



North Central Texas
Council of Governments

DALLAS-FORT WORTH AIR QUALITY IMPROVEMENT PLAN

A Priority Climate Action Plan Deliverable - March 1, 2024



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City of Fort Worth	DFW International Airport
City of Frisco	Hood County Clean Air Coalition
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City of Grand Prairie	University of Texas at Dallas
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City of Mansfield	
City of Mesquite	
City of Midlothian	
City of Oak Ridge	

A full list of agencies who provided letters of support is available in Appendix 2.

Acronyms

Air Emissions Reporting Requirements (AERR)

Air Transportation Advisory Committee (ATAC)

Americans with Disabilities Act (ADA)

Attainment Demonstration (AD)

Automatic Traffic Recorder (ATR)

Auxiliary Power Unit (APU)

Aviation Administration’s Aviation Environmental Design Tool (AEDT)

California Air Resources Board (CARB)

California Climate Action Registry (CCAR)

Climate Pollution Reduction Grants (CPRG)

Code of Federal Regulations (CFR)

Comma Separated Values (CSV)

Comprehensive Climate Action Plan (CCAP)

Comprehensive Environmental and Climate Action Plan (CECAP)

Compressed Natural Gas (CNG)

Congestion Mitigation and Air Quality (CMAQ) Improvement Program

CO-OP Electric Power Cooperative

Dallas Area Rapid Transit (DART)

Dallas Fort Worth (DFW) Air Quality Improvement Plan (AQIP)

Dallas Garland & Northeastern Railroad (DGNO)

Department of Transportation (DOT)

Disadvantaged Business Enterprise (DBE)

Disadvantaged Communities (DACs)

Eastern Research Group (ERG)

Electric Generating Units (EGU)

Electric Vehicles (EV)

Emissions and Generation Resource Integrated Database (eGRID)

Energy Efficiency and Conservation Block Grants (EECBG)

EPA's Enforcement and Compliance History Online (ECHO)

Environmental Defense Fund (EDF)

Environmental Protection Agency (EPA)

Executive Board

Facilities Level Information on Greenhouse Gases Tool (FLIGHT)

Fats, Oils, and Grease (FOGs)

Federal Transit Administration (FTA)

Fuel Cell Electric Vehicles (FCEVs)

Fort Worth & Western Railroad (FWWR)

Gasoline Gallon Equivalent (GGE)

Global Warming Potential (GWP)

Greenhouse gas (GHG) Emissions Inventory (GHG EI)

Heating, Ventilation, and Air Conditioning (HVAC)

Integrated Stormwater Management Program (iSWM)

Intelligent Transportation Systems (ITS)

International Panel on Climate Change (IPCC)

Light Emitting Sodium (HPS)

Liquified Petroleum Gas (LPG)

LoanSTAR Texas LoanSTAR (Saving Taxes and Resources)

Local Governments for Sustainability, former International Council for Local Environmental Initiatives (ICLEI)

Local Government Operations Protocol (LGO)

Low Income/Disadvantaged Communities (LIDACs)

MOU Memorandum of Understanding?

Metropolitan Planning Organization (MPO)

Metropolitan Statistical Area (MSA)

MOtor Vehicle Emissions Simulator (MOVES Model)

Municipal Separate Storm Sewer System (MS4)

National Ambient Air Quality Standards (NAAQs)

National Emissions Inventory (NEI)
National Pollutant Discharge Elimination System (NPDES)
National Oceanic and Atmospheric Administration (NOAA)
North Central Texas Council of Governments (NCTCOG)
Oxides of Nitrogen (NO_x)
Particulate Matter (PM)
Priority Climate Action Plan (PCAP)
Property Assessed Clean Energy Program (PACE)
Public Works Council (PWC)
Operations and Maintenance (O&M)
Railroad Commission of Texas (RRC)
Reasonable Further Progress (RFP) [Request for Proposal???)
Regional Codes Coordinating Committee (RCCC)
Regional Emissions Enforcement Program (REEP)
Regional Integration of Sustainable Efforts Coalition (RISE)
Regional Toll Revenue (RTR)
Regional Traffic System Program (RTSP)
Regional Transportation Council (RTC)
Regional Smoking Vehicle Program (RSVP)
Resource Conservation Council (RCC)
Saving Money and Reducing Truck Emissions (SMARTE)
Social Costs of Greenhouse Gas Emissions (SC-GHG)
South-Central Partnership for Energy Efficiency as a Resource (SPEER)
Sources Hours Extended Idling (SHEI)
Source Hours Parked (SHP)
Surface Transportation Block Grant (STBG)
State Energy Data System (SEDS)
State Implementation Plan (SIP)
Texas Commission on Environmental Quality (TCEQ):

Texas Parks and Wildlife (TPW)
Texas Pollutant Discharge Elimination System (TPDES)
Texas Water Development Board (TWDB)
TexN Model
Total Maximum Daily Load Implementation Plan (TMDL I-Plan)
Transportation Computer-Aided Design (TransCAD)
Transportation Analytical Forecasting Tool (TAFT)
Transportation Planning Funds (TPF)
Travel Demand Management (TDM)
Trinity Railway Express (TRE)
TTI Texas A&M Transportation Institute
TxShare Cooperative Purchasing Program
Texas Department of Transportation (TxDOT)
U.S. Energy Information Administration Form 861 – Annual Electric Power Industry Report (EIA-861).
U.S. DOE Department of Energy
Vehicle Miles Traveled (VMT)
Vehicle-to-Grid Technology (V2G)
Volatile Organic Compounds (VOCs)
Wastewater and Treatment Education Roundtable (WATER)
Water Quality Management Plan (WQMP)
Water Resources Council (WRC)
Workforce Solutions for North Central Texas (WSNCT)

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1- Introduction

The North Central Texas Council of Governments (NCTCOG) is a voluntary association of, by, and for local governments, established to assist in regional planning for 16 counties in North Texas. The counties served by NCTCOG include Collin, Dallas, Denton, Ellis, Erath, Hood, Hunt, Johnson, Kaufman, Navarro, Palo Pinto, Parker, Rockwall, Somervell, Tarrant, and Wise. This service area incorporates all of the 11-county Dallas-Fort Worth (DFW)-Arlington Metropolitan Statistical Area (MSA).

NCTCOG is serving as the Lead Agency for the DFW-Arlington MSA under the Environmental Protection Agency (EPA) Climate Pollution Reduction Grants (CPRG) Planning Grants Program and was the grantee that developed this Dallas-Fort Worth Air Quality Improvement Plan (DFW AQIP) Priority Climate Action Plan (PCAP), which serves to fulfill the PCAP deliverable as specified by the EPA under the CPRG Planning Grants Program. NCTCOG consists of 11 departments, including the Environment and Development and Transportation departments. Staff from these two departments led the development of this document and will lead the implementation of proposed priority measures. The NCTCOG Workforce Solutions for North Central Texas Department will join in efforts to develop a Comprehensive Climate Action Plan (CCAP) over the next year.

Climate Pollution Reduction Grants Overview and Purpose

Overview: Authorized under Section 60114 of the Inflation Reduction Act, the CPRG Program¹ provides \$5 billion in grants to states, local governments, tribes, and territories to develop and implement plans for reducing greenhouse gas (GHG) emissions and other harmful air pollutants. Phase 1 of the CPRG Program offered noncompetitive funding to all 50 states, the 67 most populous MSAs, and tribes/territories to develop the following deliverables:

1. **PCAP** -- due March 1, 2024 (states and MSAs) and due April 1, 2024 (tribes, tribal consortia, and territories)
2. **CCAP** -- due two years after planning grant award, or approximately mid-2025 (states and MSAs) and due at the close of the grant period (tribes, tribal consortia, and territories)
3. **Status Report** -- at the end of the four-year grant period (approximately mid-2027)

Purpose of PCAP: According to the EPA CPRG Planning Grant Notice of Funding Opportunity, the PCAP is a narrative report focused on near-term (i.e., by 2030), high-priority, implementation-ready measures to reduce GHG pollution and an analysis of GHG emissions reductions that would be achieved through implementation.²

NCTCOG has a long history of working collaboratively with local governments (cities, counties, transit agencies, special districts, and school districts) and other local, state, and federal partners across the region on air quality issues. Air quality collaboration efforts began in the mid-1990s when four counties within the NCTCOG region were designated as nonattainment for the pollutant ozone and have continued to grow and expand as air quality concerns have become more complex. These issues are

¹ www.epa.gov/inflation-reduction-act/climate-pollution-reduction-grants

² www.epa.gov/system/files/documents/2023-02/EPA%20CPRG%20Planning%20Grants%20Program%20Guidance%20for%20States-Municipalities-Air%20Agencies%2003-01-2023.pdf

described further in Section 2: Regional Context and Section 3.2: Emissions Inventories for Criteria Pollutants of Regional Concern.

The EPA CPRG Program presented a natural opportunity to extend these standing relationships around air quality concerns beyond ozone to other local air quality issues. NCTCOG received support from local governments across the region to take the role of Lead Agency for development of a regional plan and has coordinated across a variety of stakeholders in the region to develop this DFW AQIP, which has been drafted to fulfill the PCAP deliverable. Local governments were major contributors, along with stakeholder input contributed by NCTCOG committee members (which includes nonprofit and business entities), local nonprofits and other organizations, and residents. More detail on this engagement and input is provided in **Section 1: Regional Engagement. The purpose of the DFW AQIP, which constitutes the PCAP for the NCTCOG region, is to identify and drive implementation of measures that achieve reductions in GHGs, ozone precursors, and fine particulate matter emissions to achieve comprehensive air quality improvement.**

DFW AQIP – Overview and Definitions

This document contains the following:

- **Introduction** – Information on the CPRG, definitions, scope, and approach to develop the DFW AQIP.
- **Regional Context** – Information on local concerns and how they impacted the development of the DFW AQIP.
- **GHG Emissions Inventory** – A simplified inventory of greenhouse gases produced in the 16-county NCTCOG region.
- **Emissions Inventories for Criteria Pollutants of Regional Concern** – Information on criteria pollutants of regional concern.
- **Measures** – List of implementation-ready measures (i.e., projects, programs, and policies) to reduce greenhouse gases and criteria pollutants.
- **Benefits Analysis** – A high-level analysis of the potential health benefits to the region through the implementation of proposed measures and associated reduction of criteria pollutants.
- **Low Income and Disadvantaged Communities (LIDAC) Benefits Analysis** – An analysis that identifies where LIDAC are in the region, how they were engaged, potential climate risks LIDAC are facing, and the air quality and other community benefits LIDAC may experience from the implementation of measures.
- **Review of Authority to Implement** – Analysis of the ability of the region to implement proposed measures.
- **Intersection with Other Funding Availability** – A high-level analysis of existing funding sources to implement measures. This information has been incorporated with the measures in **Section 4**.
- **Next Steps** – A discussion of how NCTCOG and local governments will leverage the DFW AQIP to apply for the CPRG Implementation Grants and develop the next EPA-required deliverable, the CCAP.

Scope of the DFW AQIP

The geographic scope of the DFW AQIP includes all 16 counties served by NCTCOG. This includes Collin, Dallas, Denton, Ellis, Erath, Hood, Hunt, Johnson, Kaufman, Navarro, Palo Pinto, Parker, Rockwall, Somervell, Tarrant, and Wise counties. The NCTCOG region captures the entire 11-county DFW-Arlington

MSA that NCTCOG was required to include as the Lead Agency for CPRG Planning Grants. Exhibit 1 provides the 2023 estimated population of each county within the NCTCOG region, as well as the total regional population encompassed by the scope of this plan.

Exhibit 1: Population by County³

County	2023 Population Estimate (January 1)
Collin	1,175,974
Dallas	2,675,009
Denton	1,006,492
Ellis	218,125
Erath	43,287
Hood	62,511
Hunt	109,127
Johnson	201,427
Kaufman	158,672
Navarro	55,639
Palo Pinto	29,277
Parker	155,607
Rockwall	124,734
Somervell	9,899
Tarrant	2,188,951
Wise	70,159
Total 16-County NCTCOG Population	8,284,890

Note that the total NCTCOG 16-county population is larger than 36 states and the geographic extent of the NCTCOG region encompasses 12,800 square miles, which is larger than nine states. Thus, the scope of the DFW AQIP is comparable to the scope and scale of many state plans.

The scope of this plan includes a variety of measures across GHG emissions sectors, as outlined in Exhibit 2. These sectors were defined to mirror the scope of the emissions sectors included in the regional Greenhouse Gas Emissions Inventory (GHG EI) discussed in greater detail in **Section 3**.

³ <https://data-nctcogis.opendata.arcgis.com/documents/2023-nctcog-population-estimates-publication/explore>

Exhibit 2: Definition of Sectors for Emissions and Measures Included in the DFW AQIP

Sector	Description of Emissions	Description of Measures
Transportation	Includes emissions from on-road mobile (e.g., cars, trucks, buses), non-road mobile (e.g., landscape equipment, construction equipment), and off-road mobile (e.g., trains, aircraft) emissions sources.	Transportation measures are initiatives that are implemented in the transportation system or its right-of-way that reduce mobile source emissions through technologies or system efficiencies, improve energy efficiency associated with transportation system lighting, or create carbon sinks by enhancing use of vegetation or expanding green space.
Energy	Includes emissions from electricity, natural gas, and other energy generation consumed within the 16-county NCTCOG region.	Energy measures are initiatives that reduce electricity consumption in buildings owned by public sector agencies or residential buildings. Also includes measures that mitigate upstream emissions from power generation through mechanisms such as on-site solar, energy storage, and/or microgrids. Private sector commercial or industrial buildings are not within the scope of the DFW AQIP.
Materials Management (Solid Waste)	Includes emissions from landfills, waste collection, transport, and management, including emissions associated with waste diversion and alternative uses.	Materials Management measures are initiatives that would reduce the amount of greenhouse gases emitted from the landfill, or by organic materials diverted from the landfill to other beneficial use. These initiatives also include waste-to-energy efforts around renewable gas energy; and emissions reductions through utilizing more energy efficient waste hauling equipment, route selection, and scheduling.
Water, Wastewater, and Watershed Management	Includes emissions from water supply, stormwater management, wastewater collection, transport, and treatment. It also includes emissions associated with plant equipment and process residuals.	Water, Wastewater, and Watershed Management measures are those that would reduce the amount of energy used to manage, treat, collect, and/or disperse water and wastewater by supporting water conservation and storage, energy efficient plant practices, and both chemical and residual management efforts.

Sector	Description of Emissions	Description of Measures
Agriculture/Forestry/Land Use	Includes emissions from urban and rural agricultural practices, green space expansion, and temperature management within the built environment.	Agriculture, Forestry, and Land Use measures include efforts that will reduce urban stormwater runoff through landscape, expand local food supply, improve air quality, increase carbon capture, reduce urban heat island effects, and support responsible agriculture operations.
Cross-Sector	Varies	Cross-Sector measures include efforts that will in general improve air quality overall but may not wholly fit within one sector or another.

Approach to Developing the DFW AQIP

The NCTCOG approach to developing the DFW AQIP was driven by sources of air pollutants of concern in the region, as detailed in **Section 3**. A key objective was to be proportional in ensuring that proposed measures were aligned with the sectors and emissions sources with the greatest contribution of air pollutants. As the local emissions inventories indicate, the transportation sector contributes over 40 percent of regional GHG emissions and nearly two-thirds of ozone-forming emissions of nitrogen oxides (NO_x), with energy consumption producing just over half of regional GHG emissions and a smaller segment of local ozone precursors. To achieve meaningful air quality improvement, it will be critical to reduce air pollution from across all sectors and emissions sources. Thus, NCTCOG took a multisector approach to identifying measures.

Regional Engagement

Collaboration with the diverse Dallas-Fort Worth area population was integral to developing the DFW AQIP and began in March 2023 prior to NCTCOG applying to be the Lead Agency for the CPRG: Planning Grants on behalf of the DFW-Arlington MSA. Regional engagement consisted of two main efforts: (1) **Stakeholder/Intergovernmental Engagement** (primarily entities interested in implementing measures, such as local governments, private sector companies, etc.) and (2) **Public Engagement** (primarily those who may not be able to implement measures but would like to provide feedback, such as community members, nonprofits, community-based organizations, etc.).

Engagement was conducted through a variety of methods, including a project webpage (www.publicinput.com/dfwAQIP), surveys, e-blasts, and public meetings. A full inventory of outreach conducted is available in **Appendix 1: Outreach Inventory**.

Stakeholder/Intergovernmental Engagement

Stakeholder/Intergovernmental Engagement consisted of three focus areas: **Engagement with Collaborating Agencies, Stakeholder Engagement, and Committee Engagement**.

Engagement with Collaborating Agencies –

Collaborating agencies primarily consisted of public entities who provided a letter of support to NCTCOG stating they wished to support NCTCOG in applying to the CPRG Implementation Grants and participate in the development of the DFW AQIP. These collaborating agencies served as an “advisory” group and

were invited to regular meetings to discuss plan development, review potential measures, and added to a Microsoft Teams channel to assist with the development of the DFW AQIP.

Prior to submitting to the CPRG Planning Grants, NCTCOG staff began requesting letters of support from entities within the region. NCTCOG invited regional city managers, county administrators, and county commissioners to a meeting on March 30, 2023 to discuss the CPRG Planning Grants opportunity and request a letter of support. Information on the CPRG Planning Grants and a request for letters of support was also brought to committees in March and April 2023. These letters of support were provided to the EPA on April 28, 2023, along with NCTCOG’s Notice of Intent to Participate. Collaborating agencies served as an “advisory” group and were invited to regular meetings to discuss plan development, review potential measures, and added to a Microsoft Teams channel to assist with the development of the DFW AQIP.

NCTCOG’s formal workplan, which outlined how NCTCOG would use the CPRG Planning Grant funds to develop the required deliverables, was submitted to the EPA on May 31, 2023, and NCTCOG received an official award from the EPA in September 2023. Additional letters of support have been accepted throughout the development of the DFW AQIP and a full list of letters received is available in **Appendix 2: Letters of Support**.

Collaborating agencies were invited to a kick-off meeting on June 21, 2023 to discuss development of the DFW AQIP, as well as stakeholder workshops (detailed in the next section, **Stakeholder Engagement**) in August, September, and October to discuss potential measures to improve air quality. Following formal receipt of the CPRG Planning Grant award from the EPA in September 2023, NCTCOG began holding meetings on the topic of developing the DFW AQIP with collaborating agencies. Meetings were held from October 2023 to February 2024, with a total of seven meetings held with collaborating agencies. As of February 2024, 40 letters of support have been received, and the entities providing these letters represent over 70 percent of the population across the 16-county NCTCOG area.

Stakeholder Engagement –

Stakeholder engagement was conducted to allow for feedback opportunities from entities who wished to provide feedback but were unable to provide a letter of support or continuously participate in the development of the plan. Stakeholder engagement was conducted through both meetings and an online survey.

NCTCOG held a series of workshops open to all entities and the public in August, September, and October 2023 requesting feedback on potential measures to address emissions from the sectors defined in Exhibit 2. A summary of measures recommended during those meetings is available in **Appendix 3: Summary of CPRG Workshops**. Additionally, NCTCOG hosted a meeting in January 2024 for entities that may be subject to fees under Section 185 of the Clean Air Act if the region is unable to attain the 2008 National Ambient Air Quality Standard (NAAQS) for ground-level ozone by July 2027. During this meeting, NCTCOG staff discussed CPRG as an opportunity to implement measures to reduce emissions in the hopes of reaching attainment and avoiding Section 185 fees. Attendees were primarily industrial facilities but included local governments that own landfills, wastewater treatment facilities, and power plants.

An online survey was created to collect input from stakeholders interested in implementing measures included in the DFW AQIP. The survey consisted of 152 measures across five categories (transportation,

energy, water/wastewater/solid waste, agriculture/forestry/land use, and carbon removal) and requested respondents rank measures based on their interest in implementing them. The list of 152 measures was developed through the workshops mentioned above, the EPA’s Quantified GHG Reduction Measures list,⁴ Dallas’ Comprehensive Environmental and Climate Action Plan,⁵ toolkits created for NCTCOG by Environmental Defense Fund Climate Fellows, a 2006 Control Strategy Catalog developed for the Texas State Implementation Plan, and staff feedback. Respondents were able and encouraged to skip categories not relevant to their organization or expertise to minimize lack of knowledge or relevancy from impacting the survey results. Exhibit 3 lists the types of organizations who responded to each sector.

Exhibit 3: Summary of Responses Received by Organization Types and Topics for Stakeholder Survey

Number of Responses per Topic	Organization Type			Total Responses
	Local Governments	Nonprofits	Private Company	
Transportation	21	6	10	47
Energy	12	5	8	27
Water, Wastewater, and Solid Waste	13	4	3	22
Agriculture, Forestry, and Land Use	11	7	1	17
Carbon Removal	8	6	4	18

A summary of stakeholder survey responses is available in **Appendix 4: Stakeholder/Implementer Survey Results**, along with a blank version of the survey. Additionally, Appendices 11 through 16 list DFW AQIP measures and cross references feedback from the stakeholder survey to illustrate the degree to which that measure was supported.

Additionally, NCTCOG brought information regarding the DFW AQIP to meetings with external stakeholders, as detailed in **Appendix 1: Outreach Inventory**. A total of 30 stakeholder meetings were held and/or attended.

Committee Engagement –

Due to NCTCOG serving as the regional planning agency for North Central Texas, the agency has many committees and subcommittees comprised of members from the public and private sector that provide valuable input on regional planning and air quality issues. These committees were utilized to “screen” measures for feasibility and regional interest. A full list of NCTCOG committees is available at <https://www.nctcog.org/nctcog-committees>. The following committees approved the DFW AQIP:

⁴ www.epa.gov/statelocalenergy/quantified-climate-action-measures-directory-local-directory

⁵ <https://www.dallasclimateaction.com/>

- **Public Works Council (PWC)**⁶
 - The PWC provides expertise and support to the Executive Board and staff on a wide range of local public works issues. For example, the PWC provides continuing advice regarding the Public Works Construction Standards - North Central Texas, as well as such issues as managing right-of-way, comprehensive and consistent storm water management, and regional pavement design guidance, as well as identified subregional issues. The Public Works Council took action in support of the DFW AQIP on February 15, 2024.
- **Resource Conservation Council (RCC)**⁷
 - The RCC serves as the regional solid waste advisory council to the NCTCOG, formally delegated with developing and implementing the state-mandated Regional Solid Waste Management Plan (Regional Plan). The RCC also supports the process for formal disbursement of solid waste program implementation grants from the Texas Council of Environmental Quality (TCEQ) and provides support and advice to the NCTCOG Executive Board on methods to conserve, recover, and recycle available resources and to provide proper handling and disposal of non-recoverable waste materials. The Resource Conservation Council approved the plan on February 28, 2024.
- **Regional Integration of Sustainability Efforts (RISE) Coalition**⁸
 - The RISE Coalition, formerly the North Central Texas Stewardship Forum, works to engage interested local governments in peer-exchange opportunities to support sustainability and environmental initiatives. Staff presented the measures to the RISE Coalition on February 20, 2024, and they agreed to provide a letter of support.
- **Regional Transportation Council (RTC)**⁹
 - The RTC is the independent transportation policy body of the Metropolitan Planning Organization. The RTC consists of 45 local elected or appointed officials from the metropolitan area and representatives from each transportation provider in the region. The RTC oversees the metropolitan transportation planning process. The RTC approved transportation elements of the DFW AQIP on February 8, 2024.
- **Surface Transportation Technical Committee (STTC)**¹⁰
 - STTC reviews, comments on, and prepares recommendations regarding surface transportation planning and funding of transportation improvements in the Dallas-Fort Worth Metropolitan Area. STTC consists of approximately 80 members, predominantly engineers and other technical staff from local entities. STTC endorsed the transportation elements of the DFW AQIP on February 23, 2024.
- **Water Resources Council (WRC)**¹¹
 - The WRC serves as the regional water quality planning council to the NCTCOG, formally delegated with developing and implementing the state-mandated Water Quality Management Plan (WQMP). The WRC advises NCTCOG's Executive Board on both technical and policy issues

⁶ www.nctcog.org/envir/committees/public-works-council

⁷ www.nctcog.org/envir/committees/resource-conservation-council

⁸ www.nctcog.org/envir/committees/regional-integration-of-sustainability-efforts-ris

⁹ www.nctcog.org/trans/about/committees/regional-transportation-council

¹⁰ www.nctcog.org/trans/about/committees/surface-transportation-technical-committee

¹¹ www.nctcog.org/envir/committees/water-resources-council

related to water resources matters. The WRC also oversees the water resources planning process and performs technical review of water-related grant applications. The Water Resources Council approved the Water, Wastewater, Solid Waste, and Agriculture/Forestry/Land Use elements of the DFW-AQIP on February 7, 2024.

Appendix 5: Committee Rosters contains the committee rosters for these five committees, in addition to the NCTCOG Executive Board, which approved the full DFW AQIP on February 22, 2024.

Public Engagement

Public engagement was conducted through in-person and virtual meetings and surveys.

At the in-person meetings, all project materials were provided in English and Spanish, and an interpreter was present at each to assist with translation. Staff presented background information on CPRG, and attendees were able to visit several public input stations that included a paper map activity, a survey (discussed below), and display boards. The open houses were publicized via flyers, e-blasts, social media, and paid advertising. Participating local governments also promoted the meetings via their own communications channels. **Appendix 6: Public Meeting Materials** includes examples of open house visuals, as well as copies of promotional materials.

Two virtual listening sessions were held where attendees were provided information on the DFW AQIP and were able to provide feedback on their concerns and potential measures for inclusion in the DFW AQIP. In total, nine public meetings were held solely for the DFW AQIP, five of which were in person, two were virtual, and two were in person/virtual hybrid.

A summary of feedback received during the meeting is available in Exhibit 4.

Exhibit 4: Summary of Public Meeting Feedback

Public Meeting Feedback**		
Date	Location	Summary
11/14/2023	Virtual Listening Session*	<p>Concerns were expressed regarding diesel/gasoline equipment (food trucks, lawn equipment, construction equipment), concrete batch plants, urban drilling, and idling vehicles. Attendees recommended adding more electric vehicle (EV) infrastructure and providing incentives for EVs.</p> <p>An attendee recommended holding meetings at different times (i.e., evening or during the weekend) to make the meetings more accessible.</p> <p>Two polls related to the Dallas-Fort Worth Air Quality Improvement Plan were taken during the meeting.</p> <p>Poll #1: Which of the following are you most concerned about? (Select top 3 priorities)</p> <ul style="list-style-type: none"> - Public Health (45%) - Local Air Quality (73%) - Extreme Weather Events (36%)

Public Meeting Feedback**		
Date	Location	Summary
		<ul style="list-style-type: none"> - Rising Energy Costs (36%) - Lack of Access to Food (18%) - Lack of Public Transportation (27%) - Lack of Jobs (0%) - Climate Change (55%) - Urban Areas Warming Due to Human Activities (45%) <p>Poll #2: Which sectors should be targeted in the DFW AQIP? (Select all that apply)</p> <ul style="list-style-type: none"> - Transportation (100%) - Energy (63%) - Water (38%) - Wastewater (13%) - Solid Waste (63%) - Agriculture/Land Use (50%)
12/4/2023	City of Dallas	<p>Attendees recommended the addition of more tree cover, the creation of "green" parking lots, adding solar to more buildings (the Dallas convention center was recommended), providing more weatherization rebates for residents, and adding pavement that can sequester carbon.</p> <p>Concerns were expressed regarding the lack of accessible sidewalks in parts of Dallas and lack of local technicians who are certified to do home weatherization.</p>
12/12/2023	City of Aledo	<p>Concerns were expressed regarding a rail crossing causing significant vehicle idling, lack of sidewalks in certain areas, and resiliency issues.</p> <p>Questions were asked about the CPRG and opportunity for grant funding for the region through the CPRG Implementation Grants.</p>

Public Meeting Feedback**		
Date	Location	Summary
1/8/2024	City of Arlington/Virtual*	<p>Concerns were expressed regarding urban drilling and associated local health issues (especially childhood asthma rates), food access, and bicycle accidents.</p> <p>Attendees recommended staff identify ways to create less carbon-intensive construction, electrify appliances/heating, ventilation, and air conditioning (H-VAC), add more high-density housing, provide free transit passes, add community solar and solar to parking garages, decarbonize airports, create a regional bus rapid transit network, add bike and bus only lanes, ensure diesel vehicles are meeting current emission standards, and add more electric vehicle charging stations.</p> <p>Attendees discouraged carbon trading and requiring electric vehicle owners to pay additional registration fees.</p> <p>NCTCOG was encouraged to reach out to younger community members through avenues such as TikTok, Instagram, Facebook; collect feedback by meeting people where they are (such as grocery stores, schools, etc.), focus on environmental justice, and host a community meeting in Spanish only.</p>
1/9/2024	City of Granbury	<p>Questions were asked regarding EV charging availability, current EV registration, time needed to charge an EV, and the appropriate amount of fees to charge an EV since they do not pay gas tax.</p> <p>Attendees suggested adding more public transit and recommended locations for electric vehicle charging stations.</p>
1/16/2024	City of Fate	<p>An attendee encouraged staff to include supporting the Property Assessed Clean Energy (PACE) Program in the Air Quality Improvement Plan.</p> <p>Attendees made recommendations on potential trails, sidewalks, and public transportation improvements.</p>
1/18/2024	City of Fort Worth	<p>Concerns were expressed regarding urban drilling, lack of public transit (including trains/subways), lack of sidewalks (especially in southern Fort Worth), poor internet access, and distribution centers impacting local residents due to noise and air pollution.</p> <p>Attendees recommended incentivizing developers to not cut down trees, add more trees near schools, and add more air quality monitoring, especially in low-income areas.</p> <p>Questions were asked regarding the low-income and disadvantaged communities’ benefits analysis and the potential</p>

Public Meeting Feedback**		
Date	Location	Summary
		for fees due to the region's nonattainment status for ground-level ozone.
1/24/2024	Virtual Listening Session*	<p>Attendees suggested the addition of more transit, low-heat pavement, EVs and electric appliances, hydrogen refueling stations, native plants, and trees. They also recommended the preservation of existing green space, a reduction in parking lots, enforcement of idle reduction policies, and utilizing vehicle-to-grid technologies.</p> <p>Numerous comments were made regarding a need for more air quality monitoring, especially around gas wells.</p> <p>Two polls related to the development of the Dallas-Fort Worth Air Quality Improvement Plan were taken during the meeting.</p> <p>Poll #1: Which of the following are you most concerned about? (Select top 3 priorities)</p> <ul style="list-style-type: none"> - Public Health (54%) - Local Air Quality (71%) - Extreme Weather Events (20%) - Rising Energy Costs (14%) - Lack of Access to Food (14%) - Lack of Public Transportation (20%) - Lack of Jobs (3%) - Climate Change (60%) - Urban Areas Warming Due to Human Activities (23%) <p>Poll #2: Which sectors should be targeted in the DFW AQIP? (Select all that apply)</p> <ul style="list-style-type: none"> - Transportation (81%) - Energy (81%) - Water (38%) - Wastewater (35%) - Solid Waste (38%) - Agriculture/Land Use (50%)
1/29/2024	City of Cleburne	Suggestions were made to have more incentives for decarbonization of fleet vehicles and the addition of more alternative fuel stations. An attendee suggested an EV trial vehicle for fleets. Concerns were expressed about needing training support for technology transitions, and recommendations made against projects that provide short-term incentives in exchange for future mandates/requirements.

Public Meeting Feedback**		
Date	Location	Summary
		<p>An attendee suggested programs that retrofit and weatherize low-income and disadvantaged residential homes. There was interest in programs that would support energy improvements in city facilities.</p> <p>Attendees made suggestions on improving intersections to reduce idling and traffic congestion.</p>

*Recording available at www.publicinput.com/dfwAQIP

**This effort was also taken to Transportation Public Meetings in June 2023, October 2023, and January 2024. Feedback was included with those comment reports provided to the Regional Transportation Council.

An online survey for the general public was published in November 2023 requesting input on the following:

- Community Concerns (i.e. Climate Change, Public Health, Local Air Quality, Extreme Weather Events, Rising Energy Costs, Food Access, Lack of Public Transportation, and Job Access)
- Level of Agreement on Specific Issues Occurring in Each Sector (Transportation, Energy Use and Industrial Operations, Water/Wastewater/Solid Waste, Agriculture/Forestry and Land Use)
- Ways NCTCOG Can Engage with Communities (Open Text Field)
- Other Feedback (Open Text Field)

As of February 9, 2024, 284 survey responses were received. Exhibit 5: illustrates where survey responses were received from, with 12 counties in the NCTCOG region represented.

Exhibit 5: Geographic Distribution of Survey Responses

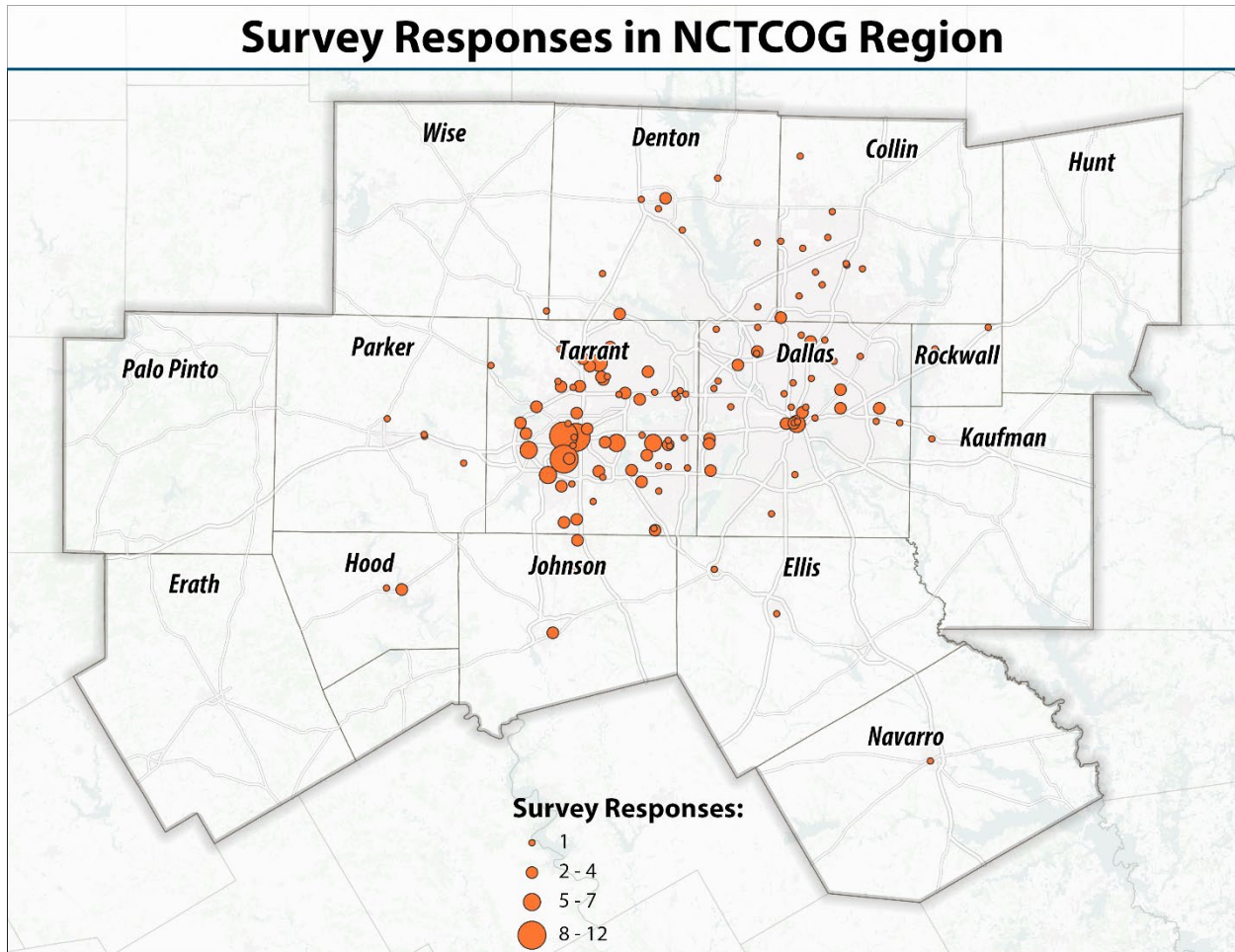
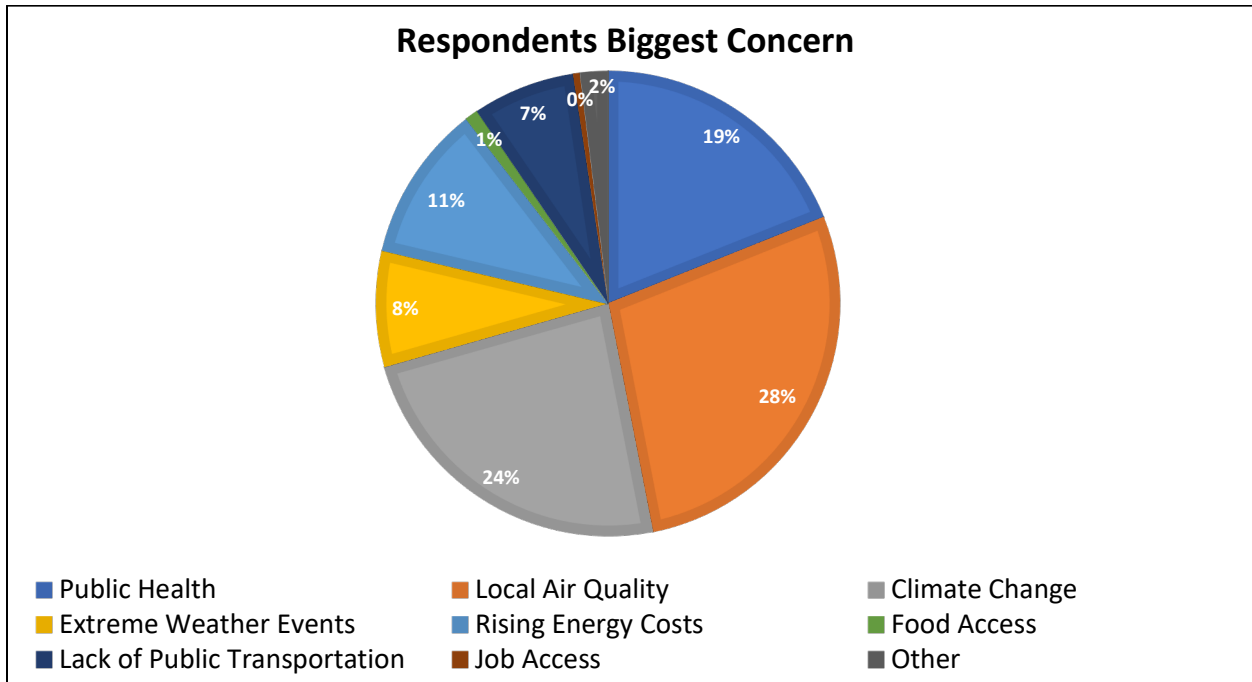


Exhibit 6 shows respondents' number one/biggest concern. Notably, the main concern of residents was local air quality, followed by climate change and public health as the second and third ranked issues, respectively. The number of respondents who ranked local air quality and public health as their biggest concern demonstrates regional demand for measures with significant criteria pollutant reduction, in addition to GHG reduction. **Appendix 7: Public Survey Results** contains a full summary of public survey responses.

Exhibit 6: Public Survey Respondents Biggest Concern



Connection to Existing Regional Plans and Local Climate/Air Quality Plans

While no regional-level (e.g., county or MSA) or statewide “climate plans” have been developed to date, a variety of existing regional plans to incorporate elements related to climate change and/or air quality were referenced in development of this plan. These regional plans span multiple sectors, and each are developed by NCTCOG in collaboration with local governments, stakeholders, and other committees and incorporate their own respective stakeholder engagement and input processes. These plans were cross-referenced to ensure that relevant projects, strategies, or initiatives that fit the DFW AQIP criteria were encompassed in recommended measures. Relevant regional plans include:

- **Mobility 2045**,¹² the long-range transportation plan for the 12-county metropolitan planning area. It guides the spending of federal and state transportation funds based on regional goals. The plan recommends projects, programs, and policies that aim to meet the mobility plan goal themes of mobility, quality of life, system sustainability, and implementation.
- **Appendix E** of the most recent Proposed DFW Severe Area Attainment Demonstration (AD) State Implementation Plan (SIP) Revision for the 2008 Eight-Hour Ozone NAAQS.¹³ This appendix, submitted by NCTCOG to the Texas Commission on Environmental Quality (TCEQ), outlines measures being implemented at the local level that achieve air quality benefits in the ozone nonattainment area.
- **The 2023 Update to the North Central Texas Water Quality Management Plan**¹⁴ addresses regional water quality and water quantity concerns, as well as wastewater management issues. The plan is updated annually to report on NCTCOG’s efforts to address impaired waterbodies and

¹² www.nctcog.org/trans/plan/mtp/mobility-2045-2022-update

¹³ <https://www.tceq.texas.gov/airquality/sip/dfw/dfw-latest-ozone>

¹⁴ www.nctcog.org/envir/natural-resources/water-resources

support regional water needs. The plan highlights NCTCOG’s key initiatives in water management and planning.

- **The Regional Solid Waste Management Plan (2022-2042)**¹⁵ examines various waste streams, addresses regional landfill capacity, and establishes goals for waste diversion, reduction, and safe handling of waste at permitted facilities. The plan looks at demand for solid waste infrastructure until 2042.

In addition, many municipalities in NCTCOG’s region have created sustainability, clean air, or air quality improvement plans. Many of the measures included in the DFW AQIP are consistent with the objectives of those plans. **Appendix 8: Inventory of Local Government Regional Plans** contains relevant plans created by local governments.

Notably, the City of Dallas’ Comprehensive Environmental and Climate Action Plan (CECAP)¹⁶ is one of few climate plans officially adopted by a municipality across the NCTCOG area. NCTCOG staff served on the advisory committee during development of the Dallas CECAP. The Dallas CECAP includes participation in a variety of NCTCOG initiatives among the various actions the city intends to undertake to address climate change concerns, and staff leveraged knowledge gained during participation in Dallas CECAP engagement efforts to inform DFW AQIP development.

Greenhouse Gas Emissions Inventory

In 2023, NCTCOG created the first North Central Texas Regional Greenhouse Gas Emissions Inventory¹⁷, which documented GHG emissions in the 12 counties (Collin, Dallas, Denton, Ellis, Hood, Hunt, Johnson, Kaufman, Parker, Rockwall, Tarrant, and Wise) for which NCTCOG serves as the Metropolitan Planning Organization (MPO). During development of the DFW AQIP, this inventory was expanded to encompass all 16 counties within the NCTCOG area, which involved adding emissions inventories from Erath, Navarro, Palo Pinto, and Somervell counties. Thus, the scope of the GHG EI is now consistent with the scope of the DFW AQIP. Methodology and results of the GHG EI are detailed in **Section 3**.

Measure Selection and Quantification

Selecting Measures

As feedback from meetings and surveys was collected, NCTCOG began refining input into a preliminary list of measures for inclusion in the Plan. To refine these measures, NCTCOG cross-referenced the regional plans described in **Section 1** and reviewed the following:

1. Is there regional interest?
2. Is someone able and willing to implement it?
3. Can it be done in the next five years?
4. Does it provide broad, quantifiable greenhouse gas and criteria pollutant reductions?

As NCTCOG refined measures, staff requested entities interested in implementing measures submit a **project scope** indicating what measures they would like to implement, when it could be implemented, and cost estimates. **Appendix 9: Project Scope Summary** summarizes all project scopes received. This information was used to further refine the scope and scale of measures proposed for inclusion in the

¹⁵ www.nctcog.org/envir/materials-management/materials-management-plan

¹⁶ <https://www.dallasclimateaction.com/>

¹⁷ <https://www.nctcog.org/trans/quality/air/emissions-inventories/local-regional-greenhouse-gas-emission-inventory>

DFW AQIP, so the measures included are inclusive of the types of projects that have been suggested for implementation.

Quantification

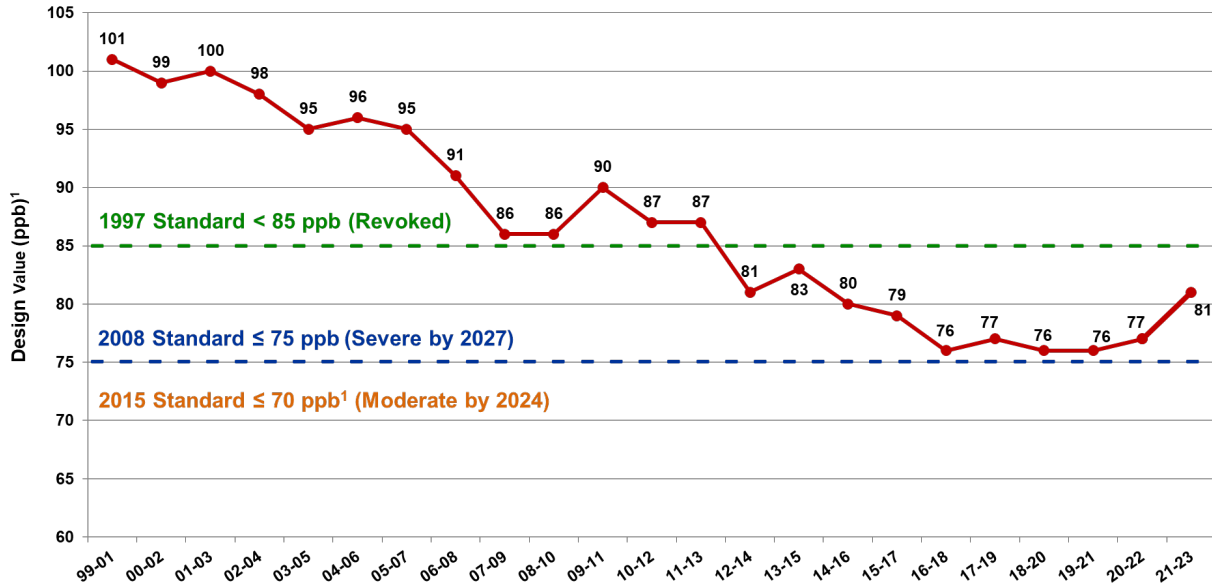
The quantification of projected GHG and co-pollutants reductions are estimates, with many measures including a range of potential reductions. In general, calculations were conservative as to not overestimate the benefits. Many different resources and tools were used to produce these qualifications, and when possible, EPA recommended tools and datasets were used. These tools, methods, assumptions, and references are documented in Appendix 9: Methodology for Quantifying Measures.

2- Regional Context

As noted, NCTCOG has a long history of working collaboratively with local governments (cities, counties, transit agencies, special districts, and school districts), and other local, state, and partners across the region on air quality issues. This collaboration was borne from long-standing ozone nonattainment issues but is expanding as other air quality concerns are becoming more urgent. These multipollutant air quality issues are the foundation for why NCTCOG has taken the lead in coordinating the DFW AQIP at the 16-county regional level, and why this plan is so important to advancing improvement across North Central Texas. Additionally, NCTCOG has been fostering collaboration among cities with TCEQ Municipal Texas Pollutant Discharge Elimination System Permits to provide joint water quality compliance water-quality monitoring efforts across the Trinity River Basin since about 2012, in addition to a long-standing tradition of supporting regional code development and adoption, and regional solid waste management cooperation.

Ozone nonattainment issues have plagued the NCTCOG region for over three decades, starting in the mid-1990s when only four counties were designated nonattainment. While there has been substantial improvement in ground-level ozone concentrations, reflected by the decreasing design value illustrated in Exhibit 8, the EPA has continued to lower the ozone NAAQS to reflect the latest data on ground-level ozone concentrations that are protective of human and environmental health. As these standards have become more stringent over time, the geographic scope of the nonattainment area has increased to now encompass 10 counties. Moreover, as multiple deadlines to meet the ozone standards have come and gone, the EPA has reclassified the region multiple times and now, for the first time, 10 counties have reached the “severe” nonattainment designation, which is the worst designation to be applied across the region to date.

Exhibit 7: Ozone Design Value Trendline 1999-2023



¹Attainment Goal - According to the US Environmental Protection Agency National Ambient Air Quality Standards, attainment is reached when, at each monitor, the *Design Value* (three-year average of the annual fourth-highest daily maximum eight-hour average ozone concentration) is equal to or less than 70 parts per billion (ppb).

The NCTCOG Transportation Department, the RTC, and the NCTCOG Executive Board together serve as the MPO for 12 counties in the DFW region (Collin, Dallas, Denton, Ellis, Hood, Hunt, Johnson, Kaufman, Parker, Rockwall, Tarrant, and Wise). As detailed in **Section 3**, 10 of these counties (Collin, Dallas, Denton, Ellis, Johnson, Kaufman, Parker, Rockwall, Tarrant, and Wise) have been designated by the EPA as nonattainment for the pollutant ozone. As the MPO in an ozone nonattainment area, NCTCOG has responsibility for incorporating air quality planning into transportation planning efforts at the regional level, specifically via Transportation Conformity and the Metropolitan Transportation Plan, which are two of the core functions of the MPO. The MPO works closely with regional, state, and federal partners to plan and recommend transportation projects that will improve mobility and encourage more efficient land use, all while minimizing the impact on the region’s air quality.

Exhibit 8 also illustrates that the progress in reducing ozone concentrations has stalled. Until the last few years, the region was benefiting from improvements (that is, reductions) in ground-level ozone despite the fact that population, vehicle miles of travel, and levels of economic activity were all increasing. However, in the past few years, ozone levels have started to worsen again, with the design value creeping back up. The reasons for this are not yet understood, but the pervasiveness of the region’s ozone nonattainment issues underscore the compelling need for widespread actions across all emissions sectors to achieve improvements.

Several other air quality developments have arisen recently that began extending NCTCOG air quality activities beyond ozone related MPO obligations. As discussed in **Section 3**, the revised NAAQS for fine particulate matter will likely trigger new nonattainment designations for the two most populous counties in the NCTCOG region – Dallas and Tarrant – under this pollutant. This means that approximately 4.9 million residents will be living in areas designated as nonattainment for two different air pollutants –

ozone and fine particulate matter – both of which cause respiratory issues and put this population at greater risk of health issues and other negative impacts. Local air quality has already been the most pressing local concern, as illustrated in the survey responses provided in **Appendix 7: Public Survey Results**. New nonattainment designations under a second pollutant will greatly exacerbate existing worries among residents.

In addition, new Federal Performance Measures¹⁸ requirements related to greenhouse gases attributable to the transportation system will require that State Departments of Transportation (State DOTs) and MPOs establish declining CO₂ emissions targets for the GHG measure and report on progress toward achievement of those targets¹⁹. State DOTs will establish two- and four-year statewide emissions reduction targets, and MPOs will establish four-year emissions reduction targets for their metropolitan planning areas. In addition, the rule requires MPOs that have urbanized areas with populations of 50,000 or more to establish additional joint targets. State DOTs and MPOs have the flexibility to set targets that work for their respective climate change policies and other policy priorities, so long as targets are declining. State DOTs and MPOs are also required to report on their progress in meeting the targets. State DOTs established targets February 1, 2024. Subsequent targets will be established and reported no later than October 1, 2026.

While these air quality issues continue to pose challenges, the NCTCOG region faces constant population and economic growth. According to the 2010 and 2020 Decennial Censuses and the Mobility 2045 Update demographic forecast,²⁰ in recent years, the region has continued to add roughly 125,000 residents per year and is on track to exceed a population of 11 million by 2045. The population growth parallels an increase in economic activity, especially in the freight sector. The Federal Highway Administration (FHWA) estimates freight shipment tonnage will increase between 2015 and 2045 by 40 percent nationally,²¹ and the value of freight shipments to and from the DFW area is estimated to increase by 67 percent in a low-growth scenario, according to the FHWA Freight Analysis Framework.²² The NCTCOG Freight North Texas report details the extensive network of freight assets and impact of freight in the NCTCOG region.^{23,24} Increases in population and economic activity lead to more activity in nearly every emissions sector for multiple pollutants: increased vehicle miles of travel, greater demand for electricity generation, more need for waste management resources, additional pressure on water and wastewater treatment facilities, and more land development that decreases the amount of available green space that absorbs or mitigates air pollutants.

The release of the EPA CPRG Program coincided with these issues and has presented a natural opportunity to weave the various concerns together into this comprehensive air quality plan. Leveraging its existing work, NCTCOG took the lead in coordinating stakeholders across the region to develop the DFW AQIP. Local governments were major contributors, along with stakeholder input contributed by NCTCOG committee members (which includes nonprofit and business entities), local nonprofits and other

¹⁸ <https://www.nctcog.org/trans/data/info/measures/system>

¹⁹ <https://www.federalregister.gov/documents/2023/12/07/2023-26019/national-performance-management-measures-assessing-performance-of-the-national-highway-system>

²⁰ <https://www.nctcog.org/trans/plan/mtp/mobility-2045-2022-update>

²¹ <https://www.transportation.gov/briefing-room/dot-releases-30-year-freight-projections>

²² https://faf.ornl.gov/faf5/dtt_total.aspx

²³ <https://www.transportation.gov/briefing-room/dot-releases-30-year-freight-projections>

²⁴ <https://nctcog.org/getmedia/a3642652-f78b-4bbc-b33f-85fd13e599c3/Freight-North-Texas-2022-A-FREIGHT-Mobility-Plan.pdf>

organizations, and residents. More detail on this engagement and input is provided in **Section 1: Regional Engagement**. The resulting DFW AQIP has been developed to achieve reductions in greenhouse gas, ozone precursors, and fine particulate matter emissions.

3- Emissions Inventory

Greenhouse Gas Inventory

Base Year

This inventory utilizes 2019 as its baseline year, because it is the most recent year for which the necessary data was available and best represents normative regional operations for the 16-county NCTCOG region before disruptions due to COVID-19.

Scope

The three greenhouse gases included in this inventory are carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O). Most charts in this report represent emissions in “carbon dioxide equivalent” (CO₂e) values, calculated using the Global Warming Potentials (GWP) from the Intergovernmental Panel on Climate Change (IPCC) 5th Assessment Report.²⁵ The GWP is an indicator describing the radiation impact of one unit of a greenhouse gas to one unit of CO₂. It indicates the degree of harm to the atmosphere.

Exhibit 8: Global Warming Potentials

Greenhouse Gas	Global Warming Potential
Carbon Dioxide (CO ₂)	1
Methane (CH ₄)	28
Nitrous Oxide (N ₂ O)	265

Inventory Methodology

The ICLEI Community Emissions Protocol

Version 1.2 of the U.S. Community Protocol for Accounting and Reporting GHG Emissions²⁶ was released by ICLEI in 2019 as a nationally recognized standard in guidance to help U.S. local governments develop effective community GHG emissions inventories by establishing reporting requirements for all community GHG emissions inventories.

The community inventory in this report includes emissions from the five Basic Emissions Generating Activities required by the Community Protocol:

- Use of electricity by the community
- Use of fuel in residential and commercial stationary combustion equipment

²⁵ <https://www.ipcc.ch/assessment-report/ar5/>

²⁶ <https://icleiusa.org/us-community-protocol/>

- On-road passenger and freight motor vehicle travel
- Use of energy in potable water and wastewater treatment and distribution
- Generation of solid waste by the community

The 2019 regional inventory also includes the following activities to be more comprehensive:

- Wastewater processing
- Off-road and non-road sectors
- Airport and aviation emissions
- Water/pleasure craft emissions

The ICLEI Local Government Operations (LGO) Protocol

In 2010, ICLEI, the California Air Resources Board (CARB), and the California Climate Action Registry (CCAR) released Version 1.1 of the LGO Protocol.²⁷ The LGO Protocol serves as the national standard for quantifying and reporting greenhouse emissions from local government operations. The purpose of the LGO Protocol is to provide the principles, approach, methodology, and procedures needed to develop a local government greenhouse gas emissions inventory.

The following activities are included in the LGO inventory:

- Energy and natural gas consumption from buildings and facilities
- Wastewater treatment processes
- On-road transportation from employee commute and vehicle fleet

Emissions Quantification Methods

Greenhouse gas emissions can be quantified in two ways:

- **Measurement-based methodologies**, which refer to the direct measurement of greenhouse gas emissions (from a monitoring system) emitted from a flue of a power plant, wastewater treatment plant, landfill, or industrial facility.
- **Calculation-based methodologies**, which calculate emissions using activity data and emission factors. To calculate emissions accordingly, the basic equation below is used:

$$\text{Activity Data} \times \text{Emission Factor} = \text{Emissions}$$

Most emissions sources in this inventory are quantified using calculation-based methodologies. Activity data refers to the relevant measurement of energy use or other greenhouse gas-generating processes such as fuel consumption by fuel type, metered annual electricity consumption, annual vehicle miles traveled, etc.

Emission factors are used to convert energy usage or other activity data into associated quantities of emissions. Emission factors are usually expressed in terms of emissions per unit of activity data (e.g., lbs CO₂/kWh of electricity). For this inventory, calculation results are given in Carbon Dioxide Equivalent Emissions in Metric Tons (MTCO₂e).

²⁷ <https://icleiusa.org/ghg-protocols/>; https://s3.amazonaws.com/icleiuseresources/lgo_protocol_v1_1_2010-05-03.pdf

Community Emissions Inventory Results

Total communitywide MTCO₂e for the regional 2019 inventory are shown in Exhibits 10 through 13. Exhibit 14 shows an overview of the relative distribution of communitywide emissions by sector. The Energy sector (comprised of residential, commercial, and industrial subsectors) makes up the largest portion of the regional inventory at 53 percent. Transportation & Mobile Sources is the second largest sector contributing to regional emissions at 43 percent, with the Waste and Wastewater sector making up the remaining emissions. Note that emissions from the water supply sector have been included in the Energy sector as water pumping is energy intensive.

Exhibit 9: Communitywide NCTCOG Area 16-County 2019 Annual CO₂e Emissions – Energy

Sector	Fuel or Source	2019 Usage	Usage Unit	2019 Emissions (MTCO ₂ e)
Residential Energy				
	Electricity	56,878,355	MWh*	22,506,452
	Natural Gas (Utility Fuel Combustion)	82,432,173	MMBtu*	4,384,279
	Kerosene and Distillate Fuel Oil (Non-Utility Fuel Combustion)	1,276	MMBtu	95
	Propane (Non-Utility Fuel Combustion)	3,774,980	MMBtu	234,271
	Wood (Non-Utility Fuel Combustion)	375,569	MMBtu	3,741
Residential Energy Total				27,128,838
Commercial Energy				
	Electricity	26,005,061	MWh	10,290,060
	Natural Gas	48,384,406	MMBtu	2,573,397
	Kerosene and Distillate Fuel Oil (Non-utility Fuel Combustion)	4,245,660	MMBtu	316,130
	Propane (Non-Utility Fuel Combustion)	2,977,516	MMBtu	184,781
	Wood (Non-Utility Fuel Combustion)	119,052	MMBtu	239
Commercial Energy Total				13,364,607
Industrial Energy				
	Electricity	17,419,413	MWh	6,892,766
	Natural Gas	1,672,497	MMBtu	88,767
	Distillate Fuel Oil (Non-Utility Fuel Combustion)	55,453,329	MMBtu	4,116,477
	Propane (Non-Utility Fuel Combustion)	66,350,347	MMBtu	4,103,339
Industrial Energy Total				15,201,349
Energy Total				55,694,794

Units: MMBtu - Metric Million British Thermal Unit; MWh - Megawatt Hour

Exhibit 10: Communitywide NCTCOG Area 16-County 2019 Annual CO₂e Emissions – Transportation

Sector	Fuel or Source	2019 Emissions (MTCO ₂ e)
Transportation		
On-Road	Gasoline	31,426,078
	Diesel	9,038,873
Aviation	Total Jet A (Jet Kerosene) and Aviation Gasoline	1,405,499
Off-Road/Non-Road	Total Off-Road/Non-Road Fuel Types	3,521,275
Pleasure Craft	Diesel	95
	Gasoline	1,760
Rail	Freight Diesel and Passenger Diesel	378,586
Transportation Total		45,772,166

Exhibit 11: Communitywide NCTCOG Area 16-County 2019 Annual CO₂e Emissions – Solid Waste, Water and Wastewater

Sector	Fuel or Source	2019 Usage	Usage Unit	2019 Emissions (MTCO ₂ e)
Solid Waste				
Solid Waste	Waste Generation	10,486,236	MT*	3,911,496
	Flaring	20,505,666,550	cf/y*	56,010
Solid Waste Total				3,967,505
Water and Wastewater				
Water and Wastewater	Effluent Nitrogen Load	1,439	kg N/day*	1,093
Water and Wastewater total**				1,093

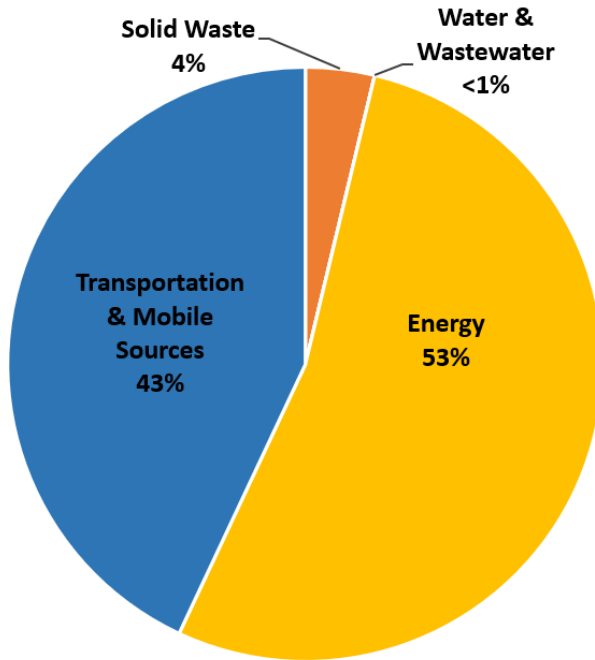
*Units: MT – Metric Tons; cf/y - Cubic Feet/Year; kg N/day Kilogram of Nitrogen Load/Day

** Note that Water Supply emissions are included in the Commercial and Industrial Energy sector emissions.

Exhibit 12: Communitywide NCTCOG Area 16-County 2019 Annual CO₂e Emissions – Total

Sector	2019 Emissions (MTCO ₂ e)
Energy Total	55,694,794
Transportation Total	45,772,166
Solid Waste Total	3,967,505
Water and Wastewater Total	1,093
Total Communitywide NCTCOG Area 16-County [MTCO₂e]	105,435,559

Exhibit 13: Communitywide NCTCOG Area 16-County 2019 Annual CO₂e Emissions by Sector



Electricity

Electricity Data GHG Emissions Methodology

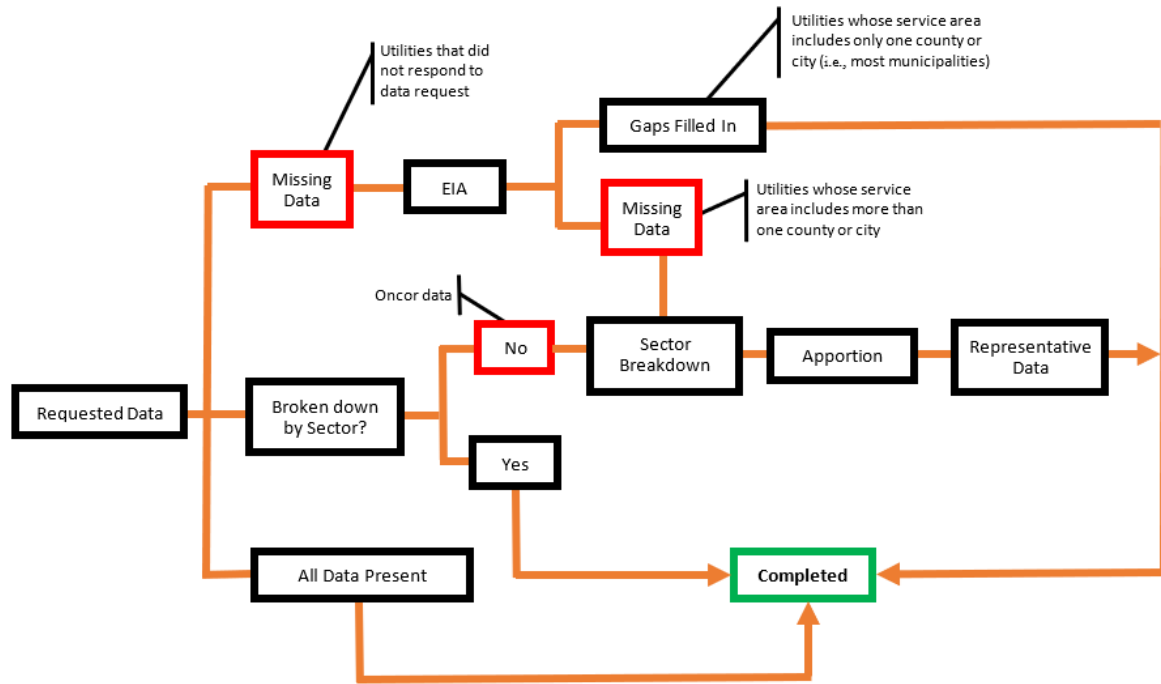
Electricity data activity was estimated using a combination of Energy Information Administration data (EIA-861)²⁸, NCTCOG GIS data, the National Land Cover Database,²⁹ GIS data, and electricity usage data from municipal owned utilities (MOU), cooperatives (CO-OP) and electric transmission providers. The data was categorized by residential, commercial, and industrial sectors for each county within the 16-county region.

Electricity usage for each county contained the summation of electricity usage from each electricity utility provider that served the county. Depicted below in Exhibit 15 is a process flow diagram describing the data gathering and representative data apportioning process for county electricity data.

²⁸ <https://www.eia.gov/electricity/data.php>

²⁹ <https://www.usgs.gov/centers/eros/science/national-land-cover-database>

Exhibit 14: County Electricity Data Methodology



Limitations

Limitations for the electricity sub-sector inventory primarily relates to data constraints due to data availability and the level of data granularity. Some data requests were not fulfilled by electricity utility providers. When this was the case, EIA-861 data was apportioned with GIS to supplement. Oncor data was aggregated regardless of energy sector and EIA data was not at a county level, which lead to data apportionment processing.

Assumptions

The following are assumptions made to complete the emissions inventory for the electricity sub-sector:

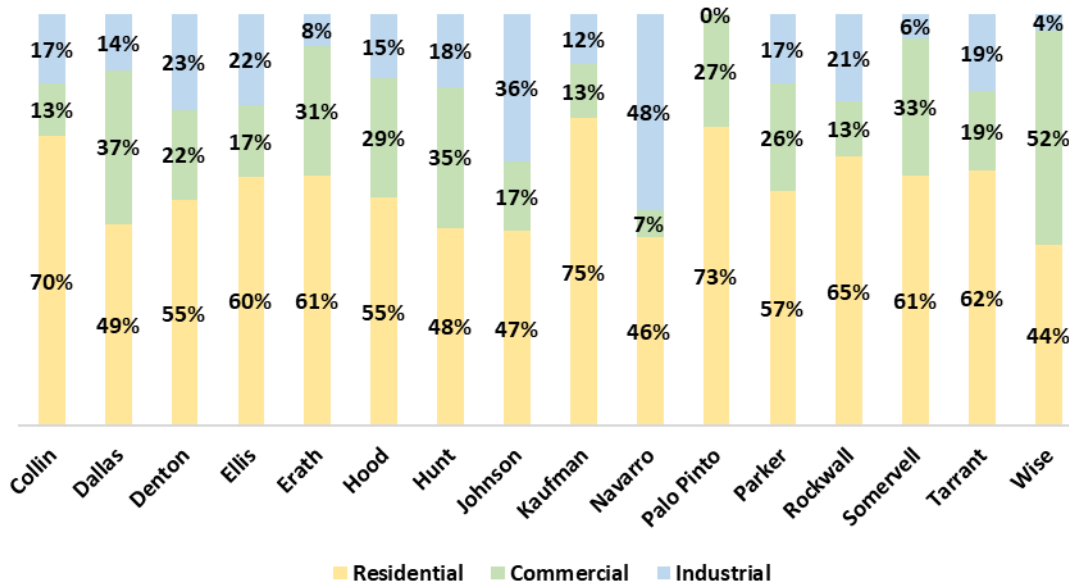
- There is no overlap between CO-OPS and MOUs in coverage and those in a MOU area are subject to using the MOU.
- Land-use data incorporation assumes that negligible electricity consumption occurred in areas that are not urbanized/incorporated.
- Apportioned data assumes equal amount of usage per area – counties with more urban developments, industrial, or commercial sectors are likely to have fluctuating electricity usages.

Electricity Data GHG Emissions Results

The energy sector is the largest contributor to CO₂e across the inventory, at 53 percent of regional emissions in 2019, with electricity being the bulk of the energy sector emissions – electricity from the residential, commercial, and industrial energy sub-sectors combined account for almost 38 percent of the regional inventory’s CO₂e. Total electricity emissions for 2019 in the 16-county region were 39,689,277 metric tons of CO₂e, of which 57percent (22,506,452 MTCO₂e) were residential, 26 percent (10,290,060

MTCO_{2e}) were commercial, and 17 percent (6,892,766 MTCO_{2e}) were industrial. The sector percentage breakdown of the electricity consumption for each county can be seen in Exhibit 16.

Exhibit 15: NCTCOG Area 16-County 2019 Annual Electricity Usage by Sector



Natural Gas

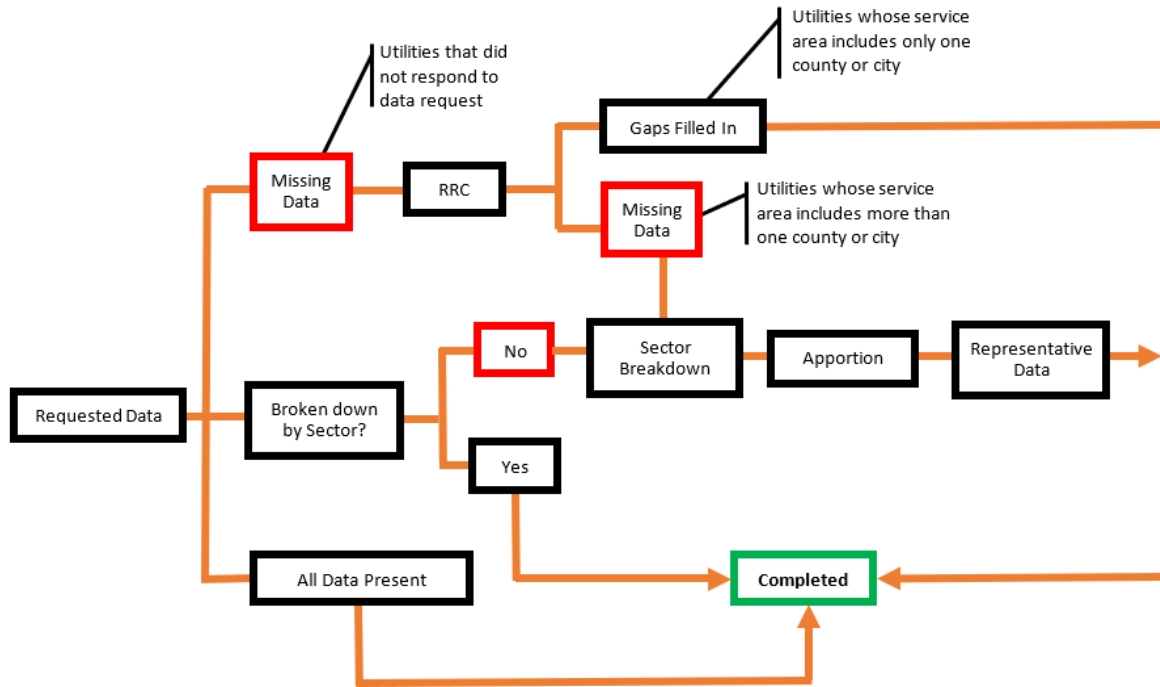
Natural Gas Data GHG Emissions Methodology

Natural gas data was collected either directly from utilities or indirectly as supplemental data from the Railroad Commission of Texas (RRC).³⁰ Data collected directly from utilities included division of natural gas by residential, commercial, and industrial sectors for each county in the NCTCOG region. Data collected indirectly from the RRC included only residential and a combined mix of commercial and industrial sectors, which would then need to be processed and attributed to cohort cities and counties (see Exhibit 17).

Creating the representative data from RRC was accomplished by first identifying if a city within the NCTCOG region was serviced by more than one utility. If a city was serviced by only one utility, it could be added into the data for that county. However, if a city was serviced by more than one utility or that city existed in multiple counties, natural gas consumption data was apportioned based on that city’s urban land use from the 2019 National Land Cover Database. The percentage of urban territory for each county within the service areas was then attributed to the individual county.

³⁰ <https://www.rrc.texas.gov/resource-center/>

Exhibit 16: County Natural Gas Data Methodology



Limitations

Limitations for this emissions inventory primarily come from the use of supplemental data from the RRC. Ideally, data for natural gas consumption would have come directly from each utility that serves the NCTCOG region. The RRC receives natural gas consumption data directly from utilities. However, the structure of RRC data limits the scope of this inventory as RRC data does not include any unincorporated areas within counties and is limited to the city level. Additionally, the RRC data does not differentiate between commercial and industrial.

Assumptions

The following are assumptions that were made to get the most wholistic view of natural gas consumption for the NCTCOG region:

- Commercial and industrial sector data from the RRC would only be included as commercial in the final product. This was done since data from Atmos Energy supported a more commercial heavy natural gas consumption.
- Data from Texas Gas Service included a “Public Authority” consumption. This sector was included as commercial in the final product since it included entities such as universities and government buildings.
- Most natural gas consumption is assumed to be in urban areas to help apportion data to different counties. However, this is not entirely true as numerous other land use areas consume natural gas.

Electricity Data GHG Emissions Results

Total natural gas consumption for 2019 in the region was 132,489,077 MMBtu: of which 82,432,173 MMBtu was residential, 48,384,406 MMBtu was commercial, and 1,672,497 MMBtu was industrial. A breakdown by natural gas consumption for each county can be seen in Exhibit 18.

Exhibit 17: NCTCOG Area 16-County 2019 Annual Natural Gas Usage by County, per Sector [MMBtu]

County	Residential	Commercial	Industrial
Collin	17,069,925	5,026,766	97,509
Dallas	28,237,312	22,366,973	278,197
Denton	11,976,048	3,947,603	20,518
Ellis	849,596	608,677	82,046
Erath	137,039	146,443	4,192
Hood	95,415	118,542	0
Hunt	484,158	452,233	151,925
Johnson	648,447	501,344	165,429
Kaufman	814,352	404,970	29,478
Navarro	306,134	258,106	13,622
Palo Pinto	171,300	198,130	5,759
Parker	384,276	440,237	6,869
Rockwall	1,404,920	449,868	0
Somervell	12,353	49,748	0
Tarrant	19,691,689	13,174,683	816,954
Wise	149,210	240,084	0

Stationary Non-Utility Fuel Combustion

Stationary Non-Utility Fuel Combustion GHG Emissions Methodology

Stationary Non-Utility Fuel Combustion is reported by each source to the U.S. EPA under 40 CFR Part 98 Subpart C – General Stationary Fuel Combustion Sources and is also collected by the U.S. EIA for usage in their State Energy Data System (SEDS).³¹ Reported data was extracted for statewide usage and downscaled for each sector, with the industrial sector data also gathered via the EPA’s Facilities Level Information on Greenhouse gases Tool (FLIGHT)³² for regional guidance and comparative purposes. Data was then input into ICLEI’s ClearPath tool to convert total consumption into metric tons of CO₂e using an emissions factor conversion for the corresponding fuel combusted.

Limitations

Limitations for this emissions inventory primarily relate to data availability for accuracy and precision. Ideally, data for stationary non-utility fuel consumption would have come directly from each utility that serves the NCTCOG region. As the threshold for the federal GHG reporting program is 25,000 MT CO₂e for any facility to appear in reporting, many smaller emitters are left out and may cumulatively be a

³¹ <https://www.eia.gov/state/seds/>

³² https://ghgdata.epa.gov/ghgp/main.do?site_preference=normal

significant number of emissions that are unaccounted. Additionally, EIA SEDS aggregates consumption of all types of distillate fuel oil into one number for the residential and commercial sectors. Therefore, custom emissions factors appropriate for general distillate fuel oil consumption of all types were used for ClearPath entry by using CO₂ emission factor from the EIA, and CH₄ and N₂O emission factors from EPA's emission factors in Appendix C of the U.S. Community Protocol.³³

Assumptions

The following are assumptions that were made to get the most wholistic view of stationary non-utility fuel consumption for the NCTCOG region:

- FLIGHT data was used to highlight what large industrial facilities exist in the region and what fuel types were consumed in 2019. This information was used as an indicator for what are likely the only fuels with widespread use throughout the region's industrial sector and therefore what fuels would also be unlikely to be used at smaller facilities in a nonnegligible amount.
- Assumed electricity, natural gas, and district heating/cooling to all be delivered by utilities and included in other sectors of this emissions inventory.
- Commercial and industrial sectors are involved in downscaling non-local (i.e., statewide) data on fuel consumption to a local level using Census job counts.
- EIA assumes statewide residential coal consumption in 2008 and beyond to be zero/negligible.

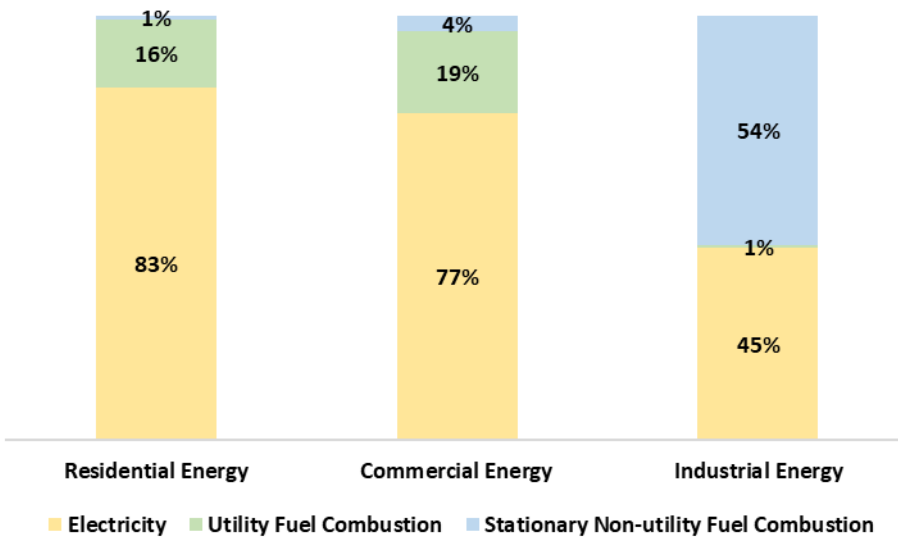
Stationary Non-Utility Fuel Combustion GHG Emissions Results

Total stationary non-utility gas consumption for 2019 in the region resulted in 8,959,074 MTCO₂e of emissions of which 238,107 MTCO₂e were residential, 501,150 MTCO₂e were commercial, and 8,219,816 MTCO₂e were industrial.

A sector-wide percentage comparison of the regional emission total is shown in Exhibit 19 below.

³³ <https://icleiusa.org/us-community-protocol/>

Exhibit 18: NCTCOG Area 16-County 2019 Annual Energy Emissions



Transportation: On-Road

On-Road GHG Emissions Methodology for the NCTCOG 12-County Metropolitan Planning Area (MPA)

Estimation of Vehicle Activity

The Dallas-Fort Worth Travel Model, Transportation Analytical Forecasting Tool (TAFT), serves as the source for forecasting vehicle miles of travel (VMT) and other travel characteristics for the North Central Texas nonattainment area. The network-based TAFT is executed in the TransCAD environment, which is a GIS-based commercial travel demand software package for transportation planning. The NCTCOG Transportation Department is responsible for executing TAFT and conducting various planning studies for the region. The forecasting technique of TAFT is based on a four-step sequential process designed to model travel behavior and predict the level of travel demand at regional, sub-area, or small area levels. These four steps are: Trip Generation, Trip Distribution, Mode Choice, and Roadway Assignment.

Estimation of Off-Network Activity

The non-roadway-based inventory estimates (e.g., from vehicle starts, parked vehicle evaporative processes, non-roadway-based vehicle idling, hoteling activity) were calculated as the product of the amount of associated activity and the mass per unit of activity. To estimate the source hours parked (SHP) and vehicle starts activity, vehicle population estimates were needed. Hoteling activity estimates (composed largely of the emissions-producing source hours extended idling (SHEI) and diesel auxiliary power unit (APU) hours) were based on county-specific actual estimates.

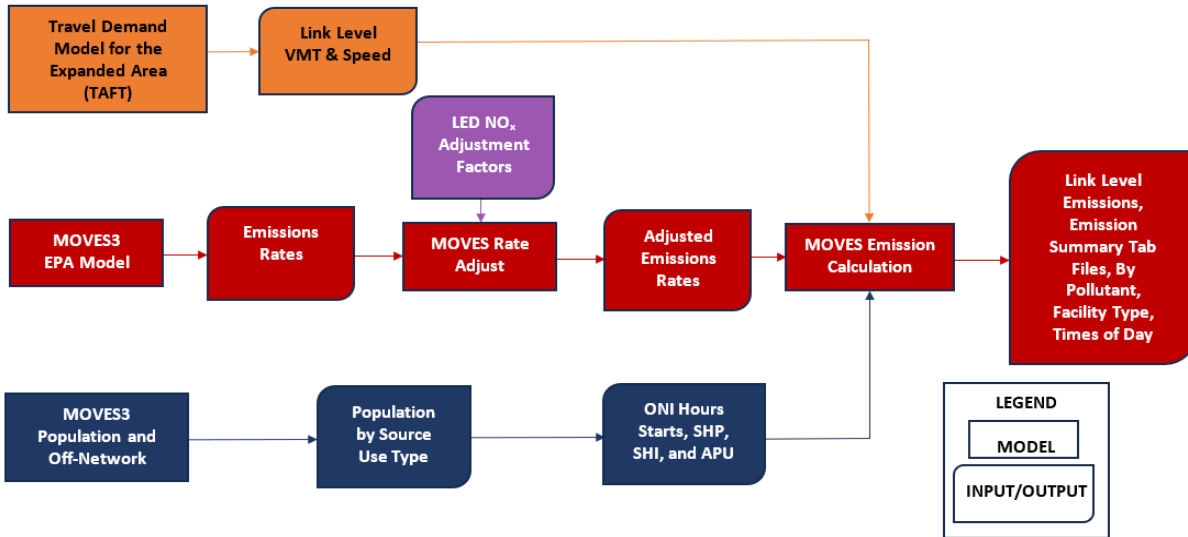
The methodology provided by the Texas A&M Transportation Institute (TTI), similar to the region’s transportation conformity, was used to calculate the vehicle population and off-network activity estimates.

Emissions Estimation

Emissions were calculated using the EPA’s MOtor Vehicle Emission Simulator (MOVES) 3 model (in the Rates mode) and the utilities developed by TTI. The utilities combine vehicle and off-network activity and emission rates to create emission estimates.

Exhibit 20 below outlines the emission calculation modeling process used to calculate the Dallas-Fort Worth Metropolitan Planning Area emissions estimates.

Exhibit 19: Emissions Modeling Process



On-Road GHG Emissions Methodology for the NCTCOG additional Four Counties (Erath, Navarro, Palo Pinto, and Somervell)

The emission estimates for the four counties of Erath, Navarro, Palo Pinto, and Somervell were calculated using the EPA’s MOVES 3 model in the Inventory mode, utilizing the EPA’s default activities.

On-Road GHG Emissions Results

The emissions for Collin, Dallas, Denton, Ellis, Erath, Hood, Hunt, Johnson, Kaufman, Navarro, Palo Pinto, Parker, Rockwall, Somervell, Tarrant, and Wise counties were produced at a summer weekday level, and a conversion factor from the Texas Department of Transportation’s (TxDOT) Automatic Traffic Recorder (ATR) data was used to annualize the estimates. The on-road annual CO₂e emissions for the analysis year 2019 are listed in Exhibit 21 below.

Exhibit 20: NCTCOG Area 16-County 2019 Annual On-Road CO₂e Emissions

County	MTCO ₂ e
Collin	4,386,731
Dallas	14,642,389
Denton	3,476,454
Ellis	1,384,734

County	MTCO ₂ e
Erath	347,899
Hood	346,761
Hunt	958,525
Johnson	965,320
Kaufman	1,214,645
Navarro	689,279
Palo Pinto	341,823
Parker	1,010,439
Rockwall	441,550
Somervell	79,864
Tarrant	9,479,378
Wise	699,160
Total	40,464,951

Transportation: Off-Road/Non-Road

Off-Road/Non-Road GHG Emissions Methodology

The off-road/non-road emissions include emissions from various equipment such as agricultural, airport, commercial, construction and mining, industrial, lawn and garden, logging, railroad, and recreational. The emissions estimates were developed using the TexN model, a tool for estimating Texas-specific emissions from off-road/non-road sources. TCEQ contracted with Easter Research Group (ERG) to develop the model. The TexN model uses EPA's Non-Road model to calculate emissions, as previously required by the EPA for developing emissions estimates for State Implementation Plan revisions, national emissions inventories, and reasonable further progress (RFP) analyses. Since TexN was developed, TCEQ has frequently updated the Texas-specific data within the tool and enhanced the tool's functionality. The recent version available, TexN 2.2, was utilized for this inventory.

Off-Road/Non-Road GHG Emissions Results

The TexN 2.2 model was set to the scenario year of 2019, an annual period, and was run for all 16 counties (Collin, Dallas, Denton, Ellis, Erath, Hood, Hunt, Johnson, Kaufman, Navarro, Palo Pinto, Parker, Rockwall, Somervell, Tarrant, and Wise). The off-road/non-road annual CO₂e emissions for the analysis year 2019 are listed in Exhibit 22 below.

Exhibit 21: NCTCOG Area 16-County 2019 Annual Off-Road/Non-Road CO₂e Emissions

County	MTCO ₂ e
Collin	397,742
Dallas	1,418,388
Denton	290,817
Ellis	138,050
Erath	24,414
Hood	36,107

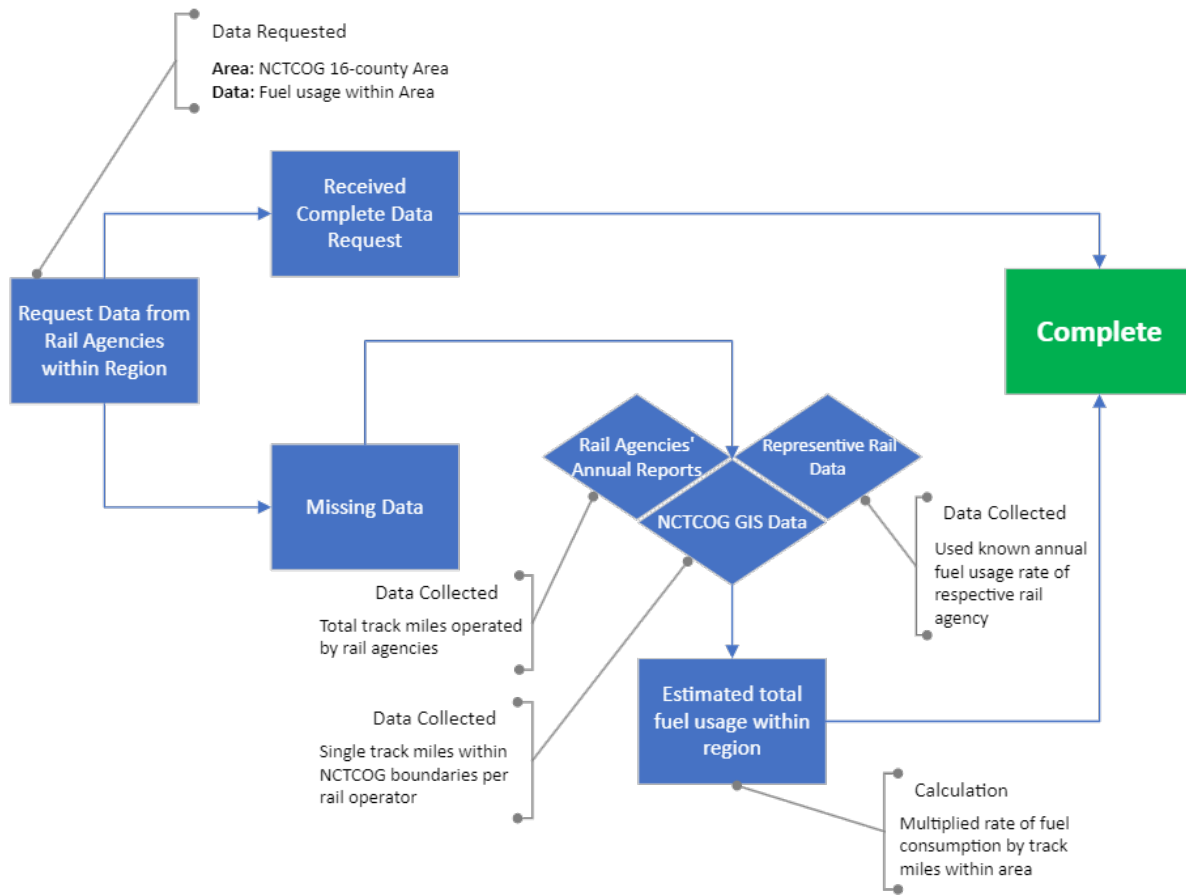
County	MTCO ₂ e
Hunt	38,465
Johnson	75,241
Kaufman	82,530
Navarro	34,333
Palo Pinto	20,748
Parker	65,856
Rockwall	51,097
Somervell	16,351
Tarrant	778,049
Wise	53,089
Total	3,521,275

Rail

Rail Data GHG Emissions Methodology

Rail data was collected from a combination of fuel usage data from regional rail agencies data requests, total rail track miles and annual fuel use from rail agencies’ sustainability/annual reports, representative rail data (for rail entities that had no data available), and single rail track miles operated by rail agencies within the NCTCOG region from the NCTCOG GIS database (see Exhibit 22). The data was categorized as freight diesel, passenger diesel, and passenger electric.

Exhibit 22: County Rail Data Methodology



Rail emissions were estimated by calculating the rate of fuel consumption per single track mile for each rail agency and applying that rate to the number of single-track miles within the NCTCOG region.

$$Fuel\ Consumption_{Regional} = \frac{Fuel\ Consumption_{Total}}{Single\ Track\ Mile_{Total}} \times Single\ Track\ Mile_{Regional}$$

$$Emissions_{Regional} = Fuel\ Consumption_{Regional} \times ERCOT\ eGRID\ emission\ factor$$

Limitations

For this emissions inventory, the assumption that each track mile had the same emission rate was used to calculate emissions. Unless the rail agency solely operated within the NCTCOG region and provided their total fuel usage, this assumption did not account for the number of trips or number of locomotives for each track, which would invariably over or underestimate the emissions per track mile. Additionally, ICLEI’s ClearPath tool used only the Emissions & Generation Resource Integrated Database (eGRID) for the rail transportation factor set. “The eGRID is a comprehensive source of data from EPA’s Clean Air Markets Division on the environmental characteristics of almost all electric power generated in the United States.”³⁴ However, eGRID may not accurately estimate the emissions from rail diesel as its focus

³⁴ www.epa.gov/egrid

is related to electricity generation and those associated emissions. This would work for electric rail transportation but may not as accurately calculate emissions for diesel rail transportation.

Assumptions

The following are assumptions that were made to complete the emissions inventory for the rail sector:

- Each track mile was assumed to have the same emission rate for all rail agencies.
- Fuel consumption from the Trinity Rail Express (TRE) was estimated using fuel consumption rates from Dallas Area Rapid Transit (DART) and Trinity Metro because both operate part of the TRE.
- There was no fuel consumption attributed to the Northeast Texas Rural Rail Transportation District because no trains were likely to run on the tracks located within the NCTCOG region.
- The rate of fuel consumption for Dallas, Garland & Northeastern Railroad (DGNO) was used to estimate Fort Worth & Western Railroad (FWWR) fuel consumption because no fuel data was available for FWWR and DGNO was a known representative data source.
- DART Light Rail electricity consumption is already accounted for in the electricity emissions inventory.

Rail Data GHG Emissions Results

The total CO₂e region associated with the rail sector in the region for 2019 was 378,586 metric tons. Tarrant County freight rail is shown to have contributed the highest amount of CO₂e with 68,507 metric tons followed by Dallas County freight rail with 54,697 metric tons of CO₂e. The electricity use associated to the rail sector is already accounted for in the electricity sector in the emissions inventory.

Exhibit 23: NCTCOG Area 16-County 2019 Annual Rail Sector (Passenger and Freight) CO₂e Emissions

County	MTCO ₂ e
Collin	20,383
Dallas	69,179
Denton	42,902
Ellis	38,111
Erath	2,021
Hood	1,492
Hunt	10,212
Johnson	32,728
Kaufman	5,808
Navarro	25,839
Palo Pinto	6,916
Parker	6,597
Rockwall	667
Somervell	0
Tarrant	86,880
Wise	28,851
Total	378,586

Pleasure Craft

Pleasure Craft Data GHG Emissions Methodology

Pleasure craft data was provided as a regional annual estimate based on data from the Texas Parks and Wildlife (TPW) Boat Registration inventory.³⁵ The pleasure craft inventory was filtered down to the boats in the 16-county region that were built by 2019 and fuel description was processed to count all pleasure craft that may use diesel or gasoline. Pleasure craft emissions were estimated by establishing hours of pleasure craft operation and applying the number of boats in each speciated category against a conservative estimate for annual hours of boating per pleasure craft, then applying the hours against the corresponding emission factors from EPA's MOVES 3 model.

The EPA's MOVES 3 emission factors were for the scenario year of 2019 and for 16 counties (Collin, Dallas, Denton, Ellis, Erath, Hood, Hunt, Johnson, Kaufman, Navarro, Palo Pinto, Parker, Rockwall, Somervell, Tarrant, and Wise).

Limitations

Limitations for this section of the emissions inventory include having to rely on TPW boat registration data accuracy. Fuel description was a vital column for being able to fully speciate pleasure craft emissions, and inconsistencies generally required manual edits for dataset manipulation. An additional limitation pertains to the location of pleasure craft usage and the number of hours operated, which were estimated using data on registered boats in Texas from the 2012 National Recreational Boating Survey³⁶ and the corresponding exposure hours. There are also limitations on emission quantification due to the usage of summer weekday averages for each class of craft for emission rates.

Assumptions

The following are assumptions that were made to complete the emissions inventory for regional pleasure craft emissions:

- Pleasure craft registered within the 16-county region that also had a year built of 2019 or earlier were included in estimates.
- All pleasure craft were assumed to operate, and to operate an equal amount within the region.
- TPW data post-processing occurred to superimpose corresponding fuel descriptions and emission factors. The following occurred:
 - Boats registered as sail propulsion that did not have an engine or fuel description were superimposed as "NONE/NA" fuel description.
 - Boats registered as sail propulsion that did not have an engine but were listed with a diesel fuel description were assumed to be inboard/sterndrive as a conservative estimate.
 - Fuel description "NONE/NA" was not included for emission estimates.
 - Fuel description as electric were not included for emission estimates to avoid potential double counting.
 - Fuel description "OTHER" that also had no engine were not included for emission estimates.
 - Pleasure craft with a blank fuel description and no engine were not included for emission estimates.

³⁵ <https://tpwd.texas.gov/>

³⁶ [2012 NRBS State-Level Data Boat Numbers Exposure Hrs tables 020615.pdf](#)

- Combined engine types of NONE/NA, OTHER, (Blanks), & POD DRIVE were assumed to use the most conservative gasoline emission factor.
- Summer weekday activity is consistent across the region and representative of activity levels.

Pleasure Craft Data GHG Emissions Results

The estimated regional pleasure craft MTCO_{2e} emissions for the analysis year 2019 are listed in Exhibit 25 below.

Exhibit 24: NCTCOG Area 16-County 2019 Annual Pleasure Craft CO_{2e} Emissions

County	MTCO _{2e}
Collin	229
Dallas	360
Denton	296
Ellis	65
Erath	12
Hood	87
Hunt	30
Johnson	67
Kaufman	52
Navarro	25
Palo Pinto	25
Parker	95
Rockwall	49
Somervell	3
Tarrant	419
Wise	41
Total	1,855

Aviation

Aviation Data GHG Emissions Methodology

To maintain consistency with the state, regional aviation data emissions were sourced from the 2019 and 2020 data used in development of the SIP through a recent airport emissions inventory (“2020 Texas Statewide Airport Emissions Inventory and 2011 through 2050 Trend Inventories”)³⁷ provided by TTI for TCEQ. The report is required every three years by the EPA to fulfill Air Emissions Reporting Requirements (AERR) for usage in the EPA’s National Emissions Inventory (NEI).

The emissions estimates were modeled using average summer weekday emissions from airport (APU and ground support equipment) and aircraft emissions through the Federal Aviation Administration’s Aviation Environmental Design Tool (AEDT). The most recent version of AEDT, AEDT 3d, was used for modeling

³⁷ <https://www.tceq.texas.gov/downloads/air-quality/research/reports/emissions-inventory>

and emission estimates and are listed in Exhibit 26 below. As noted within the study, aircraft emissions were based on calculations for taxi-in, taxi-out, climb, and landing.

Limitations

Limitations for this emissions inventory primarily come from the use of an external report. As the report is only required every three years by the AERR, there may be times that data may be unavailable or that required years may not align with desired/horizon years. Additionally, the COVID-19 pandemic may have had some impact on this study.

Assumptions

The following assumptions were made:

- All commercial, military, and turbine engines use Jet A (Jet Kerosene), are domestic passenger flights, and are between jurisdictions (scope 3).
- All piston engines use Aviation Gasoline, are domestic passenger flights, and are within jurisdictions (scope 1).
- The model assumes a maximum mixing height of 3,000 feet for emissions, so emissions at/above cruising altitude are not included in results.

Aviation Data GHG Emissions Results

Exhibit 25: NCTCOG Area 16-County 2019 Annual Aviation CO₂e Emissions

County	MTCO ₂ e
Collin	47,474
Dallas	213,161
Denton	24,020
Ellis	8,748
Erath	941
Hood	1,994
Hunt	7,529
Johnson	3,902
Kaufman	3,786
Navarro	2,349
Palo Pinto	137
Parker	5,799
Rockwall	1,656
Somervell	23
Tarrant	1,081,707
Wise	2,273
Total	1,405,499

Solid Waste

Solid Waste GHG Emissions Methodology

Greenhouse gas emissions from the Solid Waste sector were calculated using methane generation and flaring data from federal regulatory reporting for the 26 registered landfills within the inventory area for the year 2019. Methane is generated from the breakdown of organic material within landfills and may either be released directly into the atmosphere, captured for flaring, or converted into compressed natural gas (CNG). Flaring is the process of combusting landfill gas to reduce methane and other harmful compounds emitted.

Landfill methane generation is reported by landfills to the U.S. EPA under 40 CFR Part 98 Subpart HH – Municipal Solid Waste Landfills. This data was extracted for each landfill in the inventory area via the EPA’s FLIGHT tool and totaled for the entire region. Data was input into ICLEI’s ClearPath tool to convert total methane generated into metric tons of CO₂e.

Landfill gas flaring emissions data was extracted using the EPA’s FLIGHT tool. Landfills are required to report the amount of landfill gas flared, the fraction of methane in the landfill gas, and the equipment destruction efficiency. The amount of gas flared was totaled for the inventory area, and averages were calculated for the fraction of methane and equipment destruction efficiency. Data was entered into ICLEI’s ClearPath tool to convert the total amount flared into metric tons of CO₂e.

The waste characterization factor set used was from the 2019 North Central Texas Waste Characterization Study.³⁸

Limitations

Since landfill methane is a Scope 1 emission, all methane emissions from each landfill are attributed to the county in which the landfill is located. All generation and disposal data are assumed to be from within the same county for ease of attribution. Hood, Kaufman, Rockwall, and Wise counties have no landfills reporting through EPA FLIGHT or TCEQ.

Data on emissions associated with compost facilities is not included in the Solid Waste sector as these facilities are not currently reporting emissions to EPA or TCEQ. Emissions from the collection and transportation of solid waste are included in the on-road transportation sector.

Solid Waste GHG Emissions Results

As to be expected, compared to the vast emissions from the energy and transportation sectors in the area, emissions generated from solid waste are comparably small, see Exhibit 27, below.

³⁸ https://www.nctcog.org/getmedia/d9a1bc1c-40fd-4acf-8029-d17c250c5f37/Final-Waste-Characterization-Memo_For-Distribution.pdf

Exhibit 26: NCTCOG Area 16-County 2019 Annual Solid Waste CO₂e Emissions

Solid Waste Sector Emissions [MT CO ₂ e]	
Waste Generation Emissions	3,911,496
Landfill Gas Flaring Emissions	56,010
Total	3,967,505

Wastewater and Water Treatment

Wastewater and Water Treatment GHG Emissions Methodology

Greenhouse gas emissions from the Water Supply sector were calculated based on the total volume of water intake for water providers within the inventory area. Water intake data is reported by water providers to the Texas Water Development Board (TWDB) and published in TWDB’s Water Use Survey.³⁹ Total intake volume was converted to kWh of electricity usage using the ICLEI U.S. Community Protocol, Appendix F, Method WW.14: Calculation of Upstream Emissions Associated with Water Supply, Conveyance, Treatment and Delivery.⁴⁰ The data was then entered into ICLEI’s ClearPath tool to convert total electricity usage into metric tons of CO₂e.

Emissions from wastewater effluent discharge were calculated based on data available through the EPA’s Enforcement and Compliance History Online (ECHO)⁴¹. Daily nitrogen load was estimated via monthly averages reported to the EPA’s National Pollutant Discharge Elimination System (NPDES)⁴² by wastewater facilities, based on nitrogen readings taken at effluent discharge sites. Daily averages are reported by facilities in lbs/day, so they were converted to kg/day. County data was calculated and entered into ICLEI’s ClearPath tool to convert daily nitrogen load to annual metric tons CO₂e. For ease of calculation and to properly assign Scope 1 emissions at the point of source, all wastewater effluent is assumed to be generated and treated in-boundary.

Limitations

Not all wastewater treatment facilities in the region have reported their nitrogen emission in the NPDES database. Facilities that were not present were omitted in this inventory.

Data on emissions associated with the supply of potable water is included in this report as information only. All emissions associated with water supply are related to the electricity used in water conveyance, treatment, and distribution, which is captured by the Commercial and Industrial Energy sectors.

In the absence of site-specific data, the energy intensities used in the calculations of electricity usage for each stage in the water supply process come from national averages and may have varying degrees of reliability.

Data on emissions associated with anaerobic digestion of wastewater biosolids is not included as this data is not currently reported to EPA or TCEQ. Only six of the 130 wastewater treatment facilities in the

³⁹ <https://www.twdb.texas.gov/waterplanning/waterusesurvey/index.asp>

⁴⁰ <https://iclei.usa.org/us-community-protocol/>

⁴¹ <https://echo.epa.gov/>

⁴² <https://www.epa.gov/npdes>

inventory area currently have onsite anaerobic digesters. There are no emissions associated with the combustion of wastewater biosolids as no wastewater treatment facilities in the inventory area engage in biosolid combustion. Process methane and nitrous oxide emissions from wastewater treatment lagoons and nitrification/denitrification are not included as this data is not currently reported to EPA or TCEQ. Emissions from septic systems are not included as there is no regional database for on-site sewage systems, so the total number of septic systems in the inventory area is unknown.

Wastewater, and Water Treatment GHG Emissions Results

Compared to the emissions from the energy and transportation sectors in the area, emissions generated from wastewater are small. The results of the wastewater effluent discharge emission calculation are shown in Exhibit 28 below. Note that water supply emissions are displayed for information only; these emissions are included in the inventory of the energy sector.

Exhibit 27: NCTCOG Area 16-County 2019 Annual Water and Wastewater CO₂e Emissions

Water and Wastewater Sector Emissions [MT CO ₂ e]	
Water Supply Emissions*	500,669*
Wastewater Effluent Discharge Emissions	1,090
Total (Emissions from Water and Wastewater Including the Emissions part of Energy Sector)	501,759

*Water Supply Emissions data is included in this section for information only. These emissions are included within the Commercial and Industrial Energy sector emissions.

Emissions Inventories for Criteria Pollutants of Regional Concern

The EPA’s NAAQS are designed to protect human and environmental health and establish regulations for six criteria pollutants. For air quality to be considered “good” or comply with NAAQS, air pollutant concentrations need to be measured at levels below the NAAQS – levels that are higher than the NAAQS are considered to “violate” or “exceed” the standard. Exhibit 29 illustrates the current status of attainment designations (meaning the designated area meets or is in compliance with NAAQS) versus nonattainment designations (meaning the designated area violates or exceeds the NAAQS).

Exhibit 28: NAAQS Criteria Pollutants

Air Pollutant	Abbreviation	DFW Region Status
Carbon Monoxide	CO	In attainment
Lead	Pb	In attainment
Nitrogen Dioxide	NO ₂	In attainment
Particulate Matter	PM ₁₀	In attainment
Ground-Level Ozone	O ₃	10 counties (Collin, Dallas, Denton, Ellis, Johnson, Kaufman, Parker, Rockwall, Tarrant, and Wise) designated nonattainment for the 2008 standard 9 counties (Collin, Dallas, Denton, Ellis, Johnson, Kaufman, Parker, Tarrant, and Wise) designated nonattainment for the 2015 standard

Air Pollutant	Abbreviation	DFW Region Status
Particulate Matter	PM _{2.5}	2 counties (Dallas and Tarrant) likely to be designated nonattainment under NAAQS rules finalized February 7, 2024
Sulfur Dioxide	SO ₂	Partial nonattainment in Navarro County due to an aggregate plant

Ozone (O₃)

Portions of the NCTCOG area continue to exceed NAAQS for ground-level ozone. Ten counties in North Texas (Collin, Dallas, Denton, Ellis, Johnson, Kaufman, Parker, Rockwall, Tarrant and Wise) violate federal standards for having high concentration of ground-level ozone under the 2008 8-hour ozone standard of 0.075 ppm and 9 counties (excluding Rockwall) are in nonattainment for the 2015 8-hour ozone standard of 0.07 ppm. Since ozone is not emitted directly, efforts to improve air quality and reduce ozone focus on sources of ozone precursor pollutants NO_x and VOCs. There are many more VOCs in the atmosphere than NO_x. The large ratio of VOCs to NO_x means that North Central Texas is “NO_x limited,” which results in ozone formation being much more sensitive to changes in NO_x than VOCs, and the primary efforts to address ozone in the region focus on NO_x reduction.

Significance of Ground-Level Ozone

Clinical studies indicate prolonged exposure to elevated concentrations of ground level ozone may reduce lung function, increase the frequency of asthma episodes, and reduce the body’s ability to resist respiratory infections. In addition to threatening human health, high ground-level ozone concentrations pose a risk to the environment, wildlife, and agriculture. Although ground-level ozone is monitored year-round, the EPA designated ozone season for the DFW region is from March 1 through November 30 when high ozone concentrations are most common.

Economic impact of Ozone pollution

Failure to meet federal standards for air quality could result in additional emission-control requirements or fee-based penalties that can unfavorably affect local businesses and also result in a freeze on federal transportation funding. This would ultimately affect jobs in the region and cost money in lost productivity due to traffic congestion delays.

Emissions Inventory

With ground-level ozone being a secondary pollutant, emissions estimates of ozone precursors (NO_x and VOCs) are part of TCEQ’s SIP revisions available at the [Texas SIP Revisions](#).

Particulate Matter

On February 7, 2024, EPA strengthened the NAAQS for fine Particulate Matter (PM_{2.5}). Specifically, the annual PM_{2.5} standard has been lowered from 12.0 micrograms per cubic meter to 9.0 micrograms per cubic meter. The two most populous counties in the NCTCOG region – Dallas and Tarrant – could be designated as nonattainment under this revised standard⁴³ due to having a PM_{2.5} monitor in each county with an annual reading above the 9.0 micrograms per cubic meter limit.

⁴³ <https://www.epa.gov/pm-pollution/national-ambient-air-quality-standards-naags-pm>

Significance of Particulate Matter

Exposure to Particulate Matter can affect the lungs and heart. It has been associated with premature death in people with heart or lung disease, nonfatal heart attacks, irregular heartbeat, aggravated asthma, decreased lung function, and increased respiratory symptoms. Besides people with heart or lung diseases, children and older adults will most likely be affected by exposure to particle pollution.

Environmental effects consist of haze, which is often a result of particle pollution, and environmental and material damage. Since particles can be carried over long distances, the source and deposition region can vary significantly. When settling, the effects depend on the chemical composition of the particles but may make lakes and streams acidic, change the nutrient composition in coastal waters and river basins, as well as in soil which can lead to damage to forests and farm crops, contribute to acid rain, and affect the diversity of ecosystems.⁴⁴

Economic impact of Particulate Matter Pollution

The impacts on the environment and existing ecosystems also have an impact on agriculture, including the food industry, and the local price and job landscape. In addition, they can affect seemingly unrelated industries such as the condition of construction materials and tourism, leading to widespread effects on local health conditions and the economy.

Emissions Inventory

PM_{2.5} emissions estimates are available on the EPA's comprehensive and detailed estimate of air emissions of criteria pollutants, criteria precursors, and hazardous air pollutants from various air emissions sources, <https://www.epa.gov/air-emissions-inventories/national-emissions-inventory-nei>.

GHG Emissions Projections

NCTCOG has not developed GHG emissions projections as part of the DFW AQIP-PCAP. These projections will be developed as part of the CCAP to be submitted in summer 2025.

GHG Reduction Targets

NCTCOG has not developed GHG emissions reduction targets as part of the DFW AQIP- PCAP. These targets will be developed as part of the CCAP to be submitted in summer 2025.

⁴⁴ <https://www.epa.gov/pm-pollution/health-and-environmental-effects-particulate-matter-pm>

4- DFW AQIP Measures

As detailed in **Section 1: Regional Engagement**, NCTCOG collaborated with local governments, residents of North Texas, and other stakeholders to develop the following list of priority measures to reduce greenhouse gases and criteria pollutants of local concern. This list is not intended to be inclusive of all efforts to reduce GHGs and improve air quality being made in the region, but rather is a focused list of near-term, high-priority, implementation-ready measures, as required by the EPA in the PCAP Planning Guidance.⁴⁵ Additional measures will be added to the CCAP.

This section provides a narrative discussion of:

- Sector in which measures would be implemented, as defined in Exhibit 2 (including Transportation; Energy; Water/Wastewater; Materials Management (Solid Waste); and Agriculture, Forestry, and Land-Use)
- Program area (a high-level description on existing efforts in the region which are related to this measure, including efforts that are not quantifiable or cannot be done during the scope of the PCAP (2025-2030))
- PCAP measure (a description of related project(s) that cumulatively result in emissions reductions), and
- Projects (a specific, quantified effort) within each measure.

All measures will be implemented within the NCTCOG 16-county area. Except for the rail projects within the Clean Vehicle and Equipment Program measure (Replace/Improve Diesel Locomotives and Add Wayside Power for Rail Operations), specific sites are not yet determined and will be confirmed as funding for implementation is secured. The accompanying Appendices 11 through 16 provide additional detail on each measure, including:

- Applicable sector
- Estimate of the quantifiable GHG emissions reductions
- Estimate of criteria pollutant reductions (when applicable)
- Implementing agency or agencies
- Implementation schedule and milestones
- Metrics for tracking progress
- Expected community benefits (additional details on community benefits is available in **Section 5**)

All measures included in the DFW Air Quality Improvement Plan are either voluntary in nature (e.g., an incentive) or are actions that would be performed by an implementing agency with regard to its own assets (e.g., a municipality installing solar panels on its own buildings). Thus, all measures are within the authority of the implementing agency. No regulatory measures are proposed.

Transportation Sector Measures

NCTCOG and collaborating agencies have developed this list of measures to comprehensively improve air quality for all modes of transportation. Historically, the NCTCOG Transportation department has

⁴⁵ <https://www.epa.gov/system/files/documents/2023-02/EPA%20CPRG%20Planning%20Grants%20Program%20Guidance%20for%20States-Municipalities-Air%20Agencies%2003-01-2023.pdf>

administered programs, made policy recommendations, participated in partnerships, educated the region, and supported other stakeholders in their own emission-reducing activities, with the primary goal of these efforts has been to reach ozone attainment. However, many of these efforts also reduce emissions of particulate matter and GHG; thus, supporting efforts to improve air quality comprehensively. Through multipollutant emissions reductions, these measures will both improve air quality and protect public health and provide other benefits to the community as detailed in **Section 5**.

Transportation measures are organized within the following program areas: **Clean Vehicles and Transportation Energy Efficiency, Congestion Management, Sustainable Development, and Transit**.

Appendix 10: DFW AQIP- Transportation Measures, contains a full list of measures and projects, feedback received from surveys described in **Section 1: Regional Engagement**, and information on air quality and community benefits.

Program Area: Clean Vehicles and Transportation Energy Efficiency

Efforts have been ongoing in the region to reduce emissions produced from vehicles through changes in vehicle technology or emission rates at the individual vehicle level. To meet the federal ozone standard, it is necessary to address the major contributing factors to mobile emissions. These efforts have been focused in three main areas: (1) Adoption of alternative fuels and electric vehicles, (2) Adoption of strategies to reduce fuel consumption (i.e., idling, cold starts, hard accelerations, etc.), and (3) Ensuring compliance of existing vehicle engine standards and regulations. Additionally, NCTCOG has developed a Clean Fleet Policy template, which provides a framework for local fleets to reduce emission and fuel consumption (www.nctcog.org/fleetpolicy). One hundred eleven entities have adopted the Clean Fleet Policy, with 17 of the adoptees representing a Collaborating Agency, showing their broad commitment to improving air quality in the region.

Additionally, as transportation electrifies and integrates with the power grid, there is an increasing need to improve energy efficiency in transportation to help offset additional load placed on the grid by electric vehicles.

Alternative Fuel and Electric Vehicle Adoption

NCTCOG is designated by the Department of Energy as the host agency of the Dallas-Fort Worth Clean Cities Coalition (DFWCC). This Coalition works to reduce transportation energy use and improve air quality by increasing the use of alternative fuel and advanced technology (e.g., hybrids) vehicles and equipment. The Coalition provides technical support, resources, and guidance to fleets and other drivers to facilitate transition of the vehicle fleet; coordinates infrastructure planning and readiness; facilitates best practices around transportation-energy integration; and promotes increased awareness of these technologies and projects throughout the region through a website, e-newsletter, and local events. More information is available at the Coalition website: www.dfwcleancities.org.

Due to local air quality issues, this program first prioritizes use of zero-tailpipe emissions fuels (e.g., battery electric and hydrogen fuel cell electric vehicles), with a secondary focus on fuels that can reach California Air Resources Board Low-NO_x certifications (e.g., natural gas, with an emphasis on renewable natural gas, and propane), followed by other alternative fuels (biofuels). Substantial effort is directed toward transportation electrification through the Electric Vehicles North Texas initiative within DFWCC (www.dfwcleancities.org/evnt).

An Annual Report to the Department of Energy documents use of these fuels and other clean vehicle technologies throughout DFW, reflecting the work of dozens of local fleets. The National Renewable Energy Laboratory uses this data to quantify emissions benefits and petroleum displacement. This report shows that in a typical year, fleets in the region are already achieving a reduction of over 29 million gasoline gallon equivalent (GGE) of conventional fuel, 100,000 tons of GHG emissions, 50 tons of NO_x emissions, 60 tons of VOC emissions, and 3.5 tons of PM_{2.5} emissions, through use of cleaner-burning alternative fuels, idle reduction, or other fuel efficiency measures.⁴⁶ According to the Annual Report, 19 of the Collaborating Agencies have already adopted alternative fuels vehicles.

The region has shown significant interest in EVs, as shown through significant increase in EV adoption. From January 2023 to January 2024, The North Texas region saw a 56 percent increase in EV registration, going from 58,609 to 91,322.⁴⁷ An annual National Drive Electric Week event, organized by DFWCC, provides a hands-on opportunity for area residents to learn about EVs, and DFWCC works to integrate EV education and other hands-on opportunities into events throughout the year. Robust investment in EV charging station infrastructure is underway and will support continued growth in EV adoption. This includes over \$83 million in EV charging station funding already secured for the NCTCOG area through several key initiatives: approximately \$65 million in new charging sites through the Texas EV Charging Plan,⁴⁸ approximately \$15 million in new sites through a grant award to NCTCOG under the Charging and Fueling Infrastructure Program,⁴⁹ and approximately \$3.7 million through a grant award to NCTCOG to repair/replace/upgrade existing chargers that are not operational.⁵⁰

⁴⁶ https://www.dfwcleancities.org/files/ugd/df5b3b_09e671e4e35c4e4c9c2c1a96bc5b22e7.pdf

⁴⁷ <https://www.dfwcleancities.org/evsintexas>

⁴⁸ <https://www.txdot.gov/projects/projects-studies/statewide/texas-electric-vehicle-planning-03-22-22.html>

⁴⁹ https://www.fhwa.dot.gov/environment/nevi/evc_raa/ev-charger-raa-prog/

⁵⁰ https://www.fhwa.dot.gov/environment/nevi/evc_raa/ev-charger-raa-prog-grant.cfm?_gl=1*13n3eei*_ga*MTY4MDczNjc2LjE2OTYzNjU5MTU.*_ga_VW1SFWJKBB*MTcwNTU4ODU1NS4yNy4xLjE3MDU1ODg1NiUuMC4wLjA.

Measure: Clean Vehicles and Equipment Program

The adoption of “cleaner” vehicles, such as electric, propane, natural gas, and biofuels is an essential step to reduce emissions from the transportation sector. Collaborating agencies and NCTCOG have identified various fuels and vehicle types to target for transition to comprehensively address emissions from all vehicle types while acknowledging the need for technological advancements for some fuel types to meet operational needs.

<p>Estimated Annual Greenhouse Gas Benefits:</p> <p>553.31-711.23 metric tons</p> <p>Expected Community Benefits:</p> <p>Economic Development and Job Creation; Improved Health and Well-Being; Increased Resiliency/Ability to Adapt; Reduced Noise Pollution; Reduced Costs</p> <p>Estimated Annual Criteria Pollutant Reduction:</p> <p>NO_x: 25.18-26.56 metric tons</p> <p>VOCs: 0.02-0.06 metric tons</p> <p>PM_{2.5}: 1.11-1.12 metric tons</p>
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This measure consists of several key projects:

Project: Heavy-Duty Hydrogen Pilot Program

Fuel cell electric vehicles (FCEVs), powered by hydrogen, offer zero tailpipe emissions, similar to battery electric vehicles. However, FCEVs are likely to offer key benefits compared to battery electric vehicles – most notably:

- **Weight:** Batteries are heavy, so trucks and routes that are weight-constrained may find a FCEV to be a better solution to avoid loss of payload.
- **Range:** To date, batteries have a shorter range, whereas FCEVs are anticipated to be more closely comparable to ranges of diesel trucks for how far one can drive in a single day.
- **Fueling Time:** Hydrogen fueling is expected to be completed in approximately five minutes,⁵¹ which is similar to the time it takes to fuel a conventional internal combustion engine, which can help avoid changes in operational patterns that might be needed to accommodate the longer charging times for EV trucks.

These benefits are most pronounced in the medium- and heavy-duty vehicle sectors, where demanding duty cycles to serve freight needs or intense passenger transit needs may have difficulty accommodating the downtime needed to charge a battery electric vehicle. NCTCOG recently

⁵¹ https://afdc.energy.gov/fuels/hydrogen_basics.html

received an award⁵² to build hydrogen fueling stations around the Texas Triangle (the highways connecting DFW, Houston, and San Antonio), which will jump-start availability of refueling infrastructure for longer-haul freight applications. Transition of these freight vehicles to zero emissions technology is critical to improving regional air quality, as heavy-duty diesel vehicles contribute a disproportionately high fraction of ozone-forming pollution in the DFW ozone nonattainment area.

A localized pilot project completed in the next few years will provide critical lessons learned and helpful case study information to inform broader adoption of FCEV technology as the network of fueling stations is built. NCTCOG will coordinate with local fleets to identify near-term pilot project applications and seek incentive funding needed to complete a deployment, with emphasis on the medium- and heavy-duty vehicle segments.

Project: Zero- and Near-Zero Freight and Work Truck/Bus Program

Many “working” vehicle and equipment sectors (e.g., utility trucks, public works trucks, contractor pickup truck fleets, police vehicles, cargo handling cranes, etc.) cannot readily be electrified because the duty cycles of these fleets require nearly continuous operations that preclude the downtime needed to charge or are otherwise difficult to electrify. However, substantial benefits can be gained through specific strategies that are often not eligible under existing grant programs:

- Hybridization, particularly in operations that require power take-off functionality, resulting in substantial idle time.
- Electrification in vehicle sectors that are often not included in other grant programs (e.g., light-duty pickup trucks operating in fleets, which often fall under the minimum gross vehicle weight rating needed to be eligible for grant programs).
- Replacement of old, high-emitting gasoline, natural gas, or propane vehicles (most grant programs only fund replacement of old diesel, leaving old vehicles powered by other fuel types on the road despite their inefficiencies and high pollution rates).

Through this project, incentives can be provided to cover the incremental cost of purchasing hybrid, plug-in hybrid, or electric drivetrain vehicles in the “working vehicle” or sectors, and associated infrastructure, if needed. The project will provide preference for replacement projects that also scrap existing vehicles, but will not require scrappage of existing vehicles, which is a major barrier for many fleets’ participation in existing grant programs.

The scope and quantification of this program encompasses conversion of waste trucks to lower emissions vehicles, which is a project listed also in the Materials Management (Solid Waste) Sector.

Additionally, to increase the rate of transportation decarbonization, it is essential to develop infrastructure capable of supporting medium- and heavy-duty vehicles. Substantial investment is being made in EV charging infrastructure but much of that is focused on light-duty passenger vehicle EV use. Medium- and heavy-duty vehicles require different site configurations and power needs and may require different build-out strategies.

⁵² https://www.fhwa.dot.gov/environment/cfi/grant_recipients/

Project: Low-Emission Non-Road Equipment Program

Non-road vehicles/equipment, such as lawn equipment, ground support equipment, construction equipment, cargo-handling equipment, and even airplanes, can produce a significant number of emissions despite only representing a small amount of vehicles/equipment operating in Texas. This is due to different regulations for non-road and on-road vehicles/equipment and differences in operating hours. Providing incentives for non-road vehicle equipment to transition to alternative fuels (propane, compressed natural gas, etc.) or zero-emission (electric or hydrogen) can significantly reduce emissions. Through this project, NCTCOG intends to work with fleet operators around the region to secure incentives for the transition of fleet-owned non-road equipment.

Project: Public Sector Fleet Transition Program

Many public entities in DFW have begun adoption of alternative fuel and electric vehicles and have seen success. According to the Annual Report, 19 of the collaborating agencies have already adopted alternative fuels vehicles. However, as vehicle technologies advance, there are many opportunities to test new technologies and reduce emissions. Providing incentives for public entities to transition or pilot new vehicles can help further develop the market and demonstrate the feasibility of adoption to the rest of the region.

Project: Replace/Improve Diesel Locomotives

The replacement, upgrading, and improvement of older, high-emitting diesel locomotives is an opportunity for substantial emissions reductions in the NCTCOG area. Three Class I railroads (BNSF Railway, Kansas City Southern Railway, and Union Pacific Railroad) and two regional railroads (Dallas, Garland and Northeastern Railroad and the Fort Worth and Western Railroad) operate within the region, with over one million container lifts occurring each year across three intermodal facilities.⁵³ These intermodal facilities are home to “switcher” locomotives, which are often the oldest locomotives owned by a railroad, placed into switchyard service where age and reliability issues are less impactful than in cross-country line-haul service. Consequently, communities living in proximity to rail switchyards are exposed to particularly high, constant levels of particulate matter and diesel exhaust from these locomotives, which triggers negative health impacts. These switcher locomotives also consume a very high quantity of fossil fuels. NCTCOG has coordinated with several freight railroads in the past on projects to replace older locomotives with newer technologies, and staff is involved in the EPA Mobile Source Technical Review Subcommittee, which is evaluating locomotive technology options for the future. NCTCOG will work with freight rail operators to identify opportunities to introduce cleaner locomotive technology to the region, ranging from Tier 4 to zero emissions options.

Beyond freight rail activity, the NCTCOG region includes three diesel-powered passenger rail systems that operate daily service. One of these systems, the TRE, connects downtown Fort Worth and Downtown Dallas, serving commuters across the region. The route is completely contained within Dallas and Tarrant counties. TRE operations are comprised of 11 aging diesel locomotives that range from uncontrolled emissions to Tier 2 emissions standards. These locomotives need replacement to

⁵³ <https://nctcog.org/getmedia/a3642652-f78b-4bbc-b33f-85fd13e599c3/Freight-North-Texas-2022-A-FREIGHT-Mobility-Plan.pdf>

improve efficiency, reduce operating and maintenance costs, and reduce emissions. Through the PCAP, NCTCOG will work with DART and Trinity Metro, who co-own and operate the TRE, to secure funding for full fleet replacement to a minimum of Tier 4 emissions standard that will substantially reduce all air pollutants.

Project: Add Wayside Power for Rail Operations

Each of the TRE locomotives has an auxiliary engine dedicated to generating Head-End Power for lighting, climate control, and communications in passenger cars and coaches. These engines run continuously, even during layover periods when the commuter rail is not in service. This consumes a large amount of diesel fuel and generates substantial air pollution, particularly for the communities living in close proximity to the layover facility. Through this project, electrical cabinets will be installed to allow these engines to “plug in” to the electric grid to provide Head-End Power rather than running the auxiliary diesel engines, thus reducing fuel consumption, GHG emissions, criteria pollutant emissions, exposure to diesel exhaust, less engine wear and tear, and reduced noise pollution.

Other Available Funding:

A variety of funding initiatives are available from federal and state sources to replace or purchase alternative fuel and electric vehicles. NCTCOG has identified over 30 different funding opportunities for vehicle and equipment technology improvements (e.g., vehicle replacement funding, purchase of alternative fuels, etc.) and maintains a comprehensive list at www.nctcog.org/trans/quality/air/funding-and-resources/fundingvehicle. This list includes programs from TCEQ’s Texas Emissions Reduction Plan, the EPA’s Diesel Emission Reduction Act, and more. However, many of these funding opportunities have constraints, resulting in funding “gaps” where technologies are not available, or there is not an adequate amount of funding to support the need of the DFW region. The projects outlined above are focused on filling the “gaps” and ensuring the region has adequate funding available to successfully transition to these new technologies.

Measure: Low Carbon Liquid Fuels Program

Low carbon liquid fuels include ethanol, biodiesel, renewable diesel, sustainable aviation fuel, and/or renewable gasoline. These fuels are considered “drop-in” fuels, meaning they do not require the purchase of a new vehicle or conversion of an old vehicle to utilize the fuel. Typically, the GHG reductions from the utilization of these fuels are received “up-stream,” meaning the GHG reduction is received during the creation of the fuel, not at the “tailpipe,” or when the fuel is used. However, these fuels are an essential “transitional step” to reach full decarbonization of the transportation sector as not all use cases are applicable to electrification within the PCAP timeframe.

Estimated Annual Greenhouse Gas Benefits:

92.4-1113.7 metric tons

Expected Community Benefits:

Economic Development and Job Creation; Increased Resiliency/Ability to Adapt; Reduced Costs; Increased Access to Service and Amenities; Improved Health and Well Being

Estimated Annual Criteria Pollutant Reduction:

NO_x: N/A

VOC: 0.01-0.04 metric tons

PM_{2.5}: 0.0-0.003 metric tons

This measure consists of several key projects:

Project: Build Infrastructure to Enable Use of Low-Carbon Liquid Fuels

Currently, there are 62 ethanol stations, three biodiesel stations, zero renewable diesel, and zero renewable gasoline stations in North Texas.⁵⁴ Building additional stations will ensure stakeholders in the region have the opportunity to pick the best fuel for both the environment and their operational needs.

Project: Provide Incentives for Utilizing Biofuels in Locomotives/Non-Road Equipment

While biofuels can typically be used without any vehicle conversion, the fuels themselves can sometimes be more expensive, as shown in the Department of Energy’s Alternative Fuel Price Report.⁵⁵ Paying the difference between a conventional fuel (diesel and gasoline) and a biofuel can help remove barriers to utilization and improve air quality.

⁵⁴ <https://afdc.energy.gov/states/tx>

⁵⁵ <https://afdc.energy.gov/fuels/prices.html>

Other Available Funding:

Funding for low-carbon liquid fuel station development through the U.S. Department of Agriculture’s Higher Blends Infrastructure Incentive Program: Rural Development Program.⁵⁶ This program offers \$90 million each quarter. Additionally, the IRS provides funding for the production of alternative fuels and biodiesel producers (40A, 6426, 6427) and funding for the investment in refueling property through the Alternative Fuel Refueling Property Credit (30C).

At this time, NCTCOG is unaware of funding to offset the for the utilization of biofuels in locomotives/non-road equipment in Texas.

Adoption of Strategies to Reduce Fuel Consumption

As discussed above, NCTCOG coordinates regional efforts to optimize the operations of conventional fuel vehicles (i.e., diesel and gasoline) and improve air quality. These efforts include the following:

- **Engine Off North Texas**

Engine Off North Texas addresses vehicle idling through a comprehensive anti-idling campaign that includes promotion of idling restrictions for heavy-duty vehicles, educational and awareness materials available for distribution regionally, and partnerships with local governments and businesses to develop and improve idle reduction policies. More information is available at www.engineoffnorthtexas.org.

- **Saving Money and Reducing Truck Emissions (SMARTE)**

SMARTE builds relationships with truck drivers, fleet managers, and vendors to educate and engage the freight industry regarding strategies and opportunities to reduce diesel fuel consumption and improve air quality, promote the use of EPA SmartWay verified technologies, highlight applicable initiatives like DFWCC, Clean Fleet Policy, and EPA SmartWay Transport Partnership Program, and passing along funding opportunity information. More information is available at www.nctcog.org/SMARTE.

No measures are included under this focus area for the PCAP. Measures may be considered for inclusion in the CCAP.

Compliance of Existing Vehicle Engine Standards and Regulations

As discussed above, NCTCOG coordinates regional efforts to ensure vehicles meet federal and state designated emission standards and regulations. These efforts include the following:

- **Regional Emissions Enforcement Program**

The Regional Emissions Enforcement Program (REEP) is an initiative to help identify and remove high-emitting vehicles with expired, fraudulent, and improper state emissions inspections and temporary paper tags from Texas roadways. Participating law enforcement officers can enter citations issued for fraudulent registration certificates, as well as violations of the smoking vehicle policy, truck lane restrictions, and anti-idling ordinances into a centralized database, thus providing officers access to tickets written across multiple jurisdictions. More information is available at www.nctcog.org/REEP.

- **Regional Smoking Vehicle Program**

The Regional Smoking Vehicle Program (RSVP) encourages drivers to voluntarily repair and maintain their vehicles through public awareness. Smoking vehicles can be reported anonymously. The owners will be mailed information regarding possible causes and solutions to vehicle emissions

⁵⁶ <https://www.rd.usda.gov/programs-services/energy-programs/higher-blends-infrastructure-incentive-program>

problems. The outreach includes information on financial assistance that may be available for vehicle replacement. More information is available at www.smokingvehicle.net.

- **Car Care Awareness**

NCTCOG partners with nonprofit and community organizations, and auto repair facilities at clinics, workshops, and events to educate North Texans about proper vehicle maintenance and what to do when the check engine light illuminates. NCTCOG staff will also provide information and resources related to keeping vehicles compliant through the state’s vehicle inspection program and reducing emissions in the DFW region. More information is available at www.ntxcare.org.

Measure: Regional Emissions Compliance Program

The Regional Emissions Compliance Program is designed to ensure vehicles operating on the roads are doing so within the guidelines of the law. In recent years, there has been an increase of fraudulent behavior concerning vehicle registrations, inspections, and emissions component tampering. Other areas of compliance include citations for excessive tailpipe smoking and vehicle idling restriction ordinance violations.

<p>Estimated Annual Greenhouse Gas Benefits:</p> <p>Not quantifiable as existing rates of violation are unknown. However, enforcement of idling restrictions, in particular, reduces fuel consumption and GHGs.</p> <p>Expected Community Benefits:</p> <p>Improved Health and Well-Being; Increased Engagement/Awareness, Increased Safety; Reduced Noise Pollution</p> <p>Estimated Criteria Pollutant Reduction:</p> <p>Not quantifiable as existing rates of violation are unknown. However, enforcement of existing emissions standards and idling restrictions does achieve multipollutant reductions.</p>

Project: Fund Emissions Compliance Activities and Operations

Funding to cover law enforcement personnel hours as part of a dedicated emissions compliance task force to investigate and monitor methane emissions from industrial, energy and transportation sectors, as well as combat fraudulent vehicle emissions inspections, registrations, and vehicle engine tampering; ensure compliance and cite violations associated to visibly smoking vehicle tailpipes, heavy-duty truck highway lane restrictions, and vehicle idling restriction ordinances.

Other Available Funding:

Approximately \$176 million was collected in air quality fees associated with vehicle inspections. These funds were collected for a dedicated purpose, to improve air quality. These funds continue to be held by the State of Texas in a special account, and legislative efforts continue to have those funds reappropriated to those counties that paid into it.

This funding would allow for law enforcement efforts such as combating fraudulent vehicle inspections and registrations, vehicle emissions component tampering, ensuring compliance by citation of violations associated to visibly smoking vehicle tailpipes, local idling ordinances and heavy-duty truck highway lane restrictions.

Energy Efficiency in Transportation

Transportation infrastructure consumes a substantial amount of energy, not only in the fuel used in vehicles but also in the power systems required to operate lighting, traffic management facilities and camera systems, transportation facilities (e.g., passenger shelters, bus stations, train stations, and airports), and in the case of electrified transportation, the systems themselves (e.g., DART Light Rail systems). Thus, there are opportunities to reduce emissions through the adoption of more energy efficient measures and the purchase of renewable energy.

Measure: LED Streetlighting Program

Many streetlights are still powered by older, inefficient, high-pressure sodium (HPS) technology, which could be replaced with light-emitting diodes (LEDs) that would consume far less electricity. This older lighting also often requires more frequent maintenance, provides less lighting, and causes glare and light pollution. As the region faces pressing needs to offset increased energy consumption associated with growth, retrofitting older technologies with high efficiency fixtures is a readily available strategy to mitigate increased grid load and minimize emissions.

Estimated Annual Greenhouse Gas Benefits:

0.0002 metric tons per light

Expected Community Benefits:

Economic Development and Job Creation; Increased Resiliency/Ability to Adapt; Reduced Costs; Increased Access to Service and Amenities; Improved Health and Well-Being

Estimated Annual Criteria Pollutant Reduction:

NO_x: 0.0002 metric tons per light

VOCs: N/A

PM_{2.5}: N/A

Project: Retrofit Streetlights with LEDs

Streetlighting owned by local governments is a prime candidate for retrofits as it is within the jurisdiction of the local government and can reduce emissions from the energy sector by reducing electricity demand. Notably, the electrical load associated with nighttime street illumination “turns on” as the sun starts to set in the evening, which is now the time of day that the Texas electrical grid faces the most capacity constraint due to declining solar output. Efforts to shave the grid load associated with streetlighting is thus complementary to the latest daily capacity and demand curves.

NCTCOG will coordinate with local governments that own streetlights to provide an LED streetlight retrofit program for lighting owned and operated by local governments. NCTCOG will also facilitate peer exchange opportunities between local governments and Oncor Electric Delivery, which owns and operates much of the streetlighting in the NCTCOG region, to increase awareness among local governments about options available to transition lighting owned by Oncor to LED technology.

Other Available Funding:

A variety of energy efficiency related funding initiatives are available from federal and state sources, including Energy Efficiency and Conservation Block Grants (EECBG) and Texas State Energy Conservation Office LoanSTAR funding, but the demand for energy efficiency projects far exceeds available funding. In addition, streetlighting, which is not connected to a specific building facility, sometimes falls outside the scope of programs that focus on facility efficiencies.

Green Airport Planning

The 16-county region of North Central Texas is home to a variety of public and private aviation facilities. Of the more than 600 aviation facilities, 41 are public-use airports, with 30 included in the Federal Aviation Administration’s National Plan of Integrated Airport Systems. NCTCOG has created and nurtured relationships with the general aviation airports in the Dallas-Fort Worth region through the Air Transportation Advisory Committee (ATAC), which provides a pathway for information, guidance, and best practices. With the numerous amounts of facilities in the region, efforts are being made to increase the airport’s sustainability practices. Notably, the two large commercial airports in the region have already developed plans to reduce emissions: Dallas-Fort Worth International Airport, which was the first airport in North America to receive Carbon-Neutral Airport Accreditation and has a sustainability management plan,⁵⁷ and Dallas Love Field Airport, which has received Level 3-Optimisation status under the Airport Carbon Accreditation Program and has a carbon management plan.⁵⁸

Measure: Green Airport Planning Program

Airports are known producers of emissions. Green airport planning initiatives can mitigate various emissions and pollutants. Airports that pursue Carbon-Neutral Airport Accreditation, integrate environmental sustainability into airport contracts, and implement industry best practices will reduce emissions. Green airport planning is essential for promoting sustainable development, protecting the environment, and improving the quality of life of communities in the region.

⁵⁷ <https://www.dfairport.com/business/community/sustainability/>

⁵⁸ <https://www.dallas-lovefield.com/Home/Components/News/News/263/>

Estimated Annual Greenhouse Gas Benefits:

39-57,500 metric tons

Expected Community Benefits:

Economic Development, Job Creation, Increased Safety, Increased Resiliency, and the Ability to Adapt

Estimated Annual Criteria Pollutant Reduction:

Not Currently Quantifiable

Project: Increase Education/Best Practices for Green Airports

Through the ATAC, NCTCOG will coordinate with North Texas airports on implementing green planning initiatives and best practices. NCTCOG staff will also provide information and resources relating to other green initiatives and sustainability efforts at airports to help reduce emissions in the Dallas-Fort Worth region.

Other Available Funding:

A significant source of funding for airports to implement measures to improve air quality is the Airport Improvement Program (AIP) Supplemental Grant Program. Provided through the Federal Aviation Administration (FAA), this program funds a network of 3,300 eligible airports. The purpose of the supplemental discretionary grant program is to make grants to eligible airports for construction projects, associated airport capital planning, noise planning and noise mitigation projects, and energy and environmental sustainability projects. At least \$25,000,000 will be made available for the Voluntary Airport Low Emissions Program (VALE) and the Zero-Emission Vehicle and Infrastructure Program (ZEV), according to the Joint Explanatory Statement (JES). The JES also directs the FAA to ensure that funds are made available to reduce the impact of noise on local communities, including funding grants for noise planning and noise mitigation.

Program Area: Transit

NCTCOG collaborates with regional transportation providers on public transportation planning, funding, and operations to identify opportunities to enhance services and improve the efficiency and effectiveness of the current transit system in the region for all transit users. Transit modes may include rail, fixed route, paratransit, and demand response service. Improving regional transit systems through enhancements to existing service or establishment of new service will incentivize new passengers to shift modes to use transit, decreasing emissions and congestion. Key strategies that NCTCOG is prioritizing include service expansion projects, system planning studies, and operational improvements.

NCTCOG currently works with several regional transportation providers, including the Dallas Area Rapid Transit System, Trinity Metro (dba Fort Worth Transportation Authority), Denton County Transportation Authority, Span Inc., STAR Transit, Public Transit Services, City County Transportation, and Community Transit Service, along with many other local city governments and other transit-related organizations. At NCTCOG, the Transit Management and Planning area's current projects include vanpool coordination, transit planning studies, regional planning coordination, and coordinating funding for transit

implementation and operation. For more information go to www.nctcog.org/trans/plan/transit-management-and-planning.

Measure: Transit Enhancement Program

Public transportation provides people in North Central Texas with access to essential opportunities, reduces the number of cars on the roads, relieves congestion for those who drive, and improves air quality. From passenger amenities and alternative transportation modes to raising awareness of available transit, transit enhancements will help optimize existing transit assets and increase ridership.

Estimated Annual Greenhouse Gas Benefits:

3,193.13-6,571.30 metric tons

Expected Community Benefits:

Economic Development and Job Creation; Improved Health and Well-Being, Increased Access to Service and Amenities, Increased Resiliency/Ability to Adapt; Increased Awareness/Engagement; Reduced Costs

Estimated Annual Criteria Pollutant Reduction:

NO_x: 1.41-2.90 metric tons

VOCs: 0.77-1.58 metric tons

PM_{2.5}: 0.01-0.02 metric tons

This measure consists of several key projects:

Project: Enhance Existing Transit Service

Improving and enhancing existing transit service will assist in increasing ridership and removing barriers to transit use by upgrading select passenger amenities (e.g., passenger shelters, ADA improvements) and expanding service (e.g., higher frequencies or additional routes). Improvements in underserved areas and on services that improve transit access to medical appointments, education, work opportunities, or job training will be prioritized.

Project: Expand Vanpool Program

Vanpool is a shared commuter transportation service that offers an alternative transportation option for people to commute to work. With anticipated growth in the North Central Texas Regional Vanpool Program, the integration of electric vehicles into the program would provide an opportunity to explore effectiveness and reduce emissions.

Project: Subsidize Transit Passes

Funding provided to local governments and transit agencies can be used to subsidize transit passes, potentially during periods of the year with historically high emissions or poor air quality. These passes could be provided to individuals or businesses and be tied into larger educational outreach efforts to encourage transit use in the region.

Project: Develop Mobility Hubs & Transit-Oriented Developments

The region has 83 light and commuter rail stations, six streetcar stops, and over 4,500 bus stops. Coordinated land use in transit-oriented development around these transit facilities encourages transit trips and reduces automobile emissions. Each transit location offers the chance to leverage micro-mobility and active transportation supportive amenities as a mobility hub.

Other Available Funding:

Funding for transit services and infrastructure is typically available to NCTCOG through the following federal sources:

- Federal Transit Administration (FTA) Section 5307 Urbanized Area Formula Grant Program
- Federal Transit Administration Section 5310 Enhanced Mobility for Seniors and Individuals with Disabilities Grant Program
- Surface Transportation Block Grant (STBG)
- Congestion Mitigation and Air Quality (CMAQ)

Availability of operating funds are limited through these funding programs for larger transit systems. The additional funding (CMAQ and STBG) only supports initial service costs and would likely not encompass the transit enhancements the aforementioned projects would include.

Funding for transit passes is not typically available from federal funding sources. However, NCTCOG may be able to support this project through the following local sources:

- Regional Toll Revenue (RTR) Funds
- Regional Transportation Council Local Funds

Measure: Transit Planning Program

Future transit service options and system improvements are developed through a combination of technical analysis and feedback gathered through outreach efforts. These planning efforts and their associated recommendations are essential to making sure that service and system enhancements do not interfere with one another and are in line with regional and interagency goals. This results in a more efficient and connected transportation network, which will potentially reduce congestion and emissions, encourage local stakeholders to continue investing in transit, and bring in new transit users.

Project: Develop Regional Transit Plan

NCTCOG develops regional transportation plans to improve mobility across the North Central Texas region. These plans would identify service gaps, offer recommendations to enhance existing transit systems, and expand transportation options and funding. This project includes regional planning efforts such as Mobility 2050, anticipated completion date in 2025, and North Central Texas Regional Transit 2.0: Planning for Year 2050, anticipated completion date in 2025, and can be used to support initiatives to address air quality concerns in North Central Texas.

Estimated Annual Greenhouse Gas Benefits:

Not Quantifiable; but planning is a foundational step to enabling implementation of transit measures that do achieve emissions benefits.

Expected Community Benefits:

Economic Development and Job Creation; Improved Health and Well-Being, Increased Access to Service and Amenities, Increased Resiliency/Ability to Adapt; Increased Awareness/Engagement; Reduced Costs

Estimated Annual Criteria Pollutant Reduction:

NO_x: N/A

VOCs: N/A

PM_{2.5}: N/A

Other Available Funding:

Funding for transit planning is typically available to NCTCOG through the following federal sources:

- FTA Section 5307 Urbanized Area Formula Grant Program
- FTA Section 5310 Enhanced Mobility for Seniors and Individuals with Disabilities Grant Program
- Surface Transportation Block Grant
- Congestion Mitigation and Air Quality

Funding for regional transit planning assistance specifically is typically available to NCTCOG through the following federal sources:

- Transportation Planning Funds (TPF)/FTA Section 5303 Metropolitan Transportation Planning Program

NCTCOG may also be able to support this project through the following local sources:

- Regional Transportation Council Local Funds

Program Area: Sustainable Development

NCTCOG has continually supported sustainable development in the region for over two decades through the Sustainable Development Program in the Transportation Department and Environment & Development Department. The Transportation Department Sustainable Development Program works with local governments to plan and fund active transportation (bicycle and pedestrian) trips and transit-oriented development. More information is available at <https://nctcog.org/trans/plan/land-use>. These programs help reduce growth in vehicle miles traveled by shifting trips away from traditional vehicle modes, leading to reduced transportation-related emissions.

Measure: Active Transportation Program

The Active Transportation Program includes creating and/or enhancing pedestrian and bicycle facilities, including sidewalks, off-street shared-use paths, and on-street bikeways throughout the region, including around the transit network, to link individuals to other modes of transportation as an alternative to driving a vehicle. These active transportation facilities promote a shift to non-motorized travel in lieu of motor vehicle trips with associated automobile emissions.

<p>Estimated Annual Greenhouse Gas Benefits:</p> <p>12,527.66 metric tons</p> <p>Expected Community Benefits:</p> <p>Economic Development and Job Creation; Improved Health and Well-Being, Increased Access to Service and Amenities, Increased Resiliency/Ability to Adapt, Increased Safety; Increased Awareness/Engagement</p> <p>Estimated Annual Criteria Pollutant Reduction:</p> <p>NO_x: 4.33 metric tons</p> <p>VOCs: 2.85 metric tons</p> <p>PM_{2.5}: 0.07 metric tons</p>
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Project: Improve/Expand Bicycle and Pedestrian Facilities

North Texas has over 8,618 miles of existing and planned on-street bikeways and shared-use paths for pedestrians and bicyclists which are intended to be used as a means of transportation. North Texas residents highly prefer these dedicated on-street and off-street bikeways separated from vehicle traffic. In addition, studies have also shown thousands of miles of sidewalks are missing along streets throughout the region. Extending these facilities to transit stops and major destinations, including schools and major commercial and employment centers, will encourage more active transportation trips and reduce vehicle emissions.

Dedicated on-street bike lanes and protected bikeways separated from vehicular traffic are critical infrastructure elements to connect cyclists with destinations in lieu of driving. Restriping streets, installing buffer separations from traffic, and deploying other safe designs for on-street bikeways will complement and extend the reach of the regional off-street trail network, and help shift trips to non-motorized travel resulting in reduced motor vehicle trips and their associated emissions.

Other Available Funding:

Funding for active transportation infrastructure is typically available to NCTCOG and the region through the following Federal sources:

- Surface Transportation Block Grants
- Congestion Mitigation and Air Quality

- Transportation Alternatives Set-Aside Program

Measure: Green Purchasing/Green Construction Program

For sustainable development to meet its greatest potential, efforts to balance environmental stewardship with economic development and social well-being should extend into how the consumption, processing, and management of specific natural resources and construction materials can affect greenhouse gas emissions and/or resiliency to climate change. Creation of a Green Purchasing/Green Construction Program can establish a market preference for the affirmative selection and acquisition of products and/or services most effective in minimizing negative environmental impacts over their lifecycle of extraction, manufacturing, transportation, utilization, recycling, and/or disposal. Consistent with the Biden Administration’s recent launch of the federal Buy Clean Initiative, examples of such environmentally preferable characteristics include products and services involving the conservation of energy and/or water, optimized use of renewable energy resources, reduced or minimal generation of waste and releases of harmful pollutants, integration of reusable and/or recycled materials, and/or alternatives to the use of toxic chemicals and biohazardous agents.

<p>Estimated Annual Greenhouse Gas Benefits:</p> <p>8.04 metric tons per 5000 ft length</p> <p>Expected Community Benefits:</p> <p>Economic Development and Job Creation; Increased Resiliency/Ability to Adapt; Improved Health and Well-Being</p> <p>Estimated Annual Criteria Pollutant Reduction:</p> <p>NO_x: 0.09 metric tons per 5000 ft length</p> <p>VOCs: Not Currently Quantifiable</p> <p>PM_{2.5}: Not Currently Quantifiable</p>
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Project: Green Purchasing/Green Construction Program

Through this project, the region would increase the use of low-embodied carbon, recycled content, and/or high-efficiency materials (e.g., materials that extend the life of projects and reduce the frequency of necessary construction/maintenance), and employ reduced-emission construction methods (e.g., low-emission equipment), materials (e.g., low-emission or high-albedo coatings/surfaces), or management practices (e.g., tools/field work improving oversight and efficiency). It would also encourage opportunities to lower “embodied” GHG emissions within operations and maintenance (O&M) activities and the promotion of more sustainable “end-of-lifecycle” actions such as reuse, salvage/deconstruction, and disassembly. Finally, while the program would ensure these innovative products/services satisfy long-term performance and durability requirements, they would additionally aid in increasing permeability of the built environment to enhance stormwater management, reduce stormwater runoff, and decrease flooding risks.

This project can be implemented regionally through the North Texas Share (TXShare) Cooperative Purchasing Program, administered by NCTCOG. This cooperative engages local governments in identifying and streamlining common purchasing needs, which NCTCOG then competitively procures in a manner that is compliant with Uniform Guidance (2 CFR 200) and Texas Local Government code procurement policies and procedures so that local governments can readily use TXShare contracts without having to conduct their own competitive procurements. This makes products and services available through TXShare attractive for local government purchase. New contracts for no-/low-carbon products and processes can be added, and consideration of the social costs of GHGs could be incorporated into new selections of existing products or processes.

Other Available Funding:

Like other sustainable development program measures, funding is generally accessible to NCTCOG through the following Federal sources:

- Surface Transportation Block Grants
- Congestion Mitigation and Air Quality
- Transportation Alternatives Set-Aside Program

In addition, at the state level, the Green Project Reserve from the Texas Water Development Board Clean Water State Revolving Fund may be an option.

Measure: Urban Heat Island and Green Spaces Program

A new generation of infrastructure projects that harness or integrate the power of nature can help achieve development goals and improve air quality. Incorporating nature-based solutions into mainstream infrastructure systems can result in lower lifecycle costs and increased resilience. This project seeks to break the silos between water infrastructure, the environment, and transportation infrastructure to help create and fund innovative spaces that integrate these components throughout the composition of urban development patterns to effectively tackle challenges of energy consumption, elevated GHG emissions, and compromises to the health, comfort, and quality of the human and natural environment. Because urban areas are highly concentrated with structures like buildings, roads, and other infrastructure that absorb and re-emit the sun’s heat more than natural landscapes, if vegetation is limited, they can become “islands” of higher temperatures relative to outlying areas. Compounded with the effects of climate change, increased human health and energy grid instability risks due to prolonged extreme heat exposure can result.

This measure will mitigate this increased heat and reduce GHG through implementation of green spaces and vegetation associated with transportation infrastructure, which can lower urban heat island effects or ambient temperatures in transportation rights-of-way and near major transportation facilities. Simultaneously, such measures can help communities become more resilient to severe weather events and serve to reconnect communities in situations where green spaces or parks are added above or below transportation corridors that previously divided neighborhoods. The Klyde Warren deck park in downtown Dallas is an example of this type of project.

Estimated Annual Greenhouse Gas Benefits:*

1,183.97 metric tons

Expected Community Benefits:

Economic Development and Job Creation; Increased Resiliency/Ability to Adapt; Improved Health and Well-Being

Estimated Annual Criteria Pollutant Reduction:*

NO_x: 0.47 metric tons

VOCs: 0.05 metric tons

PM_{2.5}: 0.05 metric tons

*Not all benefits currently quantifiable

This measure consists of several key projects:

Project: Expand Use of Landscaping, Vegetation, and Tree Cover

A comprehensive heat response plan generally involves an expanded use of landscaping and vegetation as cooling strategies to mitigate extreme heat island effects. This program would integrate the planting of trees and other vegetation cover within transportation projects and in transportation rights-of-way by providing shade and cooling through increased evaporation/transpiration. The increased greenery would provide the added benefits of reduced stormwater runoff and erosion protection to alleviate increased performance degradation. The program would also encourage the use of cool paving materials on streets, sidewalks, parking lots, and other assets that remain cooler than conventional pavements by reflecting more solar energy and/or enhancing evaporation and permeability. These actions would help not only in cooling both the paved surfaces and surrounding air masses, but they can also improve nighttime visibility and provide an extra increment of stormwater runoff reduction.

Project: Develop Parks/Plazas/Open Spaces

New parks and plazas are programmed gathering spaces that offer increased capacity for trees and vegetation and support active transportation. Regional examples include Klyde Warren Park and the planned Harold Simmons Trinity Park in Dallas. Additionally, new green spaces could arise through the growth of vegetative layers on the rooftops of buildings such as “rooftop gardens” or “eco-roofs.” These increased green/open spaces provide greater surface/volume areas for shade and removing heat from the air through evaporation/transpiration.

Project: Preserve Existing Green Spaces

The preservation of existing agricultural, open, forested, and/or wetland spaces should be encouraged via a comprehensive range of development and conservation strategies that help protect and bolster the natural environment, while simultaneously making the surrounding communities more attractive, livable, adaptable, and economically/ environmentally stronger. The Preserve

Existing Green Space Measure supports the Expansion of Green Space Measure in the Agriculture, Forestry, and Land-Use Sector.

Other Available Funding:

Traditional transportation funds are not typically eligible for items in the urban heat island and green spaces section. For example, Surface Transportation Block Grants can be used in the structural elements of projects such as deck parks but cannot extend to the landscaping of the parks on top. Typically, local funds must be used for green space, parks, and trees.

Program Area: Congestion Management

Efforts in the region to reduce emissions from vehicles via the Congestion Management Program involves optimizing transportation systems to enhance traffic flow and minimize congestion-related delays. Key strategies encompass the development of comprehensive congestion management plans, deployment of advanced traffic signal control systems and signal retiming, implementation of intelligent transportation systems (ITS) technologies, promotion of ridesharing and carpooling initiatives, and adoption of innovative traffic management solutions. These efforts are complemented by ongoing collaboration with local jurisdictions, transportation agencies, and stakeholders to identify and address congestion challenges effectively. For more information go to <https://www.nctcog.org/trans/manage/congestion-management-process>.

Measure: Enhanced Regional Traffic Signal Timing Program

GHG and criteria pollutants can be reduced by optimizing traffic flow and reducing congestion. This is due to vehicles idling producing additional emissions than vehicles driving normally.⁵⁹ By implementing advanced technology and data-driven strategies to synchronize traffic signals, this measure seeks to minimize vehicle idling and improve overall traffic efficiency. By reducing delays and streamlining traffic movements, the program aims to decrease fuel consumption and emissions associated with stop-and-go

<p>Estimated Annual Greenhouse Gas Benefits:</p> <p>602.39 - 801.64 metric tons</p> <p>Expected Community Benefits:</p> <p>Increased Access to Service and Amenities; Economic Development and Job Creation, Increased Safety, Reduced Costs; Increased Resiliency/Ability to Adapt; Improved Health and Well-Being; Reduced Costs</p> <p>Estimated Annual Criteria Pollutant Reduction:</p> <p>NO_x: 0.28-0.36 metric tons</p> <p>VOCs: 0.16-0.20 metric tons</p> <p>PM_{2.5}: < 0.01 metric tons</p>

⁵⁹ <https://www.energy.gov/sites/default/files/2021-12/ES-ConsumerGuide-Vehicle-Idling-508.pdf>

traffic patterns. This proactive approach to traffic management contributes to a reduction in GHG, promoting a more sustainable and environmentally friendly transportation system.

This measure consists of several key projects:

Project: Upgrade Traffic Signal Equipment

NCTCOG has recently developed a Phase 1 Signal Needs Assessment, which surveyed 6,800 traffic signals across the region to develop an inventory of traffic signals that do not meet the regional minimum traffic equipment standard. Upgrading these signals will enhance travel efficiency by enabling the traffic signals to perform more optimally over time, including retaining proper signal timing.

Project: Improve Signal Timing in the Region

Arterial congestion contributes significantly to the total congestion in the region, especially due to inefficient traffic patterns and unnecessary idling. The region has a continuous program called the Regional Traffic Signal Program (RTSP), which retimes traffic signals in the region to improve traffic flow and reduce vehicular emissions. Proper signal timing ensures a more consistent speed and reduces delays. Consequently, this reduces vehicular emissions by minimizing frequent starts and stops, unnecessary idling, and minimizing slow vehicle speeds where tailpipe emission rates of all pollutants are at their highest. Typically, these traffic signal retiming activities take 9 to 12 months, and the signals can be retimed every four years.

In November 2023, NCTCOG was awarded a contract to implement a Regional Traffic Signal Performance Measures Platform for Signalized Intersections in the 10-County DFW nonattainment area, which will enable NCTCOG and regional agencies to monitor traffic signal performance, enabling prioritization of traffic signal improvement and investment to optimize the performance of the entire traffic signal system across the region. Timing recommendations can be mapped against the Phase 1 Signal Needs Assessment to ensure that equipment upgrades necessary to retain proper timing are completed prior to retiming investments, where equipment is substandard, to best leverage available resources. Initial retiming recommendations are expected to be available across the entire region by mid-2024, enabling the roll-out of timing improvements in a strategic manner at the outset of the PCAP timeframe.

Project: Bus Signal Prioritization

The efficiency of public transportation can be improved by implementing signal prioritization for buses. This initiative seeks to enhance the reliability and timeliness of bus services by giving buses priority at traffic signals, allowing them to move more swiftly through intersections. For example, communication between a traffic signal software and a sensor or software on a bus will prompt the traffic light to stay green, or turn green, to allow the bus to move through the corridor seamlessly without stopping at a red light. Through the project, NCTCOG communities can expect to see improvements in public transit reliability and reduced travel times for bus passengers, which may prompt increased ridership by making transit service more reliable. This will contribute to a more

efficient and environmentally friendly urban transportation network, while also providing improved service to transit users.

Other Available Funding:

Current funding for the Regional Traffic Signal Program is sourced from CMAQ funds allocated by the RTC in the Transportation Improvement Program (TIP). Funding to upgrade traffic signal equipment has just started to be allocated through STBG funds. However, the available funding cannot fund all upgrades needed, and additional funding is needed to complete the upgrading and optimization of the system.

Measure: Transportation System and Truck/Rail Optimization Program

Transportation systems are most vulnerable to safety, congestion, and connectivity deficiencies when links in the freight supply chain are not functioning optimally, and this can contribute greatly to unwarranted pollutant emissions. Safely and efficiently linking critical commodity flows to/from businesses and households within the region, across the country, and around the world requires blending of technological innovation and meaningful traditional transportation infrastructure investments. For connected and automated vehicles (CAVs), the potential effects of congested and poor condition facilities can become more acute as unpredictable driver behaviors, natural or human-caused incidents, defective signage/signals/markings, and various changes to the built environment can increase complexity of the operational design domain and introduce risks to reliable fleet operations. A combined digital/physical infrastructure solution can enhance safety, while also creating an enabling ecosystem for at-scale CAV development to further improve supply chain performance and simultaneously lower GHG emissions.

<p>Estimated Annual Greenhouse Gas Benefits:</p> <p>1,158.64 metric tons</p> <p>Expected Community Benefits:</p> <p>Increased Access to Service and Amenities; Economic Development and Job Creation, Increased Safety, Reduced Costs; Increased Resiliency/Ability to Adapt; Improved Health and Well-Being; Reduced Noise Pollution</p> <p>Estimated Annual Criteria Pollutant Reduction:</p> <p>NO_x: 1.28 metric tons</p> <p>VOCs: 0.54 metric tons</p> <p>PM_{2.5}: 0.03 metric tons</p>

This measure consists of several key projects:

Project: Roadway Improvements

While a fully integrated technology platform is central to the success of the Freight Flow Optimization Program, some distinct physical improvements to the roadway network are essential to ensure remote sensing and communications apparatus are well positioned for seamless integration over the

entire DFW MPA. Those physical infrastructure needs are comprised of specific capacity deficiencies, missing or insufficient direct connector ramps, poor alignments, and/or the repair/replacement of assets vulnerable to rapid deterioration due to conditional or environmental stressors. This innovative integration of physical infrastructure and technology applications will greatly reduce freight movement inefficiencies, enable further propagation of CAV testing/deployment, and ensure improved capacities of detecting and addressing state of good repair.

Project: Technology and Multimodal Connectivity Improvements

The Freight Flow Optimization Program will unlock a fully integrated logistics ecosystem, with (1) optimized physical infrastructure at key locations for freight activities, (2) full roadway instrumentation to generate real-time insights on traffic and road surface conditions, and (3) an associated software platform to deliver these insights to both road users and operators, with the capacity/compatibility for future integration/expansion deeper into the public roadway network as more effective/comprehensive management may ultimately permit. This project can improve safety via improved traffic/asset management, automated incident detection, notifications to shift vehicular movements during times of high congestion, and optimized signalization. This increased efficiency would translate into significant travel time and operational cost savings well beyond the limits of regional freight-oriented developments, which would then elicit improved air quality and resiliency to changing environmental conditions.

The U.S. DOT Area of Persistent Poverty (APP)/Historically Disadvantaged Community (HDC) Status Tool has highlighted how the lack of multimodal transportation access around freight-oriented developments is a traditional community indicator of disadvantage. While land uses and travel patterns associated with freight logistics centers have customarily been less conducive or context-sensitive to widespread non-motorist uses, the needs to attract and retain a larger base of labor/business activity, provide healthy contributions to work-life balance, and encourage greater convenience/flexibility for mixed, and less auto-centric, development options are starting to reverse those trends. This project will build on this impetus to support more inclusive, affordable, and sustainable travel options for workers, residents, and visitors alike in the transitional areas to/from freight-oriented developments. Such products/outcomes will ensure more major employment/activity locations are more within reach of numerous new users/customers, and these increased opportunities will result in substantive emission reductions regionwide.

Project: Grade Separations

Within the 12-county transportation planning area, there are 2,442 at-grade rail-highway crossings, including 1,384 across the two most densely populated counties (Dallas and Tarrant).⁶⁰ These locations present substantial safety risks for train-vehicle collisions, but also result in air pollution associated with queues of vehicles stopped and idling as a train crosses. A rail grade separation eliminates the interaction between rail and automobile traffic. This can be done with the road being moved below or above the rail line. This allows for safer and efficient automobile and rail movements as they no longer interact with each other and reduce emissions of both GHGs and criteria pollutants by minimizing vehicle idling. NCTCOG and local jurisdictions are constantly collaborating to plan,

⁶⁰ <https://nctcog.org/getmedia/a3642652-f78b-4bbc-b33f-85fd13e599c3/Freight-North-Texas-2022-A-FREIGHT-Mobility-Plan.pdf>

design, and construct additional road-rail grade separations, and several locations can be constructed within the PCAP timeframe.

Other Available Funding:

These types of projects can often be funded by traditional transportation funding, including STBG and CMAQ funds available to NCTCOG as formula funding due to its role as the MPO. However, regional funding needs far outstrip available funds, and certain elements – especially technology elements associated with freight flow optimization – often fall outside the scope of traditional transportation funding and, at times, the absence of these “nontraditional” project elements makes a high impact on project effectiveness. Discretionary grant programs and local funds (including bond programs) can also support implementation.

Measure: Vehicle Miles Traveled Reduction Program

This measure seeks to reduce the amount of VMT across the region, which consequently reduces fuel consumption and vehicular emissions, through a variety of projects that may either reduce the length of trips or eliminate trips altogether. This measure is related to the Active Transportation Program and Transit Enhancement Program, both of which also seek to eliminate or shorten single-occupant vehicle trips.

<p>Estimated Annual Greenhouse Gas Benefits:</p> <p>717,888.09 metric tons</p> <p>Expected Community Benefits:</p> <p>Economic Development and Job Creation; Improved Health and Well-Being; Increased Access to Service and Amenities; Increased Resiliency/Ability to Adapt; Increased Awareness/Engagement; Increased Safety</p> <p>Estimated Annual Criteria Pollutant Reduction:</p> <p>NO_x: 355.66 metric tons</p> <p>VOCs: 59.85 metric tons</p> <p>PM_{2.5}: 4.79 metric tons</p>
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This measure consists of several key projects:

Project: Improve Job-Housing-Transportation Balance

The concept to job-housing balance aspires to locate complementary employment and housing opportunities close together to reduce commute distances or encourage non-single occupant vehicle trips. Rather than a literal “balance” of jobs and housing, strategies to achieve this typically focus on increasing the mix of job types and housing types in a given area. An example would be that NCTCOG has focused on increasing the mix of jobs and housing on its rail transit corridors to increase transit ridership. Efforts to further encourage this would include studies of areas of interest to analyze data on existing jobs and housing options and suggest land use policy changes to increase a mix of options.

Project: Provide Incentives to Encourage Commuting During Off-Peak Times or Working Remote

The NCTCOG Employer Trip Reduction (ETR) Program is an educational program designed to reduce work-related drive alone commute trips through the marketing and implementation of Travel Demand Management strategies such as rideshare programs (carpooling and vanpooling), telecommuting and flexible work-hour programs, transit, bicycling, and walking. Through the ETR Program, employers are assisted with the formation of company-specific Trip Reduction Programs which may include program education and recruitment, program setup and maintenance, and data collection and reporting of results. An essential tool used within the Regional Trip Reduction Program is www.TryParkingIt.com, the regional commute tracking, ride-matching, and commuter reward system. The website enables commuters to locate carpool and vanpool ride matches, along with transit and bicycle matches. When users enter their alternative commute trips, the website generates a summary of miles saved, trips reduced, and harmful emissions reduced. Try Parking It users also earn reward points towards G.R.E.E.N. (Give, Receive, Expand, Effect, North Texas) Rewards and Entertainment Book Rewards for recording their alternative commute trips. Registered employer administrators may also contribute their own rewards to www.TryParkingIt.com, which can be viewed and obtained by the specific company's employees only.

Project: Utilize Smart Infrastructure to Improve Operations

Drone operations can be added or improved by utilizing smart infrastructure technologies. In addition to existing weather information, deploying ground-based sensors that integrate into a public network allows for drone operations and services to be viable and scalable. These drone-based operations can reduce both consumer and delivery vehicles on the road, reducing pollution and potential safety hazards while creating resilient services.

Other Available Funding:

Currently, NCTCOG utilizes STBG funding, local funds, and Transportation Development Credits to administer the Try Parking It Program. CMAQ funds could potentially be eligible as well.

Energy Sector Measures

NCTCOG and collaborating agencies have developed a list of measures to comprehensively improve air quality to address the Energy Sectors. These measures will reduce GHGs, of which the energy sector is responsible for approximately 53 percent, as discussed in **Section 3**. However, this 53 percent includes GHGs associated with power consumed in the Water, Wastewater, and Watershed Management Sectors, as water pumping is very energy-intensive. They will also reduce criteria pollutants by reducing upstream demand for power generation from conventional power sources.

Appendix 11: DFW AQIP-Energy Measures, contains a full list of measures and projects, feedback received from surveys described in **Section 1: Regional Engagement**, and information on air quality and community benefits.

Program Area: Energy Demand Management Program

This program focuses on facilitating energy management and efficiency education, activities, and partnerships with emphasis on the public sector. By conserving energy through efficiency measures and expanding use of renewable generation, air pollution associated with conventional power generation can

be reduced while increasing resiliency and reliability of the grid. Additionally, the Regional Integration of Sustainability Efforts Coalition was established by NCTCOG to foster peer exchange and collaboration among local governments supporting sustainability and environmental initiatives across the region. Resources are compiled on the Conserve North Texas website at <https://www.conservenorthtexas.org>. Key existing efforts include:

- **Local Government Energy Reporting:** All political subdivisions, state agencies, and institutes of higher education in a nonattainment area or an affected county are required to reduce electricity consumption by at least 5 percent each year, based on a 2019 baseline, and report their progress.⁶¹ NCTCOG and the South-Central Partnership for Energy Efficiency as a Resource (SPEER) provide support to improve data quality and reporting rates through workshops, white papers, and case studies, all of which are posted on the Conserve North Texas website <https://www.conservenorthtexas.org> in the Local Government Energy Reporting Toolkit.
- **Building Codes:** NCTCOG conducts surveys under the support of its Regional Codes Coordinating Committee (RCCC), to help the region identify cities operating under outdated energy codes (i.e., 2012 and older) and connect them with SPEER for assistance in updating their codes. The updates can greatly impact the degree of energy consumption of buildings in their city. Energy code survey results over the past five years are posted on the NCTCOG Code Adoption Survey webpage (<https://www.nctcog.org/envir/regional-building-codes/code-adoption-surveys>). NCTCOG has also worked with local governments to integrate code elements that exceed standard code requirements. A statement supporting solar-ready code appendices was approved by the RCCC in October 2021.⁶² NCTCOG has begun providing information to local stakeholders about the amount of EV charging that could be integrated into new or reconstructed parking areas. Through new projects like Charging Smart, NCTCOG will assist in preparing municipalities to set EV-friendly building codes.
- **Property Assessed Clean Energy (TX-PACE):** This financial tool incentivizes commercial and industrial property owners to upgrade their infrastructure for energy efficiency or water conservation. NCTCOG works to expand adoption of and use of PACE financing due to its ability to reduce energy and water consumption within commercial buildings, improve regional air quality by reducing the need for electricity generation, and provide economic benefits by spurring investment in communities.
- **Solar Technologies:** Key efforts to advance solar adoption across the region include supporting local governments in pursuing SolSmart designation; achieving a SolSmart designation for the region; maintaining a central website at <https://www.gosolartexas.org/> to house Texas-specific information; development of regional template materials for permitting, zoning, and building codes; and hosting trainings for first responders, inspectors, permitting officials, and other staff to increase local governments' knowledge of solar technology. NCTCOG goals include drafting a plan for increased solar deployment, securing SolSmart designation for at least 10 additional municipalities, and increasing deployment of solar across all sectors while leveraging the connections between solar deployment and other regional goals such as emergency preparedness and grid resiliency.

Measure: Public Sector Energy Efficiency and Refrigerant Transition Program

Updating and replacing various systems, appliances, and lighting in public buildings can lead to substantial energy efficiency improvements, aligning with efforts to reduce carbon emissions and

⁶¹ <https://statutes.capitol.texas.gov/Docs/HS/htm/HS.388.htm#388.005>

⁶² [Aug2021_DRAFT-NCTCOG-Solar-Ready_Support-Statement_V-3.pdf](#)

decrease electricity consumption. For example, LED lights in buildings offer significant energy savings compared to traditional lighting technologies, with studies showing up to a 90 percent reduction in energy consumption and a lifespan up to 25 times longer than incandescent bulbs.⁶³

Updating the heating and cooling systems of a building to newer, more efficient systems of heat pumps, chillers, HVAC, and boilers is part of the effort needed to ensure this energy efficient transition. It should be noted that updating certain HVAC or chiller equipment may also enable transition of refrigerants to newer refrigerants with lower global warming potential, thus reducing GHGs not only from the energy sector through improving efficiency of the equipment itself, but also by reducing hydrofluorocarbons from refrigerant chemicals. Hydrofluorocarbon emissions are not currently captured in the GHG EI, thus, to be conservative, reductions from refrigerants have not been calculated and all quantification is based strictly on energy efficiency.

Additionally, promoting available financial incentives for technology upgrades can further increase the adoption of more energy efficient technologies in buildings.

Estimated Annual Greenhouse Gas Benefits:

0.00002-0.004 per metric ton per retrofit

Expected Community Benefits:

Increased Resiliency and Ability to Adapt; Job Creation and Economic Development; Improved Health and Well-Being

Estimated Annual Criteria Pollutant Reduction:

NO_x: 0.00000001-0.000002 metric ton per retrofit

VOCs: 0.000000004-0.0000001 metric ton per retrofit

PM_{2.5}: 0.000000001-0.0000002 metric ton per retrofit

This measure consists of several key projects:

Project: Increase Energy Efficiency of Existing Buildings

Entities can replace older, inefficient appliances and systems, such as HVAC, heat pumps, meters, chillers, and boilers to reduce GHG and criteria pollutants. For the PCAP, NCTCOG expects to focus on replacing these appliances with the most efficient EnergyStar-certified units. Public entities are expected to be the focus of the PCAP.

Project: LED Lighting Retrofits

NCTCOG will support public agencies will in replacing lighting technology with LED lighting technology. These replacements will be focused on facilities, rather than the replacement of LED-Streetlighting, which is included in the Transportation Sector.

⁶³ <https://www.energy.gov/energysaver/lighting-choices-save-you-money>

Other Available Funding:

A variety of energy efficiency related funding initiatives are available from federal and state sources, including Energy Efficiency and Conservation Block Grants (EECBG) and Texas State Energy Conservation Office LoanSTAR funding, but the demand for energy efficiency projects far exceeds available funding.

Measure: [Residential Efficiency Rebate Program](#)

To aid in the improvement of the region’s air quality, energy efficiency improvements to residential homes must also be addressed. Developing a streamlined process and encouraging residents to participate in a free energy audits/assessment, akin to the Preliminary Energy Assessment provided to public agencies by the State Energy Conservation Office, would be a first step in a process to reduce energy costs and energy consumption. Combining the audit/assessment with a rebate for home weatherization and group-purchase solar would further incentivize residents to implement energy improvements.

<p>Estimated Annual Greenhouse Gas Benefits:</p> <p>0.000001 per metric ton per household</p> <p>Expected Community Benefits:</p> <p>Increased Resiliency and Ability to Adapt; Job Creation and Economic Development; Improved Health and Well-Being; Reduced Costs; Increased Awareness and Engagement</p> <p>Estimated Annual Criteria Pollutant Reduction:</p> <p>NO_x: 0.000000001 metric ton per household</p> <p>VOCs: 0.00000003 metric ton per household</p> <p>PM_{2.5}: 0.0000000005 metric ton per household</p>
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This measure consists of several key projects:

Project: Conduct Residential Energy Audits and Weatherization Rebate Program

Local governments are interested in offering opportunities for residents to obtain free residential energy audits or preliminary energy assessments to identify potential energy or water efficiency improvements. In addition, some local governments are interested in providing rebates for residential energy efficiency and weatherization improvements.

Project: Provide Incentives for Residential Solar

Local governments can provide incentives for residential solar installations, facilitate community solar opportunities, and/or support "Solarize" group-purchase options to reduce residential solar costs.

Other Available Funding:

The [Residential Clean Energy Credit](#) is available through Internal Revenue Service [Form 5695](#) and includes home energy audits, qualified solar electric property costs, insulation material or air sealing material or systems, and other energy saving improvements. The annual credit equals 30 percent of the costs of new, qualified clean energy property for homes installed between 2022 through 2032. The credit percentage rate phases down to 26 percent for property placed in service in 2033 and 22 percent for property placed in service in 2034. The energy efficient home improvement credit has a maximum of \$1,200 annual credit limit, which may not provide enough of an incentive for residents whose housing needs a substantial amount of work. Also, there are limits for each category of qualified energy efficiency improvements. Renters can claim the credit, however, are not likely to make energy saving improvements to a home they do not own. Landlords or other property owners that do not live in the home cannot claim the credit.

Incentives may be available from utilities, but awareness is often lacking and there may be other barriers to obtaining the financial assistance. For example, a large proportion of NCTCOG regional residents live in the deregulated part of the ERCOT market for which Oncor Electric Delivery serves as the transmission and distribution service provider. Oncor offers a variety of incentives through the Take a Load Off Texas Program,⁶⁴ but Oncor is not allowed to provide the incentive directly to a homeowner and must instead provide the incentive through an approved contractor. This puts the burden of finding and selecting a reputable vendor on the homeowner and creates uncertainty about whether the full value of the incentive was actually realized by the resident.

Measure: Energy Plans/Audits/Policies

Public and commercial buildings and industrial facilities can increase energy efficiency and reduce GHGs by conducting an energy audit/preliminary energy assessment to identify energy and water efficiency improvements. In addition, using a tool such as the Energy Star Portfolio Manager to compare a building's energy consumption to similar buildings can identify opportunities for improvements.

Estimated Annual Greenhouse Gas Benefits:

Not Quantifiable but is a critical step to enabling implementation of emissions-reducing retrofits or other measures.

Expected Community Benefits:

Increased Awareness and Engagement; Increased Resiliency and Adaptability Engagement

Estimated Annual Criteria Pollutant Reduction:

Not quantifiable but is a critical step to enabling implementation of emissions-reducing retrofits or other measures.

This measure consists of several key projects:

⁶⁴ <https://www.oncor.com/takealoadofftexas/>

Project: Implement Building Energy Performance Management Program/Plan/Policy

Building owners can utilize the Energy Star Portfolio Manager to benchmark and track a building's performance. Benchmarking energy consumption can help a building owner or facility manager understand whether their building is consuming energy at a rate that is higher, lower, or about average relative to similar buildings, which can help identify whether there are "low-hanging" opportunities for greater improvements. Building owners can then establish an energy performance management plan and/or policy using resources such as the Energy Star Guidelines for Energy Management.

Project: Conduct Energy Audits for Organizations

Local governments and owners of commercial buildings/facilities in the region are interested in reducing the energy consumption of buildings. Conducting a comprehensive energy audit/preliminary energy assessment for public and commercial buildings will identify potential energy or water efficiency improvements and is a critical first step toward these improvements. Energy audits are a valuable tool to support the business case for energy conservation projects at a facility and can be used as the foundation for a long-range plan. In addition, an energy audit is often a necessary step for obtaining third-party financing for a project, such as Property Assessed Clean Energy (PACE) financing and utility incentives. This measure will have a larger effect on air quality for the area surrounding these facilities due to the large carbon footprint of these facilities.

Other Available Funding:

Owners of qualified commercial buildings who place in service energy-efficient commercial building property may be able to claim [a tax deduction](#), however, an energy audit is not an eligible project. Incentives or rebates for energy audits for commercial buildings or industrial facilities are generally not available. The Rural Energy for America Program Energy Audit and Renewable Energy Development Assistance Grant assists rural small businesses and agricultural producers by conducting and promoting energy audits and providing Renewable Energy Development Assistance, however, small businesses are not eligible to apply directly to this program and must be in an eligible rural area.

Public agencies in Texas can secure Preliminary Energy Audits at no cost through the Texas State Energy Conservation Office through either the Local Governments Program or Schools Program.⁶⁵

Measure: Green/Cool Roof Replacements

Cool roofs reflect more sunlight than a conventional roof, absorbing less solar energy and lowering the temperature of a building, saving energy and money. Additional benefits can be realized when cool roofs are installed on many buildings in a community, such as reduction of the urban heat island effect, slowing the formation of smog from air pollutants, and reducing peak electricity demand. Green (vegetative) roofs are cooled by the evaporation of water from plant surfaces rather than by the reflection of sunlight but must be designed with respect to the structural capacity of the roof.

⁶⁵ <https://comptroller.texas.gov/programs/seco/programs/>

Estimated Annual Greenhouse Gas Benefits:

0.0002-0.01 metric tons per building roof

Expected Community Benefits:

Increased Resiliency and Ability to Adapt; Job Creation and Economic Development; Improved Health and Well Being

Estimated Annual Criteria Pollutant Reduction:

NO_x: 0.00000006-0.000004 metric tons per building roof

VOCs: 0.000000002-0.0000002 metric tons per building roof

PM_{2.5}: 0.000000007-0.0000005 metric tons per building roof

Project: Implement Cool/Green Roofs

NCTCOG will collaborate with public entities to replace or improve existing roofs with cool and green roofs on government buildings. Cool roof projects may include white paint for reflectivity and green roofs with planted vegetation, and other projects.

Other Available Funding:

A variety of energy-efficiency-related funding initiatives for public sector agencies are available from federal and state sources, including Energy Efficiency and Conservation Block Grants (EECBG) and Texas State Energy Conservation Office LoanSTAR funding, but the demand for energy efficiency projects far exceeds available funding.

Measure: Distributed Energy and Resilience for Public Entities

Improving energy resilience for communities and public buildings can increase public safety and the continuity of critical services to communities. For instance, a public building with adequate energy resilience elements and space can be used as an emergency shelter in the event of a power outage. Resiliency elements can include battery or hydrogen fuel cell energy storage, solar, microgrids, cleaner burning generators (propane, natural gas), and electric vehicles. Developing community-scale microgrids can reduce the demand for power

Estimated Annual Greenhouse Gas Benefits:

30.66-101.99 metric tons

Expected Community Benefits:

Increased Resiliency and Ability to Adapt; Job Creation and Economic Development; Improved Health and Well-Being

Estimated Annual Criteria Pollutant Reduction:

NO_x: 0.67-0.89 metric tons

VOCs: negligible – 0.05 metric tons

PM_{2.5}: 0.02 metric tons

generated from large power plants and lessen grid demand spikes when the grid is available, as well as provide electrical power in the event of a power outage.

This measure consists of several key projects:

Project: Resilient Building Improvements

Public entities can safeguard against power outages by adding resiliency elements, such as battery or hydrogen fuel cell energy storage, solar, microgrids and cleaner burning generators (propane, natural gas).

Project: Increase Grid Resiliency for Communities

Public entities and utilities will collaborate to develop community-scale renewable energy (wind, solar), microgrids, battery storage, and/or hydrogen fuel cell storage, or vehicle-to-grid facilities to provide power to communities in the event of a power outage.

Project: Develop Emergency Shelters

Public entities will identify and retrofit appropriate buildings to include resiliency elements to accommodate sheltering of the public in the event of a power outage. These buildings would accommodate many people and include building types such as community centers, large libraries, and schools.

Other Available Funding:

[The Federal Emergency Management Agency’s \(FEMA\) Building Resilient Infrastructure and Communities \(BRIC\)](#) Grant Program provides proactive investment in resilience for communities, so they are better prepared and remain resilient prior to a natural disaster, including utility/infrastructure protection. For fiscal year 2022, BRIC funding requests exceeded the amounts available for Hazard Mitigation Assistance grant programs showing the need for more funding to reduce hazards.

Measure: Advancing Energy Elements in Building Codes

With the increased adoption of EVs, EV chargers, and solar, a regional codes program addressing these technologies becomes important for the cost effective and expeditious deployment of these technologies. A program to provide additional training, resources, and outreach is needed to expand

adoption across the region of the most recent building codes to include solar-ready, as well as EV-friendly codes or standards.

Estimated Annual Greenhouse Gas Benefits:

Not Quantifiable

Expected Community Benefits:

Increased Awareness and Engagement; Increased Resiliency and Adaptability; Increased Safety

Estimated Annual Criteria Pollutant Reduction:

Not Quantifiable

Project: Expand Regional Codes Program to Support EVs, Solar, and Energy-Efficient Buildings

NCTCOG will work with local governments to enhance and expand the regional codes program with additional training and outreach to expand adoption of the most recent building codes, including solar-ready provisions supported by the RCCC and energy efficiency. NCTCOG will also collaborate with cities to promote adoption of the 2021 International Energy Conservation Code, and future revisions of this code, to the extent allowed by state law. In addition, staff will work with local governments to develop resources to guide regional adoption of EV-friendly (e.g., EV-ready, EV-capable, and/or EV-installed) building codes or standards.

Other Available Funding:

Through the Inflation Reduction Act, funding was made available to adopt the latest building energy code for residential buildings (2021 International Energy Conservation Code (IECC)) and commercial buildings (ANSIASHRAE/IES Standard 90.1-2019) or other codes and standards that achieve equivalent or greater energy savings, as well as adopt a building energy code that meets or exceeds the zero energy provisions in the 2021 IECC code or other codes and standards with equivalent or greater energy standards. In addition, the [Federal Emergency Management Agency's \(FEMA\) Building Resilient Infrastructure and Communities \(BRIC\) Program](#) provides funding specifically for building code activities under a new "Codes Plus Up" Program.

Water, Wastewater, and Watershed Management Sectors

While the water, wastewater, and watershed management sectors together comprise a very small percentage of the overall GHG emissions, and do not form a significant generator of priority pollutants, access to clean water is foundational to public health and quality of life. And more critically, this sector, more than any other, faces the greatest risk of impact from a changing climate. Periods of low precipitation disrupted by single high-intensity storm events will increase, along with more extreme degree days (100°F+), and the frequency and intensity of severe thunderstorms will increase.⁶⁶ These projections will have a significant impact on the rapidly growing NCTCOG region. For this area to be able

⁶⁶ [Fifth National Climate Assessment \(globalchange.gov\)](#)

to protect water resources and actively plan for the future, appropriate actions will need to be taken by private entities, residents, business members, and our participating local governments. Continuing collaboration with water agencies will be essential for successful long-range resource planning.

NCTCOG and collaborating agencies have developed a list of measures to comprehensively improve local resilience within four primary program areas: **Watershed Management, Water and Wastewater Infrastructure, Wastewater Infrastructure, and Water Resources**. Measures in these program areas are focused on comprehensively addressing water resources in the NCTCOG region by addressing water quality and supply, wastewater collection, treatment and reuse, and effective watershed management to address both flooding and drought. The sector addresses both the important nexus between water and energy, and the need to build infrastructure resilience to address flooding, drought and critical water supply. These measures will reduce GHGs and criteria pollutants.

Appendix 12: DFW AQIP-Water, Wastewater, and Watershed Management Measures, contains a full list of measures and projects, feedback received from surveys described in **Section 1: Regional Engagement**, and information on air quality and community benefits.

Program Area: Watershed Management

NCTCOG’s Watershed Management programs are designed to maintain and improve water quality, support flood reduction, and enrich habitats in the watersheds of North Central Texas. The NCTCOG region has 73 waterways, comprised of stream segments and reservoirs. Fifty-nine of those 73 segments are considered impaired, according to the 2022 Integrated Report of Surface Water Quality and Texas 303(d) List.⁶⁷ The largest regional source of water is the Trinity River, and protection of this resource remains one of the highest priorities across all water-related efforts. When the water quality in the river is compromised due to contamination from stormwater runoff, bacteria loading, and invasive species, water treatment facilities must expend more energy to rectify the problem, contributing to additional GHG. To mitigate this concern, NCTCOG coordinates with local governments and other stakeholders to identify opportunities to improve watershed protection. Several relevant NCTCOG programs that exist to address watershed challenges in North Central Texas include:

- **Trinity River COMMON VISION:** The Trinity River COMMON VISION is a regional initiative designed to support the Trinity River watershed and its residents, by addressing common concerns for the river, such as flood management, contamination prevention, low flow, and other issues. A coordinated effort to address these concerns has been in place since the 1980s. In 1990, nine local governments, three counties, and two special districts established a formal agreement with NCTCOG for cooperative planning for stewardship of the Trinity River. Since its foundation, COMMON VISION has conducted a feasibility study and completed multiple projects to restore native habitats and preserve the riparian corridor.
- **Flood Management Task Force:** The Flood Management Task Force (FMTF) is a work group comprised of 10 cities and 4 counties, in addition to other governmental entities, who work to support the Trinity River COMMON VISION Program. Members of the FMTF provide advisement and guidance on technical matters related to the COMMON VISION initiative.
- **Corridor Development Certificate (CDC) Program:** Since the 1990s, the CDC has provided further regulation of development within the Trinity River corridor to reduce flood risk. The certification program allows for floodplain development, while ensuring that floodplain construction and development will not present increased flood risks. Extensive analyses of new development to confirm a “no-rise” condition for river flood elevations is required for developments occurring in

⁶⁷ [2022 Integrated Report of Surface Water Quality and Texas 303\(d\) List](#)

the Trinity River watersheds along this corridor. In 2020, NCTCOG developed a CDC tracking system, trinityrivercdc.com, where users can view all CDC permits within the region.

- **Regional Stormwater Coordinating Council (RSCC):** The Regional Stormwater Coordinating Council provides oversight and guidance regarding the execution of NCTCOG’s Regional Stormwater Management (RSWM) Program to support regional compliance under community Phase 1 and Phase 2 Texas Pollutant Discharge Elimination System (TPDES) Municipal Separate Storm Sewer System (MS4) permits. In the RSWM Program, NCTCOG collaborates and coordinates multiple initiatives to support appropriate stormwater management under these permits:
 - **Regional Water Quality Monitoring**, one of the more critical efforts is the regional water quality characterization effort that coordinates wet weather-, dry weather-, Rapid Bio-assessment protocol, and other water quality monitoring for the Trinity River and primary tributaries.
 - **The Integrated Stormwater Management (iSWM) Program (www.iswm.nctcog.org)**, is a cooperative initiative specifically aimed at promoting guidelines for more sustainable construction and development by participating cities, counties, and transportation agencies towards greater use of post-construction controls, such as low impact development or nature-based solutions, to provide local hydrologic storage, water quality improvements, water quality protection, streambank protection, and flood mitigation.
 - **The Regional Stormwater Coordinating Council** also supports the Texas SmartScape (<http://www.txsmartscape.com/>) outreach and education initiative. Texas SmartScape seeks to educate the public on best landscape management practices, including the benefits of using plants that are native or adapted to the regional climate and local conditions. Other program efforts include conserving local water supplies, improving stormwater runoff quality, and reducing pesticide, fertilizer, and herbicides use.
 - **The Illicit Discharge Detection and Elimination (IDDE) Roundtable** (<https://www.nctcog.org/envir/committees/regional-stormwater-management-coordinating-council/illicit-discharge-detection-elimination-task-for>) supports the RSWM Program by developing best practices related to illicit discharge and contamination prevention.
- **Water Resources Council**

As defined above, the Water Resources Council works to support the NCTCOG regulatory role in developing and implementing the Regional Water Quality Management Plan (WQMP). This plan helps to identify potential needs and priorities for improving water quality in the region. Every year, the WRC reviews and votes to approve the WQMP prior to submittal to TCEQ.

Measures under this program area include implementation of integrated stormwater management and low-impact developments, expanding pollution prevention measures, updating water conveyance infrastructure, and increasing available stormwater detention volumes.

Measure: Implement Integrated Stormwater Management, Low-Impact Development, Green Stormwater Infrastructure, and Other Nature-Based Solutions

Green infrastructure, in the form of rain gardens, bioswales, and other low-impact stormwater management tools support carbon sequestration and decrease the amount of impervious surface in the built environment. The soil in these structures filters rainwater to remove any bacteria and other pollutants present on roads and other hard surfaces, improving runoff water quality in the process.

These measures also can provide additional hydrologic storage in a watershed to reduce both the peak flow rates and volumes associated with urban runoff.

<p>Estimated Annual Greenhouse Gas Benefits:</p> <p>2,367,80.2 metric tons per installment</p> <p>Expected Community Benefits:</p> <p>Green Spaces and Community Beautification, Job Creation and Economic Development, Increased Safety; Improved Health and Well-Being; Increased Resiliency and Adaptability</p> <p>Estimated Annual Criteria Pollutant Reduction:</p> <p>NO_x: 0.94 metric tons per installment</p> <p>VOCs: Unspecified</p> <p>PM_{2.5}: 0.10 metric tons per installment</p>
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Key projects associated with this measure are:

Project: Provide Economic Rebates for Green Infrastructure and Water Efficient Landscaping

Rebates incentivize business owners to add green infrastructure to commercial properties. Property owners can anticipate a water use reduction through efficient landscaping, which reduces energy use at the water treatment plant level.

Project: Update Local Policy, Codes, Drainage Criteria and Ordinances

Updating local policy, codes, drainage criteria, and ordinances as necessary encourages wider adoption of nature-based solutions, resulting in reduced stormwater peaks and volumes, improved water quality, and associated green space benefits.

Project: Implement Bioswales and Other Organics Stormwater Collection Areas to Increase Local Storage

Implementing bioswales and other organic stormwater collection areas provides extra storage and treatment for runoff during extreme storm events. This project would also support urban heat island mitigation.

Project: Install Smart Controls and Sensors to Low Impact Developments and Green Infrastructure to Analyze and Quantify Stormwater Collection Efforts

Smart Controls and sensors for green infrastructure connect with existing irrigation systems to prevent overwatering and support the efficiency of rain capture. This reduces energy expenditure resulting from irrigation.

Project: Restore, Protect, and Maintain Riparian Corridor Ecosystems

Riparian areas are the margin of space that runs alongside rivers and streams where significant amounts of vegetation can be found. This vegetation slows stormwater runoff and provides filtration for pollutants that would otherwise enter the water body. Projects of this kind would also restore damaged and degraded ecosystems to their previously held function.

Other Available Funding:

Funding may be available through the Texas Water Development Board’s Green Project Reserve. Entities submitting projects must be eligible for Clean Water State Revolving Funds. While partial loan forgiveness is potentially available for qualifying entities, all funding through the Texas Water Development Board requires a form of repayment.

Measure: Expand Contamination Detection and Pollution Prevention Measures

A key part of reducing GHG is preventing pollution before it enters the atmosphere. NCTCOG works with entities in possession of Municipal Storm Sewer System (MS4) permits to support their efforts related to illicit discharge detection and prevention. Activities under this measure would enhance field investigations to quickly cease contamination and increase response time.

<p>Estimated Annual Greenhouse Gas Benefits:</p> <p>Not Quantifiable</p> <p>Expected Community Benefits:</p> <p>Improved Health and Well-Being; local MS4 compliance</p> <p>Estimated Annual Criteria Pollutant Reduction:</p> <p>Not Quantifiable</p>

Key project associated with this measure:

Project: Provide Discharge Detection and Sampling Kits for Illicit Discharge Detection and Elimination (IDDE) Investigations

This project would outfit IDDE field investigators with discharge detection kits to support increased sampling and provide quicker detection for pollution to MS4 facilities. Increased sampling can eliminate pollution in water bodies, through source identification and elimination, to prevent requiring a lengthy and energy-consuming treatment processes.

Other Available Funding:

Local stormwater utility fees can be used to support these programs; Texas Water Development Board offers funding for sampling and analysis of contaminants, but repayment is required.

Measure: Update Stormwater and Wastewater Conveyance Infrastructure

Upgrades to conveyance infrastructure (pipes, storm drains, manhole covers, etc.) lessen the resources required to capture and convey stormwater runoff and wastewater. These updates reduce common operations and maintenance (O&M) challenges, such as sanitary sewer overflows, that can involve time-

consuming cleanups and be resource intensive. Using efficient practices in the construction of this infrastructure can also reduce energy consumption, eliminating GHG.

Estimated Annual Greenhouse Gas Benefits:

52.46 metric tons

Expected Community Benefits:

Improved Health and Well-Being; Water Conservation; Increased Resiliency and Adaptability

Estimated Annual Criteria Pollutant Reduction:

NO_x: N/A

VOCs: 0.38 metric tons

PM_{2.5}: N/A

Key projects associated with this measure are:

Project: Install Smart Manhole Covers

Smart manhole covers are remote field units that utilize sensors to detect leaks. This alerts utility technicians to potential sewer blockages/overflows before the contaminated water reaches lakes, rivers, and streams.

Project: Utilize Trenchless Pipe Rehabilitation

This project prioritizes using trenchless construction methods in pipe rehabilitation tasks. Using trenchless rehabilitation methods would limit the traffic impacts from construction and reduce waste when compared to remove and replace construction methods.

Other Available Funding:

Funding may be available through the Texas Water Development Board, U.S. Department of Housing and Urban Development, EPA/TCEQ/TWDB Clean Water Revolving Fund, and through US Department of Agriculture. Local budgets, utility fees, and Capital Improvement Bond Programs can also be used to finance appropriate infrastructure upgrades.

Measure: Increase Available Stormwater Detention Volumes

Developing areas with increased impervious cover, the increased occurrence in higher intensity and duration rainfall events, and condition of aging and undersized drainage infrastructure all require additional storage to prevent flooding across the watershed. Additional storage is required either by localized storage such as LID, Green Infrastructure, and nature-based solutions, or through implementation of larger engineered detention and retention basins.

Detention basins are typically wet or dry. Dry detention ponds can be used for multiple purposes such as parks or recreational fields; these facilities fill with excess runoff and then typically are drained within about 24 to 72 hours. Wet ponds, or retention ponds, maintain a normal maintenance pool, and include

additional storage for rain events; wet ponds with aeration can provide limited water quality improvement. There is an identified need to expand available stormwater detention capacity in several

<p>Estimated Annual Greenhouse Gas Benefits:</p> <p>Not Quantifiable</p> <p>Expected Community Benefits:</p> <p>Increased Safety; Improved Health and Well-Being; Increased Resiliency and Adaptability</p> <p>Estimated Annual Criteria Pollutant Reduction:</p> <p>Not Quantifiable</p>
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areas of the NCTCOG region to help address increased runoff with associated flood risks.

Key project associated with this measure:

Project: Augment Stormwater Detention Basin Storage

The construction and maintenance of stormwater detention basins supports flood management practices, especially in at-risk communities. Detention basins temporarily store water from heavy rainfall where it is then allowed to drain slowly over time through underground systems. The addition of this infrastructure would reduce local flood potential. These also save on land acreage used, as they are temporary and tend to be smaller than retention ponds.

Other Available Funding:

Funding may be available through the Texas Water Development Board, U.S. Department of Housing and Urban Development, FEMA, and the Texas Water Development Board through the FIF and SWIFT programs and through the U.S. Department of Agriculture. Local stormwater utility fees and/or Capital bond programs may also be used to implement stormwater infrastructure projects.

Program Area: Water and Wastewater Treatment Infrastructure

Currently, North Central Texas is serviced by six major utility providers, in addition to municipal water utility companies. NCTCOG collaborates with water and wastewater utility providers to assist in long-term water utility planning, including the continuous analysis and revision of treatment processes to support efficient and cost-effective productivity. These efforts seek to increase the longevity of treatment systems, while addressing new challenges present in the growing region. Existing related NCTCOG programs include:

- **Wastewater and Treatment Education Roundtable (WATER):** NCTCOG advocates for and supports efficient wastewater treatment by providing public education on the proper care of plumbing systems. Aiming to reduce potential damage to the region’s household plumbing systems and wastewater treatment systems and decrease hazards to water quality, the Wastewater And Treatment Education Roundtable supports educational efforts related to the proper disposal of items such as wipes, paper towels, feminine hygiene and personal care products, medicines, household hazardous waste, and fats, oil, and grease (FOG). The program creates educational materials such as videos, social media, and print items to support the message of responsible plumbing practices. Those materials are available on the Defend Your Drains North Texas website

(www.defendyourdrainsnorthtexas.com). As part of this effort, WATER supports a regional FOG collection, the Holiday Grease Roundup, during the holidays through the Cease the Grease Program, which encourages residents to bring their grease and used cooking oils to collection sites where it is recycled into biodiesel or biogas.

- **Water Resources Council:** Since 1979, the Water Resources Council (WRC) has advised on technical and regulatory issues related to water quality and quantity. The WRC is made up of utility providers and public interest groups. The council provides guidance on all activities under the Water Quality Management Plan, a program funded through the EPA in response to Section 604(b) of the Clean Water Act. The program responds to water-related concerns within the North Central Texas region by hosting workshops and webinars quarterly on water issues in the region. Under this grant, NCTCOG also acts as the designated water quality planning agency for the North Central Texas region and is responsible for developing the Water Quality Management Plan (WQMP) and updating it annually. This plan helps to identify potential needs and priorities for improving water quality in the region. Every year, the WRC reviews and votes to approve the WQMP prior to submittal to TCEQ.

Measures under this program area include improvements to water and wastewater treatment procedures to increase energy efficiency and promote equipment longevity.

Measure: Improve Water and Wastewater Treatment Process Efficiency

The bulk of the region’s GHG from the water sector come from the energy required to acquire and treat the regional water supply. This process involves the intake and extraction, conveyance, treatment, and distribution of water for potable and non-potable uses such as industrial operations, irrigation, and commercial and domestic uses. Revising this process to be more mindful of energy consumption will reduce emissions and support energy supply needs well into the future.

<p>Estimated Annual Greenhouse Gas Benefits:</p> <p>1639.27 metric tons per utility plant</p> <p>Expected Community Benefits:</p> <p>Increased Resiliency and Adaptability; Improved Health and Well-Being; Job Creation and Economic Development; Increased Awareness and Engagement</p> <p>Estimated Annual Criteria Pollutant Reduction:</p> <p>NO_x: 0.72 metric tons per utility plant</p> <p>VOCs: 0.06 metric tons per utility plant</p>
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Key projects associated with this measure are:

Project: Develop and Implement a Strategic Energy Management and Conservation Plan for Water Utilities

Developing best management practices regarding efficient treatment demonstrates a plant's commitment to reducing GHGs in practice. These efforts could include the formulation of an on-site energy policy, participating in an energy audit, and establishing energy conservation and usage goals. These are accomplished through a thorough data and process analysis to identify strategies to achieve emissions reductions, establish key performance indicators, and publish annual reports.

Project: Update Aging Water/Wastewater Treatment Plant Infrastructure

As the region grows, demands placed on treatment equipment increases, wearing out aging systems faster. Water and wastewater treatment plants experiencing struggles due to aging infrastructure benefit from energy-efficient upgrades and retrofits such as new pumps, filtration systems, etc.

Project: Increase On-Site Renewable Energy into Wastewater Treatment Plant Site

Diversifying energy sources not only reduces emissions, it also lessens the demand on the state's energy grid. The installation of renewable energy resources at water and wastewater treatment plants supports the use of co-generation, combined heat & power, solar, hydroelectric, and wind energy in the treatment process.

Project: Pursue Energy-Efficient Disinfection Processes

Supporting energy-efficient disinfection processes, such as chlorination, reduces energy expenditures from biomass cookstoves and reduces the energy required to the disinfection stage of the water treatment process.

Project: Install Water-Source Heat Pumps at Water and Wastewater Treatment Plants

Heat pumps generally fall into one of three types of systems – air, water-source, or geothermal – and collect heat from the air, water, or land around it to provide heating and cooling. Utilizing water that is readily available in treatment plants to operate water-source heat pumps saves energy expenditure at the plant level.

Project: Support Bio-Gas Capture and Reuse in Wastewater Treatment Plants

Biogas is a byproduct of wastewater treatment after the biosolids have been separated out of the water being treated. Given the right infrastructure for capture and storage, this gas can be sold to a third party, or used on-site as an energy source. Effective capture of this gas can reduce the GHG emissions from wastewater treatment.

Other Available Funding:

Funding may be available through the Texas Water Development Board or U.S. Department of Agriculture, but repayment is required. Low-income communities with populations under 20,000 may seek funding through Communities Unlimited's Water and Wastewater Loan fund, but repayment is required. Additional funding may be available through the EPA Clean Water Revolving Fund, as administered by the Texas Water Development Board.

Program Area: Wastewater Infrastructure

Improving wastewater infrastructure requires a range of strategies that promote sustainable use of water resources, protect public health, and support economic growth. This typically includes wastewater

conveyance infrastructure, as discussed above, in addition to localized on-site sewage treatment facilities, ways of addressing bio-solids from treatment, and ways of supporting wastewater reuse. Existing related NCTCOG programs include the WATER Roundtable and Water Resources Council, described in preceding paragraphs.

Measures under this program area include addressing on-site sewage facility systems, improving biosolid management, and supporting effluent reuse.

Measure: Address On-Site Sewage Facility Systems

On-site sewage facility (OSSF) systems, often known as septic systems, store and treat wastewater at the site of generation before release. These systems, typically consisting of a tank and drain field, are generally found in rural areas and in locations without access to public wastewater infrastructure. In Texas, all OSSF systems installed after 1989 must be permitted by an authorized authority, under the direction of TCEQ. NCTCOG is working to develop a regional database that would display permitted and non-permitted systems within the region. OSSF systems that fail due to aging materials or improper maintenance release waste and pathogens into surface and groundwater, increasing the presence of nitrogen and other nutrients into the water supply.

<p>Estimated Annual Greenhouse Gas Benefits:</p> <p>0.0148 metric tons per system</p> <p>Expected Community Benefits:</p> <p>Improved Health and Well-Being; Increased Resiliency and Adaptability; Job Creation and Economic Development; Reduction in Bacteria-Related Discharges in Areas with Related Total Maximum Daily Loads</p> <p>Estimated Annual Criteria Pollutant Reduction:</p> <p>NO_x: <.01 metric tons per system</p> <p>VOCs: 0.0087 metric tons per system</p> <p>PM_{2.5}: <0.01 metric tons per system</p>

Key projects associated with this measure are:

Project: Identify and Repair Aging On-Site Sewage Facility Systems

Often, Authorized Permitting Authorities do not have contact with existing OSSF systems until the system fails and contamination has already occurred. The project would provide Authorized Permitting Authorities with software upgrades to better track systems for more efficient and timely repairs.

Project: Provide Sanitary Sewage Upgrades in Developing Areas with Existing On-Site Sewage Facility Systems

Upgrading existing OSSF systems to connect with sanitary sewer systems will eliminate the problems of system failure and the subsequent pollution that follows the failure. This project invests in providing treatment to communities previously without public wastewater infrastructure.

Project: Provide Financial Rebates to Upgrade OSSF

This project provides homeowners with financial incentives to upgrade septic systems prior to a system failure. Repairs and system maintenance can be costly, especially in the rural LIDAC communities where these systems are present, and these rebates would reward homeowners for making timely and necessary repairs.

Other Available Funding:

Funding may be available through the U.S. Department of Agriculture’s Decentralized Water Systems Grant Program, the U.S. Department of Agriculture’s Water and Waste Disposal Loan and Grant Program, and the Texas Water Development Board’s Rural Water Assistance Fund, but repayment is required.

Measure: Improve Biosolids Management

Biosolids management involves addressing the process residuals, that is discarding solids, or sewage, from wastewater during treatment to effectively manage the organic waste present from the in-flow to the treatment plant. While current quantification tools were not able to specify a methane reduction expected from enacting these measures, methane generation occurs during biosolid treatment. The correct management of this generation allows for appropriate methane capture before it is released into the atmosphere.

<p>Estimated Annual Greenhouse Gas Benefits:</p> <p>22.04 metric tons per utility capture</p> <p>Expected Community Benefits:</p> <p>Green Spaces and Community Beautification; Increased Resiliency and Adaptability; Improved Health and Well-Being</p> <p>Estimated Annual Criteria Pollutant Reduction:</p> <p>NO_x: 0.00001 metric tons per utility capture</p> <p>VOCs: Unspecified</p> <p>PM_{2.5}: 0.0001 metrics tons per utility capture</p>
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Key projects associated with this measure are:

Project: Divert Biosolids from Wastewater Treatment into Thermal Waste-to-Energy Facilities

Biosolids are the remnants of organic material left after domestic wastewater treatment. After removal from the water, biosolids transferred to waste-to-energy facilities can be digested via anaerobic digesters to create biogas, an energy source. This project explores implementing thermal

treatment processes, like gasification and pyrolysis, to effectively reduce the water portion of the biosolid, and create an inert residual that has less volume, and is less problematic for disposal. This effort would reduce GHG from treatment processes, and reduce biosolids waste volumes, but depending on the process used, may have high energy needs to support the process, and may not result in full air quality improvements for all constituents.

Project: Divert Biosolids from WWTP into Waste-to-Energy Facilities

Biosolids are the remnants of organic material left after domestic wastewater treatment. After removal from the water, biosolids are transferred to anaerobic digesters, or other go-generation processes to create biogas, a renewable energy source. This project would develop processes and necessary infrastructure for waste transfer, in addition to implementing additional anaerobic digestion and/or co-generation units to convert organic waste to energy.

Project: Update Biosolids Management from WWTP for Placement into Low-Carbon Soils to Sequester Carbon Through Landfarming

Due to their organic nature, biosolids are rich in nutrients such as nitrogen. Once separated out from treated wastewater, biosolids applied to soils, particularly soil in need of restoration, provide agricultural benefits, in addition to supporting domestic gardening and forestry. When used in reclamation sites, applied biosolids regenerate soil previously damaged by development and can prevent further erosion. We note recent concerns related to the potential for per- and polyfluoroalkyl substances (PFAS) in water treatment residuals, and evaluation of this risk will be required.

Other Available Funding:

Funding may be available through the Texas Water Development Board’s Clean Water State Revolving fund and their Economically Distressed Areas Program, but repayment is required.

Measure: Support Effluent Reuse

Wastewater reuse is another effective strategy for improving wastewater management. Wastewater reuse involves using treated wastewater for beneficial purposes such as irrigation, industrial processes, or toilet flushing. In water-scarce regions, wastewater reuse is an essential source of water supply. Recycling and resource recovery from wastewater is another innovative strategy for improving wastewater management.

Effluent reuse occurs in two separate ways: direct and indirect. Direct effluent reuse is a process that allows for the reuse of treated water for non-potable purposes without first being discharged to waters of the state. Indirect reuse occurs when water is discharged first into a reservoir or stream to mix with ambient waters already present. While both options present vastly different requirements, they are both viable options to supporting regional water needs during dry months. Direct reuse, in particular, streamlines the process, reducing energy use along the way.

Estimated Annual Greenhouse Gas Benefits:

1,012.28 metric tons per utility

Expected Community Benefits:

Improved Health and Well-Being; Increased Resiliency and Adaptability;
Water Conservation

Estimated Annual Criteria Pollutant Reduction:

NO_x: 0.46 metric tons per utility

VOCs: 0.02 metric tons per utility

PM_{2.5}: 0.05 metric tons per utility

Key projects associated with this measure are:

Project: Reduce Chemical Use Affecting Reuse Options

Water reuse practices allows treatment plants to engage in “fit-for-purpose” treatment,⁶⁸ a process that determines the use and destination of the water and treats it accordingly. Certain uses, such as industrial heating and cooling, irrigation, and certain agricultural practices, do not require as much chemical intervention as potable drinking water, saving on chemical and energy expenditure. Decrease the amount of energy/chemicals utilized at water treatment plants by upgrading and expanding the current reuse program, which distributes non-potable reclaimed water for irrigation and industrial processes.

Project: Implement Methods for Non-Potable Water Reuse

Effluent reuse programs involve retrofitting plants with conveyance infrastructure to reroute treated, non-potable water to its final destination. Fit-for-purpose treatment reduces energy consumed in the treatment process and invites plants to think intentionally about required energy use for non-potable water.

Other Funding Available:

Funding may be available through the Bureau of Reclamation’s WaterSMART Water and Energy Efficiency Grant. Funding that requires repayment may be available through EPA’s Water and Infrastructure Finance and Innovation Act Program.

Program Area: Water Resources

Water resources in Texas, and in the NCTCOG region, are increasingly vulnerable to changes in climate. Climate change will continue to cause profound changes in the hydrologic cycle, increasing the risk of flooding, drought, and degraded water supplies for both people and ecosystems. These impacts will disproportionately impact LIDAC communities. Climate change is intensifying rainfall and floods, deepening droughts, and shifting weather patterns causing profound effects on freshwater supplies and

⁶⁸ <https://www.epa.gov/waterreuse/basic-information-about-water-reuse>

quality. Shrinking rivers and declining groundwater threaten cities and rural communities and endanger forest, riverine, and other ecosystems across the United States.⁶⁹

The above sections show the many ongoing efforts by NCTCOG towards effectively managing water resources in the NCTCOG region. This program area focusses on improving water conservation efforts.

Measure: Improve Local Water Conservation

While Texas continues to experience dry summers, water conservation strategies are especially crucial for NCTCOG’s 16-county region, where population growth is projected to increase exponentially in the coming decades. The Texas Water Development Board is responsible for carrying out the state’s regional water planning process and addressing water supply concerns in its State Water Plans. The Texas Water Development Board classifies most of the NCTCOG region under the Region C Planning group, with some counties existing in Regions G and D. NCTCOG hosts and collaborates with Region C water planners as they plan for the water supply needs in most of the counties in North Central Texas. Accessing water through storage and harvesting techniques would lessen the burden on water treatment facilities during the times of year when water is already in short supply. This, in turn, releases the energy expended to capture, treat, and distribute surface and ground water. Aside from storage, promoting smart use among utility customers helps bolster water conservation efforts.

<p>Estimated Annual Greenhouse Gas Benefits:</p> <p>217.72 metric tons per utility</p> <p>Expected Community Benefits:</p> <p>Increased Resiliency and Adaptability; Improved Health and Well-Being; Water Conservation; Reduced Costs; Increased Awareness and Engagement</p> <p>Estimated Annual Criteria Pollutant Reduction:</p> <p>NO_x: 0.04 metric tons per utility</p> <p>VOCs: Not Quantifiable</p> <p>PM_{2.5}: 0.009 metric tons per utility</p>

Key projects associated with this measure are:

Project: Utilize Automated Metering Infrastructures (Water Meters)

Automated metering infrastructure allows the customer and utility to proactively locate continuous water usage, which indicates a potential leak, on the city and private side. This early detection saves energy on extraction and treatment.

⁶⁹ [Water \(globalchange.gov\)](https://www.globalchange.gov)

Project: Explore Aquifer Storage and Recovery (ASR)

In looking at options for long-term water supply, there is considerable interest in finding ways of storing water from wetter periods, for use in times of drought, and as a means for augmenting surface water drinking water supply.⁷⁰

Aquifer storage and recovery (ASR) is the use of an aquifer to store water from a different source or location for later use. Aquifer recharge (AR) is the intentional recharge of an aquifer by injection well or other enhanced infiltration. The ability to use ASR or AR facilities depend on several factors, including: (1) a source of water to store or recharge, (2) an aquifer nearby that is physically able to store your desired volumes, and (3) capacity to treat the source water to ensure it is chemically compatible with the aquifer and does not degrade its quality. Sources of water to store may include surface water, groundwater, or reclaimed water and may only be available seasonally. Ideally, the candidate aquifer is nearby to reduce pipeline costs. The aquifer must be able to physically receive the volume of water to be stored. Different aquifers can receive different amounts of water and infrastructure will need to be designed to meet the physical capabilities of the aquifer. Water that is stored underground cannot degrade the native water in the aquifer. So, assessing chemical compatibility between the stored water and the aquifer— both the aquifer’s water and the host rock— is necessary. Chemically incompatible water could cause clogging or liberate unwanted constituents, such as arsenic, iron, and manganese, into the water. Source water for an ASR or AR facility may need treatment to ensure compatibility with the aquifer and this pretreatment may increase project costs.

In 2020, the TWDB performed an inventory of ASR projects across the state, and portions of the western NCTCOG region were identified as having the physical aquifer conditions that may support consideration of this type of project.⁷¹ The Tarrant Regional Water District (TRWD) is piloting this technology by drilling one full-scale demonstration ASR well and one monitoring well at the Trinity River Authority (TRA) water treatment plant in Fort Worth. The water that will be stored through the well will be treated, potable water. The process, thus far, from inception to pilot well has taken eight years. So, while an important option for consideration as the region faces increasingly limited water, there is a relatively long timeline associated with implementation.

The project includes providing funding to further explore Aquifer Storage and Recovery (ASR) projects, to establish redundant water supply, and as a potential storage option.

Project: Develop Aquifer Protection and Land Preservation Efforts

Aquifer protection increases water storage during times of drought and other lengthy dry conditions. Projects of this type establish protected land to be solely designated for aquifer storage. This land establishment supports Aquifer Storage and Recovery (ASR) projects, lessening the energy expenditure of treatment infrastructure.

⁷⁰ [Texas Water Development Board information - Aquifer Storage and Recovery & Aquifer Recharge](#)

⁷¹ Texas Water Development Board. 2020. Statewide Survey of Aquifer Storage Suitability for Aquifer Storage and Recovery Projects or Aquifer Recharge Projects. Available at: [2000012405.pdf](#)

Project: Implement Building-Scale Rainwater Harvesting for Commercial and Municipal Buildings

Like ASR, rainwater harvesting is a storage technique that captures water when it is in abundance to support future dry conditions. At the building level, this rainwater is collected in rain barrels, and above or below ground cisterns, for use in irrigation and other non-potable water uses.

Project: Establish Home Water Conservation Audits and Smart Water Meter Rebate Programs

Audit programs help utility customers assess their own water use and identify potential conservation opportunities. This increases customer education and engagement, while simultaneously helping to lower the energy needed to supply water to residents.

Project: Implement Municipal and Commercial Water Conservation Audits with Irrigation Repair Programs

Irrigation systems are infamous for water leaks through equipment issues that result in water system losses. This project implements irrigation system audit programs to help municipal and commercial system operators identify opportunities to conserve water by identifying equipment components that need repair. Opportunities for irrigation system conversion to non-potable, or cooling tower discharge for irrigation system makeup water should also be explored. The project can include contract opportunities for implementing irrigation system repairs. This can help reduce excess water use, and conceivably lower the energy needed to supply this water.

Other Funding Available:

Funding may be available through the Texas Water Development Board, U.S. Department of Housing and Urban Development, EPA/TCEQ/TWDB Clean Water Revolving Fund, and through the U.S. Department of Agriculture. Local budgets, utility fees, and Capital Improvement Bond Programs can also be used to finance appropriate infrastructure upgrades.

Materials Management (Solid Waste) Sector

NCTCOG and collaborating agencies have developed a list of measures to effectively address solid waste material management within North Texas. Programs within this area include recycling, composting, and augmenting existing waste collection, reduction, diversion, and disposal efforts. These measures will reduce GHGs and criteria pollutants.

The NCTCOG Materials Management Program works together with the RCC, cities, counties, school districts, and other entities to implement the Regional Solid Waste Management Plan⁷² and to enact programs to address specific waste management issues. The Regional Solid Waste Management Plan that was adopted in August 2023 addresses emerging waste streams and evolving goals, while continuing to promote the reduction of waste and illegal dumping, the recycling and reuse of materials whenever possible, and the handling of waste safely at permitted facilities. Measures included in the PCAP reflect the recommendations of the RCC, and the current Regional Solid Waste Management Plan. Related current efforts include:

- **RCC:** Serves as the region's solid waste advisory committee, with the primary responsibility of advising NCTCOG on methods to conserve, recover, and recycle valuable resources and to provide proper handling and disposal of non-recoverable waste materials. The council also guides the

⁷² https://www.nctcog.org/getmedia/4bfbf45a-2bd2-4222-ae30-b0840015b7a3/Final-RSWMP-11-18-2022_1.pdf

development of the current Regional Solid Waste Management Plan and advises on procurement and disbursement of available grant funding from the TCEQ.

- **Time to Recycle:** NCTCOG, with the RCC, launched its Regional Recycling Survey and Campaign in August 2018. The objective of this project is to better understand the quantity and quality of materials in communities' recycling systems, and to develop a regional public educational campaign focused on increasing recycling participation and decreasing contamination. The Recycle Roundtable Subcommittee oversees the *Know What To Throw* campaign activities through a regional collaborative effort to improve the quality of recycled materials and decrease contamination. The campaign utilizes social media to drive traffic to the Time to Recycle website (<http://www.timetorecycle.com/>) where users can explore the recycling drop-off locator map to identify recycling drop-off locations near them.
- **Report DFW Dumping:** Illegal dump sites are unsightly; they are a public health hazard and have great economic impact. Waste that is improperly disposed of is at risk for open burning, producing dioxin compounds. Additionally, illegally dumped hazardous waste, such as asbestos, threatens public health when these fibers are released into the air. NCTCOG addresses illegal dumping by monitoring the Report DFW Dumping hotline and website. NCTCOG also hosts workshops with the Texas Illegal Dumping Resource Center. These workshops educated code enforcement on preventing and eliminating illegal dumping in their jurisdiction.

Additional measures that are included in the Materials Management program area include expanding local compost opportunities, diverting construction and demolition debris, upgrading waste disposal facilities, implementing recycling and transfer facilities, and improving waste collection.

Appendix 13: DFW AQIP-Materials Management (Solid Waste) Measures contains a full list of measures and projects, feedback received from surveys described in **Section 1: Regional Engagement**, and information on air quality and community benefits.

Measure: Expand Local Compost Opportunities to Reduce Organic Disposal

Organic waste forms about 27 percent of the waste stream going to area landfills and comprises a key component driving methane generation from these facilities. There are at least 27 composting/ mulching facilities identified in the region, across Collin, Dallas, Denton, Erath, and Tarrant counties, including large-scale commercial composters, municipal composting and mulching programs, and composting operations that are co-located at landfills. However, 2021 data from TCEQ indicates that composting/mulching facilities in the region recovered an estimated 1.5 million tons of organics from residential and commercial sources, or less than 1 percent of this waste stream. Expanding local compost opportunities through concierge residential services, restaurant, and special events food diversion, working with multi-family facilities to support compost options, and expanding regional compost facilities should result in a significant increase in organics diversion, with resultant drops in GHG, and priority pollutants associated with this waste stream.

Estimated Annual Greenhouse Gas Benefits:

91,371 metric tons depending on level of deployment

Expected Community Benefits:

Improved Health and Well-Being; Increased Resiliency and Adaptability;
Increased Awareness and Understanding; Limited Impacts in Other Areas (See
Appendix 13).

Annual Criteria Pollutant Reduction:

NO_x: Negligible

VOCs: Negligible

PM_{2.5}: Negligible

Key projects associated with this measure are:

Project: Implement Concierge-Type Residential Organics Pickup with Diversion to Commercial Compost Operations

Several cities in the region currently offer commercial food waste diversion, residential valet, or concierge organic pick-up programs, and subscription-based residential food scrap composting programs for their residents. Because organic materials form about 46 percent of the residential waste stream, it may make sense to expand this program within the region. Funding would support third party contracts for residents of the participating cities to pick up organics (food waste, yard waste, and storm debris). The proposed program can also include food waste collection sites throughout the region, where participants can drop off food waste for collection and composting by a selected service provider.

Project: Incentivize Multifamily Residential Developers to Incorporate Space for Community Compost and Recycling

Over 50 percent of the regions' residents reside in multifamily homes and some, but not all, facilities offer recycling and compost options. Providing compost and recycling services to multifamily facilities expands the potential to more fully capture this waste stream and helps to ensure equitable access to these services. Funding would be used to incentivize multifamily developers to provide space in their facilities to support greater recycling and composting by residents, including the above residential organics pickup options.

Project: Develop Regional Compost Facilities to Support Organic Diversion from Landfills

While there is strong public support for measures related to greater implementation of organics diversion and composting, a very small percentage of these materials is currently captured. Implementing regional compost facilities would reduce landfill GHG from organic waste streams and the GHG and priority pollutants associated with their haul. Funding would be used to implement and

expand existing and new compost facilities. End-product use and marketing can also be explored relative to commercial and other uses.

Other Available Funding:

Funding may be available through EPA Solid Waste Grants, as administered through TCEQ; projects may qualify for public-private partnership; other funding may include establishment of a Special Waste District or use of General Obligation or Revenue-Based Capital Improvement bonds. Green Bank low-interest loans may also be available to support this type of project.

Measure: Divert Organic Waste into Waste-to-Energy Systems

Organic waste forms about 27 percent of the waste stream going to area landfills and comprises a key component driving methane generation from these facilities. There are at least 27 composting/ mulching facilities identified in the region across Collin, Dallas, Denton, Erath, and Tarrant counties, including large-scale commercial composters, municipal composting and mulching programs, and composting operations that are co-located at landfills. The EPA food waste pyramid prioritizes diversion to people, then animals, then energy generation, with composting as the last resource. While there are several active food waste gleaning operations, in recognition that not all waste is suitable for humans or animals, a recent study by the University of Texas at Arlington assessed feasibility of diverting organic waste to anaerobic digestion, as a waste-to-energy opportunity.⁷³

<p>Estimated Annual Greenhouse Gas Benefits:</p> <p>Approximately 85,052.84 metric tons depending on level of deployment</p> <p>Expected Community Benefits:</p> <p>Increased Resiliency and Adaptability; Job Creation and Economic Development, Other Benefits in Appendix 13</p> <p>Estimated Annual Criteria Pollutant Reduction:</p> <p>NO_x: Negligible</p> <p>VOCs: Negligible</p> <p>PM_{2.5}: Negligible</p>

Project: Implement Organic Waste to Energy Through Anaerobic Digestion

This project basically entails implementing the process piloted in the UTA Fuel to Energy study of identifying areas with high waste density (multiple restaurants or other food sources), arranging to collect that waste on a regular basis, and deliver to one or more wastewater treatment plants as part of the feed stock. Process adjustments may be required. Funding would support third-party contracts

⁷³ (Sattler. 2022. <https://www.nctcog.org/getmedia/1dff458f-1b49-4e3c-b8a2-58760589b601/North-Central-Texas-Organic-Waste-to-Fuel-Feasibility-Study.pdf>)

for the participating cities, to pick up commercial food waste. Alternatively, the proposed program can also include food waste collection sites throughout the region, where participants can drop off food waste for collection and delivery to the wastewater treatment facility by a selected service provider.

Other Available Funding:

Funding may be available through EPA Solid Waste Grants, as administered through TCEQ; other funding may be available from the U.S. Department of Energy; projects may qualify for public-private partnership; other funding may include establishment of a Special Waste District or use of General Obligation or Revenue-Based Capital Improvement bonds. Green Bank low-interest loans may also be available to support this type of project.

Measure: Divert Construction and Demolition Debris (C&D)

There is one construction and demolition debris (C&D) recycling facility in the region (Champion Waste & Recycling’s Town & Country Recycling facility in Celina), which opened in 2015 as a single-stream construction MRF in North Texas. The facility separates construction material using a combination of processing equipment and sorting labor. Materials recycled throughout the process include cardboard, wood, concrete, metal, plastics, wallboard, paper, and aluminum. In addition to the C&D MRF, there are several material-specific processors throughout the region processing materials such as concrete/aggregate and scrap metal. Disposal facilities in the region may manually sort mixed C&D loads to divert high-value materials such as scrap metal. The exact number of material-specific C&D recycling facilities in the region is unknown. Based on available data, in 2021, C&D recycling facilities recovered at least 1,110,000 tons of recyclables. Projects to help divert a greater percentage of inert C&D materials are measures to expand regional C&D material recycling sites, partner with construction companies to adopt low-waste construction techniques and adopt construction specifications to prioritize deconstruction and salvage over demolition practices, where feasible.

<p>Estimated Annual Greenhouse Gas Benefits:</p> <p>Negligible</p> <p>Expected Community Benefits:</p> <p>Increased Resiliency and Adaptability; Job Creation and Economic Development, Other Benefits in Appendix 13</p> <p>Estimated Annual Criteria Pollutant Reduction:</p> <p>NO_x: Anticipated, but not quantifiable</p> <p>VOCs: Anticipated, but not quantifiable</p> <p>PM_{2.5}: Anticipated, but not quantifiable</p>
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Key projects associated with this measure are:

Project: Expand Regional Construction Material Recycling Efforts

While several regional C&D efforts are in planning, thus far, there has not been sufficient funding identified to allow implementation. Expansion is anticipated to extend landfill life and help support more sustainable construction practices in the region. Funding would be used to expand the number and capacity of C&D recycling facilities to encourage greater diversion of this waste stream from the local landfills.

Project: Partner with Construction Companies that Prioritize Low-Waste Techniques into Their Projects

With the rise in local commercial and municipal commitments around net-zero carbon construction, there are related project requirements to increase the reuse of recycled materials, and to reduce ancillary construction waste. This project includes partnering with local construction companies and trade associations, such as contractors' associations, to prioritize low-waste construction techniques. The effort consists of accelerating acceptance of low-waste construction techniques through education, incentives, and partnerships, and continuing to pursue zero-landfill waste practices for all construction projects.

Project: Adopt Contract Requirements to Prioritize Deconstruction Methods Over Demolition Practices Where Feasible

With the rise in local commercial and municipal commitments around net-zero carbon construction, there are related project requirements to increase the reuse of recycled materials, and to reduce ancillary construction waste. This project includes developing and incorporating contract requirements to prioritize deconstruction methods over traditional demolition processes. While deconstruction may be more costly due to the time requirements to salvage materials; this process does result in a greater percentage of the materials being reused. The NCTCOG Public Works Council (PWC) provides continuing advice regarding the regionally adopted Public Works Construction Standards – North Central Texas, as well as such issues as managing right-of-way, regional pavement design guidance, and identifying subregional issues. The Construction Standards Subcommittee of the PWC Council and the Regional Codes Coordinating Committee may help implement this project.

Other Available Funding:

Funding may be available through EPA Solid Waste Grants, as administered through TCEQ; projects may qualify for public-private partnership; other funding may include establishment of a Special Waste District or use of General Obligation or Revenue-Based Capital Improvement bonds. Green Bank low-interest loans may also be available to support this type of project.

Measure: Upgrade Waste Disposal Facilities

Municipal Solid Waste (MSW) landfills in Texas are classified as either Type I or Type IV facilities: a Type I landfill can accept a range of putrescible (organic waste that decomposes) and non-putrescible wastes, including typical household and commercial wastes, brush, C&D, nonhazardous industrial solid waste, and other wastes (e.g., wastewater treatment plant sludge, special waste). A Type IV landfill only accepts brush, C&D debris, and other similar non-household or non-putrescible waste. There are presently 18

active Type I landfills (landfills that accept all types of MSW, including C&D materials and special waste) in the North Central Texas region, located among Collin, Dallas, Denton, Ellis, Johnson, Navarro, Parker, and Tarrant counties. An estimated 11 million tons of solid waste was disposed in Type I landfills in the region in 2020, and there is an estimated 377 million cubic yards of capacity remaining at these sites. This provides a remaining landfill life of about 27 years for the region (from 2020, so about 23 years from 2024). Given the typical time needed to appropriately site, design, permit, and construct MSW disposal facilities, time is of the essence. Additionally, a properly designed, state-of-the-art disposal facility can effectively operate as an in-situ bioreactor, allowing for material decomposition to enhance longevity of the facility, in addition to enhanced ability to collect and use the related landfill gases as renewable energy. Siting of any new facility will need to consider and effectively address the potential for LIDAC community impacts, however, there is also the potential to create local jobs.

Estimated Annual Greenhouse Gas Benefits:

122,992 metric tons depending on the level of deployment

Expected Community Benefits:

Improved Health and Well-Being; Increased Resiliency and Adaptability; Job Creation and Economic Development; Increased Awareness and Understanding, Other Benefits in Appendix 13

Annual Criteria Pollutant Reduction:

NO_x: Anticipated, but not quantifiable at this time.

VOCs: Anticipated, but not quantifiable at this time.

PM_{2.5}: Anticipated, but not quantifiable at this time.

Project: Implement Western Region Resource Management Center

While the North Central Texas region is experiencing disposal challenges as landfills in the region reach capacity and close, this challenge is more pronounced in the western region. The western region has an estimated 15 years of remaining capacity, with two major landfills having less than 10-year effective capacity.

NCTCOG, in coordination with the RCC, initiated the Western Region Solid Waste Capacity Study⁷⁴ in July 2020 and completed it in July 2021. The study's objective was to gain a better understanding of the long-term solid waste management needs in the western eight counties of the North Central Texas region, which consists of Erath, Hood, Johnson, Palo Pinto, Parker, Somervell, Tarrant, and Wise (hereafter referred to as the western region) and to determine potential opportunities to address future landfill capacity challenges.

⁷⁴ NCTCOG.2021. <https://www.nctcog.org/getmedia/7beb5bef-f78e-451e-9748-ac7b880b1d2a/Alternatives-Analysis-FINAL-9-8-21.pdf>

The eight-county western region generates approximately three million tons of municipal solid waste (MSW) per year. For the period from 2022 to 2042, an estimated 69.6 million tons of waste are projected to be generated if waste generation rates remain constant and the region grows in population as anticipated. This waste is processed at one of 24 recycling facilities or 13 mulch/compost facilities or landfilled at one of the five MSW or two C&D landfills. The five MSW landfills in the region have approximately 63 million tons, or 15 to 20 years, of remaining capacity. Most of this available capacity is at the Arlington Landfill in the extreme eastern part of the western region.⁷⁵

Based on the study's results, NCTCOG has undertaken steps to establish a Western Region Solid Waste Management Authority (WRSWMA) and coordinate efforts to establish needed disposal capacity in the region. A Policy Advisory Group (PAG), which includes representatives of communities in the six western-most counties in the region, meets to determine how to move forward with recommendations from the Western Region Study.⁷⁶

The Western Region Resource Management Center (WRRMC) is designed to provide NCTCOG's western region with critically needed solid waste management infrastructure that provides lasting environmental benefits and GHG mitigation. The WRRMC is specifically designed to provide local governments and businesses in the western region with (1) options to recover materials, including recyclables, construction debris, and organics; (2) provide the private sector with resources to develop emerging technologies designed to reduce waste; and (3) options for better managing waste generated. This project would provide a template for similar facilities in other locations.

Implementing the Western Regional Material Resource Management Center (WRMRMC) is the strong recommendation of this work group. This project includes siting, planning, design, permitting, and construction of a comprehensive material resource (waste) management facility to serve the needs of the rapidly developing western areas of the NCTCOG region. The project would incorporate compost operations, recycling, C&D diversion, and state-of-the-art disposal infrastructure that is designed to reduce wind-blown debris, as well as GHG emissions. GHG emissions and priority pollutants associated with cross-regional hauling to existing landfills will also be reduced through project implementation. Siting of any new facility will need to consider and effectively mitigate the potential for LIDAC community impacts, however, this project carries the strong potential for local job creation.

Project: Implement Landfill Gas Collection and Management Systems

There are presently several landfill gas-to-energy (LFGTE) projects at 10 landfills in the region, located among Collin, Dallas, Denton, Ellis, Johnson, and Tarrant counties. Half of these projects produce high-British thermal unit (BTU) Renewable Natural Gas (RNG) for distribution off-site and half are power generation electric. Based on data from the TCEQ MSW Annual Reports and the USEPA Greenhouse Gas Reporting Program, these projects result in more than half of the landfill gas collected in the region going to beneficial use through resource recovery (RSWMP, 2023). In 2021, resource recovery activities produced 255 gigawatt-hours of electricity for sale to the grid (Regional Solid Waste Management Plan Volume II Attachments, North Central Texas Council of Governments,

⁷⁵ <https://www.nctcog.org/getmedia/3cd0d323-1983-436d-940b-4aabc2247c3a/Final-Matrix.pdf>

⁷⁶ <https://www.nctcog.org/getmedia/7beb5bef-f78e-451e-9748-ac7b880b1d2a/Alternatives-Analysis-FINAL-9-8-21.pdf>

80 Burns & McDonnell). However, during development of the PCAP, several local municipalities have indicated the need to upgrade or augment existing systems, and the desire to install new systems in other landfills. The project includes implementation of new equipment, and/or upgrading existing equipment to optimize GHG diversion and reuse as renewable energy and to reduce the practice of GHG flaring.

Project: Utilize Efficient Landfill Seals and Cover

Landfill design, including performance-based seals and covers, are developed by professional engineers with waste management expertise, approved for this intended use by the permitting process through TCEQ, and installed by contractors, and municipal staff. Using efficient landfill seals and covers can help to prevent runoff from the landfill from entering the local environment, including sensitive water systems. Related issues may require appropriate permit compliance assistance.

Project: Consider Buffers and More Appropriate Zoning for Landfills Near Residential Areas

This project relates to implementing deed restrictions, or zoning changes, in areas zoned for industrial or landfill use near residential areas. Explore buffers to extend a safe distance from landfills and other toxic waste sites, particularly those near residential land uses. Implement organic or structural exposure reduction measures to reduce residential exposure. Consider implementing vegetative screening, berms, open green space, and other measures to mitigate potential human health exposures in areas with existing pollutant burden. This is an environmental justice concern for residents in areas impacted by existing landfills, and for strong consideration in the design of new facilities.

Other Available Funding:

Funding may be available through EPA Solid Waste Grants, as administered through TCEQ; projects may qualify for public-private partnership; tipping fees from landfills may help defray overall costs; other funding may include establishment of a Special Waste District, or use of General Obligation or Revenue-Based Capital Improvement bonds. Green Bank low-interest loans may also be available to support this type of project.

Measure: Implement Recycling and Transfer Facilities

In 2021, resource recovery activities in the region resulted in an estimated total of 4.1 million tons of recycling (including single-stream, organics, C&D, tires, HHW, industrial, and other materials) equivalent to an approximate 27 percent recycling rate. (Regional Solid Waste Management Plan Volume II Attachments, North Central Texas Council of Governments, 80 Burns & McDonnell). There are 11 active MRFs in the North Central Texas region within Collin, Dallas, Denton, and Tarrant counties. Across the North Central Texas region, there is a reported total of nearly 600,000 tons per year of MRF processing capacity currently installed. In 2021, MRFs in the region recovered an estimated 493,000 tons of single-stream recycling.

However, while the North Central Texas region includes an extensive network of many sophisticated facilities, the RSWMP concluded that the facilities overall are inadequate based on the changing landscape of solid waste management and resource recovery in the region. Additionally, as the population and economic activity continue to grow, coupled with increasing demand for diversion

programs, there will be an increased need going forward for all the related recycling facility types. The continued population growth of the region will further strain the materials management infrastructure and facilities in the region, including MRFs and organics processing facilities (e.g., composting/mulching facilities). The majority of MRFs currently operating in the region are at or near capacity, meaning there is significantly more material potentially available for processing from both residential and commercial sources than there is processing capacity. Increases in recycling participation (through expanded access in rural areas of the region and/or increased capture of material from established or new programs) could quickly exceed existing capacity. Further, the level of technology installed at MRFs in the region varies. While several of the MRFs have “state of the art” processing equipment, there are a few facilities that have older, less technologically advanced processing systems.

Measures to implement recycling and transfer facilities, including upgrading existing facilities to optimize load weights, constructing additional new recycling centers in the region, and constructing bulking transfer stations at existing landfills, are being included. These measures are anticipated to help reduce VMT by waste haulers, thus improving both GHG and priority pollutants and improve local waste management operational efficiency.

Estimated Annual Greenhouse Gas Benefits:

N/A

Expected Community Benefits:

Improved Health and Well-Being; Increased Resiliency and Adaptability; Other Benefits Detailed in Appendix 13

Estimated Annual Criteria Pollutant Reduction:

NO_x: Negligible

VOCs: Negligible

PM_{2.5}: Anticipated, but not quantifiable at this time.

Key projects associated with this measure are:

Project: Upgrade Existing Facilities to Optimize Load Weights

This project proposes operational improvements at existing transfer stations to optimize the time required for loading and unloading operations (along with truck emissions associated with idling during these efforts). Efforts to renovate existing transfer stations to re-configure them to better accommodate current equipment will help with operational station efficiency. This measure extends the useful life of existing transfer stations to reflect current and future loading and capacity needs.

Project: Construct Additional Recycling Centers in the Region

This project proposes constructing additional regional recycling centers to meet the area's existing and future needs. This measure is important towards meeting regional waste diversion goals, extending landfill life, and the public's desire to increase recycling options. While curbside recycling is available in some urban areas within the region, it is not universally available everywhere. Some residents travel more than 30 minutes to the closest recycling center. Providing more convenient recycling options can increase area diversion rates and reduce GHG emissions associated with residential haul to recycle.

Project: Construct Bulking Transfer Station at Landfills

This project enhances daily landfill operations by constructing a bulking station at the landfill entrance to bulk waste, thus optimizing trips from the entrance to the landfill face. It is estimated that, depending on average daily loading, this could reduce round trips by 2.5 to 3 times the current rate at some landfills. This operational element can reduce VMT at the landfill and thus reduce related GHG emissions and priority pollutants from the equipment.

Other Available Funding:

Funding may be available through EPA Solid Waste Grants, as administered through TCEQ; projects may qualify for public-private partnership; other funding may include establishment of a Special Waste District or use of General Obligation or Revenue-Based Capital Improvement bonds. Green Bank low-interest loans may also be available to support this type of project.

Measure: Improve Waste Collection

Waste collection is currently one of the most important, most challenging, and most maligned services in the region, with both municipalities and private vendors providing this service. Equipment, and form-based development codes make physical access by the equipment challenging. Projects to help improve efficiency in waste collection include expanding waste collection to multifamily facilities, implementing local policy to encourage effective route planning, and converting waste trucks to lower-emission vehicles.

Estimated Annual Greenhouse Gas Benefits:

1,500 metric tons depending on level of deployment

Expected Community Benefits:

Improved Health and Well-Being; Increased Resiliency and Adaptability; Job Creation and Economic Development; Increased Awareness and Understanding, Other Benefits in Appendix 13

Estimated Annual Criteria Pollutant Reduction:

NO_x: Anticipated, but not quantifiable at this time.

VOCs: Anticipated, but not quantifiable at this time.

PM_{2.5}: Anticipated, but not quantifiable at this time.

Key projects associated with this measure are:

Project: Expand Waste Diversion Collection Networks to Support Multifamily Dwellings

Over 50 percent of the regions’ residents reside in multifamily homes and some, but not all, facilities offer recycling and compost options. Providing compost and recycling services to multifamily facilities expands the potential to more fully capture this waste stream and helps to ensure equitable access to these services. Funding would be used to incentivize local waste management programs to extend services to multifamily facilities to support greater recycling and composting by residents.

Project: Implement Local Policy to Require Trip Planning to Reduce VMT from Waste-Hauling Processes

One of the challenges faced by many communities is that of providing timely efficient waste collection while juggling equipment, barriers to access, and other challenges. Many provide multiple trips per week to address solid waste, recycling and bulky items, and yard waste set-out. Enacting local policy to require trip planning by public and private haulers can support reduced VMT, thus reducing associated GHG emissions and priority pollutants from these processes. Trip planning may entail fewer routes, more efficient routes, and potential reduced route frequency as appropriate. This is a local policy decision that, if properly implemented, may save on fuel costs and VMT – but will require careful collaboration with stakeholders.

Project: Convert Waste Trucks to Lower-Emission Vehicles

This project would use grants from TCEQ’s Texas Emission Reduction Program, or similar programs, to purchase lower-emission waste hauling vehicles and replace existing waste trucks with lower-emission vehicles like those using RNG. Note that this project, and associated emission reductions, is included under a Transportation Measure for “Clean Vehicle & Equipment Program.”

Other Available Funding:

Funding may be available through EPA Solid Waste Grants, as administered through TCEQ; projects may qualify for public-private partnership; other funding may include establishment of a Special

Waste District or use of General Obligation or Revenue-based Capital Improvement bonds. Some improvements may be possible to implement using local budget outlays. Green Bank low-interest loans may also be available to support this type of project.

Agriculture, Forestry, and Land Use (“AGFOLU”) Sectors

The benefits of conserving, preserving, protecting, and expanding our natural world are increasingly recognized as critical to local resilience, supporting a wealth of ecologically important services to the region. NCTCOG and collaborating agencies have developed this list of measures to comprehensively improve Agriculture, Forestry, and Green Space Land-Use sectors in North Central Texas as an important way of effectively increasing green space, local food production, and residuals management associated with agriculture, and the air quality improvements, public health benefits, flood-pulse reduction, heat island reduction, and carbon sequestration through trees, native grasses, and other green space elements associated within these sectors. Ancillary measures around park acquisition and maintenance and related codes and zoning are also included. These measures will reduce both GHGs and criteria pollutants, primarily through ongoing carbon sequestration within the more natural environment.

Implementing the measures in this section is very much a multi-disciplinary effort that incorporates efforts within the Water Resources Council, Natural Resources Program, Public Works Council, Regional Codes Coordinating Council, and Center for Development Excellence program areas at NCTCOG (in addition to the previously mentioned sustainability measures included in transportation programs).

- **WRC:** As described above, the WRC advises on both technical and policy issues related to water resources matters. The WRC also oversees the Texas Water Development Board water resources and flood management planning processes, and performs technical review of water-related grant applications. Two recent efforts include the Water Quality Management Grant that supports NCTCOG efforts around water quality compliance, including local coordination around urban forestry efforts, and the Region 3 Flood Management Program Grants that include a project to allow comprehensive green space planning in Region 3 that covers north Texas.
- **Center for Development Excellence:** NCTCOG, together with private and public partners, works to help create a sustainable North Texas that is recognized nationwide as a center of development excellence. The Center for Development Excellence is for North Texas to be a region where residents, businesses, and visitors enjoy a built environment that creates a true sense of place; uses water, energy, and environmental resources effectively and efficiently; protects a diversity of habitats; reduces vehicle miles traveled; and supports public health and quality of life.
- **Public Works Council:** PWC supports the region on a wide range of local public works issues. For example, the PWC provides continuing advice regarding the Public Works Construction Standards – North Central Texas, as well as such issues as managing right-of-way, comprehensive and consistent stormwater management through iSWM, and implementing regional pavement design guidance, as well as other identified subregional issues. Two PWC subcommittees are actively involved with measures in this section of the plan:
 - **Sustainable Public Rights-of-Way (SPROW):** This PWC subcommittee supports efforts around sustainability issues associated with public works infrastructure. The goals of the program are to compile best practices for sustainable public rights-of-way, review real examples of best practices within the region, and share them. The goals of SPROW are to improve infrastructure within public rights-of-way, including, but not limited to:
 - Promote multimodal forms of transportation.
 - Improve air and water quality.

- Provide walkable communities.
- Provide safer and healthier neighborhoods, improving quality of life.
- Improve infrastructure life cycle and performance.
- Streamline construction.
- Ensure regulatory compliance.
- Promote economic development.
- Promote integration of rights-of-way and surrounding land use.
- Promote context-sensitive design.
- Balance environmental, scenic, aesthetic, cultural, and natural resources, with community and transportation needs.
- **Integrated Stormwater Management:** As described above, the iSWM Program (<https://www.nctcog.org/envir/public-works/iswm>) is a cooperative initiative aimed at developing guidelines for more sustainable construction and development to guide cities and counties to achieve goals of water quality protection, streambank protection, and flood mitigation. This program has been supporting implementation of low-impact design and nature-based solutions in the NCTCOG region for over 15 years.
- **Regional Implementation of Sustainability Efforts Coalition (RISE):** As described above, the RISE Coalition continues to coordinate and collaborate around shared sustainability goals such as completing the initial regional GHG Emissions Inventory that forms the basis of this plan.
- **Regional Codes Coordinating Council (RCCC):** The **Regional Codes Coordinating Committee** has been in place since 1967 and provides ongoing expertise relating to building construction and the standardization of regional building codes. Code-related efforts include regular review and update to the Building and Residential, Electrical, Energy and Green Construction, Fire, and Plumbing and Mechanical codes. Several codes and ordinances have been identified in this PCAP that may require review and input from the RCCC.

These sectors also invoke enormous current interest from the public, governmental agencies, non-governmental organizations, educational institutions, and numerous private trusts, businesses, and foundations. NCTCOG anticipates building upon and continuing to collaborate with recent and related efforts by the Trust for Public Lands, The Nature Conservancy, The Texas Trees Foundation, Constellation Project, Dallas Innercity Growers (DIGS), and many others.

- **Trust for Public Land:** The local office of the Trust for Public Land has been working with several cities in the region to implement green space under an equity lens, so that a higher percentage of all residents have a park, trail, or green space within one-half mile of their home. The TPL project along Five Mile Creek Greenbelt,⁷⁷ in particular, includes riparian restoration, park development, 17 miles of trail in an area with limited recreation, and green space preservation, showing how it is possible to connect communities. The Smart Cities Decision Tool⁷⁸ provides insights on where additional green space can be used to reduce heat island impacts, provide additional hydrologic storage, and connect communities. TPL worked with Fort Worth to identify a Conservation Plan⁷⁹ to preserve critical green space. Additionally, they have developed a park score⁸⁰ for most major cities in Texas that can be used to identify optimal park space moving forward.

⁷⁷ <https://www.tpl.org/our-work/five-mile-creek-greenbelt>

⁷⁸ https://web.tplgis.org/Smart_Growth_Dallas/

⁷⁹ <https://www.fortworthtexas.gov/departments/tpw/stormwater/open-space>

⁸⁰ <https://www.tpl.org/parkscore/rankings>

- **The Nature Conservancy:** The Nature Conservancy (TNC) has been working with NCTCOG for several years in support of greater adoption of nature-based solutions such as iSWM, and Low Impact Development (LID) projects. TNC was a partner with TPL on the Five Mile Creek Project and others. A recent effort included storm system modelling to demonstrate to local officials that Green Stormwater Infrastructure⁸¹ could effectively augment grey to ameliorate local flooding from the increased rainfall intensities due to climate change. Lastly, they are currently working under contract with the Texas Water Development Board,⁸² along with Freese & Nichols, to develop a set of standards to guide nature-based solution implementation in Texas.
- **Texas Trees Foundation:** The Texas Trees Foundation has also been actively working throughout the region to advance a cooler, greener landscape in North Texas. Efforts include, but are not limited to, the Dallas Heat Island Study;⁸³ efforts to transform the Southwest Medical District;⁸⁴ the Cool Schools Program;⁸⁵ the Dallas Tree Equity;⁸⁶ and mapping efforts and Urban Forest Master Plans for the cities of Argyle,⁸⁷ Dallas,⁸⁸ Denton,⁸⁹ Fort Worth,⁹⁰ Mesquite,⁹¹ and Rowlett.⁹² Additional Forest Plans have been developed for the University of North Texas (UNT), Southern Methodist University (SMU), and Abilene Christian University campuses. Lastly, considering pending compliance concerns around particulate pollution, the Particulate Matter Filtration by Urban Vegetation Study⁹³ demonstrates how vegetation can help mitigate related public health concerns.
- **Constellation of Living Memorials Project:** The Constellation of Living Memorials⁹⁴ project is a 5013(c) nonprofit that is working with community members to revive historic and forgotten cemeteries by removing invasive non-native vegetation and re-wilding with native plants to create wildlife havens and conserve these historic properties at the same time. They are completing a pilot project with eight cemeteries in Dallas and hope to expand the program regionally to other historic cemeteries.
- **Dallas Inner-city Growers (D.I.G.S.):** The Dallas Inner-City Growers⁹⁵ is a public-private organization that is convened to coordinate area implementation of the efforts under the City of Dallas Comprehensive Urban Agriculture Plan.⁹⁶ This plan includes documentation of optimal growing sites in Dallas that may be considered for agricultural uses.

Appendix 14: DFW AQIP-Agriculture, Forestry, and Land-Use (“AGFOLU”) Measures contains a full list of measures and projects, feedback received from surveys described in **Section 1: Regional Engagement**, and information on air quality and community benefits.

⁸¹ <https://www.nature.org/content/dam/tnc/nature/en/documents/GSIanalysisREVFINAL.pdf?vu=dallasgsi>

⁸² <https://www.twdb.texas.gov/flood/research/Nature-based-Solutions-2022/index.asp>

⁸³ <https://texastrees.org/urban-heat-island-management-study/>

⁸⁴ <https://www.texastrees.org/wp-content/uploads/2019/07/SWMD-Final-Project-Book-2016.pdf>

⁸⁵ <https://texastrees.org/cool-schools/>

⁸⁶ <https://texastrees.org/dallas-tree-equity-planting-map/>

⁸⁷ https://www.texastrees.org/wp-content/uploads/2019/07/Argyle-Report_Final-1.pdf

⁸⁸ https://www.texastrees.org/wp-content/uploads/2021/07/TTF_UFMP2020_05-30-21_MECHANICAL_spreads.pdf

⁸⁹ <https://www.texastrees.org/wp-content/uploads/2019/07/2016-State-of-the-Denton-Urban-Forest.pdf>

⁹⁰ <https://texastrees.org/fortworthufmp/>

⁹¹ <https://www.texastrees.org/wp-content/uploads/2019/07/2012-Mesquite-Eco-Study.pdf>

⁹² <https://www.texastrees.org/wp-content/uploads/2019/07/2018-Rowlett-Eco-Report.pdf>

⁹³ https://texastrees.wpengine.com/wp-content/uploads/2023/05/Texas-Trees-Report_02Mar2023-1-1.pdf

⁹⁴ <https://www.constellationoflivingmemorials.org/>

⁹⁵ <https://digsummit.org/>

⁹⁶ https://www.dallasclimateaction.com/files/ugd/349b65_f635d04a85974466bc9b7f5e281cf896.pdf

Program areas under the “AGFOLU” Sector include Green Space/Land Use, Forestry, Agriculture, and Regional Codes.

Program Area: Green Space and Land Use

As the DFW region develops, available green space becomes a premium, particularly when faced with competing local concerns of drainage, parks, local agriculture, economic development, and housing. There is a prevailing mindset that there is “developed” and “vacant land” that is yet to be developed. As more communities struggle with the costs of and need for additional drainage infrastructure required to offset the increased runoff from that development, there is a greater understanding that more green space needs to be preserved to slow the increased urban flood response and make the community more resilient to flooding. Moving forward, there is a strong need for effective land use planning, particularly as it relates to strategic placement of greenspace.

Existing related NCTCOG programs that address these issues include the Development Excellence Program, and the Sustainability Program. Increasingly, project development efforts at NCTCOG involve collaboration between the Transportation, Economic Development, and the Environment and Development Departments to better integrate these efforts moving forward. Measures under this program area include efforts to promote the expansion of green space, and those related to park and green space maintenance.

Measure: Promote the Expansion of Green Space

Open spaces, including parks, urban forests, wetlands, and prairies, can deliver multiple benefits, including reducing the urban heat island effect, improving air and surface water quality, sequestering carbon, and managing flooding, as well as providing habitat benefits to urban and migrating species in the form of habitat protection and diversity. Ecosystem health, in turn, protects human health by providing benefits like activities to reduce stress and increase mental and physical wellness. Projects to help expand greenspace include development of a Comprehensive Greening Plan, incentivizing green space on commercial property, installing minimally resource intensive landscape design, preserving and re-wilding historic cemeteries, upgrading governmental buildings to utilize biophilia by adding green walls, rooftops, and other site surfaces, increasing green neighborhood spaces, and acquiring/preserving high quality green space.

Estimated Annual Greenhouse Gas Benefits:

4,666.09 metric tons depending on level of deployment

Expected Community Benefits:

Increased Resiliency and Adaptability; Green Spaces and Community Beautification; Improved Health and Well-Being; Additional Benefits in Appendix 14

Estimated Annual Criteria Pollutant Reduction:

NO_x: Negligible

VOCs: Negligible

PM_{2.5}: Anticipated, but not quantifiable at this time.

Key projects associated with this measure are:

Project: Comprehensive Regional Green Space Project

This project reflects a collaborative regional effort by public, nonprofit, and private partners to develop a plan to significantly increase green space within the region, providing associated drainage, air quality, carbon sequestration, aesthetics, and public health benefits. This project entails applying for the TWDB Grant to perform the identified green space planning project from the State Flood Management Plan Region 3 sector. This planning effort would use the above-referenced prior green space planning and identification efforts to establish the overall parameters and priorities for site acquisition, conservation, preservation, and protection. Additional funding would be used to purchase areas to protect, enhance, and create green space to support healthy prairie, riparian, road rights-of-way, agricultural, historic cemeteries, parklands, and other locally appropriate vegetation, including plant nurseries and planting materials, necessary access controls and site security, and the initial irrigation infrastructure necessary to establish plant materials.

Project: Develop Financial Incentives for Commercial Property Owners to Maintain or Create Green Space

Provide tax rebates, density/height allowances, green-lined approvals, or other incentives to businesses who develop/maintain green spaces on their property. This may be similar to the “Greening Factors”⁹⁷ efforts currently under consideration by the Dallas Zoning Advisory Committee that are being used to incentivize reduced onsite parking minimums. Because more facilities are adopting Environmental-Social- Governance goals as part of their portfolio, this may serve as an additional impetus for reserving onsite greenspaces on commercial property.

⁹⁷

https://dallascityhall.com/departments/sustainabledevelopment/planning/DCH%20Documents/code%20amendments/parkin%20code/Design%20Standards%20Options_Case%20Report_ZOAC_2021.8.12_ZOAC_Final.pdf

Project: Install Minimally Resource-Intensive Landscape Design

Update landscaping to increase the amount of drought-tolerant, low-maintenance landscaping versus high-intensity turf or maintenance-intensive species, which is addressed in Water Conservation defined measures. Funding would be used to incentivize landscape makeovers.

Project: Preserve and Rewild Historic Cemeteries

This project builds on the work of the Constellation Project: Implement Program with public, private, and neighborhood community partners to restore historic cemeteries by removing invasive species and planting native drought-tolerant species as a way of preserving history and enhancing and protecting local green spaces. This project is particularly important for implementation in LIDAC communities.

Project: Upgrade Governmental Buildings to Utilize Biophilia Through Green Walls, Rooftops, and other Site Surfaces

Biophilic design is a design concept used within the building industry to increase occupant connectivity to the natural environment. It is the practice of integrating natural elements and processes into the built environment and communities. Funding would support projects that implement planted surfaces and support water irrigation systems to promote a greener built environment. This project provides funding for design, implementation, and initial care to ensure plant establishment.

Project: Increase Neighborhood Green Space

Incentivize local planting by providing rebates and other incentives to residents to plant trees and other vegetation. This would help to green up neighborhoods located in or near urban heat islands, or in areas identified in the Texas Trees Tree Equity Plan as needing additional tree canopy.

Project: Acquire/Preserve High-Priority Greenspace

Support land acquisition and the development of land management plans, and support ecosystem restoration projects. These efforts follow the above Comprehensive Green Space Plan to preserve high-priority greenspace that establishes effective wildlife corridors, supports pollinators, and provides a broad range of ecological services. This may use a combination of public, nonprofit, and other funding.

Other Available Funding:

Funding may be available through EPA Environmental Justice or Community Grant funds. The Texas Water Development Board (TWDB) may offer competitive grants through either the State Water Infrastructure Fund of Texas (SWIFT), or the Flood Infrastructure Funds (FIF). Both grant programs include measures for planning and both rural and urban flood abatement. It is noted that the State Flood Management Plan for Region 3 includes a project for green space planning that may support projects and follow-on actions in this plan. Private organizations and/or foundations may partner for these types of projects, particularly to protect and preserve property providing prime habitat. Other funding may include the use of General Obligation or Revenue-Based Capital Improvement bonds.

Some improvements may be possible to implement using local budget outlays. Green Bank low-interest loans may also be available to support this type of project.

Measure: Support Park Management and Maintenance

While parks and greenspace are popular and necessary for healthy community support, funding to support ongoing park management and maintenance is sometimes a challenge. Funding would be used to develop parks and recreation plans to increase the acreage of parkland per resident. By using other funds for park acquisition and planning, the base budget can be freed up to support an appropriate level of management and maintenance of these properties. Projects include municipal park and recreation plan development and lawn care equipment replacement.

Estimated Annual Greenhouse Gas Benefits:

36.3 metric tons depending on level of deployment

Expected Community Benefits:

Increased Resiliency and Adaptability; Green Spaces and Community Beautification; Improved Health and Well-Being; Reduced Costs; Reduced Noise Pollution; Increased Access to Service and Amenities; Additional Benefits in Appendix 14

Estimated Annual Criteria Pollutant Reduction:

NO_x: 0.014

VOCs: Negligible

PM_{2.5}: Anticipated, but not quantifiable at this time.

Key projects associated with this measure are:

Project: Municipal Park and Recreation Plan Development

While parks and greenspace are popular and necessary for healthy community support, funding to support ongoing park management and maintenance is sometimes a challenge. Funding would be used to develop parks and recreation plans to increase the acreage of parkland per resident.

Project: Lawn Care Equipment Replacement Program

The project supports replacing gas powered lawn equipment with electric and battery powered models for municipal Parks and Recreational Departments. This effort reduces noise exposure, particulates, petroleum aerosols, and other pollutants associated with this equipment. Adopting electric landscape equipment reduces potential health risks associated with operating this equipment that may affect both the operator and any adjacent community members.

Other Available Funding:

Funding may be available through EPA Environmental Justice, or Community Grant funds. Private organizations and/or foundations may partner for these types of projects, particularly to protect and preserve property providing prime habitat. Other funding may include the use of General Obligation or Revenue-Based Capital Improvement bonds. Some improvements may be possible to implement using local budget outlays. Green Bank low-interest loans may also be available to support this type of project.

Program Area: Forestry

North Texas is blessed with an impressive, yet underappreciated, resource in its trees, forests, and greenspace, known collectively as the urban forest. The urban forest is a capital infrastructure asset and, like any other capital infrastructure asset, requires management and sustained action to maintain value. However, unlike most other capital assets, the forest's value increases over time, returning on average \$2.25 dollars per dollar spent.⁹⁸ These benefits include cooling, hydrologic improvement, air and water quality regulation, improved human health and well-being, and ecological habitat services. As summarized above, there are numerous stakeholders in the North Central Texas forest ecosystem. Coordinating urban forest actions is included in the NCTGOG Water Quality Management Grant from TCEQ. The primary measure in this sector is to increase the amount of forest canopy (cover) across the metroplex.

Measure: Increase Forest Canopy

Because of the multiple benefits that a healthy tree canopy can provide, there is extraordinarily strong local interest in maintaining and expanding tree canopy within the region. As noted above, there are multiple public, private, and non-governmental entities actively working to expand tree coverage in the region. This measure's efforts are based on the extensive foundational work in this area by the Texas Forest Service, local municipalities and water districts, and the Texas Trees Foundation. Assuming ongoing implementation within the current area Urban Forest Master Plans, additional projects to help increase the forest canopy in the region include developing tree canopy assessments, establishing tree canopy goals and benchmarks, and developing an urban forestry floodplain and floodway initiative to enhance and protect riparian areas of the Trinity River system.

⁹⁸ <https://texastrees.org/dallas-urban-forest-master-plan/>

Estimated Annual Greenhouse Gas Benefits:

6.07 metric tons depending on level of deployment

Expected Community Benefits:

Increased Resiliency and Adaptability; Green Spaces and Community Beautification; Improved Health and Well-Being; Reduced Costs; Other Benefits in Appendix 14

Estimated Annual Criteria Pollutant Reduction:

NO_x: Negligible

VOCs: Negligible

PM_{2.5}: Anticipated, but not quantifiable at this time.

Project: Establish Tree Canopy Goals and Benchmarks

With the baseline tree canopy established, considering ecosystem biomes, tree equity, and urban heat island challenges, tree canopy goals and benchmarks can be established. This provides a good foundation for local municipal and other planning to expand, implement, and maintain the local urban canopy. Funding supports municipal forest canopy planning and implementation efforts to include plant materials, planting, irrigation, and tree maintenance over a limited time.

Project: Develop Urban Forestry Floodplain and Floodway Initiative

Protecting a healthy riparian area along the Trinity River mainstem and tributaries is critical to maintaining water quality, providing effective flood conveyance, moderating local temperatures, and providing critical habitat for a multitude of local species. The local cities and water districts have an interest in developing a comprehensive urban forestry floodplain and floodway initiative to develop a comprehensive way of addressing the important riparian areas and wetlands along the Trinity River corridor. Funding would support development of the Trinity River Floodway Management Area Plan and would advance riparian and wetland planting across the metroplex within publicly held lands. This effort includes, but is not limited to, the Dallas Floodway Extension and Great Trinity Forest operations and maintenance plan updates.

Project: Develop Tree Canopy Assessments

Developing an updated urban tree canopy assessment can help establish priorities and goals for implementing a comprehensive effort towards expanding the canopy and, more critically, towards effectively managing this important natural resource. Texas Trees Foundation initiated a tree canopy assessment in 2018 as part of the Urban Tree Canopy Assessment Update.⁹⁹

⁹⁹ <https://toolkit.climate.gov/tool/urban-tree-canopy-assessment>

Exhibit 29, as excerpted from the Dallas Urban Forest Master Plan,¹⁰⁰ shows overall existing canopy across the metroplex at about 28 percent, with significant variance between local cities in the DFW region. There is also a comparison of Dallas with other national cities. To address local development and other changes in the canopy since this estimate was developed, this project updates this canopy assessment to the level necessary to support regional planning to grow the local canopy, particularly considering equity and heat island impacts.

Urban tree canopy assessments can aid local cities in developing an effective tree inventory, a critical step in effective urban forest management planning. Funding would include resources for field assessment and software purchases to make inventory building easier.

Other Available Funding:

Funding may be available through EPA Environmental Justice or Community Grant funds. The USDA may have funds that could be used for these purposes. The Texas Water Development Board (TWDB) may offer competitive grants through either the State Water Infrastructure Fund of Texas (SWIFT) or the Flood Infrastructure Fund (FIF). Both grant programs include measures for planning both rural and urban flood abatement. It is noted that the State Flood Management Plan for Region 3 includes a project for green space planning that may support projects and follow on actions in this plan. Private organizations and/or foundations may partner for these types of projects, particularly to protect and preserve property providing prime habitat. Other funding may include the use of General Obligation or Revenue-Based Capital Improvement bonds. Some improvements may be implementable by using local budget processes. Green Bank low-interest loans may also be available to support this type of project. With quantification of the urban forest timber assets and documentation of appropriate management of these critical assets, funding for ongoing forest management may be available through public-sector focused carbon banks.

¹⁰⁰ TTF. 2021. https://www.texastrees.org/wp-content/uploads/2021/07/TTF_UFMP2020_05-30-21_MECHANICAL_spreads.pdf,

Exhibit 29: Comparative Urban Tree Canopy Information



Program Area: Agriculture

The North Texas region is increasingly at risk for more severe and frequent wildfires, droughts, floods, freezes and tornados. These events will disrupt crop production on conventional farms and in food supply chains from other food-producing locations that are also facing these threats. Additionally, extreme weather events, such as winter storm Uri in 2021, illustrate just how vulnerable the Texas food system is to dangerous weather events. These risks, along with supply chain shocks, point to the need to increase and diversify the sources of local food production, including both local commercial and community efforts. The USDA funds several different programs that can support traditional and urban agriculture. For this planning effort, the focus in the agriculture sector is a measure that focusses on updating current agricultural management practices.

Measure: Update Agricultural Management Practices

When the increased risk of extreme weather events is combined with supply chain issues, and fiscal challenges such as the rise in energy and other costs, are considered, there is a strong need for local government to support agriculture in streamlining operations and enhancing local food production. As identified by local communities, the agriculture measure in this plan focuses on projects that can update agricultural management practices that can reduce methane, electrify pumps used for farm applications, and expand urban growing opportunities.

Estimated Annual Greenhouse Gas Benefits:

20.11 metric tons depending on level of deployment

Expected Community Benefits:

Increased Resiliency and Adaptability; Improved Health and Well-Being; Water Conservation; Reduced Costs; Increased Awareness and Engagement; Green Spaces and Community Beautification

Estimated Annual Criteria Pollutant Reduction:

NO_x: Negligible

VOCs: Negligible

PM_{2.5}: Negligible

Projects under this measure include:

Project: Implement Manure and Livestock Management to Reduce Methane

Nationally, livestock form about 43 percent of the GHG emissions¹⁰¹ associated with agriculture, and both the US Dairy Council¹⁰² and the EPA¹⁰³ have developed opportunities for reducing methane from livestock sources. There are several common manure management practices that can reduce methane emissions, including anaerobic digestion as a wet method, and dryer methods that can sequester carbon. Current manure management practices consider impacts on GHGs (such as nitrous oxide) or sinks (such as carbon sequestration). In general, liquid manure management systems lead to anaerobic conditions and increased methane production, and switching to practices that manage manure in drier, aerobic conditions reduces methane emissions. Funding will be used to integrate anaerobic digester systems, and other techniques as appropriate into current agricultural practices.

¹⁰¹ <https://cfpub.epa.gov/ghgdata/inventoryexplorer/#agriculture/entiresector/allgas/category/current>

¹⁰² <https://nationaldairyfarm.com/wp-content/uploads/2018/10/ES-Reference-Manual.pdf>

¹⁰³ <https://www.epa.gov/agstar/practices-reduce-methane-emissions-livestock-manure-management#:~:text=In%20general%2C%20liquid%20manure%20management%20systems%20lead%20to,manure%20in%20drier%2C%20aerobic%20conditions%20reduces%20methane%20emissions.>

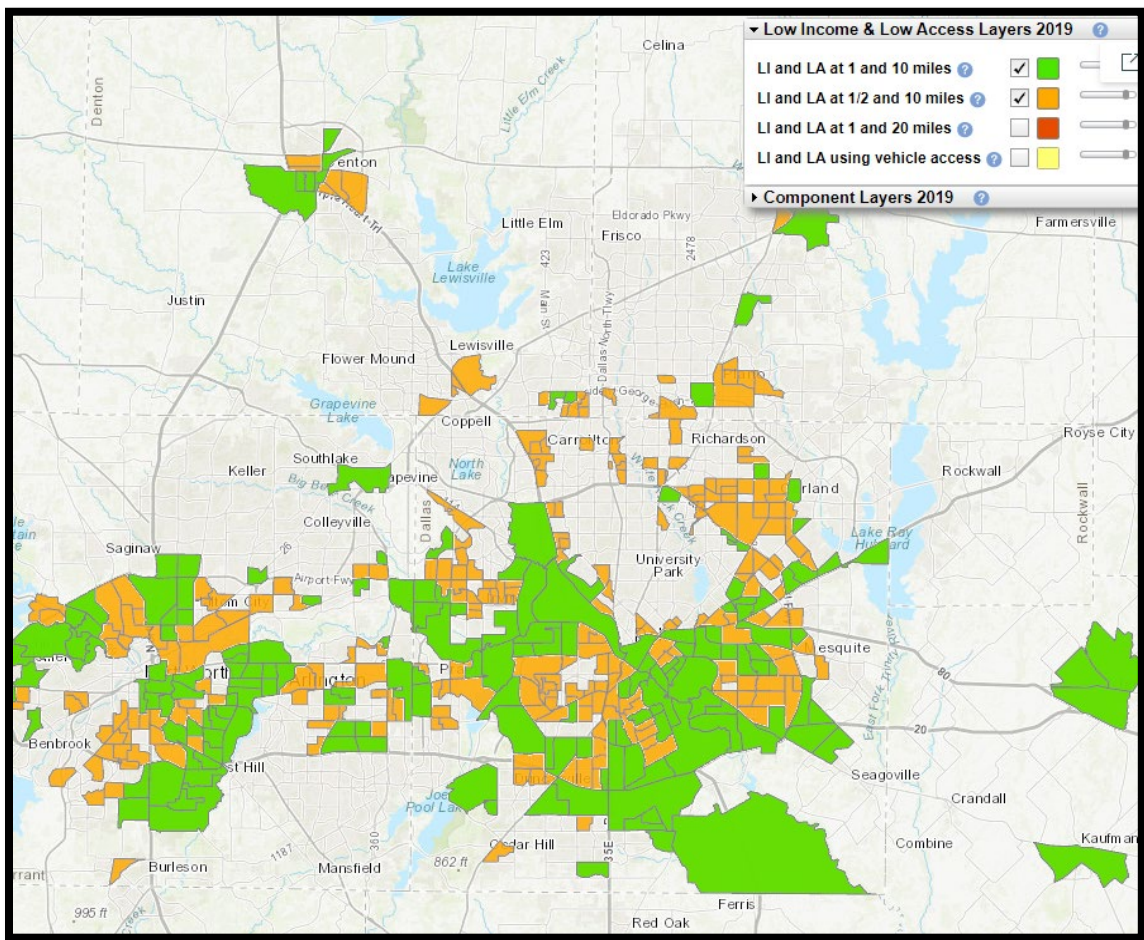
Project: Electrify Irrigation and Other Farm Equipment

Most irrigation and other farm equipment is currently powered by diesel or propane. This project supports converting this equipment to electric irrigation pumps in large landscaping operations (golf course, etc.) and farms, as appropriate.

Project: Increase/Promote Neighborhood and Community Growing Practices

While the NCTCOG region includes all forms of agricultural practice, the local average distance from farm-to-table is about 2,500 miles, as the dominant sources for food come from out of state. **Exhibit 30** is from the 2019 USDA Mapping of Low-Income households with Low Access to Food, showing large portions of the metroplex that may be at risk for food accessibility.

Exhibit 30: USDA Regional Mapping of Low-Income Areas with Limited Food Access¹⁰⁴ (2019)



This project supports local efforts to address food vulnerability, as well as the emissions associated with food transport, by increasing and promoting neighborhood and community growing practices,

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<https://gisportal.ers.usda.gov/portal/apps/experiencebuilder/experience/?id=a53ebd7396cd4ac3a3ed09137676fd40&page=Introduction>

particularly in underserved areas with food accessibility challenges. This project supports the planning, implementation, operation, and maintenance of urban agriculture, including commercial growing, community gardens, and other local efforts to boost resilience of local food supply. This effort includes promotion of community selling at farmers markets and opening commercial markets to local growers once sufficient supply is attained.

Other Available Funding:

Funding may be available through EPA Environmental Justice or Community Grant funds, through EQIP: Environmental Quality Incentives Program, USDA Rural Development Programs, Clean Water State Revolving Funds (CWSRF), and U.S. Department of Energy grants. These grant programs include measures for planning and implementing both traditional rural and urban agricultural projects. Some improvements may be possible to implement using local budget outlays. Green Bank low-interest loans may also be available to support this type of project.

Program Area: Regional Codes

Zoning codes and regulations are established by local governments to guide land use and development within specific areas. These laws help maintain the character and functionality of communities and protect the interests of property owners and the public. Periodically, as land use priorities and prevailing views on the built landscape change, these codes and regulations are updated to reflect these changes. Since 1967, the NCTCOG RCCC has worked as a group composed of local government officials, architects, engineers, contractors, educators, property management professionals, insurance representatives, builders, and developers to develop these regular regional code updates. With a better understanding of the critical environmental services that green spaces, including parks, trees, prairies, grasslands, and forest provide in an urban setting, consideration of appropriate updates to these codes to promote green space conservation and preservation is warranted, to support many of the projects in this PCAP. The only measure in this sector is that effort to update codes and zoning regulations to promote green space preservation and preservation.

Measure: Update Codes and Zoning Requirements to Promote Green Space Conservation and Preservation

Projects to update the codes and zoning requirements to promote green space conservation and preservation include integrating air quality reviews into zoning and permit review process, updating landscaping ordinances and other requirements, adopting tree ordinances that promote urban forestry in the built environment, and utilizing Smart Growth and/or transect-based codes to promote incorporating environmental analyses into the development process.

Estimated Annual Greenhouse Gas Benefits:

Anticipated, as these updates support other plan measures, but not independently quantifiable

Expected Community Benefits:

Green Spaces and Community Beautification; Increased Resiliency and Adaptability

Estimated Annual Criteria Pollutant Reduction:

NO_x: Anticipated, but not quantifiable at this time

VOCs: Anticipated, but not quantifiable at this time

PM_{2.5}: Anticipated, but not quantifiable at this time.

Project: Integrate Air Quality Review into Zoning and Permitting Review

Through integrating air quality review into zoning and permitting review, the region can integrate climate mitigation and adaptation into existing land development review and permitting processes, with a end goal of maximizing the benefits of natural geographic and watershed features.

Project: Update Landscaping Ordinances/Requirements

Many local development codes and ordinances contain outdated requirements around turf-based residential landscaping. Additionally, there are minimal requirements to protect and conserve trees and other native vegetation. This project is basically one of updating codes and ordinances, to allow greater use of the NCTCOG-promoted Smart-scape™ principles.¹⁰⁵ Updating zoning and landscaping requirements to remove barriers to installing xeriscaping and other low-maintenance landscapes (e.g., relax height restrictions on turf grasses), can help to encourage the use of more drought-tolerant plants and pollinator-friendly plants.

Project: Adopt Tree Ordinances that Promote Urban Forestry in the Built Environment

Many local development codes and ordinances contain outdated requirements around turf-based residential landscaping, and limited measures to protect existing trees and other vegetation. This project is basically one of updating codes and ordinances, to promote urban forestry in the built environment. Tree ordinances can set standards for tree planting, care, preservation, and maintenance to ensure longevity in the developed environment. Additionally, such ordinances can include measures to protect existing established trees.

¹⁰⁵ [North Central Texas Council of Governments - Texas SmartScape \(nctcog.org\)](https://www.nctcog.org/)

Project: Utilize Smart Growth and/or Transect-Based Codes to Promote Environmental Analysis in Development

This project recommends revising existing codes as necessary to utilize Smart Growth methodology. Smart Growth and transect-based codes allow communities to incorporate environmental considerations into the development process, while separating new development from Euclidean-type zoning codes.

Euclidean zoning is a zoning system where a town or community is divided into areas where specific uses of land are permitted. The system is based on the separation of land uses by type such as residential, commercial, retail, industrial, etc. Euclidean zoning is the most common form of zoning in the United States, including the NCTCOG region. That said, it does not necessarily allow for multi-use land uses such as street-level commercial units with upstairs residential units.

Transect codes are rooted in the physical form of both built and natural environments. They organize elements of urbanism – such as buildings, lots, land use, and streets – along a continuum from less intense (rural) to high intensity (urban). Transect-based codes seek to promote connectivity rather than separation by land use type. This type of zoning may make sense for a community that is developing into a new urban landform from formerly rural land use types.

Smart Growth evolved out of transect codes as an overall approach of development and conservation strategies that can help protect our health and natural environment and make our communities more attractive, economically stronger, socially diverse, and resilient to climate change. Based on the experience of communities around the nation, the Smart Growth Network¹⁰⁶ developed a set of 10 basic principles to guide smart growth strategies:

- Mix land uses.
- Take advantage of compact building design.
- Create a range of housing opportunities and choices.
- Create walkable neighborhoods.
- Foster distinctive, attractive communities with a strong sense of place.
- Preserve open space, farmland, natural beauty, and critical environmental areas.
- Strengthen and direct development towards existing communities.
- Provide a variety of transportation choices.
- Make development decisions predictable, fair, and cost effective.
- Encourage community and stakeholder collaboration in development decisions.

Adopting these zoning methods can help with implementing denser, more climate-resilient communities moving forward. The project would need funds to engage certified planners with both rural and urban experience to help develop a model code for local consideration by the region's cities and towns.

¹⁰⁶ <https://www.epa.gov/smartgrowth/about-smart-growth>

Other Available Funding:

Most of the projects identified in this measure can be implemented through coordination of the RCCC with the participating cities and affected stakeholders. No additional costs outside of regular salaried public staff are anticipated.

Cross-Sector Measures

Several initiatives span across multiple sectors. **Appendix 15: DFW AQIP- Cross-Sector Measures** contains a full list of measures and projects, feedback received from surveys described in **Section 1: Regional Engagement** and information on air quality and community benefits.

Measure: Carbon Footprint App

As part of education and outreach, development of a smartphone application or other tool that helps “gamify” responsible personal choices may be impactful in motivating behavior change on the part of individual residents. Given the magnitude of the region’s population, population growth, and the number of emissions associated with individual resident behavior (e.g., residential energy consumption or light-duty gasoline vehicle miles of travel), changes to individual habits are a critical part of ensuring progress toward emissions reductions. Such tools may include rewards programs or point trackers to serve as motivational elements.

<p>Estimated Annual Greenhouse Gas Benefits:</p> <p>Not Quantifiable</p> <p>Expected Community Benefits:</p> <p>Increased Awareness/Engagement; Increased Resiliency/Ability to Adapt</p> <p>Estimated Annual Criteria Pollutant Reduction:</p> <p>NO_x: Anticipated, but not quantifiable at this time</p> <p>VOCs: Anticipated, but not quantifiable at this time</p> <p>PM_{2.5}: Anticipated, but not quantifiable at this time.</p>
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Project: Carbon Footprint Smartphone Application and Rewards Program

This project would encourage residents to make more “green” decisions, such as carpooling or installing solar panels, through a mobile game or app. NCTCOG will survey the market to identify existing available smartphone applications that may already serve this purpose. Existing NCTCOG programs, such as TryParkingIt.com and AirNorthTexas.org, already contain some of these types of elements – in TryParkingIt.com, commuters submit alternative commute trips (e.g., transit, carpool, walk, or bike) to earn points toward rewards, and in AirNorthTexas.org, users can make personal pledges. Both initiatives consist of partnerships with stakeholders around the region, including major employers and public sector entities. NCTCOG will work with stakeholders to identify opportunities to enhance, coordinate, and/or amplify these existing campaigns with additional functionality and behavior choices.

Other Available Funding:

Other funding sources are uncertain; EPA Pollution Prevention grants or CMAQ funding may be a possibility.

Measure: Regional Air Quality Monitoring Program

As evidenced by survey responses in Exhibit 6 indicating that local air quality is the area of greatest concern among NCTCOG area residents, requests have been made for more local air quality monitoring throughout development of the DFW AQIP. Residents have cited concerns over the relatively small number of regulatory air quality monitors (across the 16-county region, there are 20 ozone monitors and 9 fine particulate monitors used for regulatory air quality monitoring by TCEQ).¹⁰⁷ In addition, residents have expressed a desire for monitoring of emissions from industrial and oil and gas facilities in proximity to sensitive receptors (like their homes), which may entail air quality monitoring designed to identify source-specific hazardous air pollutants or GHGs versus ambient concentrations of criteria pollutants. Additional monitoring data can enable more nuanced identification of emissions sources and consequently help identify appropriate emissions-reduction strategies. It can also help residents feel more confident about the types of outdoor activities they feel safe doing, can help public health practitioners in appropriate interventions as necessary for patients, and can provide data to support and communicate additional concerns to local and state regulators who are in a position to take action related to specific emissions sources.

Estimated Annual Greenhouse Gas Benefits:

Not Quantifiable, but monitoring can be critical in enabling more accurate identification of emissions sources which then allows for implementation of the most effective emissions-reductions activities.

Expected Community Benefits:

Increased Awareness/Engagement; Improved Health and Well Being; Increased Safety; Increased Resiliency/Ability to Adapt

Estimated Annual Criteria Pollutant Reduction:

Not Quantifiable, but monitoring can be critical in enabling more accurate identification of emissions sources which then allows for implementation of the most effective emissions-reductions activities.

Project: Deploy Air Quality Monitors

Various organizations, including local governments and nonprofits across the region, have started to deploy non-regulatory networks of air quality monitors to help collect additional information at a more granular level than that currently being measured by the regulatory monitoring network under oversight of TCEQ. For example, the city of Dallas has deployed a network of neighborhood air monitors as part of their Breathe Easy Dallas project, with a purpose to advance scientific

¹⁰⁷ <https://www.tceq.texas.gov/cgi-bin/compliance/monops/monitors.pl>

understanding and application of local air monitoring for improved public health outcomes among high-risk populations. NCTCOG continues to evaluate results of these projects and consider how to integrate data from these non-regulatory systems with those available from regulatory monitors, given the wide variation in technology, calibration, and industry acceptance of device validity across the various efforts. NCTCOG leads an effort through the Air Quality Health Monitoring projects and Task Force to facilitate peer exchange and consistency across local monitor project and associated results. NCTCOG has and will continue to pursue deployment of additional monitoring in conjunction with local governments where funds are available to support such efforts.

Other Available Funding:

Funding is available to support additional monitoring in certain areas within the NCTCOG region through Rider 7, which is a Legislative appropriation to TCEQ that is made available for monitoring and emissions inventories in “near-nonattainment” areas. Within the NCTCOG region, this funding can support ozone monitoring in Hood, Hunt, and Navarro counties, and particulate matter monitoring in Dallas and Tarrant counties. For each appropriation bi-annum cycle, NCTCOG collaborates with local entities on most critical needs suitable for funding that will aid in efforts to minimize emissions. Deployment of non-regulatory air quality monitors in these areas can help address local concerns or assist with filling data gaps. The EPA Environmental Justice Program, Community Change grants, Federal Highway Association Grants, and other community-based programs offer grants that can be leveraged to deploy appropriate local neighborhood level air quality monitoring that typically includes EPA-complaint data quality assurance and transparency.

Measure: Tire Recycling Initiatives

With a continual increase in population growth, city densification, and urban sprawl, the DFW region has become one of the largest metroplexes in the USA. Population growth and the prevalence of reliance on automobile travel contribute to ongoing growth in vehicle-related waste, including discarded tires. Several cities, water utilities and conservation districts have been challenged to address inappropriate disposal of waste tires, including tire dumps and riverine disposal. The 2023 Regional Resource Management Plan for the region indicates that, “There are presently 20 registered scrap tire facilities involved in tire resource recovery in the North Central Texas region, located across Collin, Dallas, Ellis, Hunt, Kaufman, Palo Pinto, Tarrant, and Wise counties. Registered scrap tire resource recovery activities include processing (i.e., cutting, grinding, shredding, baling, crushing, splitting, and recapping or retreading), recycling (i.e., preparation of used or scrap tires for re-use), and energy recovery (i.e., tired derived fuel). In 2021, tire processing and recycling facilities recovered an estimated 30,000 tons of tires for recycling.”¹⁰⁸

Illegally dumped tires pose environmental and health hazards by polluting waterways with contaminated runoff, attracting rodents and mosquitos which carry disease, and increase potential for dangerous fires due to high flammability. This program will help minimize these issues that will benefit the community by reducing the hazards posed by waste tires and improving public safety and health.

This measure will include a phased approach to addressing this issue that involves highlighting and exploring scrap tire issues impacting the region, identifying and evaluating what other areas are doing to

¹⁰⁸ https://www.nctcog.org/getmedia/4bfbf45a-2bd2-4222-ae30-b0840015b7a3/Final-RSWMP-11-18-2022_1.pdf

address scrap tires, and developing a streamlined plan to strategically mitigate the issues. The project entails evaluating the true size and breadth of the current scrap tire problem in the region, to the extent of allowing quantification of measures necessary to effectively address the issue through combined policy, ordinance, and physical cleanup. The resulting regional Scrap Tire Abatement Program expansion and evaluation can be effectively implemented.

It should be noted that an existing statewide program focused on scrap tires includes regulated activities such as: scrap tire transportation, storage, processing, recycling, energy recovery from tires, and land reclamation using tires.¹⁰⁹ TCEQ administers this program under 30 Texas Administrative Code 328 Subchapter F that specifically addresses Rules for Management of Used and Scrap Tires.¹¹⁰ Appropriate regional efforts may entail collaborating with the state to amend, enhance, and enforce current regulations as required to more effectively address this challenge.

<p>Estimated Annual Greenhouse Gas Benefits:</p> <p>Not currently quantifiable</p> <p>Expected Community Benefits:</p> <p>Improved Health & Well-Being, Increased Safety, Green Spaces and Community Beautification</p> <p>Estimated Annual Criteria Pollutant Reduction:</p> <p>Not currently quantifiable</p>
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Project: Adopt Tire Recycling Policy

Adoption and implementation of an ordinance (cities) and guidelines similar to an ordinance (counties) that promotes sustainable tire disposal practices, including recycling.

Other Available Funding:

The majority of funding for scrap tire management, recycling programs, and market development is at the state level. However, some federal research funding is available for small businesses doing innovative research. EPA does not provide funding for businesses using established technologies, however, the EPA’s Small Business Innovation Research (SBIR) Program¹¹¹ is administered by the Agency’s National Center for Environmental Research and Quality Assurance (NCERQA) in the Office of Research and Development. The Agency’s SBIR Program solicits and funds research proposals that address EPA priority needs, including solid waste management techniques. Several other states have developed programs to effectively address waste tire disposal and recycling efforts. Grants from local water conservation districts and private foundations have been used in the past to support appropriate waste tire cleanups in the NCTCOG region, particularly for tires in water bodies. Some cities with TPDES MS4 permit requirements have also leveraged stormwater utility fees to support related cleanups.

¹⁰⁹ https://www.tceq.texas.gov/permitting/waste_permits/tires

¹¹⁰ https://texreg.sos.state.tx.us/public/readtac%24ext.ViewTAC?tac_view=5&ti=30&pt=1&ch=328&sch=F&rl=Y

¹¹¹ <https://www.epa.gov/sbir>

The Regional Transportation Council has set aside approximately \$700,000 to develop and initiate a regional scrap tire abatement program. In addition, efforts will be pursued at the 89th Texas Legislative Session in 2025 for rule updates and future funding sources.

Measure: Workforce Development

The need for an educated, trained, and ready workforce is necessary for the continued efficiency and maintenance of the new technologies being adopted in the realms of clean energy, energy efficiency, transportation electrification, and more advanced technologies related to waste management and water treatment. This will require working with high schools, technical colleges, community colleges, universities, and industry partners to create curricula, trainings, career awareness, apprenticeships, and internships to provide the needed workforce for electric vehicles, electric vehicle charging stations, solar, wind, microgrids, weatherization services, and energy efficiency technologies. Additionally, there is also a strong need for National Institute of Certification in Engineering Technologies (NICET)-certified operators for water and wastewater systems, roadway infrastructure, urban agriculture and forestry, and the telematics necessary to effectively and efficiently manage these systems. Properly trained instructors will be needed, whether from industry or from academia, to support this effort.

Estimated Annual Greenhouse Gas Benefits:

Not Quantifiable, however, this is a necessary hurdle that needs to be addressed to allow effective deployment of these proposed measures that do reduce GHG emissions.

Expected Community Benefits:

Job Creation and Economic Development; Increased Resiliency and Adaptability; Increased Awareness and Engagement

Estimated Annual Criteria Pollutant Reduction:

Not Quantifiable; however, this is a necessary hurdle that needs to be to be addressed to allow effective deployment of these proposed measures that do reduce GHG emissions.

Project: Develop Local Workforce to Enable Clean Energy Adoption and Resilience

Through collaboration among NCTCOG Transportation, Environment and Development, and Workforce Solutions departments, programs to develop workforce to support implementation of PCAP measures will be developed, including electricians and technicians, for solar installations, microgrids, battery storage, and community-scale renewable energy, service providers for telematics and controls, weatherization, energy audits, and energy management for residences and buildings. This can include assisting local communities or technical colleges in launching, expanding, and amplifying curricula/certification testing to expand local workforce with necessary certifications (e.g., Building Performance Institute/ NICET certifications).

Project: Develop Local Workforce to Enable Water, Wastewater, and Drainage System Upgrades

Through collaboration among NCTCOG Transportation, Environment and Development, and Workforce Solutions departments, programs to develop workforce to support implementation of PCAP measures will be developed, including certified operators for water, wastewater, and stormwater infrastructure. This can include assisting local communities or technical colleges in launching, expanding, and amplifying curricula/certification testing to expand local workforce with necessary certifications (e.g., Building Performance Institute/ NICET, AWWA and TCEQ certifications).

Project: Develop Local Workforce to Enable “Green Space” Implementation, Wastewater, and Drainage System Upgrades

Through collaboration among NCTCOG Transportation, Environment and Development, and Workforce Solutions departments, programs to develop workforce to support implementation of PCAP measures for advancing green space development, implementation, operations, and maintenance will be developed, including certified arborists and horticulturists, farm managers, and other appropriate certifications. This can include assisting local communities or technical colleges in launching, expanding, and amplifying curricula/certification testing to expand local workforce with necessary certifications (e.g., Building Performance Institute/ NICET, Tx Department of Forestry certifications).

Other Available Funding:

EPA, Economic Development Administration, Department of Energy, and others have funding that can be used to support implementation of this measure to ensure development of green jobs to support the energy transition, as well as adaptive measures of this plan that support greater local resilience.

Measure: Education and Outreach

Educating residents and building occupants about energy conservation, efficiency, and renewable energy is crucial for promoting sustainable practices and reducing energy consumption. Encouraging communitywide adoption of renewable energy through group purchase options can lower electricity rates and improve air quality while bolstering grid resilience. Collaborating with utilities to incentivize renewable energy adoption among residents fosters a sustainable energy ecosystem, ultimately reducing demand and enhancing environmental outcomes.

Estimated Annual Greenhouse Gas Benefits:

Not Quantifiable, but critical to measure adoption

Expected Community Benefits:

Increased Resiliency and Ability to Adapt, Increased Awareness and Engagement, Improved Health, and Well-Being

Estimated Annual Criteria Pollutant Reduction:

Not Quantifiable, but critical to measure effective measure implementation

Project: Lower Electricity Rate through Group Renewable Energy Purchase

Develop or implement programs that allow residents or other customers to join together to get a lower rate for 100 percent renewable energy.

Project: Promote Renewable Energy and Energy Efficiency

Increase energy efficient behaviors among residents and building occupants through education on renewable energy, energy efficiency, and energy conservation.

Other Available Funding:

Several divisions of EPA, U.S. DOE, Department of Interior, and several state agencies and private foundations provide regular grants around appropriate education and outreach for electrification, vehicle transition, transit programs, water conservation, and other related programs may be available to help support this work. Additionally, working with nonprofits may also provide opportunities to expand the market for related messaging.

5- Benefits Analysis

Substantial benefits will be achieved for a broad, diverse population due to improved air quality resulting from co-pollutant emissions reductions achieved through implementation of selected measures. As discussed, 10 counties are designated as nonattainment under the 8-hour NAAQS, with the region recently having been reclassified by the EPA as a severe nonattainment area for the first time under the 2008 ground level ozone standard. In addition, with the finalization of the revised fine particulate matter standard, EPA has indicated that the two most populous counties in the region – Dallas and Tarrant, home to over four million residents – will likely be classified as nonattainment under the revised particulate standard. These local, criteria pollutant-related air quality issues have always been of concern for residents in the area, and the voices calling for improvements in local air quality to improve public health are growing increasingly louder and urgent. Many of the most impacted communities are those in the urban core, many of whom live near high-traffic or highly industrialized areas.

Because of these concerns, the DFW AQIP emphasizes measures that not only achieve GHG reductions, but also achieve reductions in ozone precursors (NO_x and VOCs, with NO_x as the pollutant of greater concern), as well as fine particulate matter. In total, the measures listed are estimated to reduce a minimum of 391.52 metric tons NO_x annually and 6.58 metric tons PM_{2.5} per year, which will result in improved air quality for the entire region. Note that these numbers are conservative as they are only considering per unit benefits, where multiple units are planned. Additional criteria pollutant benefits are anticipated, especially in the Agriculture, Forestry, and Land Use Sector which were not quantifiable then. In the Transportation sector, substantial funding is dedicated to the Clean Vehicle & Equipment Program, through which NCTCOG anticipates a significant reduction in diesel fuel consumption, which will also lead to reduced exposure to diesel exhaust, which is classified as an air toxic. The improvements in air quality will most prominently benefit vulnerable populations, including children, the elderly, and those already suffering from respiratory complications.

Low Income Disadvantaged Communities Benefits Analysis

Consistent with requirements outlined in the CPRG: Planning Grants Notice of Funding Opportunity,¹¹² NCTCOG has developed this Low-Income and Disadvantaged Communities (LIDAC) Benefits Analysis to identify the potential benefits which could occur in LIDAC through the implementation of proposed measures. The EPA requires the LIDAC Benefits Analysis contain the following:

- Identification of LIDAC
- Engagement with LIDAC in Planning Process
- Identification of Potential Climate Risks
- Identification and Description of Benefits of Measures¹¹³

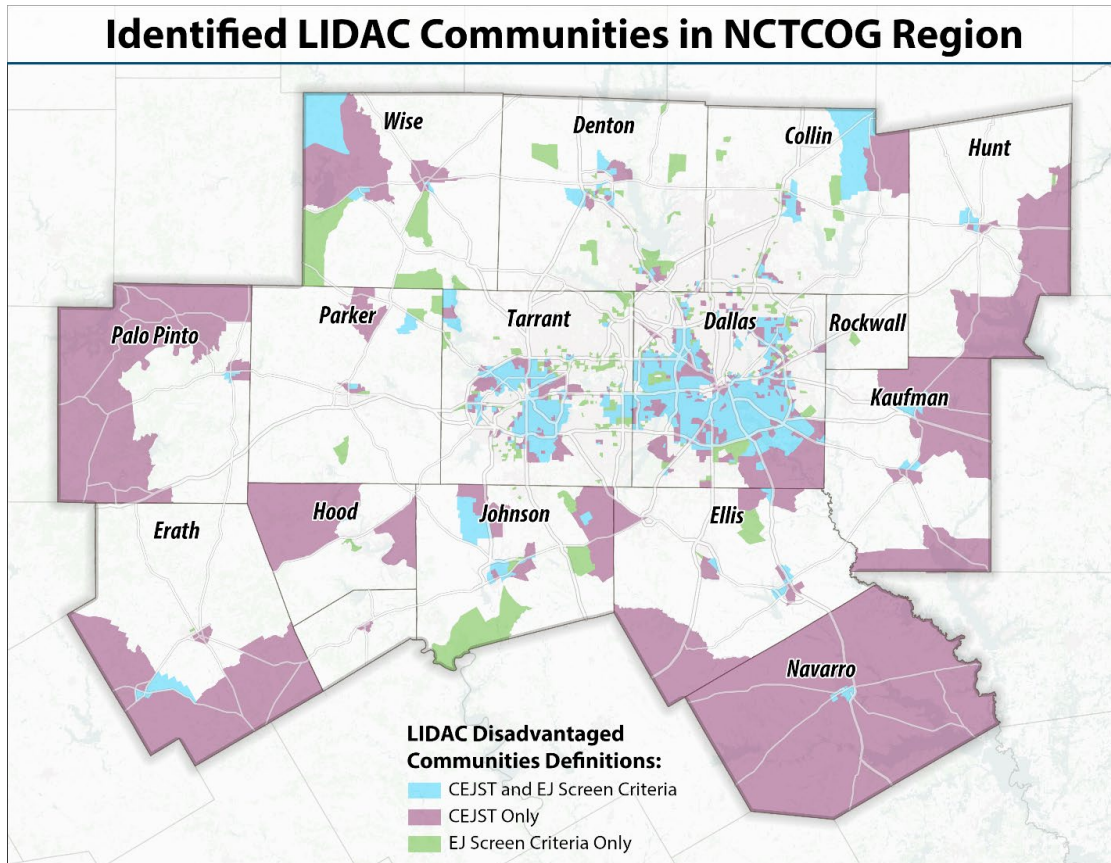
Identification of LIDAC

The EPA recommends utilizing the [Climate and Economic Justice Screening Tool](#) and the [Environmental Justice Screening and Mapping Tool](#) to identify LIDACs. These tools identify LIDACs by assessing indicators for the following categories of burden: air quality, climate change, energy, environmental hazards, health, housing, legacy pollution, transportation, water and wastewater, and workforce development. Overall, 1,669 out of the 4,496 Census blocks (~37 percent) in the NCTCOG region are identified as a LIDAC. Exhibit 31 illustrates LIDAC communities based on a combination of both tools per EPA guidance.

¹¹² <https://www.epa.gov/inflation-reduction-act/about-cprg-planning-grant-information>

¹¹³ https://www.epa.gov/system/files/documents/2023-05/LIDAC%20Technical%20Guidance%20-%20Final_2.pdf

Exhibit 31: Low-Income and Disadvantaged Communities in NCTCOG Region



Additionally, **Appendix 16: Low-Income and Disadvantaged Communities in North Texas** provides a list of the above LIDACS with Census Tract or Census Block ID numbers.

Engagement with LIDAC in Planning Process

Engagement conducted for the DFW AQIP is detailed in **Section 1: Regional Engagement**. The engagement primarily consisted of meetings (in person, virtual, and hybrid) and a public survey. To help ensure LIDAC opportunity for engagement NCTCOG ensured the following:

Public Meetings:

- All materials brought to public meetings (presentation, surveys, and posters) were translated to Spanish and a Spanish translator was present at the meetings.
- If a facility was available in a LIDAC community that met the site requirements, the meeting was held at that location.
- Ads for public meeting were run in both English and Spanish.
- Several opportunities for engagement were conducted at various times (morning and evening), locations, and modes (virtual, in person, and hybrid).

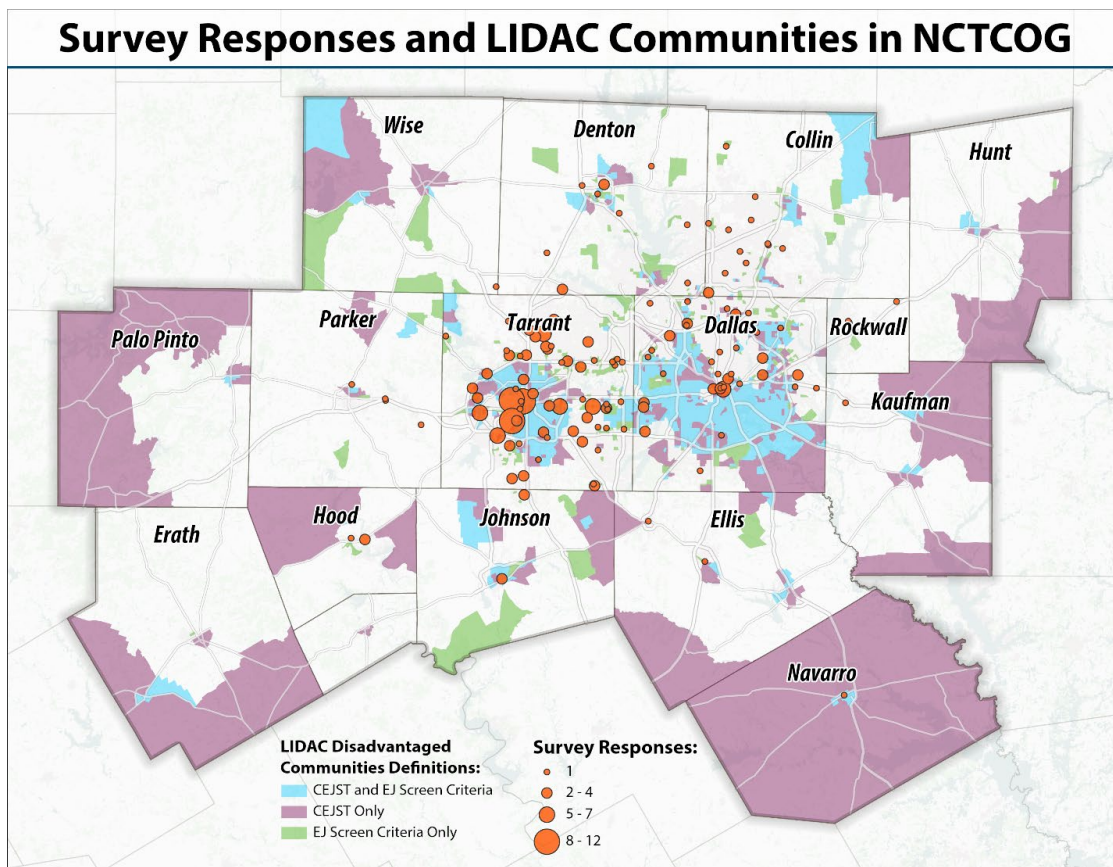
Online Survey:

- The online survey (www.publicinput.com/dfwAQIP-survey) was translated into Spanish.
- Feedback for the DFW AQIP-PCAP was accepted for 12 weeks (November 17, 2023, to February 8, 2024). All feedback received after February 9, 2024 will be incorporated into the DFW AQIP-CCAP.

Exhibit 32 shows survey responses overlaid with LIDAC. Note that survey responses are based on self-reported addresses, and it is possible the address provided does not identify that respondent as a representative of a LIDAC, but that person could work in a disadvantaged community, represent a disadvantaged community, or be a member of a community that has historically been underrepresented in air quality planning efforts, despite not living in that community at this time. As of February 8, 2024, survey responses show that 45 percent of survey respondents represent a LIDAC.

Additionally, NCTCOG conducted outreach through the NCTCOG’s Enhanced Community Engagement Program, which reached out to neighborhood associations, nonprofit organizations, local governments, local elected officials, and religious institutions to seek engagement. Community members already interact with these organizations, whereas NCTCOG may be unknown, so NCTCOG sought to partner with the community organizations to help spread the word regarding the DFW AQIP.

Exhibit 32: Online Survey Responses and LIDAC Communities in NCTCOG



Identification of Potential Climate Risks

By midcentury, it is expected the Southern Great Plains (Texas, Kansas, and Oklahoma) will experience an increase in average annual temperature, as outlined in **Exhibit 33**,¹¹⁴ and this change is expected to result in an associated increase in the frequency, severity, and cost of extreme weather-related events. This is

¹¹⁴ <https://nca2023.globalchange.gov/chapter/26/#fig-26-2>

already beginning to be seen, as from 2018 to 2022, the National Oceanic and Atmospheric Administration (NOAA) reported 52 individual billion dollar disasters affected all or part of the Southern Great Plains (Kansas, Oklahoma, and Texas) region.¹¹⁵ **Exhibit 34: U.S. Climate Vulnerability Index: Overall Climate Vulnerability** shows the region’s overall climate vulnerability as scored by combining the expected impact on environmental, social, economic, and infrastructure effects on neighborhood-level stability. Eight counties (Wise, Palo Pinto, Hood, Erath, Johnson, Navarro, Kaufman, and Hunt) score in the top 50th percentile of Climate Vulnerability. It is expected LIDAC will disproportionately feel the impact of these changes due to a limitation in resources and proximity to high-risk areas.¹¹⁶

Exhibit 33: Historical and Projected Changes in Air Temperature¹¹⁷

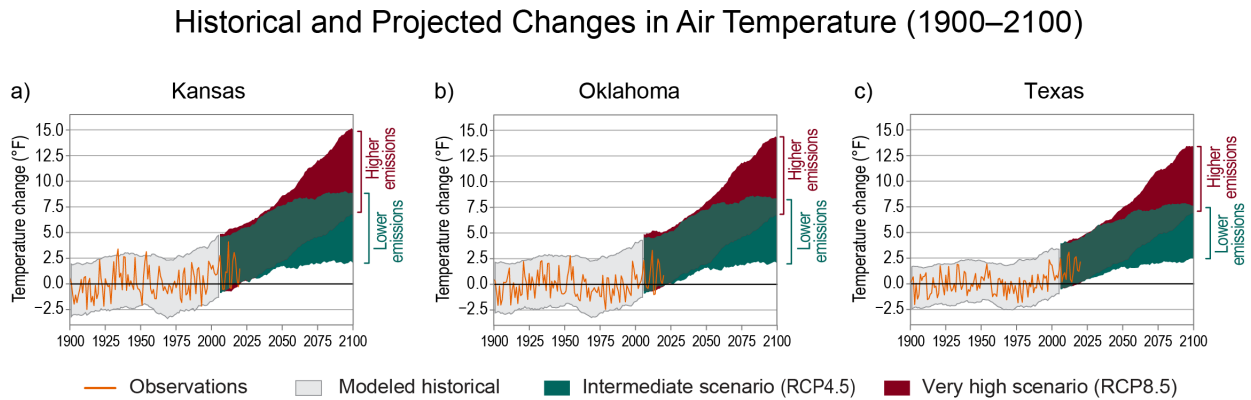
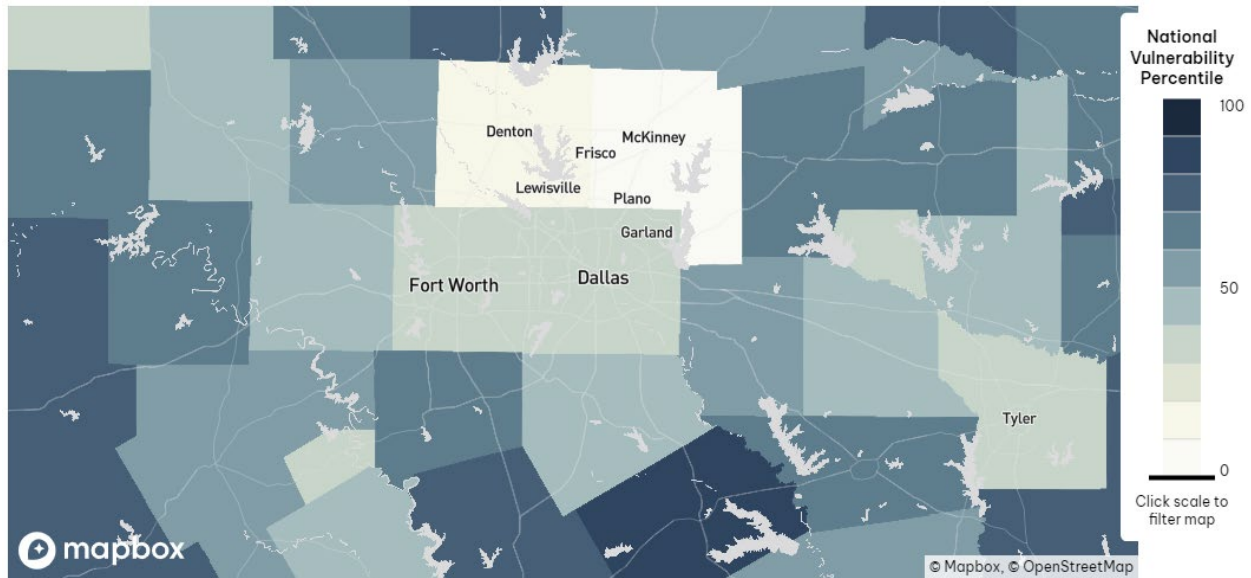


Exhibit 34: U.S. Climate Vulnerability Index: Overall Climate Vulnerability¹¹⁸



¹¹⁵ <https://nca2023.globalchange.gov/chapter/26/#fn:17>

¹¹⁶ <https://nca2023.globalchange.gov/chapter/15/#key-message-2>

¹¹⁷ <https://nca2023.globalchange.gov/chapter/26/#fig-26-2>

¹¹⁸

https://map.climatevulnerabilityindex.org/map/cvi_overall/usa?mapBoundaries=County&mapFilter=0&reportBoundaries=County&geoContext=State

Specific risks which may impact the North Texas region include, but are not limited to:

Extreme Heat and Creation of Urban Heat Islands –

As outlined in Exhibit 33, it is expected the Southern Great Plains region will experience more **Extreme Heat and Creation of Urban Heat Islands** as time passes. With each degree increase of temperature, there is an expected associated increase in mortality, as outlined in Exhibit 35.

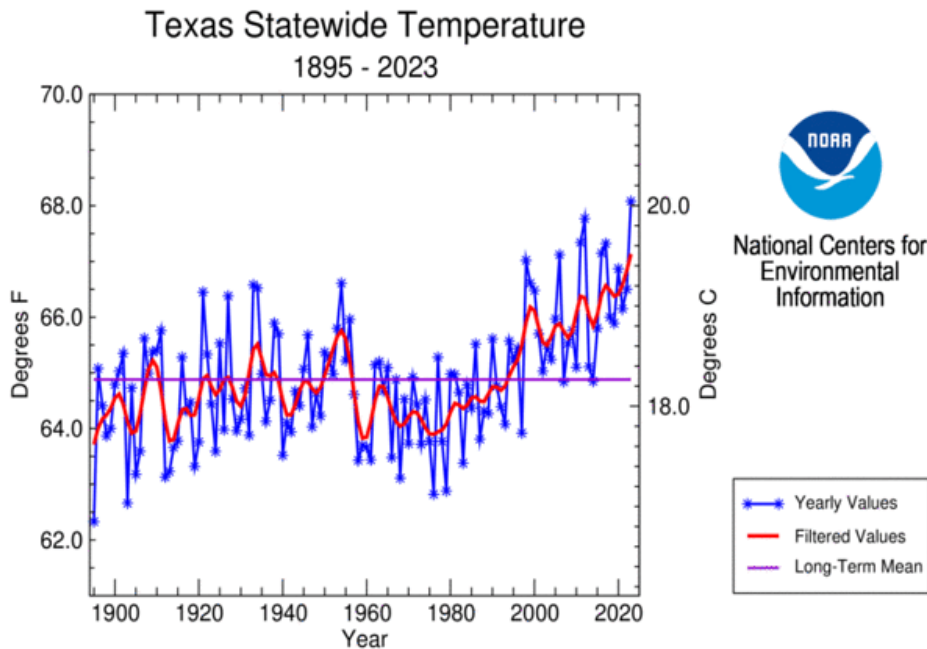
Exhibit 35: Increase in Baseline Mortality¹¹⁹

City	Baseline Mortality Per 100,000	Excess (Above Baseline) Mortality Per 100,000				
	0°C*	1°C	2°C	3°C	4°C	5°C
Dallas, TX	1.14	0.54	1.69	3.58	5.25	7.07

*0°C references deaths per 100,000 attributable to extreme temperature in the baseline climate (1986-2005). All other columns represent the change in mortality rates incremental to the baseline due to global temperature change.

Texas has already seen an increase in Statewide Temperature, as shown in **Exhibit 36**.

Exhibit 36: Texas Statewide Temperature¹²⁰



Increased temperatures can significantly impact metropolitan areas, as they are at risk for urban heat islands. Urban heat islands result when the heat created by people, cars, buses, trains, and infrastructure has nowhere to escape due to high density in metropolitan areas. Work by the Texas

¹¹⁹ https://www.epa.gov/system/files/documents/2021-09/appendix-e_temp-mortality.pdf

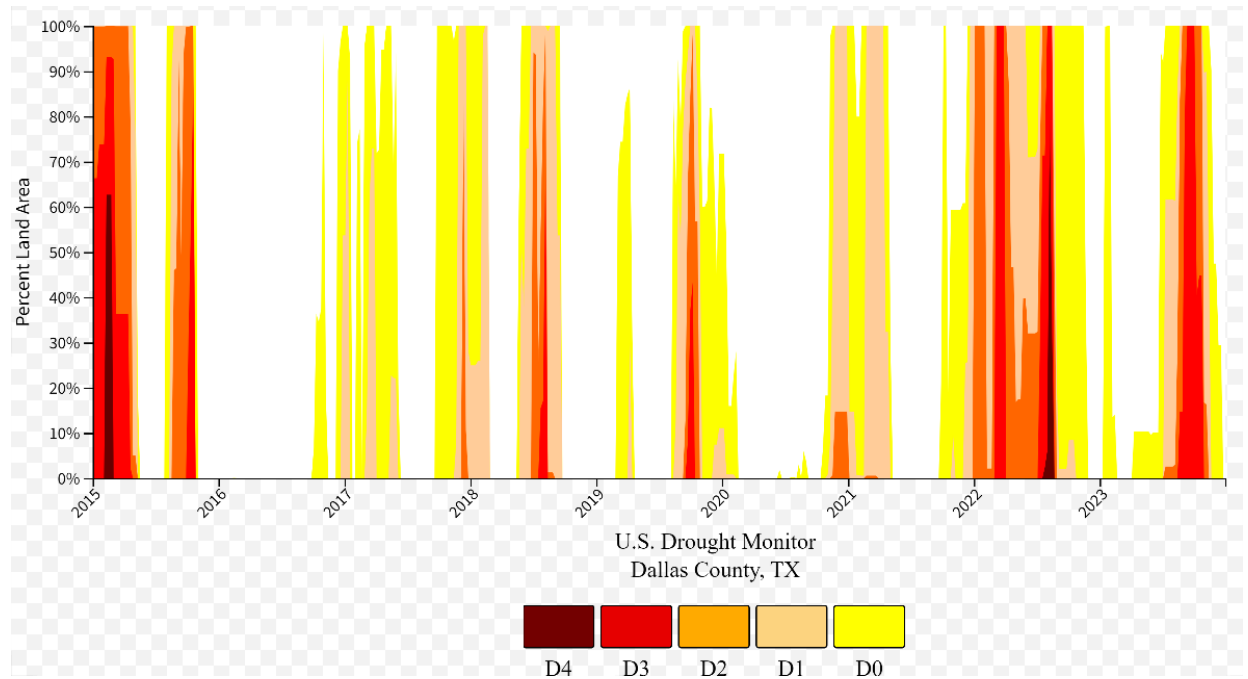
¹²⁰ <https://www.ncei.noaa.gov/access/monitoring/monthly-report/drought/202313#so-plains-sect>

Trees Foundation⁸³ and the Trust for Public Lands⁷⁸ has already identified the presence of Urban Heat Islands in the larger cities of the region.

Extreme Drought –

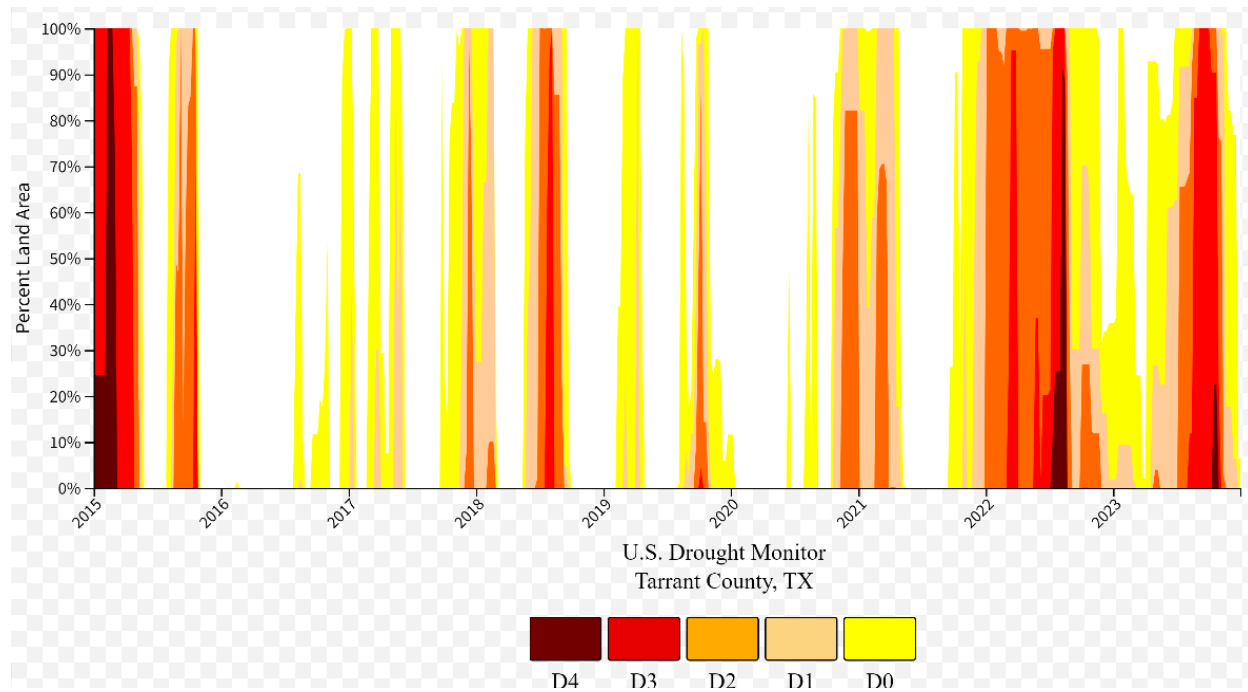
A side effect of increased heat and changes in weather patterns is **Extreme Drought**. Drought does not necessarily mean there is no water on the surface, rather it is an assessment of conditions such as dryness and water availability compared to the average amount. Texas has already experienced extreme heat for most of 2023,¹²¹ and extreme drought has been occurring in Dallas and Tarrant counties for several years, as shown in **Exhibits 37 and 38**.

Exhibit 37: National Integrated Drought Information System, Historical Conditions for Dallas County*



¹²¹ <https://www.ncei.noaa.gov/access/monitoring/monthly-report/drought/202313#so-plains-sect>

Exhibit 38: National Integrated Drought Information System, Historical Conditions for Tarrant County*



*The U.S. Drought Monitor (2000-present) depicts the location and intensity of drought across the country. Every Thursday, authors from NOAA, USDA, and the National Drought Mitigation Center produce a new map based on their assessments of the best available data and input from local observers. The map uses five categories: Abnormally Dry (D0), showing areas that may be going into or are coming out of drought, and four levels of drought (D1-D4).¹²²

Wildfires –

As extreme heat and drought occurs, the risk for wildfires, or an uncontrolled fire that destroys structures and vegetation in its path, increases. The Texas A&M Forest Service reported 43,351 wildfires in Texas that ignited within a two-miles of a community from 2018 to 2022,¹²³ At the time of this plan, over one million acres are burning in the Texas Panhandle, thought to be one of the largest wildfires in Texas history.¹²⁴ As shown in **Exhibit 39**, many of these fires were ignited within Tarrant County. Wildfires provide both a safety and health risk, as wildfires often result in criteria pollutants such as fine particulate matter, carbon monoxide, and ground-level ozone.¹²⁵

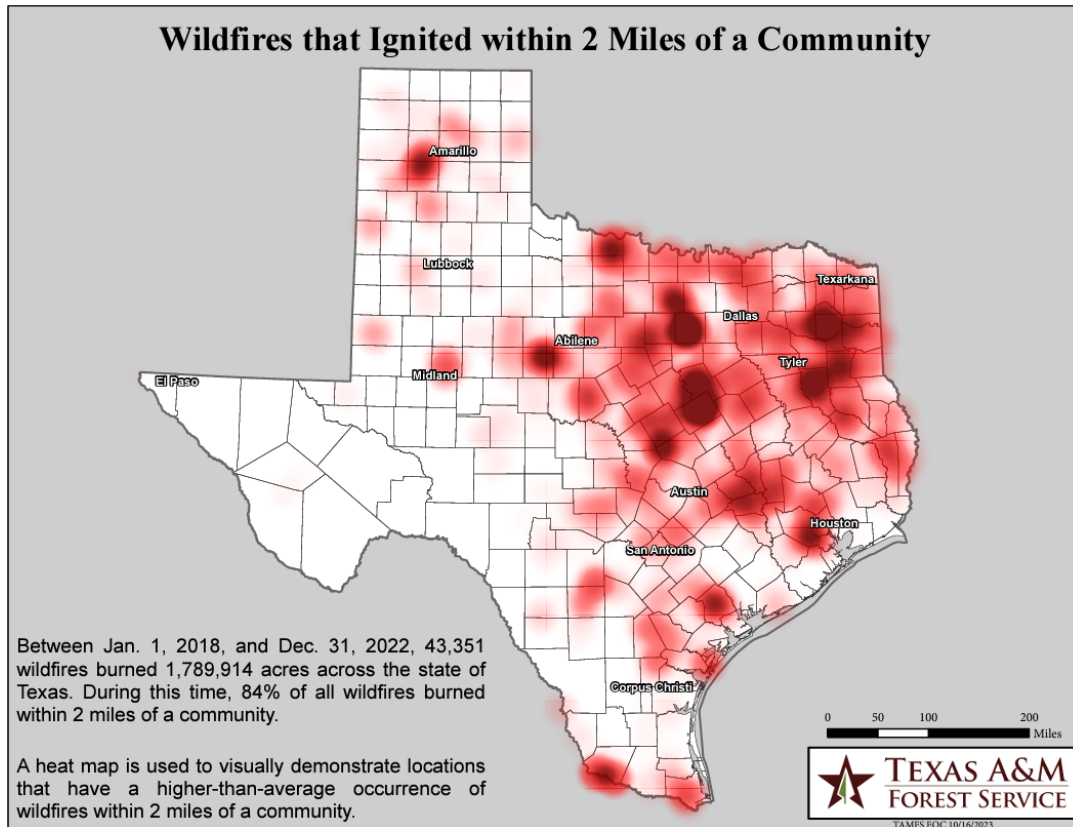
¹²² <https://www.drought.gov/states/texas/county/Tarrant>

¹²³ <https://fire-information-tfsgis.hub.arcgis.com/pages/historical-fire-statistics>

¹²⁴ [Ttxs Smokehouse Creek Fire Information | InciWeb \(nwcg.gov\)](https://www.inciweb.org/txs-smokehouse-creek-fire-information)

¹²⁵ <https://www.airnow.gov/sites/default/files/2021-09/wildfire-smoke-guide-chapters-1-3.pdf>

Exhibit 39: Wildfires Within Two Miles of a Community

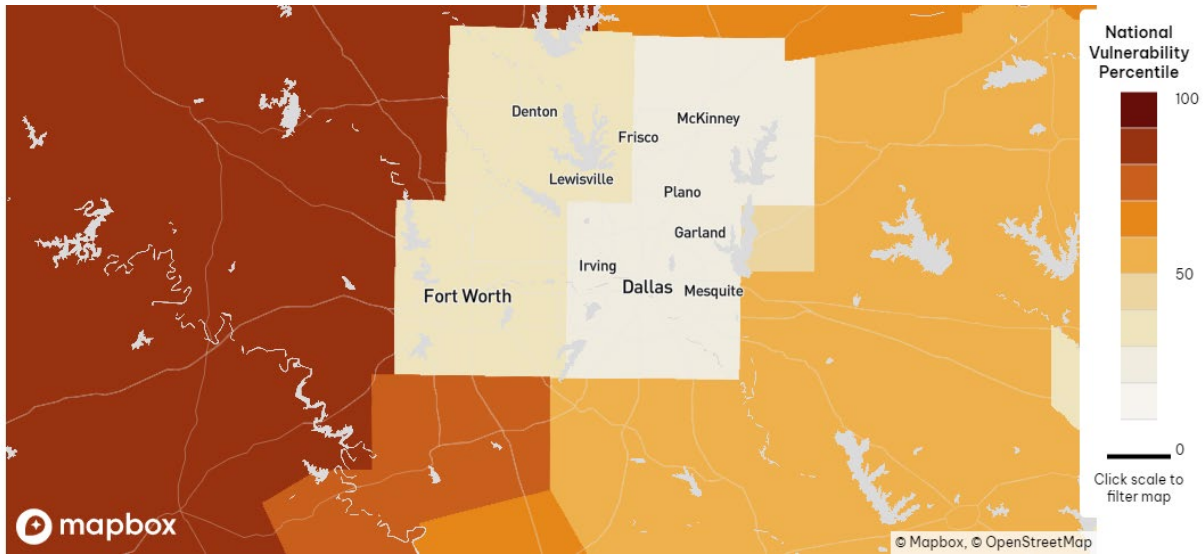


Rural counties have higher risks of wildfires and their impacts, with Parker, Wise, Hood and Erath ranking in the top 80 percent in the U.S. Climate Vulnerability Index, as shown in **Exhibit 40: U.S. Climate Vulnerability Index: Wildfires.** ¹²⁶

126

https://map.climatevulnerabilityindex.org/map/cc_extreme_events_wildfires/usa?mapBoundaries=County&mapFilter=0&reportBoundaries=County&geoContext=State

Exhibit 40: U.S. Climate Vulnerability Index: Wildfires



Potential Benefits of Measures to LIDACs

In addition to a reduction in GHGs, LIDAC are expected to experience the following community benefits through the implementation of measures:

Improved Health and Well-Being –

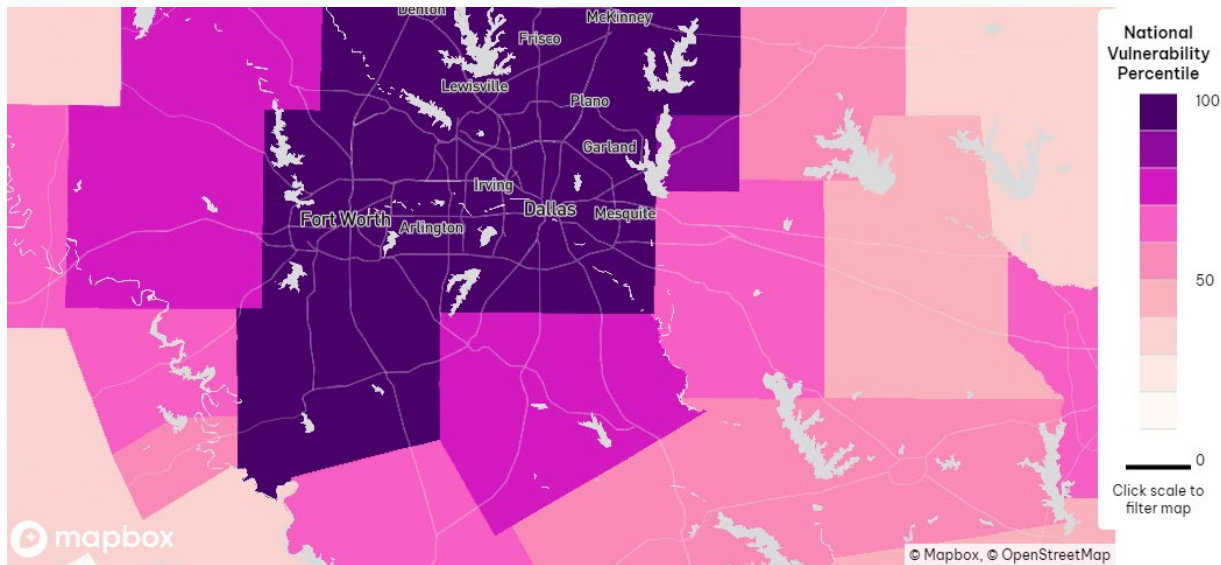
Proposed measures in the DFW AQIP can result in **Improved Health and Well-Being** through the reduction of criteria pollutants, which can reduce respiratory health issues, as detailed in **Section 3: Emissions Inventories for Criteria Pollutants of Regional Concern**. **Exhibit 41** shows 15 counties in the NCTCOG region are in the top 50 percent of vulnerability, with seven counties in the top 10 percent.¹²⁷ LIDACs are disproportionately impacted by poor air quality, with 8 percent to 9 percent of the population that utilizes Medicare in Collin, Denton, Erath, Johnson, Somervell, Tarrant, Hood, and Parker counties having asthma.¹²⁸ Anecdotal evidence conveyed to NCTCOG from health care providers around the region indicates that they do notice an increase in emergency room visits on high ozone days, and many of these additional patients are from LIDAC communities.

¹²⁷

https://map.climatevulnerabilityindex.org/map/environment_criteria_air_pollutants/usa?mapBoundaries=County&mapFilter=0&reportBoundaries=County&geoContext=State

¹²⁸ <https://www.healthyntexas.org/indicators/index/view?indicatorId=2052&localeTypeId=2&periodId=246>

Exhibit 41: U.S. Climate Vulnerability Index: Criteria Air Pollutants¹²⁹



Additionally, several measures are expected to increase **Improved Health and Well-Being** through providing more access to walkable, dense communities and green space and parks, which can result in improved physical¹³⁰ and mental health.¹³¹

Economic Development and Job Creation –

Many proposed measures in the DFW AQIP are expected to provide **Economic Development and Job Creation** to the region through expansion of local workforce and investments in new or upgraded infrastructure. On average, two to five years' investment in public infrastructure results in 1.5 times the benefit than the initial investment.¹³² Many of the measures, such as solar installation, addition of sidewalks, and more, will require local technicians to build and service the infrastructure. NCTCOG expects to work with community colleges and universities to develop the local workforce and provide more opportunities to the region.

Many measures are expected to be funded using federal funding, which would provide competitive pay and benefits, as federal investment in infrastructure will need to meet Davis Bacon Federal wage rates.¹³³ Additionally, federal funding will be required to meet the Justice 40 Initiative,¹³⁴ which requires 40 percent of the overall benefits of federal investments to flow to disadvantaged communities. Finally, many measures will be implemented by NCTCOG, which has a well-established Disadvantaged Business Enterprise (DBE) Program¹³⁵ with a current overall DBE participation goal of 17 percent. As part of the DBE Program NCTCOG hosts outreach events to facilitate networking

¹²⁹

https://map.climatevulnerabilityindex.org/map/environment_criteria_air_pollutants/usa?mapBoundaries=County&mapFilter=0&reportBoundaries=County&geoContext=State

¹³⁰ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9326484/>

¹³¹ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5663018/>

¹³² <https://www.gihub.org/articles/the-vital-role-of-infrastructure-in-economic-growth-and-development/>

¹³³ <https://www.dol.gov/agencies/whd/government-contracts/construction/faq/conformance>

¹³⁴ <https://www.whitehouse.gov/environmentaljustice/justice40/>

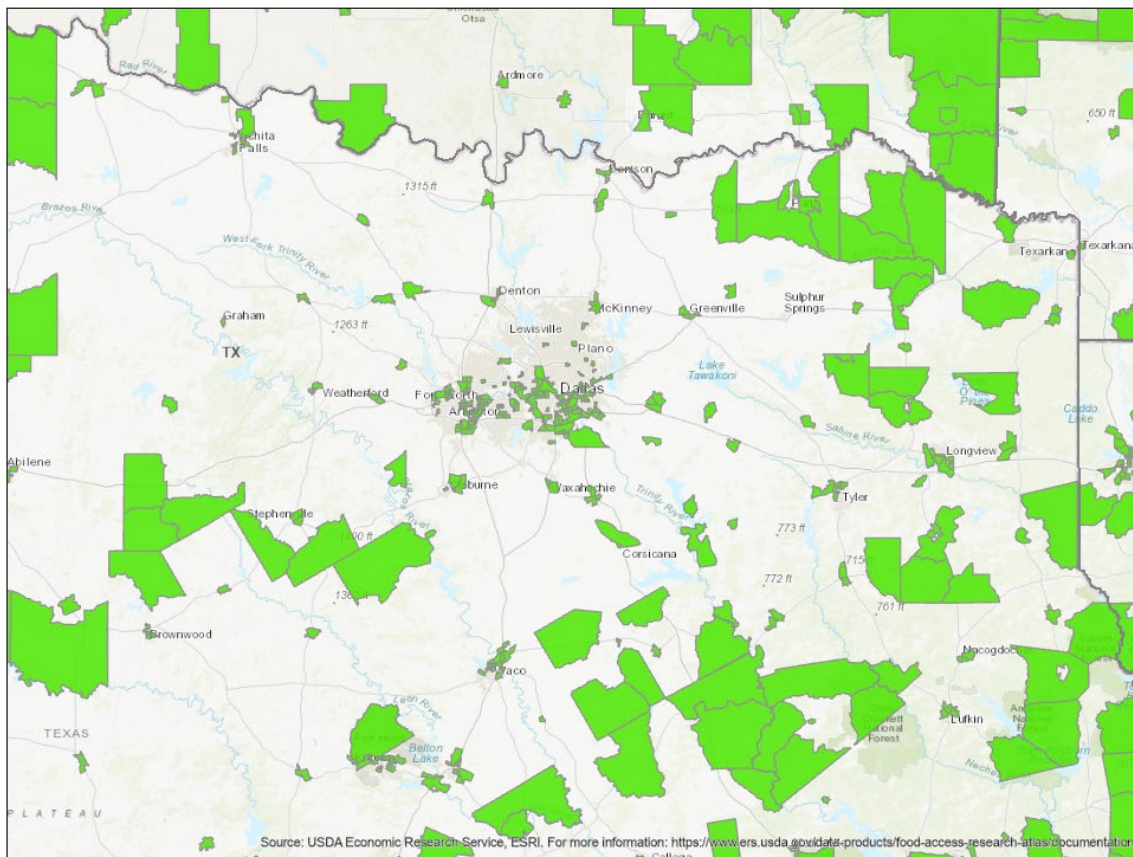
¹³⁵ <https://www.nctcog.org/trans/involve/disadvantaged-business-enterprise-dbe-program>

opportunities between DBE firms and non-DBE firms and help prepare DBEs for upcoming calls for projects.

Increased Access to Service and Amenities –

Many measures will result in **Increased Access to Service and Amenities**, or the ability of residents to access new areas and/or reach services/amenities (healthcare, healthy food, jobs) more easily. Food deserts, or communities which do not have access to fresh food, can be mitigated through the addition of new transportation options such as buses, and vanpools, and the addition of community gardens. **Exhibit 42** highlights low-income Census tracts where a significant number or share of residents is more than one mile (urban) or 10 miles (rural) from the nearest supermarket.¹³⁶

Exhibit 42: Low Income and Low Access Census Tracts



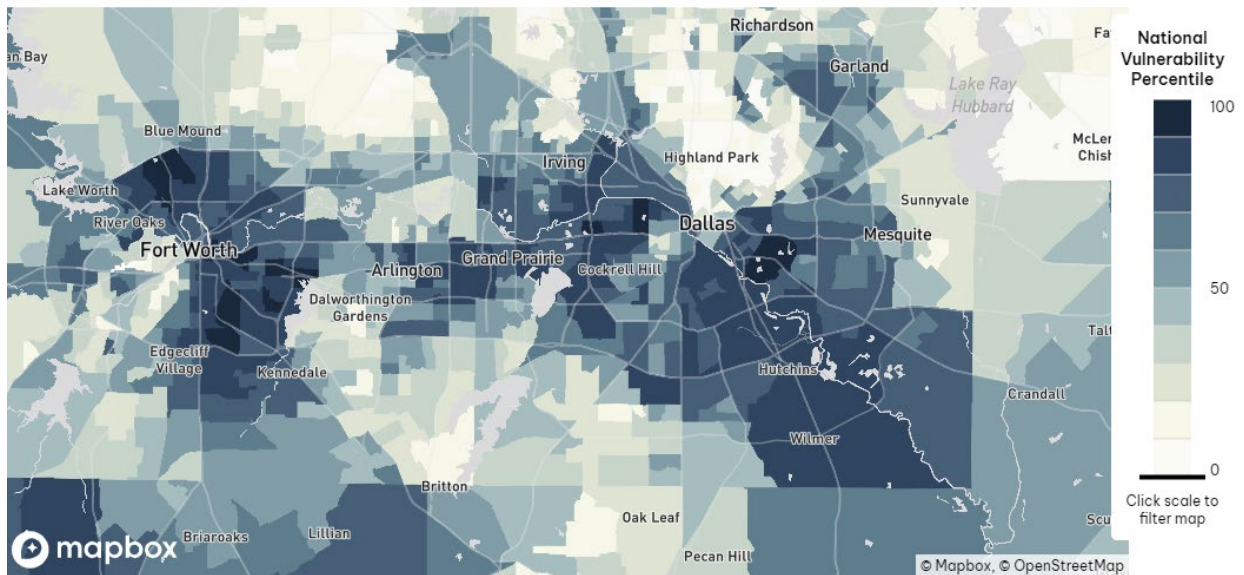
Increased Resiliency/Ability to Adapt –

As detailed in **Section 5: Identification of Potential Climate Risks**, as additional GHGs are added to the atmosphere, it is expected the region will continue to experience extreme weather, and the region needs to deploy measures which result in **Increased Resiliency/Ability to Adapt**. As discussed above, eight counties (Wise, Palo Pinto, Hood, Erath, Johnson, Navarro, Kaufman, and Hunt) in the NCTCOG region score in the top 50th percentile of Climate Vulnerability. Overall, the counties of Dallas and Fort Worth do not rank high for vulnerability, with Dallas being in the 38th percentile and

¹³⁶ <https://www.ers.usda.gov/data-products/food-access-research-atlas/go-to-the-atlas/>

Fort Worth in the 36th percentile. ***However, several Census tracts in these counties are ranked in the top 90 percent in Overall Climate Vulnerability, as illustrated in Exhibit 43.***¹³⁷ LIDAC communities are particularly vulnerable as they often live in homes that are older or have poor insulation/weatherization. Additionally, more extreme rain events and increased development of impermeable surface cover has increased the frequency and severity of flooding events. Measures that result in **Increased Resiliency/Ability to Adapt** will help the region mitigate these impacts through benefits such as water/flood mitigation (e.g., bioswales that can help absorb runoff, increased use of permeable surfaces, etc.), improved weatherization to mitigate impacts of extreme temperatures, etc.

Exhibit 43: Dallas and Fort Worth: Overall Climate Vulnerability.



Reduced Costs –

Several measures in the DFW AIQP will directly result in **Reduced Costs** for communities, such as rebates for home weatherization, installation of solar, or adoption of newer, cleaner burning fuel vehicles. NCTCOG intends to target LIDAC as the recipients of these measures and expects to see significant benefits as federal weatherization programs and incentives targeted to LIDAC have seen an average of \$372 or more every year.¹³⁸

Note there are indirect cost savings possibilities associated with many measures – for example, measures that reduce costs of a local government could eventually reduce taxes or other fees charged to its residents. However, NCTCOG has limited identification of “reduced cost” benefits to those measures where LIDAC residents can reasonably be expected to experience cost savings directly, such as residential energy efficiency improvements.

¹³⁷

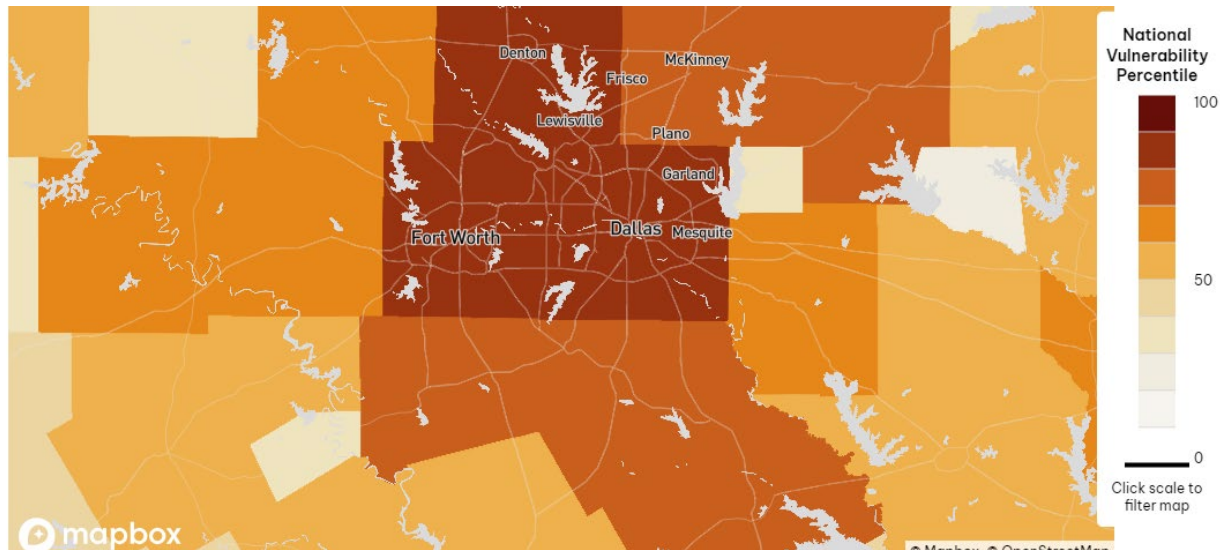
https://map.climatevulnerabilityindex.org/map/cvi_overall/usa?mapBoundaries=Tract&mapFilter=0&reportBoundaries=Tract&geoContext=State

¹³⁸ <https://www.energy.gov/scep/wap/weatherization-assistance-program>

Increased Safety –

Several measures in the DFW AQIP will result in **Increased Safety** through reduced risk to pedestrians and car operators, decreased flooding, improved housing quality, and more. There are needs for improvements in transportation safety; in 2022, there were 864 motor vehicle traffic fatalities in 206 pedestrian fatalities, and 23 pedal cyclist fatalities.¹³⁹ Transportation safety improvements can occur through adding protected bike lanes and sidewalks to protect pedestrians, and improving safety for drivers through removing forced mergers, adding roundabouts, and more. Additionally, several measures can result in **Increased Safety** through reducing the risk for flooding. As shown in **Exhibit 44: U.S. Climate Vulnerability Index: Flooding**, Denton, Fort Worth, and Dallas are in the 80th vulnerability percentile for extreme flooding events. Measures that improve weatherization of homes occupied by residents in the LIDAC communities can improve the safety and quality of housing – it is well known that during extreme heat and cold, poorly weatherized homes can literally become unsafe for their residents by exposing them to unhealthy temperatures.

Exhibit 44: U.S. Climate Vulnerability Index: Flooding



Reduced Noise Pollution –

Noise Pollution can have negative physical and mental health.¹⁴⁰ Several proposed measures in the DFW AQIP would reduce noise pollution, primarily through the reduction of vehicles on the road (i.e., transit expansion, incentives for commuting or carpooling) and through incentivizing the purchase of quieter vehicles (i.e., zero-emission vehicles) and small off-road equipment such as gas-powered landscape equipment.

¹³⁹ https://www.nctcog.org/getmedia/89364a67-6791-4c70-b04e-12513742791f/2022_CrashFactSheet.pdf

¹⁴⁰ <https://www.medicalnewstoday.com/articles/noise-pollution-health-effects>

New Green Space/Community Beautification –

Measures that result in **New Green Space/Community Beautification** can improve mental and physical health. A study done by the University of Dallas shows about 25 percent of the urban land area in the U.S. is covered in impermeable surfaces, while Dallas averages at around 35 percent,¹⁴¹ showing a need for additional greenspace in the region. Additionally, greenspaces can absorb CO₂ from the atmosphere and aid in absorbing stormwater and reducing flooding.

Increased Awareness/Engagement –

Increased Awareness/Engagement can include increased community engagement/awareness (i.e., members of the general public) and increased entity (public or private organizations) awareness/engagement. Measures expected to result in increased community engagement include residential home audit/weatherization programs and educational campaigns. Measures which can result in more entity awareness/engagement include training for employees, development of plans, and more.

Water Conservation -

As droughts increase in the region, it is essential to deploy more measures resulting in effective water conservation. Potential measures include adding automated metering infrastructure, harvesting rainwater, providing home conservation audits, repairing irrigation infrastructure and more.

6- Review of Authority to Implement

All measures included in the DFW AQIP are either voluntary in nature (e.g., an incentive) or are actions that would be performed by an implementing agency with regard to its own assets (e.g., a municipality or private company installing solar panels on its own buildings). Any code and ordinance updates would be developed by the Regional Codes Coordinating Committee that develops local codes through a consensus-based process that includes appropriate stakeholder participation; these are then available for local communities to adopt if they wish. Thus, all measures are within the authority of the implementing agency. No regulatory measures are proposed.

NCTCOG will serve as regional administrator and project manager of the DFW AQIP, guiding local governments to and through implementation of measures within their jurisdiction to implement. As a regional planning agency and MPO, NCTCOG has a long history of coordinating these types of activities through collaboration and committee structures. As the letters of support illustrate, NCTCOG has the support of entities across the region to serve in this role. Existing NCTCOG committees and programs will be leveraged where appropriate to expand or institute measures identified for implementation. Implementation will be coordinated by the NCTCOG Transportation and Environment and Development departments.

¹⁴¹ <https://magazine.utdallas.edu/2023/08/02/timely-topic-physicist-explains-urban-heat-islands-ways-to-cool-down-effects/>

NCTCOG has frequently pursued and been awarded competitive grant funding on behalf of the region, which it has then passed through to local governments and private entities as implementing agencies within the region via subawards, subcontracts, and participant support cost agreements. These same mechanisms will be utilized to implement some measures for the DFW AQIP.

7- Workforce Planning Analysis

NCTCOG has not completed a Workforce Planning Analysis as part of the PCAP. These projections will be developed as part of the CCAP to be submitted in summer 2025.

8- Next Steps

This document will be submitted to EPA to fulfill the PCAP deliverable as required by the CPRG: Planning Grants award and will be posted for review and feedback by stakeholders in the region to start soliciting responses and input on the PCAP immediately upon completion. NCTCOG will then turn attention toward development of a CCAP to be submitted in summer 2025. Key steps in developing the CCAP will include:

GHG Inventory

NCTCOG plans to utilize the EPA's MOVES model and ICLEI's ClearPath software to conduct an updated comprehensive 16-county regional GHG inventory. This updated inventory would include all GHG emissions and sinks by emission source. The inventory is expected to utilize 2022/2023 data, unless this data is not available, in which case, NCTCOG will use the latest available data. NCTCOG will ensure consistency in the development of this updated GHG EI.

GHG Emissions Projections

As NCTCOG updates and expands the GHG EI for the CCAP, NCTCOG intends to concurrently develop comprehensive sector-based (industry, electricity consumption, transportation, commercial and residential buildings, agriculture, natural and working lands, and waste and materials management) emission projections for a near- and long-term years, 2030/2035 and 2050, respectively. In addition, the projections of GHG emissions (and sinks, if feasible) would include a comparison of a current "business-as-usual" scenario to a scenario where the CCAP is fully implemented.

GHG Reduction Targets

The updated GHG EI and comprehensive sector-based emission projections would be used by NCTCOG and coordinating entities to establish quantitative GHG emissions reduction targets for the near-term (2030/2035) and long-term (2050) years. These reduction targets would be consistent with the U.S. commitments to reduce emissions by 50 to 52 percent relative to 2005 levels by 2030, and reach net zero by 2050.¹⁴² NCTCOG expects to identify at a minimum specific GHG reduction target for the energy and

¹⁴² <https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/22/fact-sheet-president-biden-sets-2030-greenhouse-gas-pollution-reduction-target-aimed-at-creating-good-paying-union-jobs-and-securing-u-s-leadership-on-clean-energy-technologies/>

transportation sectors, as these sectors are responsible for the majority of GHGs produced in the region. Requirements for Federal Highway Administration GHG performance measures in the transportation sector will be considered to ensure that CCAP targets and FHWA performance measure targets are complementary.

Quantified GHG Reduction Measures

Many short-term measures have been identified during the development of the PCAP, but NCTCOG has been very deliberate in coordination with regional stakeholders to focus on measures that can be implemented within five years. To develop the CCAP, NCTCOG will coordinate with stakeholders to identify longer-term strategies that were removed from consideration during the PCAP development phase. As part of this evaluation, NCTCOG will review any new federal guidance for selecting measures and feedback from communities and other stakeholders regarding PCAP measures. NCTCOG will also coordinate stakeholders in evaluating the effectiveness of measures as compared to near- and long-term targets. NCTCOG will continue prioritizing measures that reduce emissions of ozone precursors and PM_{2.5}. Coordinating entities who wish to implement measures will be asked to identify how each measure will support regional priorities, benefits to near- and long-term targets, and the feasibility of implementation based off topography, air quality, climate, community characteristics, and benefits to the disadvantaged communities.

After identifying the full suite of measures, NCTCOG will quantify GHG and criteria pollutants reduced for each proposed measure and the potential reduction if the CCAP was fully implemented. To ensure consistency with the EPA and with other lead organizations for the CPRG, NCTCOG will primarily use tools recommended by the EPA to quantify the GHG reduction measures. When possible, NCTCOG will use the same tools used during the PCAP to ensure consistency in the evaluation of GHG reduction measures.

Benefits Analysis

This step was started during development of the PCAP, but due to the broad geographic scope of the DFW AQIP and the number of local governments involved in PCAP measures, specific sites for project implementation are not yet known and a full benefits analysis could not be completed. As specific project sites are identified, the region will be better able to specify the types of benefits or disbenefits of PCAP measures, and the communities who will be most directly impacted, to conduct a more robust benefits analysis for PCAP measures already identified.

Additional benefits analysis will be conducted on longer-term measures newly identified for CCAP purposes. Staff will assess the qualitative and quantitative benefits and disbenefits for each CCAP measure. Quantified benefits will include the expected reduction in criteria pollutants for each individual GHG measure and the total reduction of criteria pollutants if all measures in the CCAP were implemented. The tools used and processes for identifying the benefits of measures will be selected after reviewing any EPA and stakeholder recommendations and feedback on the PCAP.

NCTCOG and coordinating entities will evaluate the public engagement conducted and feedback received during the PCAP to determine the exact outreach needed for the CCAP. However, it is expected the feedback collected during the development of the PCAP will be incorporated into the CCAP and there will be additional feedback collected via virtual meetings and other engagement opportunities. NCTCOG will

make the list of proposed measures for the CCAP available to the public and provide at least 30 days to submit comments on any benefit and disbenefits.

Low-Income/Disadvantaged Communities Benefits Analysis

NCTCOG and coordinating entities will assess the use of the EJ Screen Tool and the CEJST (<https://screeningtool.geoplatform.gov/en/>) to identify DAC and determine if the tools have comprehensively identified DAC across the region. Updates will be made as needed to create a final DAC identification. NCTCOG will then provide each collaborating entity with a list of DACs (in the format of Census Tract ID) within their jurisdiction.

Community priorities have been collected as part of PCAP engagement, but the online surveys will remain posted throughout CCAP development to continue gathering input. Staff will identify qualitative and quantitative benefits of each potential GHG reduction measure in relation to reported priorities. As expected, the primary concern expressed was related to local air quality. Thus, staff has assessed criteria pollutant reductions of PCAP measures with a focus on NO_x and PM_{2.5}, and will conduct this evaluation for additional CCAP measures as they are identified. When possible, both the direct (within the DACs) and indirect (outside the DACs) benefits will be estimated. NCTCOG will evaluate the possibility of creating a publicly-available Geographic Information System (GIS) map to show the correlation between the location of DACs as compared to proposed measures or integrating this information into other existing NCTCOG-managed publicly-available mapping resources.

Upon quantification of benefits, NCTCOG will identify the proportion of the benefits received by DAC. NCTCOG will make the list of proposed measures for the CCAP available to the public and ensure the public has at least 30 days to submit comments on the benefits and disbenefits. The virtual engagement opportunities used for the Benefits Analysis will be the same virtual engagement opportunities used for the DAC benefits analysis. NCTCOG will request zip codes from respondents to identify whether they represent a DAC. Results of these comments will be used to finalize the list of measures in the CCAP.

Review of Authority to Implement

NCTCOG anticipates retaining a focus on voluntary and incentive measures in developing the CCAP, just as with the PCAP. Certain measures, such as code adoption, are initiatives for which municipal authority is codified in state statute, and NCTCOG will identify what other measures may be under the scope of local control.

Intersection with Other Funding Availability

NCTCOG will update the funding availability analysis from the PCAP and assess federal, state, and local funding availability for each new proposed implementation measure in the CCAP. NCTCOG will also report on any funding currently available to the region to implement measures and any funding that has been obtained for the implementation of the PCAP. NCTCOG will continue supporting coordinating entities in applying for funding and, if appropriate and supported by local governments, NCTCOG will consider applying on behalf of the region funds.

Workforce Planning Analysis

Workforce Solutions for North Central Texas (WSNCT) will develop a workforce analysis to identify opportunities and shortages resulting from the potential implementation of GHG reduction measures.

Data from the 16-county region will be accessed and analyzed to determine what workforce gaps exist, training programs to be developed, and the availability of workers. WSNCT has access to labor market tools, such as Chmura JobsEQ, Lightcast, and Sites on Texas. These tools can provide various reports to help compiling and completing a workforce analysis. The results of this analysis will be presented to coordinating agencies and posted online for stakeholders to view.

Once the analysis is complete, WSNCT will convene community college partners to present the data and devise a strategy to develop training programs to provide the skills needed for the occupations. The types of occupations needed will emerge as GHG reduction measures are identified and analysis of the current job market is completed, and could vary amongst the counties based on location.

Regional Engagement

NCTCOG will integrate feedback received as part of PCAP development to inform CCAP development. NCTCOG will also consider input received on the PCAP upon posting the document, including comments received from EPA, the public, collaborating agencies, or other regional stakeholders. Once the PCAP is posted (at www.publicinput.com/dfwaqip), the document will remain available for review and commenting through December 2024, when preliminary GHG reduction measures are expected to be posted. NCTCOG and coordinating entities will evaluate engagement efforts undertaken as part of the PCAP process to determine strengths and opportunities.

All stakeholders and members of the public who participated in the development of the PCAP will be notified when it is published and will be kept up to date on the development of the CCAP via quarterly e-blasts via the Public Input engagement platform. At a minimum, virtual engagement opportunities, to allow for community feedback, will occur. New engagement opportunities will also be sought out, if necessary, after analyzing the PCAP outreach. NCTCOG will make the list of proposed measures for the CCAP available to the public and provide at least 30 days to submit comments on the qualitative and quantitative benefits, and any potential disbenefits. Additional plans for further engagement with each of the two major stakeholder groups are:

Stakeholder/Intergovernmental Engagement

NCTCOG will work with stakeholders to assess the coordination process and determine if there are opportunities for improvement to ensure the successful development of the CCAP. NCTCOG expects the coordination conducted during the development of the PCAP to continue, which will include:

- Monthly or bimonthly meetings with coordinating entities.
- Collaboration via a Microsoft Teams channel.
- Presentations and discussion items at NCTCOG committee meetings.
- Collaboration with other lead organizations for the CPRG.

Also, if coordinating entities have conducted any relevant and recent outreach for local air pollution or climate action plans, this feedback will also be incorporated into the CCAP. As feedback on GHG reduction measures is received from the community, the feedback will be made available to coordinating entities to help finalize the list of implementation measures for the CCAP.

Public Engagement

NCTCOG and coordinating entities will evaluate the public engagement conducted during the PCAP to determine what outreach was successful and where there are opportunities to improve public

engagement strategies used for developing the CCAP. This evaluation will inform additional public engagement, which may include public meetings and open house forums, and virtual listening sessions. Particular attention will be given to the degree to which PCAP successfully engaged DACs. NCTCOG had set a goal that at least 50 percent of the participants from PCAP public engagement would represent a DAC, based on the zip code that the attendee is representing. Preliminary results show that 45 percent of respondents represent a LIDAC. NCTCOG will continue outreach efforts to LIDAC for the CCAP to reach the 50 percent goal.

NCTCOG anticipates focusing additional attention on stakeholder engagement with organizations representing DACs as part of CCAP development, as the compressed schedule for PCAP development did not allow as much direct engagement with community-based organizations representing or working on behalf of DACs as had originally been envisioned.

Another large long-range regional plan – the long-range Metropolitan Transportation Plan – is also slated for development throughout 2024, and NCTCOG may look for opportunities to combine CCAP and Metropolitan Transportation Plan development in outreach to cross-pollinate stakeholder engagement and prevent “community fatigue.”