indirect	$ 2,225.90	$ 5,545.35	$ 25,205.30	$ 32,976.55
	Induced	$ 10,037.36	$ 16,387.45	$ 33,061.75	$ 59,486.56
	Total	**$ 19,175.01**	**$ 42,514.43**	**$ 170,552.85**	**$ 232,242.29**
Solar	Direct	$ 129,899.29	$ 195,645.93	$ 306,558.99	$ 632,104.21

Activity	Impact	County	State	Federal	Total
	Indirect	$ 71,663.71	$ 114,696.60	$ 202,696.27	$ 389,056.58
	Induced	$ 32,367.91	$ 52,843.74	$ 106,600.38	$ 191,812.03
	Total	**$ 233,930.91**	**$ 363,186.27**	**$ 615,855.64**	**$ 1,212,972.82**
Lights	Direct	$ 490.56	$ 2,294.73	$ 16,647.70	$ 19,432.99
	Indirect	$ 1,964.55	$ 3,466.92	$ 8,762.83	$ 14,194.30
	Induced	$ 1,868.99	$ 3,051.38	$ 6,155.98	$ 11,076.35
	Total	**$ 4,324.10**	**$ 8,813.03**	**$ 31,566.51**	**$ 44,703.64**
Digester	Direct	$ 34,025.76	$ 66,918.70	$ 216,878.31	$ 317,822.77
	Indirect	$ 22,207.54	$ 39,018.10	$ 100,398.06	$ 161,623.70
	Induced	$ 22,592.43	$ 36,883.83	$ 74,400.97	$ 133,877.23
	Total	**$ 78,825.73**	**$ 142,820.63**	**$ 391,677.34**	**$ 613,323.70**
Hydrogen Boilers	Direct	$ 5,762.23	$ 26,439.37	$ 168,231.94	$ 200,433.54
	Indirect	$ 8,711.85	$ 16,009.90	$ 44,678.37	$ 69,400.12
	Induced	$ 15,028.46	$ 24,535.66	$ 49,497.16	$ 89,061.28
	Total	**$ 29,502.54**	**$ 66,984.93**	**$ 262,407.47**	**$ 358,894.94**
Cement	Direct	$ 544.35	$ 3,806.64	$ 25,713.99	$ 30,064.98
	Indirect	$ 22,441.78	$ 32,616.92	$ 39,024.79	$ 94,083.49
	Induced	$ 4,996.04	$ 8,155.22	$ 16,441.37	$ 29,592.63
	Total	**$ 27,982.17**	**$ 44,578.78**	**$ 81,180.15**	**$ 153,741.10**

Table 26: Economic Benefit Estimate in US Dollars

Activity	Impact	Initial cost estimate	Employment	Labor Income	Value Added	Output
Solar	Direct		5	$ 227,311.78	$ 460,756.73	$ 1,015,725.26
	Indirect		5	$ 150,206.52	$ 342,828.51	$ 830,987.43
	Induced		5	$ 83,314.39	$ 157,668.95	$ 293,102.97
	Total	**$ 2,025,000.00**	**15**	**$ 460,832.69**	**$ 961,254.19**	**$ 2,139,815.66**
Wastewater	Direct		16	$ 388,307.36	$ 593,038.17	$ 1,349,464.91
	Indirect		9	$ 183,702.78	$ 286,540.89	$ 603,418.06
	Induced		8	$ 128,284.38	$ 242,786.01	$ 451,318.43
	Total	**$ 1,375,000.00**	**33**	**$ 700,294.52**	**$ 1,122,365.07**	**$ 2,404,201.40**
Landfill Gas	Direct		33	$ 790,735.00	$ 1,207,641.37	$ 2,748,001.27
	Indirect		19	$ 374,085.66	$ 583,501.45	$ 1,228,778.59
	Induced		15	$ 261,233.64	$ 494,400.60	$ 919,048.43
	Total	**$ 2,800,000.00**	**67**	**$ 1,426,054.30**	**$ 2,285,543.42**	**$ 4,895,828.29**
Regen Ag	Direct		52	$ 552,123.34	$ (696,077.02)	$ 4,148,549.16
	Indirect		85	$ 1,114,302.17	$ 1,873,041.10	$ 4,323,238.07
	Induced		22	$ 364,037.21	$ 689,322.95	$ 1,280,978.16
	Total	**$ 4,000,000.00**	**159**	**$ 2,030,462.72**	**$ 1,866,287.03**	**$ 9,752,765.39**
Hydrogen	Direct		30	$ 1,013,655.73	$ 3,588,407.01	$ 12,329,255.32
	Indirect		64	$ 1,682,039.26	$ 3,592,938.35	$ 9,014,729.76
	Induced		35	$ 587,870.11	$ 1,112,634.89	$ 2,068,229.92
	Total	**$ 12,000,000.00**	**129**	**$ 3,283,565.10**	**$ 8,293,980.25**	**$ 23,412,215.00**
Tree Planting	Direct		33	$ 511,082.34	$ 682,398.66	$ 974,279.13
	Indirect		12	$ 129,672.46	$ 144,987.49	$ 215,483.99
	Induced		9	$ 145,116.47	$ 274,594.08	$ 510,501.64
	Total	**$ 1,000,000.00**	**54**	**$ 785,871.27**	**$ 1,101,980.23**	**$ 1,700,264.76**
Solar	Direct		26	$ 1,276,529.24	$ 2,587,500.85	$ 5,704,072.89

Activity	Impact	Initial cost estimate	Employment	Labor Income	Value Added	Output
	Indirect		30	$ 843,524.28	$ 1,925,243.82	$ 4,666,628.90
	Induced		28	$ 467,873.92	$ 885,431.55	$ 1,645,996.95
	Total	**$ 5,700,000.00**	**85**	**$ 2,587,927.44**	**$ 5,398,176.22**	**$ 12,016,698.74**
Lights	Direct		3	$ 84,226.54	$ 88,515.10	$ 345,729.65
	Indirect		2	$ 39,217.03	$ 69,017.65	$ 156,142.30
	Induced		2	$ 27,019.81	$ 51,129.42	$ 95,053.52
	Total	**$ 340,760.00**	**6**	**$ 150,463.38**	**$ 208,662.17**	**$ 596,925.47**
Digester	Direct		41	$ 988,418.75	$ 1,509,551.72	$ 3,435,001.59
	Indirect		24	$ 467,607.08	$ 729,376.82	$ 1,535,973.24
	Induced		19	$ 326,542.05	$ 618,000.75	$ 1,148,810.54
	Total	**$ 3,500,000.00**	**84**	**$ 1,782,567.88**	**$ 2,856,929.29**	**$ 6,119,785.37**
Hydrogen Boilers	Direct		24	$ 766,083.06	$ 1,134,560.67	$ 2,956,156.44
	Indirect		9	$ 204,567.58	$ 338,320.92	$ 774,435.84
	Induced		13	$ 217,248.87	$ 411,117.71	$ 764,278.87
	Total	**$ 3,000,000.00**	**47**	**$ 1,187,899.51**	**$ 1,883,999.30**	**$ 4,494,871.15**
Cement	Direct		3	$ 162,252.03	$ 165,667.87	$ 1,110,650.31
	Indirect		6	$ 184,065.34	$ 360,175.29	$ 1,024,234.25
	Induced		4	$ 72,143.44	$ 136,615.12	$ 253,864.73
	Total	**$ 1,000,000.00**	**13**	**$ 418,460.81**	**$ 662,458.28**	**$ 2,388,749.29**
Overall Total		**$ 36,740,760.00**	**692**	**$ 14,814,399.62**	**$ 26,641,635.45**	**$ 69,922,120.52**

Table 27. Health Benefits in Number of Cases of Implementing Priority Measures

Category	Mortality (L)	Mortality (H)	Infant Mortality	Nonfatal Heart Attacks (L)	Nonfatal Heart Attacks (H)	Hospital Admits, Cardiovascular (except heart attacks)
Transportation	3.31	7.53	0.02	0.38	3.09	0.78
Agriculture	1.44	3.26	0.01	0.14	1.27	0.32
Waste & Material Management	0.08	0.18	-	0.01	0.07	0.02
Electric Power Industry	1.80	4.09	0.01	0.17	1.56	0.39
Commercial/Residential& Municipal	0.68	1.53	0.01	0.06	0.59	0.15

Table 28. Health Benefits of Implementing Priority Measures Continued

Category	Hospital Admits, All Respiratory	Acute Bronchitis	Upper Respiratory Symptoms	Lower Respiratory Symptoms	Emergency Room Visits, Asthma	Asthma Exacerbation	Minor Restricted Activity Days	Work Loss Days
Transportation	0.78	4.68	84.47	59.45	1.82	87.77	2,342.40	397.64
Agriculture	0.32	1.94	34.99	24.64	0.76	36.35	914.65	155.13
Water, Waste & Material Management	0.02	0.10	1.75	1.23	0.04	1.81	45.26	7.66
Electric Power Industry	0.39	2.25	40.60	28.58	0.89	42.17	1,072.13	181.32
Commercial, Residential & Municipal	0.15	0.98	17.63	12.41	0.37	18.19	453.24	77.12

Table 29. Economic Benefits of Health Improvements in US Dollars

Category	Short Summary		Overall total	Mortality	Nonfatal Heart Attacks	Infant Mortality	Hospital Admits, All Respiratory
Transportation	Hydrogen Fueling	Low Value	$21,324,072	$20,916,148	$29,052	$177,311	$21,512
		High Value	$48,071,224	$47,422,434	$269,918		
Agriculture	Regen Ag	Low Value	$15,728,659	$15,442,650	$21,383	$121,748	$15,841
		High Value	$35,461,232	$34,997,940	$198,666		
Water, Waste & Material Management	Landfill GCCS	Low Value	$432,889	$425,413	$563	$3,261	$417
		High Value	$976,070	$963,925	$5,231		
Water, Waste & Material Management	Digester	Low Value	$423,855	$416,535	$551	$3,193	$408
		High Value	$955,699	$943,808	$5,122		
Electric Power Industry	Solar Project 10	Low Value	$5,771,574	$5,671,651	$7,696	$42,837	$5,709
		High Value	$13,016,425	$12,852,686	$71,513		
Electric Power Industry	Solar Project 7981	Low Value	$14,319,936	$14,071,425	$19,111	$106,632	$14,174
		High Value	$32,293,426	$31,886,459	$177,566		
Agriculture	Trees	Low Value	$295,565	$290,225	$401	$2,270	$297
		High Value	$666,424	$657,760	$3,726		
Commercial, Residential & Municipal	LED lighting	Low Value	$415,815	$408,571	$556	$3,113	$412
		High Value	$937,678	$925,826	$5,163		
Transportation	Asphalt	Low Value	$15,854,806	$15,566,687	$24,582	$95,986	$13,227
		High Value	$35,741,575	$35,249,627	$228,410		
Water, Waste & Material Management	Wastewater Upgrade	Low Value	$2,681	$2,629	$4	$23	$3
		High Value	$6,044	$5,961	$34		
Buildings	Hydrogen Boiler	Low Value	$7,116,493	$6,977,904	$9,674	$61,035	$7,165
		High Value	$16,040,917	$15,822,120	$89,882		

Table 30. Economic Benefits of Health Improvements in US Dollars Continued

Category	Short Summary	Hospital Admits, Cardiovascular (except heart attacks)	Acute Bronchitis	Upper Respiratory Symptoms	Lower Respiratory Symptoms	Emergency Room Visits, Asthma	Asthma Exacerbation	Minor Restricted Activity Days	Work Loss Days
Transportation	Hydrogen Fueling	$15,499	$1,680	$2,099	$934	$593	$3,774	$111,989	$43,482
Agriculture	Regen Ag	$11,477	$1,175	$1,467	$653	$418	$2,648	$78,713	$30,486
Water, Waste & Material Management	Landfill GCCS	$303	$30	$38	$17	$11	$67	$1,997	$772
Water, Waste & Material Management	Digester	$297	$29	$37	$16	$10	$66	$1,956	$756
Electric Power Industry	Solar Project 10	$4,154	$398	$497	$221	$143	$897	$26,960	$10,411
Electric Power Industry	Solar Project 7981	$10,312	$990	$1,237	$551	$356	$2,232	$67,029	$25,887
Agriculture	Trees	$215	$22	$27	$12	$8	$49	$1,469	$569
Commercial, Residential & Municipal	LED lighting	$300	$29	$36	$16	$10	$65	$1,953	$754
Transportation	Asphalt	$18,287	$1,207	$1,510	$671	$433	$2,739	$93,357	$36,121
Water, Waste & Material Management	Wastewater Upgrade	$2	$ -	$ -	$ -	$ -	$ -	$14	$6
Commercial, Residential & Municipal	Hydrogen Boiler	$5,156	$574	$717	$319	$201	$1,285	$37,780	$14,684

Cited Materials

Avalos, A., and S. Alley, 2012: Economic *and Fiscal Impact of Green-Energy Infrastructure Projects*, Center for Economic Research and Education of Central California, 26pp.

Bae, J, and S. Dall'erba., 2016. The economic impact of a new solar power plant in Arizona: Comparing the input-output results generated by JEDI vs. IMPLAN. *Regional Science Policy & Practice* 8.1-2: 61-73.

Brown, J., Pender, J., Wiser, R. and Hoen, B., 2012. Ex Post Analysis of Economic Impacts from Wind Power Development in U.S. Counties. *Energy Economics* 34, 1743-1754.

Brown, Marilyn A., Anmol Soni, and Yufei Li. "Estimating employment from energy-efficiency investments." *MethodsX* 7 (2020): 100955.

Council, US Green Building, and Booz Allen Hamilton, 2009. Green jobs study. *US Green Building Council, Washington, DC*.

Greene*, J.S., and M. Geisken, 2013.* Socioeconomic Impacts of A Wind Farm Development: A Case Study of Weatherford, Oklahoma. *Energy, Sustainability, and Society, 3(2):1-9.*

Hall, Charles R., et al. "Economic contributions of the green industry in the United States in 2018." *Journal of Environmental Horticulture* 38.3 (2020): 73-79.

IMPLAN Group, LLC. 2022. *IMPLAN impact analysis and social accounting software*, https://implan.com/

International Labour Organization (ILO), 2018. *World Employment and Social Outlook 2018: Greening with Jobs*.

Lindall, Scott A. et al. 2004*. The IMPLAN Input-Output System. Minnesota IMPLAN Group Inc.*

Miller, R.E. and P. D. Blair. 2009. *Input-output analysis: foundations and extensions*. 2nd ed. Cambridge Univ. Press, New York, NY, 750 p.

Mulkey, David. 2004. *Using IMPLAN to assess local economic impacts*. University of Florida Institute of Food and Agricultural Services.

National Wind Coordinating Committee. 2004. *A methodology for assessing the economic development impacts of wind power*. Washington D.C. June 2004.

Pollin, Robert, et al., 2021: *"A Program for Economic Recovery and Clean Energy Transition in California."*

Pollin, Robert, Jeannette Wicks-Lim, and Shouvik Chakraborty. "Industrial Policy, Employment, and Just Transition." *Sustainable Development Solutions Network (SDSN) USA, America's Zero Carbon Action Plan: Roadmap to Achieving Net Zero Emissions by* 2050 (2020).

Reategui, S., Stafford, E.R., Hartman, C.L., Huntsman, J.M., 2009. Generating Economic Development from a Wind Power Project in Spanish Fork Canyon, Utah: A Case Study and Analysis of State-Level Economic Impacts. *DOE/GO-102009-2760*. January 2009

Shakya, R. , and L. Ahiablame, 2021. A Synthesis of Social and Economic Benefits Linked to Green Infrastructure. *Water* 13.24: 3651.

Yushchenko, A., and M. K. Patel, 2016. Contributing to a green energy economy? A macroeconomic analysis of an energy efficiency program operated by a Swiss utility. *Applied energy* 179: 1304-1320.

Appendix I Stakeholders

Table 31. List of PAP Stakeholders

The table below includes, but is not limited to, key stakeholders who contributed to the PAP.

Key Stakeholders
Absentee Shawnee Tribe
American Electric Power
American Prime Sustainable Solutions LLC
Anthem Energy Partners (Tulsa)
ARB Energy LLC
Association of Central Oklahoma Governments
Bedrock Ventures
Brightmerge USA LLC
Brown & Gay Engineers
CF Industries
ChargePoint
Cherokee Nation
Chickasaw Nation
Choctaw Nation
Circle 9
City of Comanche
City of Eldorado
City of Frederick
City of Geary
City of Goltry
City of Granite
City of Kingfisher
City of Laverne

Key Stakeholders
City of Lawton
City of Lexington
City of Lindsay
City of Mangum
City of Miami
City of Midwest City
City of Mooreland
City of Muskogee
City of New Cordell
City of Noble
City of Okeene
City of Oklahoma City
City of Olustee
City of Pawhuska
City of Ponca
City of Prague
City of Ryan
City of Tecumseh
City of Wetumka
City of Yale
City of Yukon
Comanche Nation Tax Commission
CompostCoaches
Delaware Nation
Department of the Air Force
Disaster Resilience Network
Environmental Federation of Oklahoma

Key Stakeholders
Four Alpha LLC
Great Plains Technology Center
Green Li-ion Inc
Green Teens Curbside Recycling LLC.
Greenspeed Energy
Holcim US
Hydrogen Tech
Hydrogen Technologies, LLC
Indian Nations Council of Governments
Iowa Nation
Kickapoo Tribe
Kiowa Tribe
Lead Agency Inc.
LumenUs Scientific Solutions, LLC
Maverick Natural Resources
Miami Engineering
Miami Nation
Moore Norman Technology Center District No. 17
Muscogee Creek Nation
National Association for the Advancement of Colored People
New Era Advisors
NextEra Energy Resources Development
Nu Ionic Technology
Oklahoma All-Black Towns State Conference
Oklahoma Alliance for Geographic Education
Oklahoma Asphalt Pavement Association
Oklahoma Conservation Commission

Key Stakeholders
Oklahoma Corporation Commission
Oklahoma Department of Transportation
Oklahoma Forestry Services
Oklahoma Gas & Electric Company
Oklahoma Geological Survey, University of Oklahoma
Oklahoma Municipal Assurance Group
Oklahoma Municipal Natural Gas Coalition (OMNGC)
Oklahoma Municipal Power Authority
Oklahoma State University
Oklahoma State University, Tulsa
Oklahoma Sustainability Network (OSN)
One Gas, Inc
Oneta Power
Orange EV
Ottawa Tribe
Partner Tulsa
Pauls Valley Landfill, LLC (a GFL Environmental company)
Peoria Tribe
Phillips 66
Phillips 66 Refinery
Phoenician Resources,
Pipeline Resource
Pipeline Resource LLC
Ponca Tribe
Public Service Company of Oklahoma
Purpose Engineering (Tulsa)
Quapaw Nation

Key Stakeholders
Reagan Smith
Redbud Partners (OKC)
Ross Engineering
RW Energy
Sage Power and Reliability Company (“SPARC”) (Tulsa)
Schneider Electric
Seminole Nation
Senator James Lankford's Office
Seneker & Associates, LLC
Sierra Club
Sofidel America
South Western Oklahoma Development Authority
Superior Midstream
Sustainable Biochar
Ten-Nine Tech
The Goodyear Tire & Rubber Company
The Office of the Secretary of Energy & Environment
The Petroleum Alliance of Oklahoma
The Sustainability Alliance
THG Energy Solutions, LLC.
Tinker AFB
Town of Forgan
Town of South Coffeyville
Town of Texhoma
TREBA
U.S. Lime Company-St. Clair
United Community Action Program

Key Stakeholders
University of Oklahoma
University of Oklahoma, Norman Campus
University of Oklahoma, Tulsa
University of Tulsa
Valero Ardmore Refinery
Western Farmers Electric Cooperative
Woodside Energy

Appendix H LIDAC Outreach Documentation

CPRG Community Engagement Field Notes

Date

- 11th and 12th of November

Group

- Black Towns Revival Weekend

Location

- Tulsa, Rentiesville, Tullahassee, Clearview,

Who is there?

- Approximately 50 individuals
- Mayors, city officials, residents of Black Towns (Clearview, Tatums, Grayson, Rentiesville)
- Planning and design professionals

Activities

- Tours of Black Towns
- Interviews with mayors and residents
- Panel of mayors
- 90 min focus group session on climate pollution reduction grant

Group Questions

- Broke out into about 4 groups for 90 min session

- **Q1:** Let's discuss your community's experience with the impacts of climate pollution
    - Extreme heat
        - Energy costs
        - Fire threats are an issue they have no funding or support to mitigate
        - Wildfires would go through communities with no abetment, they are tasked with mitigating fire threats on their own but don't have the ability
        - Loss of electricity for weeks at a time for some. Loss of power impacts pump stations, rural water district
        - During ice storm, lost power to a small sewage station and had no sewage access for weeks, whole community took turns at one house for toilet and shower access
    - Very few shelters for severe weather, those that exist are a point of pride
    - Dead trees and lightning are a concern for storms
    - Drought is an issue for people on wells or with rural water districts.
    - Flash flooding occurs due to drainage problems--culverts and pipes have lots of sediment, are old, and/or under performing

- **Q2:** When you think about these things, how does it connect to the unique history of your community?
    - Once thriving communities lost considerable population to Jim Crow laws, changes in agriculture industries, inability to get credit for businesses and farms. This led people to leave for cities or other states. The small population now has difficulty raising enough revenue to provide services or combat climate effects

    - Mostly an older population
    - Many Black Towns have no more than $15k annual operating budget
    - Volunteer mayors
    - Some have strained relationships with the county and neighboring cities
        - Bad blood/discrimination
    - Many want new housing and developments
    - Land is not abundantly available--it passed to family members who live far, or they just don't want to sell.
    - Land is locked/held tightly that there isn't much to do with it

- **Q3:** What kinds of local investments would you prioritize to help with these things?
    - Most Black Towns face considerable issues with wastewater
        - Big area with few settlements
        - Septic tanks aren't allowed for this level of density
        - Struggle to get/maintain wastewater facility
        - Avoiding consent order with DEQ
        - Low-cost ability to create/maintain facilities
        - Can't grow if you can't get building permits without facilities
    - Storm Shelters
        - One town was able to add shelter to one municipal building in one town, helpful for the elderly population
    - Grant/help managing lands for wildfire management
    - Help with green infrastructure drainage systems for roads
    - No updated maps/surveys for ROW
    - Anything to help with flash flooding
    - Solid waste management--No real services in the country
    - Solar projects to back up municipal services--Town halls, pump stations (able to flush toilets during power outage)
    - Need HVAC updates
        - Especially high-efficiency ones

- **Q4:** As projects like this, or future ones if these aren't funded, move forward, how might the state or other entities best interact with your community in the future?
    - No one ever talks to them about anything, ever
        - One mayor attends every county commission so he can get information
        - No deliberate way to give them information
        - Oklahoma Council of Black Mayors to set up meetings like this
    - Skeptical of accountability
        - Asking what it would look like, who can they go to see if their communities are included
    - The way that the state provides grants ensures that it's not for them
        - Many grants are far too complex for their volunteer capacity
        - Grants seem to be perfect for them, but then they require matching funds they do not have.

CPRG Community Engagement Field Notes

Date

- December 13, 2023

Group

- Crosby Heights Vibrant Neighborhoods Partnership (VNP)
- VPN is a community-driven program in Tulsa that works with residents to direct investments in holistic neighborhood improvements.

Location

- Crosby Heights, Tulsa

Who was there?

- Approximately 10 individuals
- Leadership of the neighborhood group, local residents including renters and homeowners; Tulsa Planning staff

Activities

- 60 min focus group session on climate pollution reduction grant

Group Questions

- **Q1:** Let's discuss your community's experience with the impacts of climate pollution
    - Extreme heat / extreme weather
        - Energy costs
        - Houses and trees impacted by dangerous wind
    - Housing stock is old and poorly insulated, building construction makes insulating difficult
    - Energy costs a significant burden
    - Air quality is poor due to local refineries; the neighborhood smell impacts redevelopment/revitalization efforts
    - Legacy pollution in the river concerns residents and impacts revitalization efforts
    - Solid waste collection is an issue due to concentration of social services in the neighborhood. Waste piles up, overwhelmed existing collections sites, is spread all over the neighborhood.

- **Q2:** When you think about these things, how does it connect to the unique history of your community?
    - Building stock was built at the same time and suffers from similar issues and maintenance needs
    - Social service concentration and homeless population interacts with all these issues
    - Surrounded by highways, R/R, refinery, and the river. Creates concentrations of air pollutants and other issues

- **Q3:** What kinds of local investments would you prioritize to help with these things?
    - Need for low cost/no cost energy audit program to help business, homeowners, landlords understand energy efficiency options for old structures

    - Need for effective structure insulation programs to help business, homeowners, landlords with the cost of insulate structures
    - Need programs that are not just for homeowners that can benefit from tax credits.
    - Solar power infrastructure for key neighborhood services
    - Establish a citizen science program that would train residents to understand and monitor air and water quality

- **Q4:** As projects like this, or future ones if these aren't funded, move forward, how might the state or other entities best interact with your community in the future?
-
    - High praise for the Tulsa VNP as the gold standard--Professional representatives from the government working with local residents to define problems, set priorities and work towards selecting between alternative plans based on local needs and input

CPRG Community Engagement Field Notes

Date

- December 14, 2023

Group

- Eugene Fields Neighborhood Crime Watch. The neighborhood is part of the Choice Neighborhoods program, a federal grant program that uses public housing redevelopment as a catalyst for revitalization.
- The President of the group called a neighborhood meeting, but due to the time of year it was only her on the call. We did an individual interview instead of a focus group.

Location

- Eugene Fields, Tulsa, via Zoom

Who was there?

- The President of the Neighborhood Crime Watch

Activities

- 45 min interview/discussion on the climate pollution reduction grant

Group Questions

- **Q1:** Let's discuss your community's experience with the impacts of climate pollution
    - Residents are concerned with flood risk being located adjacent to the river
    - Adjacent refineries are also concerning due to air pollution and smell

- **Q2:** When you think about these things, how does it connect to the unique history of your community?
    - Many of the long-time residents have moved out while the public housing is being replaced.

- **Q3:** What kinds of local investments would you prioritize to help with these things?
    - Robust air quality monitoring
    - Flood risk mitigation

- **Q4:** As projects like this, or future ones if these aren't funded, move forward, how might the state or other entities best interact with your community in the future?

CPRG Community Engagement Field Notes

Date

- December 19, 2023

Group

- Phoenix District Vibrant Neighborhoods Partnership (VNP)
- VPN is a community-driven program in Tulsa that works with residents to direct investments in holistic neighborhood improvements.

Location

- Phoenix District, Tulsa

Who was there?

- Approximately 17 individuals

Activities

- 45 min focus group discussion on the climate pollution reduction grants

Group Questions

- **Q1:** Let's discuss your community's experience with the impacts of climate pollution
    - Extreme heat in the summer with very little shade
    - Dark streets at night
    - Older homes with high energy bills and insufficient insulation
    - Flash flooding / poor drainage. Also leads to mosquito problems
    - Older buildings have a lot of lead paint and mold
    - Solid waste collection is a problem in the neighborhood. Collection is efficient, there are not enough bins, and trash blocks the trail system
    - Air quality is poor

- **Q2:** When you think about these things, how does it connect to the unique history of your community?
    - the VNP program is bringing fresh resources and investment, but as a north Tulsa neighborhood, there is skepticism that projects and investment from the CPRG program will be for their neighborhood.

- **Q3:** What kinds of local investments would you prioritize to help with these things?
    - Tree planting to create canopies to reduce heat island effect.
    - Solar powered lighting for streets and trails
    - Grants for insulating older homes
    - Drainage improvements
    - Lead abatement
    - Window replacement / HVAC replacement grants
    - Air quality improvement programs for schools and day care centers
    - Solid waste collection improvements

- **Q4:** As projects like this, or future ones if these aren't funded, move forward, how might the state or other entities best interact with your community in the future?
    - the VNP program is bringing fresh resources and investment, but as a north Tulsa neighborhood, there is skepticism that projects and investment from the CPRG program will be for their neighborhood.

CPRG Community Engagement Field Notes

Date

- January 4, 2024

Group

- Capitol Hill Civic Group

Location

- Capitol Hill, OKC

Who was there?

- Approximately 30 people; local residents, nonprofit staff, city staff, local business owners

Activities

- 60 min interview/discussion on the climate pollution reduction grant

Group Questions

- **Q1:** Let's discuss your community's experience with the impacts of climate pollution
    - Extreme heat/extreme weather
    - Solid waste issues in neighborhood made worse by heat/bad weather
    - High energy costs
    - Transit/mobility issues in the area are made worse by heat/bad weather
    - They community values park and open space and has worked hard for specific areas with significant cultural importance. Worried that the city will not maintain the parks or make them less attractive as climate impacts worsen
    - Significant reliance on septic systems that degrade water table

- **Q2:** When you think about these things, how does it connect to the unique history of your community?
    - Building stock in the area is older and expensive to rehabilitate or retrofit with efficient systems
    - Local infrastructure is also old, updates from the city are slow and add expenses to neighborhood redevelopment
    - Citizenship status and language issues mean many programs do not reach people in the neighborhood that need them
    - Workforce development in the area of climate/hazards/pollution reduction relevant in this community

- **Q3:** What kinds of local investments would you prioritize to help with these things?
    - Energy audits
    - Weatherization/building efficiency upgrades for commercial and residential properties.
    - Tree planting programs such are the OGE Free tree program or Oklahoma City Beautiful
    - Park investments in amenities such as efficient water and lighting systems

    - Increase park maintenance and amenities
    - Grant fund to help septic system owners connect to sewer lines
    - A program to help incentivize recycling programs to help with solid waste collection issues in the area
    - Infrastructure improvements (sidewalks ad walkability issues), lack real connections on south side (sidewalk network), sidewalks as a needed investment in S OKC (link with OKC SNI priorities and build on recent GO Bonds)

- **Q4:** As projects like this, or future ones if these aren't funded, move forward, how might the state or other entities best interact with your community in the future?
    - Hispanic communities need a unique/different approach given citizenship issues, language, numbers of renters
    - Workforce development in the area of climate/hazards/pollution reduction relevant in this community

CPRG Community Engagement Field Notes

Date

- January 5

Group

- Restore OKC

Location

- NE Oklahoma City, via Zoom

Who is there?

- 2 of the organization's leadership related to housing and health

Activities

- 60 min discussion on climate pollution reduction grant

Group Questions

- **Q1:** Let's discuss your community's experience with the impacts of climate pollution
    - Extreme heat
    - Utility bill burden
    - Extreme weather/Power outages
    - Few outside spaces to gather safely and comfortably as a community
    - Unsafe streets/sidewalks
    - Food insecurity/lack of food access in community

- **Q2:** When you think about these things, how does it connect to the unique history of your community?
    - Housing stock is old, needs upgrades
    - History of the NE Side means very few sidewalks were built, historic disinvestment in public spaces
    - Brownfields/industrial needs mean that a lot of areas need environmental remediation

- **Q3:** What kinds of local investments would you prioritize to help with these things?
    - Expansion of Restore OKC's solarization program that provides, panels, roof upgrades, batteries, etc.
    - Expansion of safe streets program to increase walking and community connectivity
    - Composting, urban agriculture for food security
    - Home weatherization/insulation

- **Q4:** As projects like this, or future ones if these aren't funded, move forward, how might the state or other entities best interact with your community in the future?

CPRG Community Engagement Field Notes

Date

- January 11, 2024

Group

- NE OKC Neighborhood Coalition

Location

- NE OKC, via Zoom

Who was there?

- Approximately 30 people, leaders and member of NE OKC neighborhood Associations

Activities

- 30 min interview/discussion on the climate pollution reduction grant

Group Questions

- **Q1:** Let's discuss your community's experience with the impacts of climate pollution
    - Frequent and prolonged power outages. Power restoration seems to take much longer than neighboring areas
    - Extreme heat
    - Few households have generators so emergency situations are difficult to handle
    - Awareness of funding programs and resources in the community is low. Programs are difficult to access.

- **Q2:** When you think about these things, how does it connect to the unique history of your community?
    - Air quality is poor in the community due to oil and gas operations
    - Other problem sites are located in the neighborhood like medical waste, county jail

- **Q3:** What kinds of local investments would you prioritize to help with these things?
    - Weatherization/building efficiency upgrades for commercial and residential properties.
    - The community needs weather shelters / cooling centers / warming centers with solar power
    - Efficient streetlights to improve security
    - Programs to provide grants for solar power
    - Solar power back-ups for important community centers
    - More funding for tree planting programs such as the OGE Free tree program or Oklahoma City Beautiful
- **Q4:** As projects like this, or future ones if these aren't funded, move forward, how might the state or other entities best interact with your community in the future?

CPRG Community Engagement Field Notes

Date

- January 25, 2024

Group

- Charles Page Vital Neighborhood Partnership

Location

- Charles Page, Tulsa

Who was there?

- Approximately 12 people; local residents, nonprofit staff, city staff, local business owners

Activities

- 60 min interview/discussion on the climate pollution reduction grant

Group Questions

- **Q1:** Let's discuss your community's experience with the impacts of climate pollution
    - Extreme heat/extreme weather
    - Solid waste issues in neighborhood made worse by heat/bad weather and worsen health issues in the area
    - High energy costs
    - Frequent power outages; less than adequate emergency response
    - Not enough trees or amenities in parks for young families
    - Mosquito hazards a growing nuisance
    - Poorly designed and maintained drainage in the area

- **Q2:** When you think about these things, how does it connect to the unique history of your community?
    - The community feels abandoned and forgotten. No grocery stores around (the community has to travel to Sand Springs for basic/essential living supplies). Developments or funds are not assigned to Charles Page.
    - While the community needs more trees for a better canopy, many trees are not maintained and create a hazard in severe weather

- **Q3:** What kinds of local investments would you prioritize to help with these things?
    - Tree planting programs
    - Park investments in amenities such as efficient water and lighting systems
    - Increase park maintenance and amenities
    - Improved solid waste systems that are more efficient at collection
    - Improved drainage/green infrastructure to alleviate drainage and mosquito hazards
    - Improved electric infrastructure to reduce power losses, incorporate solar solutions in to enhanced street lighting

- **Q4:** As projects like this, or future ones if these aren't funded, move forward, how might the state or other entities best interact with your community in the future?
    - The community feels abandoned and forgotten. No grocery stores around (the community has to travel to Sand Springs for basic/essential living supplies). Developments or funds are not assigned to Charles Page.

CPRG Community Engagement Field Notes

Date

- January 30, 2024

Group

- The Atoka City Industrial Authority hosted the workshop

Location

- Atoka, Oklahoma

Who was there?

- 11 individuals, including the mayor, city manager, city manager from neighboring town, local residents and officials.

Activities

- 90 min interview/discussion on the climate pollution reduction grant

Group Questions

- **Q1:** Let's discuss your community's experience with the impacts of climate pollution
    - Significant drought concerns
    - Significant flood concerns
    - Silting in local waterways has caused significant problems and raising flood issues

- **Q2:** When you think about these things, how does it connect to the unique history of your community?
    - Local water quality (mineral content/hardness) drives up the cost of all infrastructure and building maintenance
    - Small towns have limited resources and technical capacity. They have done a lot with what they have, but are concerned about ability to do more and/or access resources.
    - The community is beginning to grow. Constraints are emerging from need to revitalize older properties, build expensive infrastructure to accommodate growth
    - Towns like theirs rely on Tribal Nations rather than the state for technical assistance, social services, grant writing, and funding for growing needs
    - Growing need for planning services, but no viable/affordable options available

- **Q3:** What kinds of local investments would you prioritize to help with these things?
    - Waterways – green infrastructure to mitigate erosion/silting, especially for Lake Atoka catchment
    - Water/stormwater collection/distribution replacement. Old clay pipes constrain their ability to do new projects
    - Water conservation/sourcing. New homes/business are creating greater demand for water. This will become more difficult as time passes.
    - Housing assistance—it is very difficult to build housing even when there is demand for it in the area. Infrastructure/technical costs are prohibitive

- **Q4:** As projects like this, or future ones if these aren't funded, move forward, how might the state or other entities best interact with your community in the future?
    - Atoka and towns like it feel like they are on their own. Especially compared to what they know about other states where there are centralized hubs for technical assistance, grant writing, and planning services. They implore the state to come up with ways to interact with small towns in ways that are relevant to their aspirations and needs.

CPRG Community Engagement Field Notes

Date

- February 2, 2024

Group

- El Centro Community Center

Location

- East Tulsa

Who was there?

- Approximately 10 people

Activities

- 60 min interview/discussion on the climate pollution reduction grant

Group Questions

- **Q1:** Let's discuss your community's experience with the impacts of climate pollution
    - Stormwater problems; Poorly designed and maintained drainage in the area
    - Sever weather
    - Extreme heat
    - There are fewer cars in the community, so pedestrian and bike paths are very important and impacted by heat

- **Q2:** When you think about these things, how does it connect to the unique history of your community?
    - Housing structures reaching 50 plus years with poor air conditioner and heater retention.
    - Immigration status complicates eligibility for important programs and projects
    - There are fewer cars in the community, so pedestrian and bike paths are very important and impacted by heat

- **Q3:** What kinds of local investments would you prioritize to help with these things?
    - Make Individual Taxpayer Identification Number holders eligible for all the programs.
    - Storm water issues (specifically, behind plaza sentence Cecilia and Dolores Huerta elementary).
        - Infrastructure for water retention ponds to manage flooding. Focus area (11675 E. 21st St)
        - Constant flooding with no incentives to repair parking lots/roads.
    - Tree planting programs; street canopy
    - Solar street lighting
    - Walkable and accessible sidewalks
    - Park and other recreational investments in amenities
    - Community gardens

    - Composting programs
    - Improved drainage/green infrastructure to alleviate drainage problems
    - Road repair
    - Community shelters
    - Bicycling facilities and educational programs
    - Improved electric infrastructure to reduce power losses, incorporate solar solutions in to enhanced street lighting

- **Q4:** As projects like this, or future ones if these aren't funded, move forward, how might the state or other entities best interact with your community in the future?
    - Immigration status complicates eligibility for important programs and projects. Make Individual Taxpayer Identification Number holders eligible for all the programs.

Oklahoma LIDAC Communities Important Priorities:

At least 20 distinct project ideas emerged from the focus groups that were priorities for LIDAC communities. From the survey, respondents were asked to state their level of support for 17 different kinds of projects.

All 17 received majority support from respondents. The most supported (with more than 90% of respondents) include:

- Planting trees and using shade structures to reduce urban heat
- Upgrades to wastewater facilities for better efficiency
- Prioritizing native plants for carbon capture
- Making public transit more accessible and affordable
- Making recycling and compositing available for my home
- Offering low-cost housing upgrades to improve energy efficiency for residents
- Promoting nature-based solutions including rainwater harvesting and green stormwater infrastructure
- Strengthening electric grids to better withstand extreme weather

In addition, the focus groups produced the detailed list of prioritized projects listed below.

- Avoid tax credit programs that only benefit affluent homeowners; instead, expand programs for residents, homeowners, small businesses, and landlords in LIDAC communities. These expanded programs should provide grants or funding help to:
    - audit building energy efficiency;
    - insulate older buildings;
    - replace windows and HVAC systems; and/or
    - weatherize properties for growing severe weather threats.
- Solar power back-up infrastructure for key community resources, such as community centers, government offices, water/water treatment, social services, and healthcare.
- Solar power program to enable LIDAC households to access solar power technology
- Technical expertise / grants for green infrastructure and/or replacement of aging and deficient water, wastewater, and stormwater systems.
- Mosquito control efforts.
- Solar powered streetlights and bike/pedestrian paths.
- Investments in more resilient electric systems to decrease growing power outages.
- Grants/technical expertise for tree canopy design, planting, and maintenance.
- Investments in community greenspace including trees and amenities
- Investments in active transportation including sidewalks and pedestrian paths.
- Accessible/understandable environmental quality monitoring systems that everyday people can use to inform themselves about conditions in their community, for example create a Citizen Scientist program that trains everyday LIDAC residents to understand and monitor air / water quality.
- Grants to rural LIDAC communities to improve wastewater treatment.
- Funding for community storm shelters in public facilities.
- Grants for wildfire management for small rural LIDAC communities.
- Grants to help rural LIDAC communities build/manage green infrastructure for road drainage.

- Technical assistance or planning grants for municipal and rural community solid waste improvements.
- Create a statewide resource for LIDAC communities to access programs, projects, technical expertise, and other resources to meet the challenges they face.