



Texas Carbon Reduction Strategy

February 2024

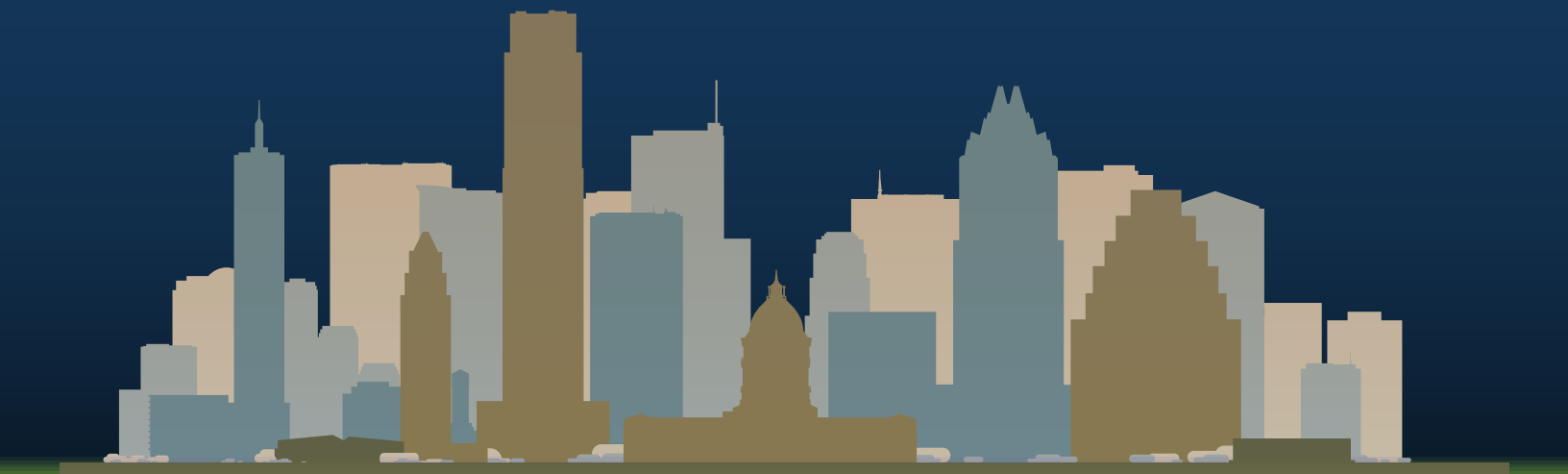


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Executive Summary

Texas Department of Transportation's (TxDOT) Carbon Reduction Strategy (CRS) supports efforts to reduce carbon dioxide (CO₂) emissions from the transportation sector in Texas. The CRS is a requirement under federal law that established the Carbon Reduction Program (CRP) through the Infrastructure Investment and Jobs Act (IIJA) (Public Law 117-58). The IIJA's dual purposes for the CRP are to reduce transportation emissions through: (1) the development of state carbon reduction strategies; and (2) funding projects designed to reduce transportation emissions. Per FHWA guidance, transportation emissions are defined as CO₂ emissions from on-road highway sources.

Funding Projects Designed to Reduce Transportation Emissions

The Carbon Reduction Program is designed to fund projects that will help to reduce transportation emissions. The program provides an estimated \$641 million in formula funding for Texas to be used over a five-year period (FY 2022 to FY 2026) on strategies and projects to reduce carbon emissions from the transportation sector, as shown in Table 1 below. Understanding that the projected transportation emissions reductions from these and other projects identified in the CRS will not completely offset estimated transportation emissions in any given year, TxDOT will seek ways to maximize emissions reductions per federal dollar spent on them using a data-driven approach.

Federal law allows states to transfer up to 50 percent of the amount apportioned for the fiscal year (FY) for certain highway programs, including CRP, to other eligible apportioned highway programs. Accordingly, TxDOT is flexing a portion of CRP funding to another federal program to address unmet needs in areas where apportioned funding was insufficient. Table 1 shows the amount of CRP funds that remain after the transfer for each FY.

Table 1. CRP Apportionment to Texas, FY 2022 – 2026 (\$ Million)

Federal FY	Estimated Federal Apportionment	Total Allocation for TX After Statewide Flex
2022	\$123	/
2023	\$126	/
2024	\$128	\$311
2025*	\$131	\$108
2026*	\$133	\$110
TOTAL	\$641	\$529

* FY 2025-2026 data shown as estimate amount.

Source: Federal Highway Administration, *FY 2022-2026 Estimated Highway Apportionments under the Bipartisan Infrastructure Law, 2022*.

By law, CRP funding is divided across urban and rural areas based on population, with 65 percent apportioned to urbanized areas and 35 percent apportioned to TxDOT to invest in any area of the state.

Development of State Carbon Reduction Strategies

Federal law requires that states, in consultation with metropolitan planning organizations (MPOs), develop a CRS that:

- (1) Supports efforts to reduce transportation emissions;
- (2) Identifies projects and strategies to reduce transportation emissions;
- (3) Supports the reduction of transportation emissions of the state; and
- (4) Is appropriate to the population density and context of the state, including MPOs.

To these ends, this CRS will serve as a framework to be applied to investments in the state from CRP and other federal program sources to address transportation emissions.

Carbon Reduction Strategies

Together with MPOs and other stakeholders, TxDOT identified seven categories of planned strategies for the CRS (Figure 1). Each serves the CRP's purpose of reducing transportation emissions, as well as TxDOT's mission of Connecting You With Texas and vision of delivering mobility, enabling economic opportunity, and enhancing quality of life for all Texans.

The categories of planned strategies were initially identified from interviews with peer state DOTs and a review of local, regional, and statewide planning and programming documents within Texas. From these activities, TxDOT identified best practices and strategies that could be integrated into the CRS.

Table 2 on the following pages provides a summary of the seven categories along with funded projects related to the carbon reduction strategies. The categories of strategies are listed in order of implementability based on results from a survey of Texas' MPOs (survey questions and results are provided in Appendix A). The projects described in Table 2 are a sample of projects that are eligible for CRP funds and have been programmed in TxDOT's Unified Transportation Program (UTP), TxDOT's ten-year capital program of projects. While not all are currently funded with CRP dollars, these example projects are shown for illustrative purposes to demonstrate the types of projects that will be the focus of TxDOT's CRP investments moving forward to comprehensively address transportation emissions. Lists of these projects are further detailed in Appendix B and Appendix E.

Figure 1. Carbon Reduction Strategy Categories and Objectives.



Table 2. Carbon Reduction Strategy Categories and Projects.

Categories of Strategies	Objective	Strategies	Example Projects –Funding Amount (CSJ)
 Advanced Technologies	Employ advanced technologies to improve traffic flow and operations.	» Traffic signal improvements and upgrades, including signal optimization » Intelligent Transportation System (ITS) traffic control device installation and upgrades » Real-time information and communication system installation and upgrades » Rail crossing traffic management system installation and upgrades » Vehicle to Infrastructure (V2I) communications technology installation and upgrades » Dynamic freight routing system upgrades » Traffic Management Center (TMC) upgrades and integration » Dynamic parking availability signs and systems installation and upgrades	<i>CRP-Funded Projects</i> » Dynamic Message Sign Upgrades on IH 45, IH 10 & IH 610 – \$9.6 million (0912-00-700). » Install Signal Phase and Time (SpAT) Signals – \$16.2 million (0912-00-701). <i>Eligible for CRP¹</i> » Traffic Management Center Upgrade Phase 4 - \$5 million (0924-06-568). » Install Dynamic Parking Availability Signs (DPAS) for Truck Parking Availability System (TPAS) - \$1.25 million (0915-00-268). » Installation of closed-circuit television (CCTV) and DMS on US 62 in El Paso County - \$1.2 million (0374-02-124).
 Travel Demand Management	Reduce congestion to improve the operational efficiency of the transportation system.	» Intersection improvements » Shifting demand to other transportation modes » Interchange improvements » Increasing vehicle occupancy rates » Shifting demand to nonpeak hours » Implementation of congestion pricing » Roundabout installation and improvements	<i>Eligible for CRP</i> » SH 6 Intersection Improvements in Harris County – \$8 million (1685-05-105). » SL 1604 Expansion with HOV-Special Use Lanes – \$131 million (2452-03-113).

1 Projects listed as “Eligible for CRP” are not currently funded with CRP dollars, but are eligible uses of CRP funds.

Categories of Strategies	Objective	Strategies	Example Projects –Funding Amount (CSJ)
 Active Transportation	Support access, availability, and safety of bicycling and walking.	» Planning, design, and construction of: » Shared use path improvements » Bike lane improvements » Bicycle and pedestrian bridge improvements » Projects to increase visibility (e.g., street lighting) » Americans with Disabilities Act (ADA) improvements » Projects improving safety for vulnerable road users » Motor vehicle-pedestrian and bicyclist separation projects » Signal upgrades » Micromobility, bikeshare, and electric bike projects » Projects to match vehicle speeds to the built area	<i>CRP-Funded Projects</i> » Construct Los Fresnos Hike and Bike Trail – \$3.4 million (0921-06-334). » Construct 10 ft. wide hike and bike trail along the Old Georgetown Railroad route between 31 St and 5th St. – \$1.1 million (0909-36-173). <i>Eligible for CRP</i> » Construct new sidewalks, pedestrian lighting, and landscaping on SH 180 in Tarrant County - \$32 million (0008-07-034). » Construct separated bike lanes and sidewalks in coordination with the FM 2493 lane widening project in Smith County - \$1.5 million (0191-03-091).
 Transit	Support the use of transit.	» Transit vehicle and equipment purchases and upgrades » Transit station improvements » Maintenance and operations facility improvements » ADA improvements » Urban rail system establishment, expansion, or preservation » Bus Rapid Transit (BRT) system establishment, expansion, or preservation » Park-and-ride facility establishment, expansion, or preservation » Dedicated bus lane improvements	<i>CRP-Funded Projects</i> » Construction of bus passenger loading areas and facility improvements – \$1 million (0921-06-372). <i>Eligible for CRP</i> » Identify and construct bus stop upgrades in Tarrant County - \$3 million (0902-00-372). » Construct multi-modal BRT busway including grade separation and connection to HOV lanes and transit center in Harris County - \$141 million (0271-07-336).

Categories of Strategies	Objective	Strategies	Example Projects –Funding Amount (CSJ)
 Construction and Maintenance	Construct and maintain infrastructure using carbon reducing practices, equipment, materials, and technologies.	» Energy-efficient streetlight and traffic control device conversions » Promote the use of carbon reducing construction equipment and materials » Cost-beneficial maintenance practices » Rail-Highway grade separation improvements » Last mile investments » Increasing bridge vertical clearances » Biologic carbon sequestration practices in highway right-of-way (ROW) » Installing renewable energy generation facilities (solar arrays and wind turbines) in highway ROW » Signage improvements to ports » Installing or upgrading flyovers accessing ports	<i>CRP-Funded Projects</i> » Replace underpass lighting and high mast fixtures with LED lighting and fixtures on IH 45 – \$4.3 million (0110-04-208). » Replace navigational lights with solar navigational lights – \$1.5 million (0912-00-698). <i>Eligible for CRP</i> » Construct 2-lane on new location with railroad grade separation on FM 528 in Brazoria County - \$16 million (1414-02-016). » Plant wildflowers on ROW in Cass County - \$190,000 (0919-00-093).
 Alternative Fuels	Support alternative fuel and electric vehicle adoption.	» Electric and alternate fuel vehicle infrastructure installation and upgrades » Designated truck parking area electrification system installation and upgrades » Implementation of engine and vehicle replacement and retrofit programs, including diesel engine retrofit projects » Purchase or lease of zero-emission construction equipment and vehicles	<i>CRP-Funded Projects</i> » Collaboration, evaluation of impacts, and development of resources to address electric grid impacts associated with electrification of transportation and deployment of strategic electrification infrastructure – \$500,000 (0918-00-436). <i>Eligible for CRP</i> » Purchase of electric vehicles and related infrastructure for implementation of transit service in Dallas County - \$1.33 million (0918-47-437). » Replace 20 40-foot heavy duty diesel buses or diesel/electric hybrids with 20 all electric buses; purchase 10 all electric "cutaway" buses; purchase necessary recharging stations in Harris County - \$29 million (0912-00-639).

Categories of Strategies	Objective	Strategies	Example Projects –Funding Amount (CSJ)
 Freight Movement	Reduce the environmental and community impacts of freight movement.	» Dedicated truck parking projects » Construction of multimodal or intermodal facilities » Projects to reduce the environmental and community impacts of freight movement, including locomotive upgrade programs » Strategies that reduce CO₂ emissions at ports, including port electrification projects » Support and collaborate on mode shift to rail.	<i>CRP-Funded Projects</i> » Construct truck parking on IH 45 – \$ 1.7 million (0675-08-123). <i>Eligible for CRP</i> » Add non-tolled managed lanes, reconstruct ramps, improve frontage road and freight movements, and add auxiliary lanes on I-35 in Williamson County - \$200 million (0015-09-178). » Construct truck parking in Wise County- \$4 million (0013-07-087).

Collaboration and Coordination

This CRS is the culmination of interviews with seven peer state DOTs and TxDOT's frequent collaboration and coordination with MPOs and other stakeholders in Texas, using a variety of in-person and virtual platforms. Stakeholder engagement included review of and feedback on proposed strategies and drafts of the CRS. As is the case with many of TxDOT's planning efforts, the CRS was drafted from internal and external research, presented to stakeholders and to the public for comment and feedback, and finalized and adopted following consideration of that input.

The CRS was developed through a process that included:

- » Interviews with peer state DOTs to understand best practices
- » A review of local, MPO, and TxDOT plans to understand common strategies that could be integrated into the CRS
- » MPO consultation and coordination meetings and online survey
- » TxDOT District consultation and coordination meetings and online survey
- » A two-week public comment period

These activities are summarized below.

Peer State DOT Best Practices Review

Interviews with peer state DOTs were conducted to identify national best practices in identifying and adopting strategies to reduce CO₂ emissions from the transportation sector (see Sidebar). Through this effort, TxDOT found that peer state DOTs were leveraging ongoing efforts, using existing transportation plans, projects, and strategies as the basis for their CRS. In addition, interviewees were flexing CRP funds to other federal programs and giving MPOs discretion to select projects on which to spend their allocated urbanized area funds.

Review of Local, MPO, and TxDOT Plans and Programs

An examination of local climate plans, MPO planning and programming documents, and TxDOT planning documents include goals, objectives, strategies, and projects that are supported by the CRS. A key finding from this analysis was that recently approved TxDOT planning documents, including the [Texas-Mexico Border Transportation Master Plan 2021](#), [Texas Delivers 2050](#) (freight plan), and [Texas Transportation Plan 2050](#) (TxDOT's latest approved Statewide Long Range Transportation Plan) share goal areas (see Sidebar). These myriad TxDOT and USDOT goals are supported by the CRS.

Peer State DOTs were interviewed to understand best practices

Indiana DOT
California DOT
Michigan DOT
Pennsylvania DOT
Oregon DOT
Washington State DOT
Confidential Interviewee

TxDOT plans share common goals

Stewardship and Sustainability
Resiliency
Mobility and Reliability
Safety
Economic Competitiveness
Asset Preservation

MPO and TxDOT District Consultation and Coordination

TxDOT engaged with the state's MPOs to provide information on the CRP and seek input on CRS strategies and projects. This collaboration and coordination between TxDOT and MPOs involved presentations, Q&A and discussion sessions, and an online survey to receive feedback and input on the proposed carbon reduction strategies. TxDOT's Districts and Divisions were similarly engaged for internal collaboration and coordination.

Public Comment Period

The draft CRS was available for a two-week public comment period in October - November 2023 through TxDOT's website. A public comment summary is included in Appendix D.

Implementation

To advance the strategies in the CRS toward implementation, TxDOT will work with MPOs and other partners to take the following actions:

- » **Integrate carbon reduction into TxDOT and MPO planning processes** by incorporating the CRS into the state long-range transportation plan (SLRTP) and MPO metropolitan transportation plans (MTP).
- » **Strengthen partnerships** with federal, state, regional, local, and private-sector organizations.
- » **Engage MPOs** to invest in projects that meet CRS objectives and address transportation emission reduction opportunities as they arise in the future.
- » **Develop performance measures and targets** in compliance with applicable federal laws and regulations.
- » **Develop a data-driven methodology for incorporating carbon reduction as a project selection criterion for CRP eligibility** by assessing carbon emissions from transportation investments and determining the utility of a decision-making framework.

Introduction

The Carbon Reduction Strategy (CRS) is a guiding document that outlines efforts in Texas undertaken to reduce transportation emissions (i.e., carbon dioxide [CO₂] emissions from on-road highway sources within a state). The CRS outlines TxDOT's strategic approach to reducing transportation emissions through investments intended to deliver a more resilient, sustainable, operationally efficient, safe, and reliable multimodal transportation system.

The goal of net-zero emissions by 2050 has been advanced through various legislative and programmatic efforts, including the Infrastructure Investment and Jobs Act (IIJA) (Public Law 117-58) and the Federal Carbon Reduction Program (CRP) established through it.

Federal Carbon Reduction Program

The federal CRP was created under the IIJA, which was signed into law on November 15, 2021. The IIJA established the CRP, codified as 23 United States Code (U.S.C.) § 175, to reduce transportation emissions through the development of state carbon reduction strategies and funding projects designed to reduce transportation emissions. The program provides a national total of \$6.4 billion in federal formula funds for federal fiscal years (FY) 2022 through 2026² for projects that aim to reduce emissions from transportation sources.

Administered by the Federal Highway Administration (FHWA), the CRP allocates a lump sum for each state to divide across urban and rural areas based on population. Sixty-five percent is to be obligated in urbanized areas with populations over 200,000, urbanized areas with populations between 50,000 and 200,000, urban areas with populations between 5,000 and 49,999, and other areas with populations less than 5,000. The remaining 35 percent may be invested in any area of the state.

Carbon Reduction Strategy Requirements

Federal law provides the following requirements for the CRS:

The carbon reduction strategy of a State ... shall:

- (A) *support efforts to reduce transportation emissions.*
- (B) *identify projects and strategies to reduce transportation emissions, which may include projects and strategies for safe, reliable, and cost-effective options-*
 - (i) *to reduce traffic congestion by facilitating the use of alternatives to single occupant vehicle trips, including public transportation facilities, pedestrian facilities, bicycle facilities, and shared or pooled vehicle trips within the State or an area served by the applicable metropolitan planning organization, if any;*
 - (ii) *to facilitate the use of vehicles or modes of travel that result in lower transportation emissions per person-mile travelled as compared to existing vehicle and modes; and*
 - (iii) *to facilitate approaches to the construction of transportation assets that result in lower transportation emissions as compared to existing approaches;*
- (C) *support the reduction of transportation emissions of the State;*
- (D) *at the discretion of the State, quantify the total carbon emissions from the production, transport, and use of materials used in the construction of transportation facilities within the state; and*
- (E) *be appropriate to the population density and context of the state, including any metropolitan planning organization designated within the State.*³

² Federal Highway Administration, FY 2022-2026 Estimated Highway Apportionments under the Bipartisan Infrastructure Law, October 2022.

³ 23 U.S.C. § 175(d)(2).

This CRS meets this federal standard in the following ways:

- (A) The CRS **supports efforts to reduce transportation emissions** by including projects from TxDOT's plans that have been proven to reduce emissions and are eligible uses under the CRP.
- (B) The CRS **identifies projects and strategies to reduce transportation emissions**, including projects and strategies that provide safe, reliable, and cost-effective options for reducing traffic congestion, facilitate use of public transportation and active transportation facilities, and support emissions-reducing approaches to transportation infrastructure construction.
- (C) The CRS **supports the reduction of transportation emissions of the State** by guiding investments of CRP and other federal aid in the State towards strategies and projects that are anticipated to reduce transportation emissions and are eligible activities under the CRP.
- (D) The CRS is **appropriate to the population density and context of the State** because the strategies and projects identified within the CRS were determined through collaboration and coordination with Texas' MPOs.

This CRS does not quantify the total carbon emissions from the production, transport, and use of materials used in the construction of transportation facilities within the State. It is still compliant with the law, however, because, in exercising the state's discretion, TxDOT determined that such a quantification does not currently exist and could not be completed by the federal deadline. However, TxDOT will consider including these construction-related emissions for the CRS revision in four years if they have been quantified in the interim.

While MPOs are not required to develop their own CRS, FHWA encourages state DOTs and MPOs to coordinate on two types of actions:

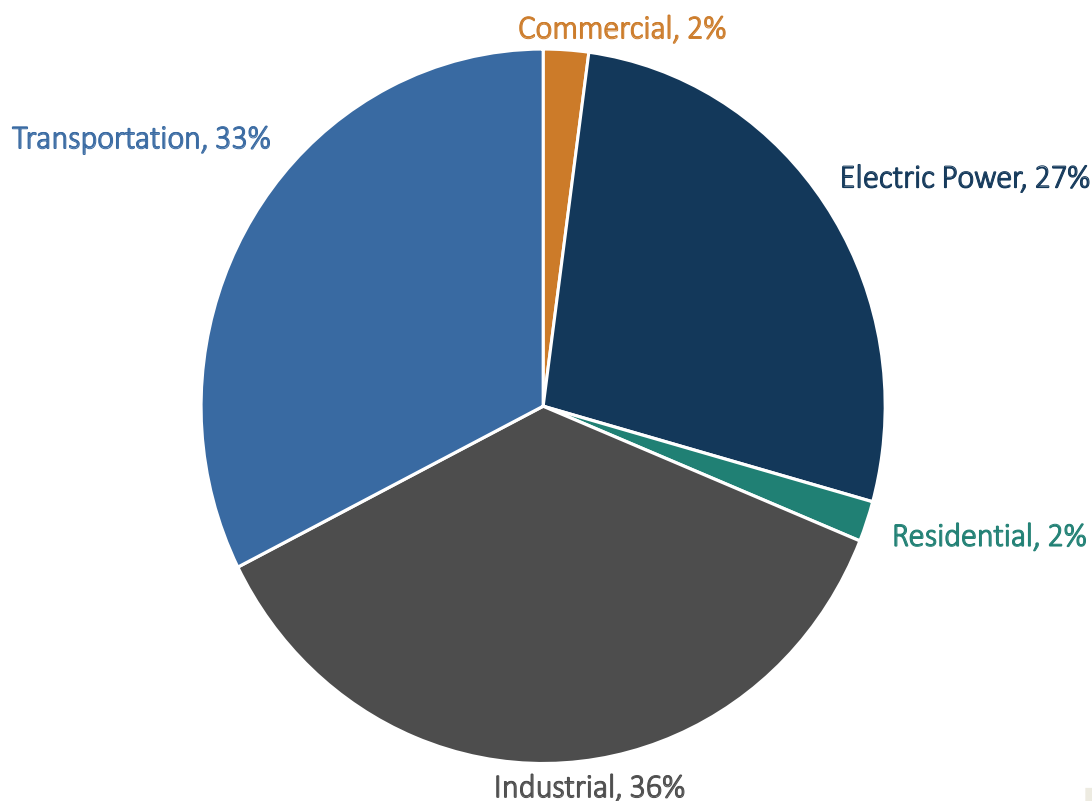
- (1) Obligate CRP funds to projects that support implementation of the CRS.
- (2) Develop their CRS "as an integral part of their transportation planning processes" either by integrating the CRS into the state's long-range transportation plan (LRTP) or the MPO's metropolitan transportation plan (MTP) or developing a separate document that is incorporated by reference into the SLRTP and MTP.

Carbon Emissions in Texas

Because the CRS is intended to support efforts to reduce carbon emissions from the transportation sector in Texas, it is important to understand the data regarding CO₂ emissions in the state. The progress that TxDOT and MPOs make with the support of the CRP and other federal funding programs will be viewed relative to the historical, current, and trend information presented here from federal, state, and regional sources.

The latest data from the U.S. Energy Information Administration estimates that total CO₂ emissions in Texas were 663.5 million metric tons in 2021, an 84.9 percent increase from 1970 and 6.2 percent decrease from 2019. Unlike at the national level, the industrial sector was the largest source of CO₂ emissions in Texas in 2021, making up 36.4 percent of total CO₂ emissions, while the electric power sector made up 27.2 percent, the commercial sector made up 2.1 percent, and the residential sector made up 1.8 percent (Figure 2).

Figure 2. CO₂ Emissions in Texas by Sector, 2021.



Source: U.S. Energy Information Administration, July 2023.

TxDOT's Approach to the CRP

Over the five-year period from FY 2022 through FY 2026, the CRP includes an estimated \$641 million in formula funding for Texas to be used on strategies and projects to reduce carbon emissions from the transportation sector. As with other federal highway aid formula programs, CRP funds leverage state funding by requiring a 20 percent non-federal match. The estimated annual federal apportionment ranges from approximately \$123 million in FY 2022 to \$133 million in FY 2026 (Table 3). In accordance with federal law, TxDOT is flexing a portion of the CRP apportionment to another federal highway program. Table 3 shows the amount of CRP funds that remain after the transfer for each FY.

Table 3. CRP Apportionment to Texas, FY 2022 – 2026 (\$ Million)

Federal Fiscal Year	Estimate Federal Apportionment	Total Allocation for TX after Statewide Flex		
		Statewide/ Rural	Urban Area (MPO)	Total
2022	\$123	/	/	/
2023	\$126	/	/	/
2024	\$128	\$109	\$202	\$311
2025*	\$131	\$38	\$70	\$108
2026*	\$133	\$39	\$71	\$110
TOTAL	\$641	\$186	\$343	\$529

* FY 2025-2026 data shown as estimate amount.

Source: Federal Highway Administration, FY 2022-2026 Estimated Highway Apportionments under the Bipartisan Infrastructure Law, October 2022.

TxDOT has obligated CRP funds to projects that reduce transportation emissions, including lighting conversions, traffic signal improvements, ITS infrastructure, bicycle and pedestrian infrastructure, and truck parking projects. A full listing of CRP-funded projects is provided in Appendix B. To illustrate the carbon reduction impact of these types of investments, Table 4 provides a sample of funded and unfunded projects and their potential carbon reduction benefits. While TxDOT recognizes that the projected transportation emissions reductions from these and other projects identified in the CRS will not completely offset estimated transportation emissions in a given year, TxDOT will continue to assess data-driven ways to maximize the benefits of the state's CRP allocation by investing in projects that capture greater reductions per dollar spent on them.

Table 4. Examples of Projects and their Carbon Reduction Benefits

Project	Description	Estimated CO ₂ Emissions Reductions (kg per day)
Streetlighting Illumination Upgrades	Replace 149 existing high-pressure sodium (HPS) lights with light-emitting diode (LED) lights in the San Antonio area.	0.043 (from energy efficiency and lower power consumption)
Night Maintenance Activities on High-Volume Corridors	Performing maintenance activities at nighttime on high-volume corridors reduces traffic congestion resulting from peak-period maintenance-related lane closures.	682.00 (from reduced traffic congestion due to peak period maintenance-related lane closures)
IH 410 / US 281 Intersection Improvements	Improve the intersection of IH 410 and US 281 / Roosevelt Ave. by adding a U-turn lane.	35.57 (from reduced vehicle idling due to delay)
IH 35 / Zarzamora St. Intersection Improvements	Improve the intersection of IH 35 and Zarzamora St. by adding lanes.	40.03 (from reduced vehicle idling due to delay)
SH 46 / Mary Saengerhalle Rd. Intersection Improvements	Improve the intersection of SH46 and Mary Saengerhalle Rd.	46.06 (from reduced vehicle idling due to delay)
IH 35 / SPUR 422 Rd. Intersection Improvements	Improve the intersection of IH 35 and SPUR 422 Rd. by adding lanes.	82.54 (from reduced vehicle idling due to delay)
IH 35 / SouthCross Blvd. Intersection Improvements	Improve the intersection of IH 35 and SouthCross Blvd. by adding U-turn lanes.	114.99 (from reduced vehicle idling due to delay)
IH 35 / Solms Rd. Intersection Improvements	Improve the intersection of IH 35 and Solms Rd. through signal improvements.	115.96 (from reduced vehicle idling due to delay)
IH 35 / SL 337 Intersection Improvements	Improve the intersection of IH 35 and Loop 337 (SL337) / Rueckle Rd. by adding lanes.	231.72 (from reduced vehicle idling due to delay)
SH 46 / FM 3009 Intersection Improvements	Improve the intersection of SH 46 and FM 3009 by adding lanes.	338.92 (from reduced vehicle idling due to delay)
SH 46 Auxiliary Lane Improvements	Improve the auxiliary lane on SH 46 between SL 1604 and Mt. Montgomery Rd.	1,768.07 (from improved vehicle driving speeds due to reduced congestion)
LP 410 / Valley Hi Drive Interchange Improvements	Add a turnaround lane on the northbound and southbound Loop 410 frontage roads at the Valley Hi Drive diamond interchange.	2,471.91 (from reduced vehicle idling due to delay)
SH 46 / FM 3159 Intersection Improvements	Improve the intersections of SH 46 and FM 3159 by adding lanes.	2,503.56 (from reduced vehicle idling due to delay)
SH 16 / IH 410 Intersection Improvements	Improve the intersection of IH 410 and SH 16 to a full DLT intersection.	5,304.57 (from reduced vehicle idling due to delay)

Source: Texas A&M Transportation Institute

Moving forward, TxDOT, in coordination with stakeholders, will continue to invest CRP funds in projects and strategies that reduce transportation emissions (see Appendix B). The 2024 UTP includes a large number of projects or components of projects that are potentially eligible for CRP funding (see Appendix E). In accordance with federal law, these investments will provide safe, reliable, and cost-effective options to reduce traffic congestion, facilitate use of lower-emission vehicles and modes of travel, and support lower-emission methods of construction.

Parity Considerations

The CRS recognizes the need to consider the distributional inequities of environmental pollution and climate vulnerability for historically disadvantaged or underserved communities. Implementing the strategies identified in the CRS requires the consideration of parity in public involvement, programming decisions, and delivery of CRP-funded projects. These considerations are embedded in many of TxDOT's existing plans and practices, including TxDOT's Statewide Long-Range Transportation Plan (SLRTP), [Texas Transportation Plan 2050](#), and TxDOT's freight plan, [Texas Delivers 2050](#).

Carbon Reduction Strategies

The CRS is the result of a process led by TxDOT to identify strategies and projects aimed at reducing transportation emissions. The development of the CRS involved discussions with peer state DOTs, coordination with MPOs, and input from internal and external stakeholders, including the public, as shown in Table 5. A detailed summary of the work that led to the development and refining of the strategies in this CRS is provided in Appendix C. This level of analysis and engagement went above and beyond federal requirements due to best practices learned early in the CRS development process and TxDOT's understanding that stakeholder involvement and input are essential to delivering the agency's mission.

Table 5. CRS Development Schedule.

Date	Milestone
February 17, 2023	Coordination with MPOs
April 2023	Complete peer state DOT interviews
June 2023	Identify carbon reduction strategies and project types
July 14, 2023	Coordination with MPOs
July 2023	Coordination with TxDOT Districts
July – August 2023	Online survey of MPOs and TxDOT Districts
July – August 2023	Obtain feedback and draft CRS
October – November 2023	Public comment period

The strategies and projects presented in this CRS were identified through a review of best practices based on interviews with seven peer state DOTs, as well as a review of Texas planning and programming documents. The interviews identified national best practices in terms of implementing and managing the CRS and CRP. One finding regarding performance measurement was that peer state DOTs are considering adapting tools provided by the Congestion Mitigation and Air Quality (CMAQ) or other programs to measure transportation emission reductions from identified strategies and projects. Staff and equipment costs for data analysis, performance, and evaluation are eligible expenses for CRP funds. Furthermore, regarding use and oversight of CRP funds, peer state DOTs are prioritizing projects that reduce carbon emissions and meet other departmental or statewide goals as well. They are also providing MPOs discretion to prioritize urbanized area projects on their own but, through the CRS, are giving them a broad framework to assist in making those decisions.

The review of recent TxDOT planning documents, including the [Texas-Mexico Border Transportation Master Plan 2021](#), [Texas Delivers 2050: Texas Freight Mobility Plan](#), and the [Texas Transportation Plan 2050](#) (the state's current long range transportation plan), found shared goals from which the strategies in this CRS were developed, including:

» *Stewardship and Sustainability*

» *Resiliency*

» *Mobility and Reliability*

» *Safety*

» *Economic Competitiveness*

» *Asset Preservation*

Based on these findings, potential carbon reduction strategy categories were identified and presented to Texas MPOs as part of the consultation and coordination process. Under federal law, states are required to develop their CRS in consultation with MPOs designated within the state. States are also encouraged to develop their CRS as an integral part of statewide and regional transportation planning processes in coordination with MPOs. TxDOT met these requirements and guidelines by consulting early and often with MPOs throughout the development of the CRS to coordinate on apportionments of CRP funds, prioritize proposed carbon reduction strategies, and understand regional perspectives on the draft CRS.

TxDOT engaged the state's MPOs on three separate occasions during the development of the CRS to provide information on the CRP and seek input on CRS strategies and projects. This collaboration and coordination between TxDOT and MPOs involved the following activities:

- » Presentations providing an overview of the CRP and the proposed framework for the CRS.
- » Q&A and discussion sessions for participants to provide feedback.
- » An online survey used as a tool to receive feedback and input on the strategies.

In addition, TxDOT's Transportation Planning and Programming Division made presentations on the CRP and the development of the CRS to peer Divisions and TxDOT's Districts. Peer Divisions and Districts also provided feedback by survey. Appendix A provides the survey questions and responses. MPO and TxDOT District responses to the survey were valuable in the development of a list of carbon reduction categories and strategies for inclusion in the draft CRS, which were integrated into the draft CRS that was presented to the public for comment in October 2023. Though a public comment period for the CRS is not a federal requirement, it is a best practice in line with longstanding policies and practices. Public involvement and public input are key components of the development of all TxDOT plans, programs, and projects. The draft CRS was available for a two-week public comment period in October - November 2023 through TxDOT's website. A public comment summary is included in Appendix D.

Carbon Reduction Strategies – Categories, Strategies, and Project Types

As mentioned above, TxDOT identified seven categories of planned strategies for the CRS – together with MPOs and other key stakeholders – that aim to reduce transportation emissions through investments that deliver a more resilient, sustainable, operationally-efficient, safe, and reliable multimodal transportation system. They form the foundation for the carbon reduction strategies and projects that will be funded from the federal CRP to comprehensively address transportation emissions.

The categories were refined using MPO and TxDOT district feedback on implementability (combination of feasibility and value-add) and potential carbon emissions reduction and traffic congestion benefits. Figure 3 includes the description of the carbon reduction strategy categories.

Figure 3. Carbon Reduction Strategy Categories.

	Strategy Category	Description
	Advanced Technologies	Employ advanced ITS technologies and traffic monitoring, management, and communications systems to improve traffic flow and operations along the highway network.
	Travel Demand Management	Reduce congestion, invest in intersection improvements, and implement innovative traffic demand management strategies to improve the operational efficiency of the transportation system.
	Active Transportation	Support access, availability, and safety of bicycling and walking.
	Transit	Increase the attractiveness and efficiency of public transit systems.
	Construction and Maintenance	Support construction and maintenance of infrastructure using carbon reducing practices, equipment, materials, and technologies.
	Alternative Fuels	Facilitate the transition towards low-carbon fuels and support the widespread adoption of and infrastructure for EV and other alternative fuel vehicles.
	Freight Movement	Reduce the environmental and community impacts of freight movement.

These seven categories provide a framework for identifying specific strategies and associated projects that will support the reduction of transportation emissions. The following sections discuss each category in turn.



Advanced Technologies

The objective of the Advanced Technologies category of planned carbon reduction strategies is to employ advanced ITS technologies and traffic monitoring, management, and communications systems to improve traffic flow and operations along the highway network. Technology and innovation are components of TxDOT's goals, as established in the SLRTP, which guides the future of statewide multimodal transportation. The preservation of technology in a state of good repair is a stated objective of the SLRTP, which also prioritizes implementation strategies focused on emerging technologies, such as Transportation Systems Management and Operations (TSMO), ITS, and data collection and management, to improve the accessibility, affordability, and adaptability of the Texas transportation system. Technology investments are also included in *Texas Delivers 2050*, the state's freight mobility plan, which recommends new technology investments that improve safety and efficiency of existing systems and prepares Texas for the future of freight mobility. Based on feedback from stakeholders, the Advanced Technologies strategies are listed in Figure 4.

Figure 4. Advanced Technologies Strategies.

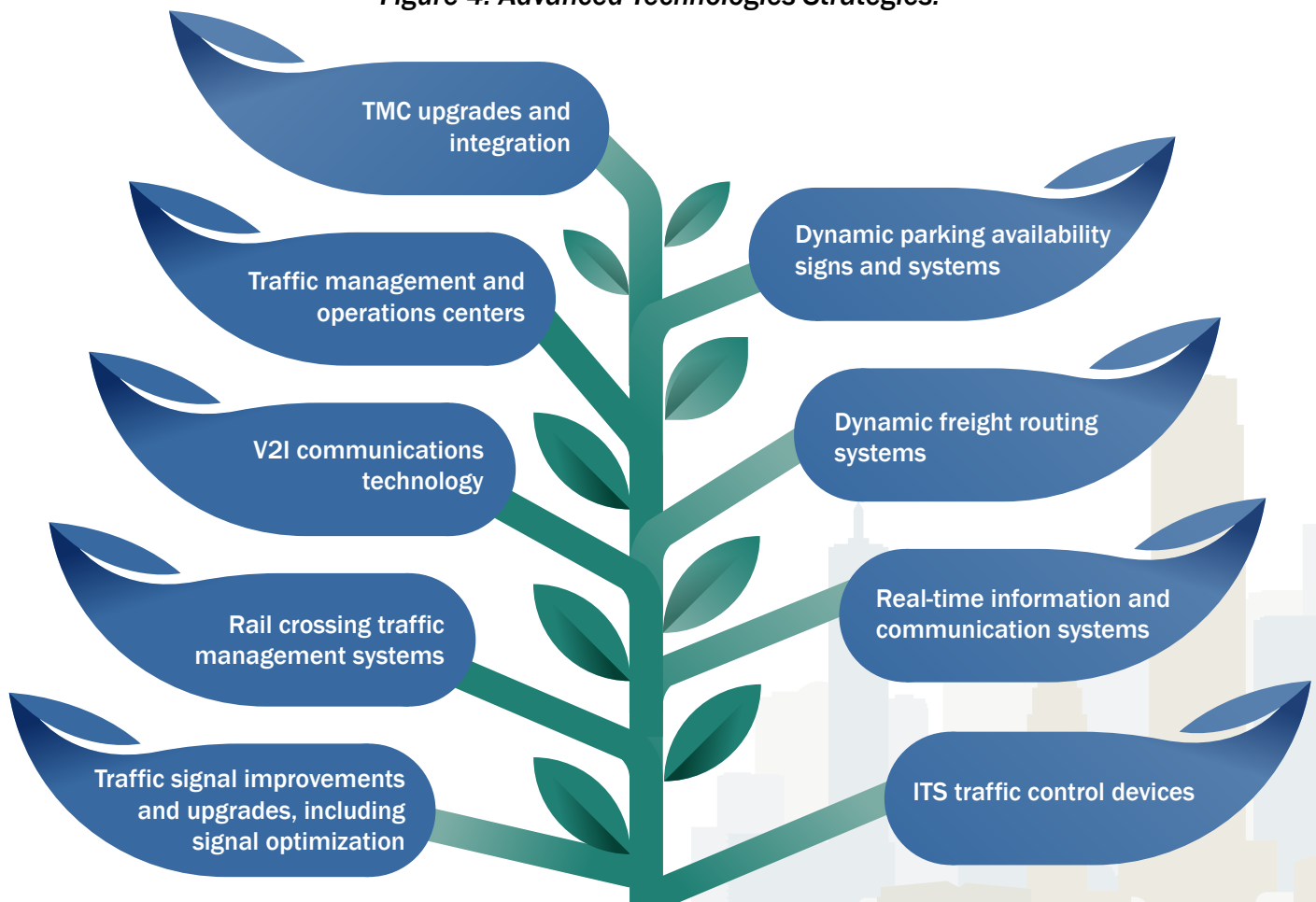


Table 6 shows types of projects that align with the Advanced Technologies strategies. Based on a review of existing projects programmed for funding in TxDOT's 2024 UTP, this list illustrates the project types that may most feasibly address transportation emissions in the state. Appendix E provides a more detailed list of projects from the 2024 UTP that are eligible for CRP funding, even though only a portion will be funded through the CRP, demonstrating TxDOT's commitment to comprehensively targeting federal funds to address transportation emissions.

Table 6. Advanced Technologies Strategies and Project Types.

Strategies	Project Types
Traffic signal improvements and upgrades, including traffic signal optimization	Upgrade existing roadway with Signal Phase and Time (SpAT) Signals and updated signal detection
ITS traffic control device installation and upgrades	ITS deployment
Real-time information and communications system installation and upgrades	Install closed-circuit television (CCTV) and dynamic message signs (DMS)
Rail crossing traffic management system installation and upgrades	At-grade rail crossing improvements
Vehicle to Infrastructure (V2I) communications technology installation and upgrades	Install V2I technology on key freight corridors
Dynamic freight routing system installation and upgrades	Install dynamic freight routing system at maritime ports
Traffic management and operations center upgrades and integration	Upgrade city TMC and traffic signal controller equipment
Dynamic parking availability signs and systems installation and upgrades	Install Dynamic Parking Availability Signs (DPAS) for Truck Parking Availability System (TPAS)



Travel Demand Management

The objective of the Travel Demand Management category of planned carbon reduction strategies is to reduce congestion, invest in intersection improvements, and implement innovative traffic demand management strategies to improve the operational efficiency of the transportation system. Optimizing system performance is a key strategic goal for TxDOT as established in the SLRTP. The development and operation of an integrated transportation system that provides reliable and accessible mobility and enables economic growth is a stated objective of the SLRTP. In *Texas Delivers 2050*, mobility and reliability are among the guiding goals for TxDOT, pursuing projects that reduce congestion and improve system efficiency and performance.

The Travel Demand Management strategies, which were developed based on feedback from MPOs and other stakeholders, are listed in Figure 5.

Figure 5. Travel Demand Management Strategies.

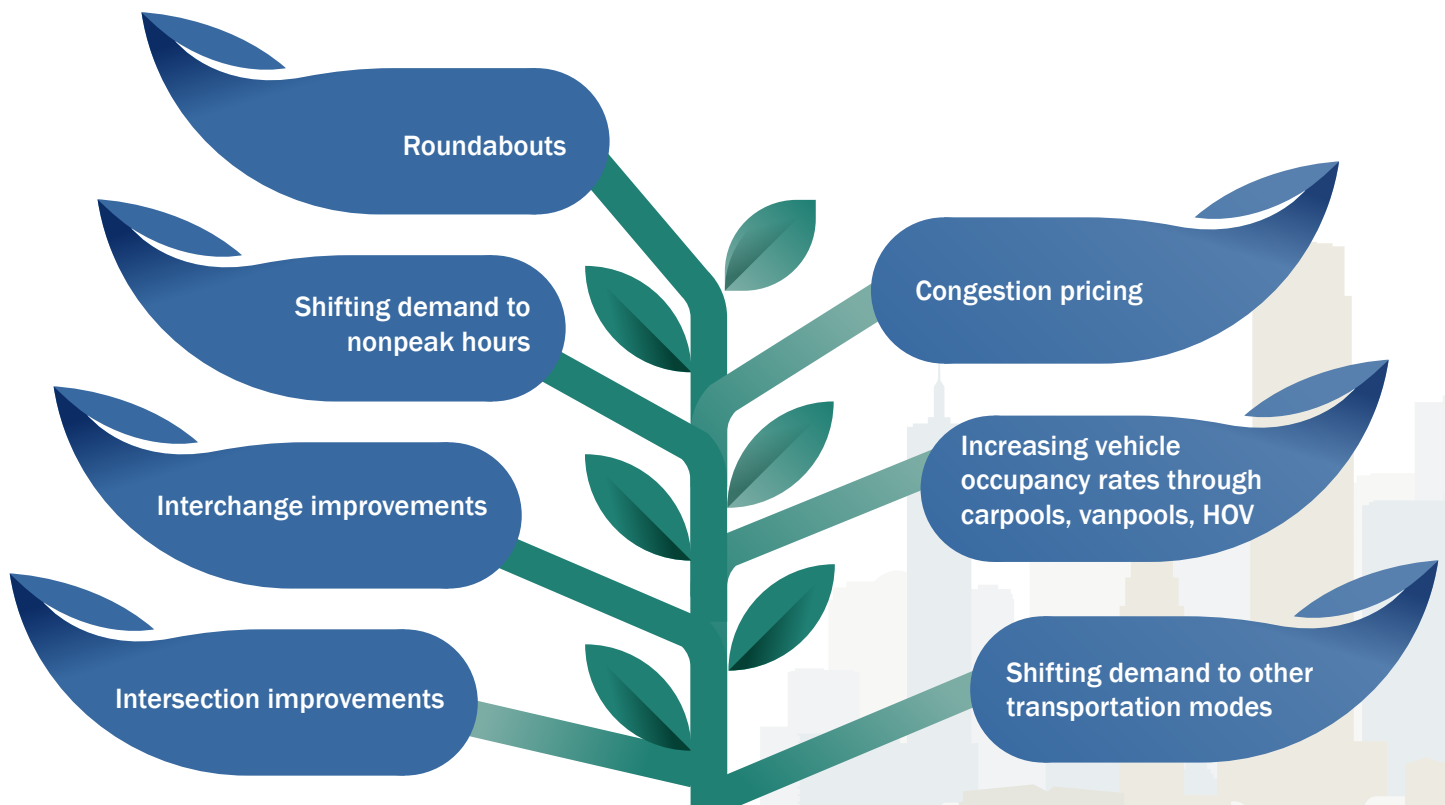


Table 7 shows the types of projects that align with the Travel Demand Management strategies based on a review of existing projects programmed for funding in TxDOT's 2024 UTP. Appendix E provides a more detailed list of projects from the 2024 UTP that are eligible for CRP funding, even though only a portion will be funded through the CRP. In this way, Table 8 demonstrates TxDOT's commitment to comprehensively targeting federal funds to projects that most feasibly address transportation emissions in the state.

Table 7. Travel Demand Management Strategies and Project Types.

Strategies	Project Types
Intersection improvements	Convert traditional intersection into a roundabout
Shifting demand to other transportation modes	Municipal Transportation Demand Management program supporting vanpool, carpool, telecommuting and education
Interchange improvements	Improve cloverleaf interchange
Increasing vehicle occupancy rates (carpools, vanpools, HOV)	Install HOV-special use lanes
Shifting demand to nonpeak hours	Convert certain lanes on a freeway to peak-period tolled lanes
Implementation of congestion pricing	Construct managed lanes with dynamic pricing



Active Transportation

The Active Transportation category of planned carbon reduction strategies supports access, availability, and safety of bicycling and walking. This objective is in line with the safety goal in the SLRTP that seeks to champion a culture of safety that reduces crashes and fatalities on the Texas transportation system, which includes bicycle and pedestrian infrastructure that TxDOT has a role in supporting. The safety goal in [Texas Delivers 2050](#) seeks to improve the safety, efficiency, and performance of the Texas Multimodal Freight Network. Based on feedback from MPOs and other stakeholders, the Active Transportation strategies are listed in Figure 6.

Figure 6. Active Transportation Strategies

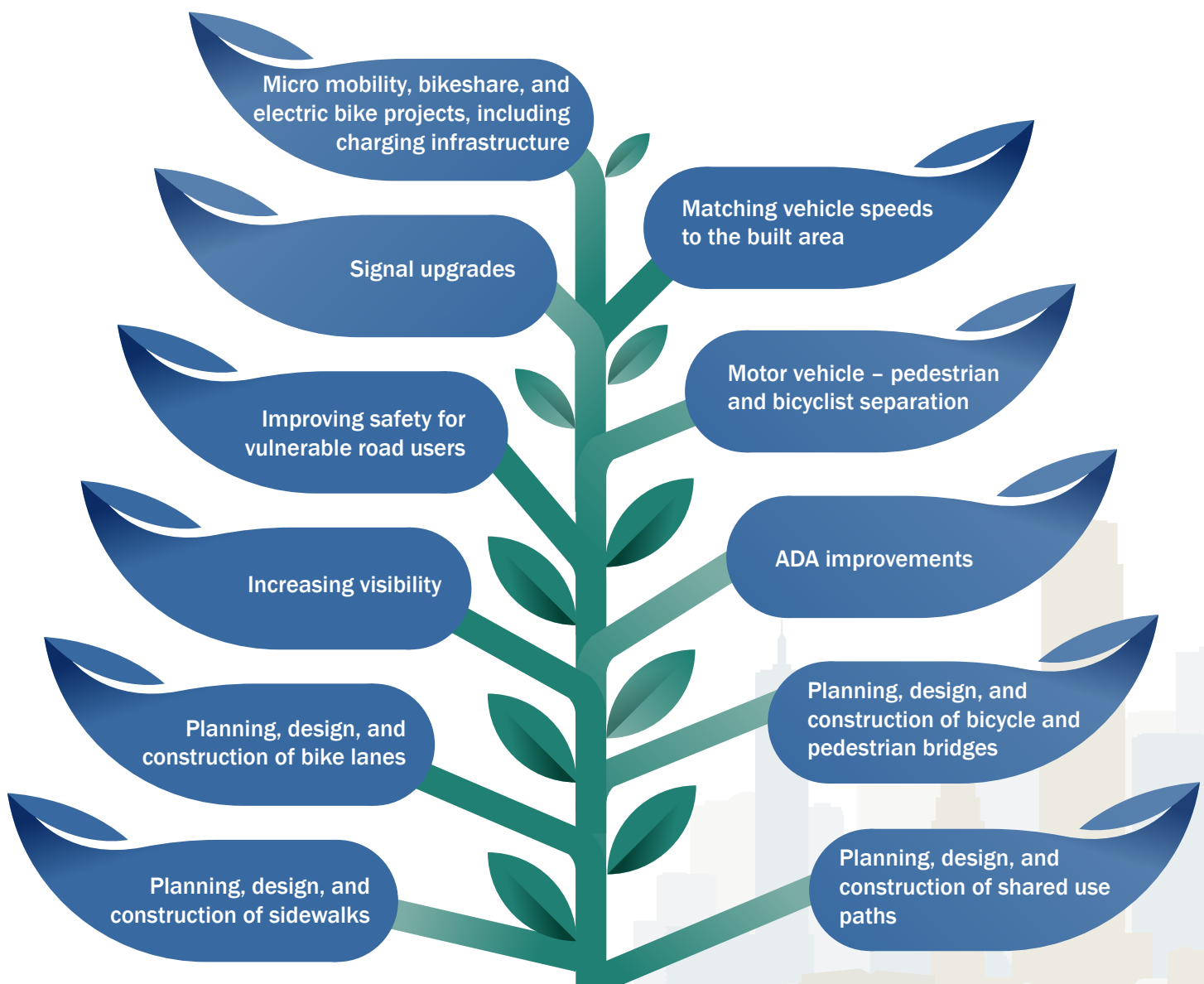


Table 8 shows project types that align with the Active Transportation strategies. Based on a review of existing projects programmed for funding in TxDOT's 2024 UTP, this list illustrates the project types that may most feasibly address transportation emissions in the state. Appendix E provides a more detailed list of projects from the 2024 UTP that are eligible for CRP funding, even though only a portion will be funded through the CRP, demonstrating TxDOT's commitment to comprehensively targeting federal funds to address transportation emissions.

Table 8. Active Transportation Strategies and Project Types.

Strategies	Project Types
Sidewalk improvements (construction, planning, and design)	Construct sidewalks, pedestrian lighting, and ADA-compliant curb ramps
Shared use path improvements (construction, planning, and design)	Construct Hike and Bike Trail
Bike lane improvements (construction, planning, and design)	Construct bicycle facilities as part of roadway construction
Bicycle and pedestrian bridge improvements (construction, planning, and design)	Construct rail transit and pedestrian bridges and structural retrofits
Project to increase visibility (e.g., street lighting)	As part of crosswalk and sidewalk reconstruction and widening, install streetlights
ADA improvements	Reconstruct roadway with concrete, add a bike lane, and upgrade for ADA compliance
Projects improving safety for vulnerable users	Safe routes to school project, including construction of new sidewalks
Motor vehicle – pedestrian and bicycle separation projects	Construct separated bike lanes and sidewalks in coordination with road reconstruction project
Signal upgrades	Reconstruct roadway for pedestrian safety with raised medians, sidewalks, and signal improvements
Micromobility, bikeshare, and e-bike projects, including charging infrastructure	Purchase electric bikes and additional batteries to augment municipal bike share program
Projects to match vehicle speeds to the built area	Construct traffic calming treatments, including new sidewalks, new signage, lighting, crosswalks, and crossing safety improvements



Transit

The Transit category of planned carbon reduction strategies seeks to increase the attractiveness and efficiency of public transit systems. Transit is part of the implementation strategy identified in the SLRTP. To improve the state's multimodal system, TxDOT is exploring and implementing a range of mode-specific strategies that can alleviate roadway congestion and improve overall mobility, including to address transit service gaps.

The Transit strategies, based on feedback from MPOs and other stakeholders, are listed in Figure 7.

Figure 7. Transit Strategies

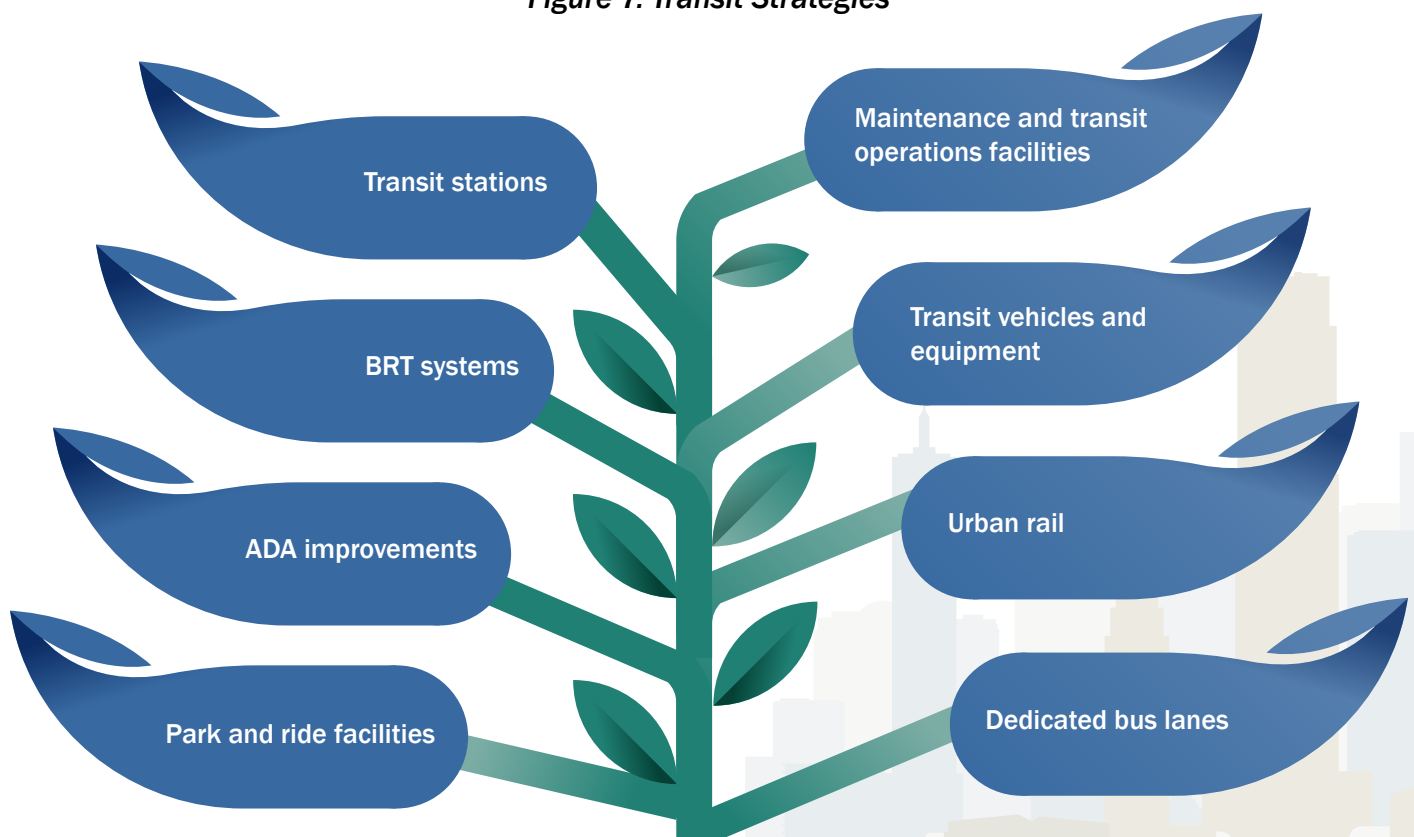


Table 9 shows the types of projects that align with the Transit strategies based on a review of existing projects programmed for funding in TxDOT's 2024 UTP. Appendix E provides a more detailed list of projects from the 2024 UTP that are eligible for CRP funding, even though only a portion will be funded through the CRP. In this way, Table 10 demonstrates TxDOT's commitment to comprehensively targeting federal funds to projects that most feasibly address transportation emissions in the state.

Table 9. Transit Strategies and Project Types.

Strategies	Project Types
Transit vehicle and equipment purchases and upgrades	Procure low-emission transit buses and fueling infrastructure
Transit station improvements	Construct bus passenger loading areas and facilities, including concrete foundations, overhead shelters, lighting, seating, and real-time schedule information displays
Maintenance and operations facility improvements	Rehabilitate bus maintenance and operations facility
ADA improvements	Construct ADA-compliant curb ramps along transit access pathways
Urban rail system establishment, expansion, or preservation	Construct regional rail extension
BRT system establishment, expansion, or preservation	Construct multi-modal BRT busway
Park and Ride facility establishment, expansion, or preservation	Construct a park-and-ride facility along a transit corridor
Dedicated bus lane improvements	Construct multi-modal HOV lanes to accommodate bus transit service along the corridor



Construction and Maintenance

The Construction and Maintenance category of planned carbon reduction strategies supports construction and maintenance of infrastructure using carbon reducing practices, equipments, materials, and technologies. The strategies support the reduction of carbon emissions from construction and materials, and, as such, are not limited to projects that mitigate tailpipe emissions. Preservation of assets and fostering stewardship are key strategic goals for TxDOT as established in the SLRP. The delivery of cost-efficient preventive maintenance for the transportation system and integration of environmental considerations into all TxDOT activities are stated objectives of the SLRTP. Asset preservation and modernization is also a goal of [Texas Delivers 2050](#), which seeks to maintain, preserve, and modernize assets on the state freight network to support multimodal movement. Based on feedback from stakeholders, the Construction and Maintenance strategies are listed in Figure 8.

Figure 8. Construction and Maintenance Strategies.

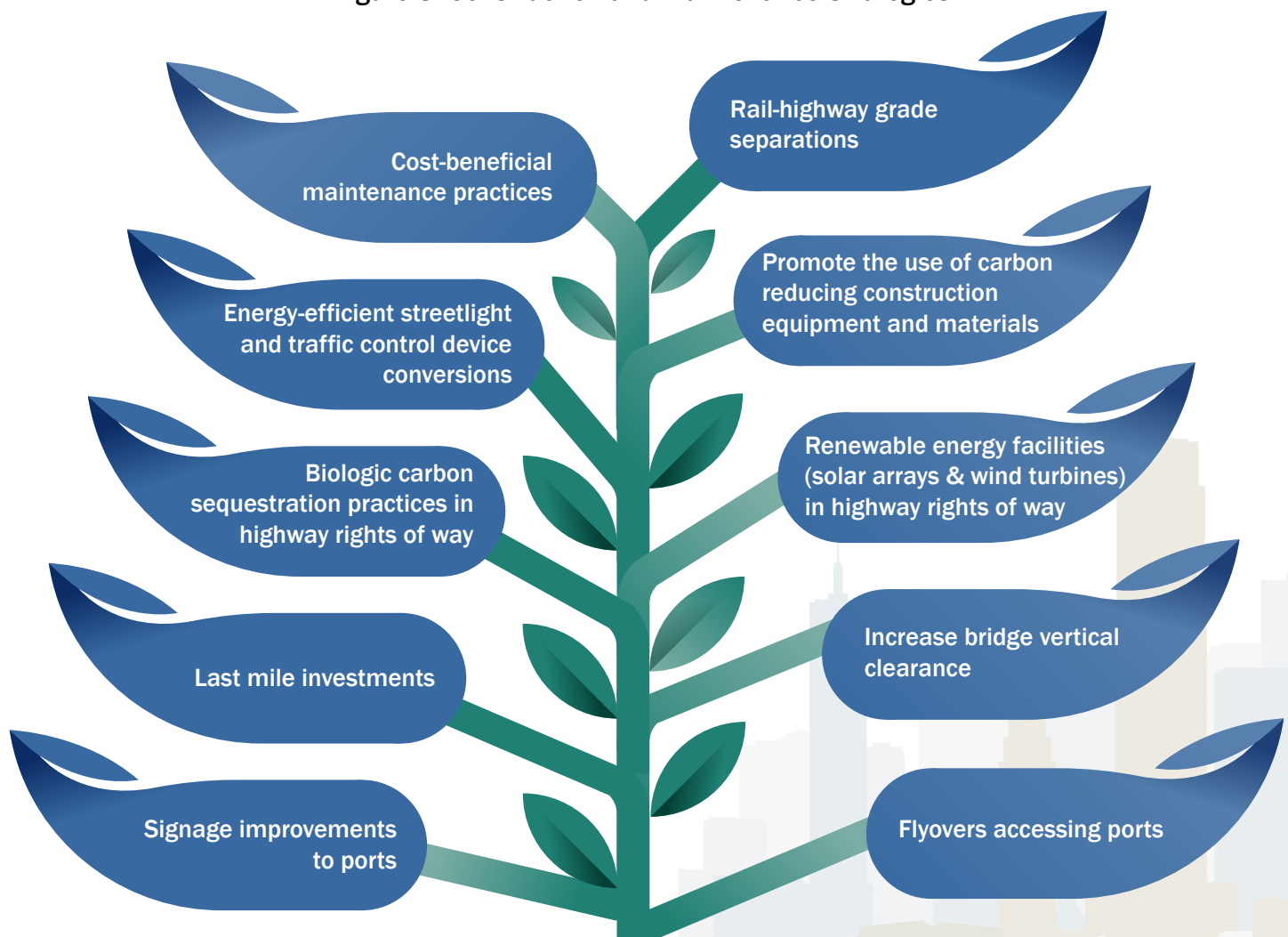


Table 10 shows project types that align with the Construction and Maintenance strategies. Based on a review of existing projects programmed for funding in TxDOT's 2024 UTP, this list illustrates the project types that may most feasibly address transportation emissions in the state. Appendix E provides a more detailed list of projects from the 2024 UTP that are eligible for CRP funding, even though only a portion will be funded through the CRP, demonstrating TxDOT's commitment to comprehensively targeting federal funds to address transportation emissions.

Table 10. Construction and Maintenance Strategies.

Strategies	Project Types
Energy-efficient streetlight and traffic control device conversions	Replace underpass lighting and high mast fixtures with LED lighting/fixtures
Use of sustainable pavements and construction materials	Use reclaimed asphalt mixes (RAP) in road construction
Cost-beneficial maintenance practices	Encourage contractors to use night construction on high-volume corridors
Rail-highway grade separation improvements	Reconstruct roadway with railroad grade separation
Last mile investments	Reconstruct last mile at port gates for heavy haul
Increasing bridge vertical clearance	Improve bridge vertical clearances along freight corridor
Biologic carbon sequestration practices in highway ROW	Plant wildflowers on highway ROW
Installing renewable energy generation facilities (solar arrays and wind turbines) in highway ROW	Install wind turbine in safety rest area
Signage improvements to ports	Add directional signage as part of project to widen existing access roads to port terminals
Installing or upgrading flyovers accessing ports	Connect flyover access to port



Alternative Fuels

The objectives of the Alternative Fuels category of planned carbon reduction strategies are to facilitate the transition towards low-carbon fuels and support the widespread adoption of and infrastructure for EV and other alternative fuel vehicles (e.g., hydrogen, natural gas, or propane-fueled vehicles). This aligns with the goal of fostering stewardship established in the SLRTP. The goal seeks to integrate environmental considerations into all TxDOT activities so that future generations of Texans can benefit from the state's valuable natural, historic, and cultural resources. In addition, Alternative Fuels aligns with the economic competitiveness goal featured in [Texas Delivers 2050](#), which seeks to support strategic transportation investments that improve the performance of the transportation network to enhance productivity, development, and the rapid increase in key industries, such as alternative transportation fuels and automotive production.

The Alternative Fuels strategies, based on stakeholder feedback, are listed in Figure 9.

Figure 9. Alternative Fuels Strategies.

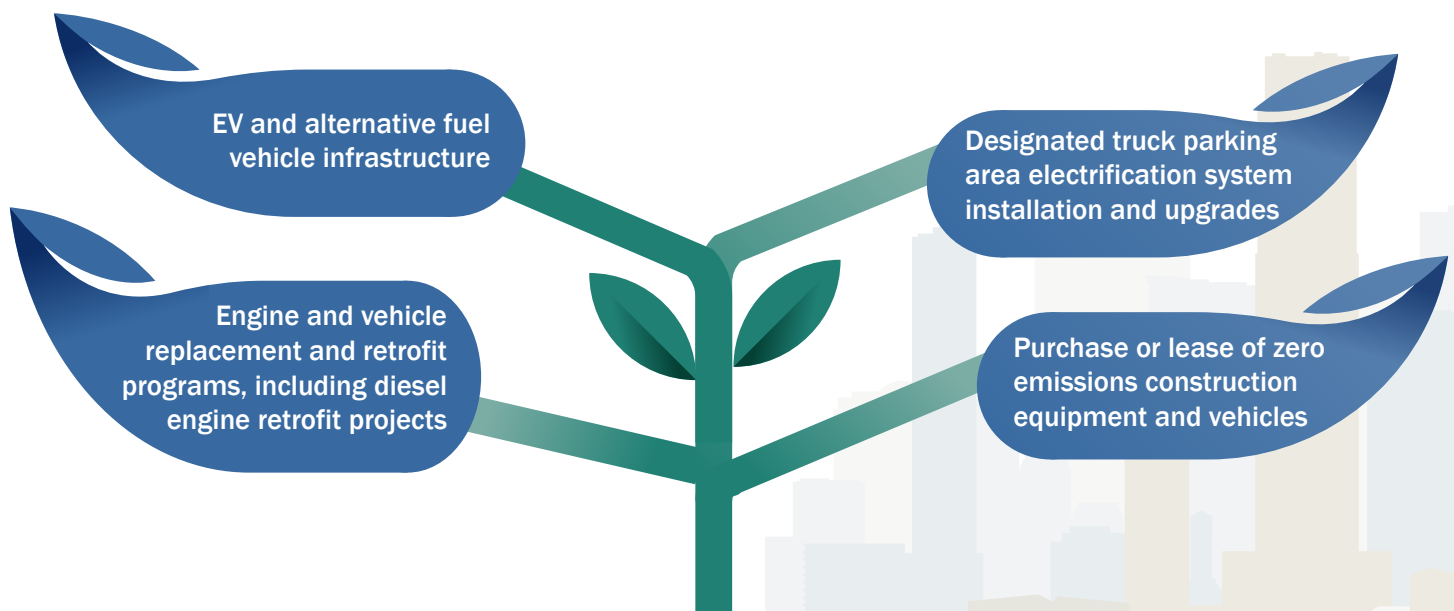


Table 11 shows project types that align with the Alternative Fuels strategies based on a review of existing projects programmed for funding in TxDOT's 2024 UTP. Appendix E provides a more detailed list of projects from the 2024 UTP that are eligible for CRP funding, even though only a portion will be funded through the CRP. In this way, Table 12 demonstrates TxDOT's commitment to comprehensively targeting federal funds to projects that most feasibly address transportation emissions in the state.

Table 11. Alternative Fuels Strategies and Project Types.

Strategies	Project Types
EV and alternative fuel vehicle infrastructure installation and upgrades	Purchase of electric vehicles and related infrastructure for implementation of rail transit service
Implementation of engine and vehicle replacement and retrofit programs, including diesel engine retrofit projects	Replace 40-foot heavy duty diesel buses or diesel/electric hybrids with all electric buses and purchase necessary recharging infrastructure



Freight Movement

The Freight Movement category of planned carbon reduction strategies is aimed at reducing the environmental and community impacts of freight movement. Freight strategies, including truck parking, are included as part of the implementation plan for the SLRTP. [Texas Delivers 2050](#) contains goals that align with this strategy category, including stewardship and resiliency, which support the responsible management of environmental resources and the development and maintenance of a resilient and secure multimodal system that can withstand and respond to various sources of disruption.

Based on feedback from stakeholders, the Freight Movement strategies are listed in Figure 10.

Figure 10. Freight Movement Strategies.

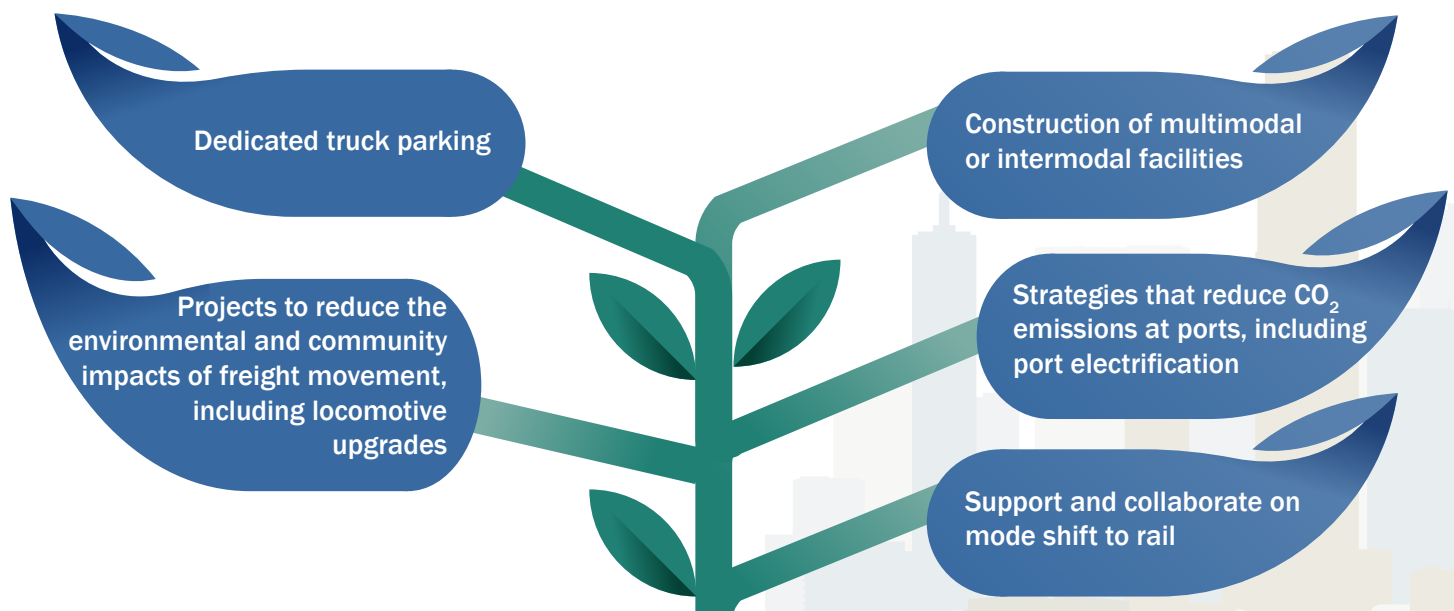


Table 12 shows project types that align with the Freight Movement strategies. Based on a review of existing projects programmed for funding in TxDOT's 2024 UTP, this list illustrates the project types that may most feasibly address transportation emissions in the state. Appendix E provides a more detailed list of projects from the 2024 UTP that are eligible for CRP funding, even though only a portion will be funded through the CRP, demonstrating TxDOT's commitment to comprehensively targeting federal funds to address transportation emissions.

Table 12. Freight Movement Strategies and Project Types.

Strategies	Project Types
Dedicated truck parking projects	Construct truck parking
Construction of multimodal or intermodal facilities	Reconstruct roadway with multimodal improvements
Projects to reduce the environmental and community impacts of freight movement, including locomotive upgrades	Construct truck parking and truck staging area near port terminals to eliminate freight movements in residential areas
Support and collaborate on mode shift to rail.	Coordinate with railroads and ports to support rail connections to the international border and maritime ports.

Program Evaluation

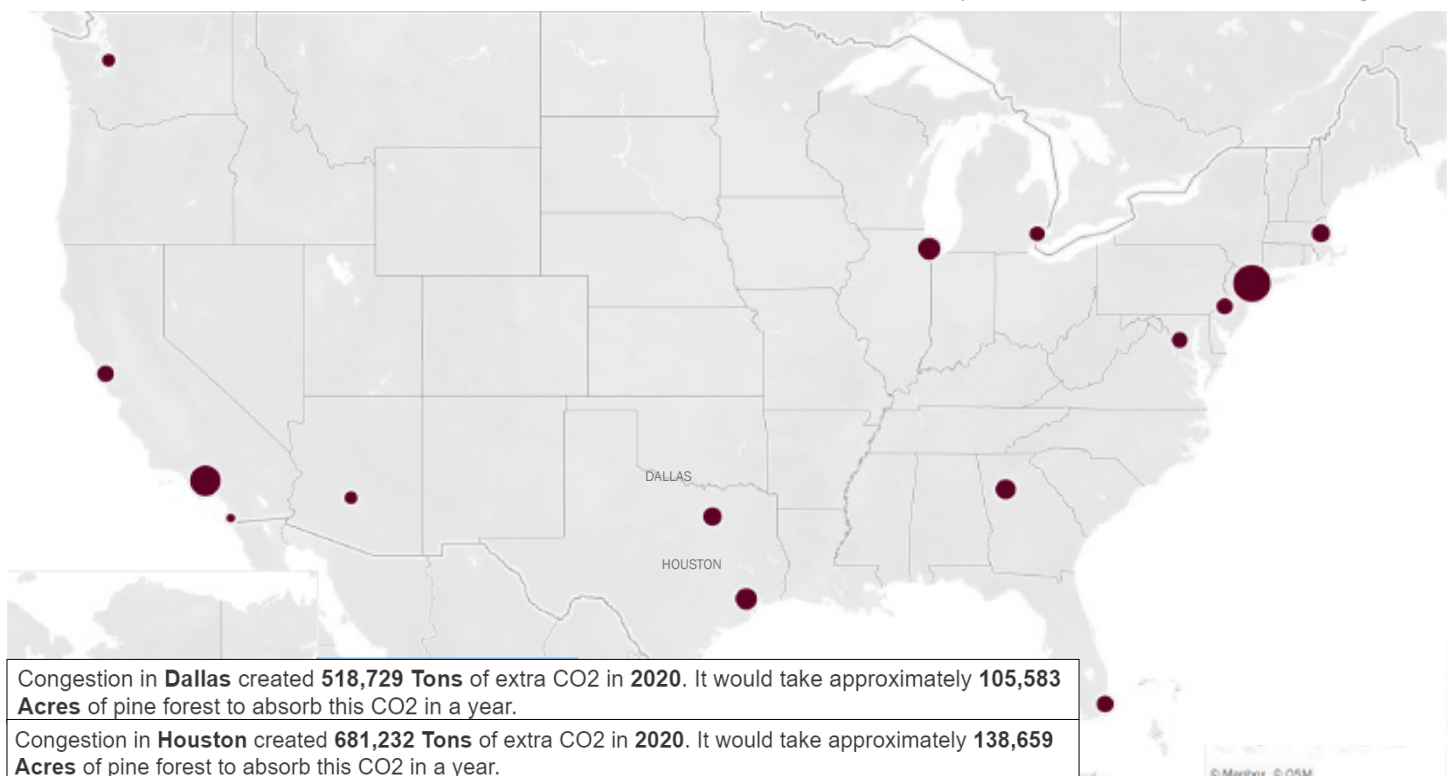
In the CRP guidance, FHWA encourages states to incorporate project evaluation into their CRP-related activities. CRP program evaluation includes data collection, as well as documentation and measurement of progress made towards meeting agency priority goals.⁴ This may require investments in personnel and equipment to establish and maintain data infrastructure, data analysis standards and processes, performance measurement, and evaluation, which are allowable costs under federal regulation (2 C.F.R. Part 200).

TxDOT's intent is to develop a data-based means of evaluating CRP-funded projects, along with transportation emissions reduction performance measures for the state's overall transportation program, as required by federal laws and regulations, in time for the CRS update in 2027. Although there are currently no federal program evaluation or performance reporting requirements for CRP-specific projects, existing reporting requirements and others in development could be adapted to evaluate CRP-funded projects. For example, TxDOT's annual Texas 100 Congested Road Segments and Urban Mobility Report⁵ (UMR, see Figure 11) already incorporate traffic volume data and traffic speed data to calculate, among other measures, excess CO₂ produced due to congestion. Though the data model does not cover all roadways in Texas, it could provide the basis from which to measure transportation emissions reductions from CRP-funded projects.

In sum, the methodology for any CRP project evaluation program will be developed following federal guidance once rulemaking has been completed. In the meantime, TxDOT and MPOs may, at their discretion, adopt a CRP project evaluation program, leveraging mechanisms and resources already in existence. This could provide a starting point for the development of a data-based CRP evaluation program for measuring success in meeting the goals of the CRP.

Figure 11. Texas Urban Mobility Report

2020 Excess CO₂ from All Vehicles: The excess amount of CO₂ emissions produced from all vehicles due to congestion.



Source: Texas A&M Transportation Institute.

⁴ Federal Highway Administration, Carbon Reduction Program (CRP) Implementation Guidance, April 2022.

⁵ The Texas 100 Most Congested Road Sections is available at <https://mobility.tamu.edu/texas-most-congested-roadways/> and the Urban Mobility Report is available at <https://mobility.tamu.edu/umr/>.

Summary and Next Steps

The CRS provides a framework for how TxDOT and MPOs will seek to reduce transportation emissions through a comprehensive strategy of projects and initiatives. The CRS encompasses planned strategies that will guide investments from the CRP to programs and projects that will deliver a more resilient, sustainable, operationally efficient, safe, and reliable multimodal transportation system. As one of many CRS documents across the U.S., this CRS plays a role in supporting federal efforts to reduce transportation emissions across the nation.

This CRS represents TxDOT's ongoing collaboration and coordination with MPOs and other stakeholders in Texas. It represents a technically and politically feasible approach to reducing transportation emissions in Texas over the next four years.

Implementation

Everyone involved in the development of the CRS has a stake in reducing transportation emissions through strategic investments of CRP funds. The CRS will continue to be used to strengthen these partnerships and make informed decisions to address transportation emissions while improving the multimodal transportation system for the safe, reliable, and efficient movement of people and goods.

Moving forward, TxDOT will work with partners on the following implementation activities:

- » **Integrate Carbon Reduction into TxDOT and MPO Planning Processes** – In the course of the coordination and collaboration meetings with MPOs, TxDOT emphasized the importance of integrating the CRS into MPO plans. TxDOT and MPOs share the expectation that future iterations of TxDOT SLRTPs and MPO MTPs will integrate the CRS and consider carbon reduction as key component.
- » **Strengthen Partnerships** – Federal, state, regional, local, and private partners have an opportunity to reduce the impacts of carbon emissions together. This may require the current partnerships TxDOT maintains with FHWA, MPOs, transit agencies, municipalities, and other governmental entities to evolve as new roles and responsibilities are adopted to implement the CRS. This evolution, however, will need to ensure that the partnerships will continue to share common goals of reducing transportation emissions.
- » **Engage MPOs in Implementation** – TxDOT will continue to collaborate and coordinate with MPOs as the CRS is implemented. Certain opportunities to implement elements of the CRS are known, such as investing federal and state funds in projects that meet the objectives of the identified carbon reduction strategies. Other opportunities are unknown at this time, so continued engagement with MPOs, specifically targeted to CRS implementation, will be necessary to address them as they arise in the future.
- » **Develop Performance Measures and Targets** – Performance measures are essential to understand successfully reducing carbon emissions. TxDOT's intent is to develop transportation emissions reduction performance measures for the state's overall transportation program, as required by federal laws and regulations, in time for the CRS update in 2027.

Currently, TxDOT complies with all existing FHWA Transportation Performance Management (TPM) performance measurement reporting requirements, which do not include a CO₂ emissions reduction target, measure, or reporting requirement. The TPM On-Road Mobile Source Emissions measure currently quantifies total emission reductions for applicable criteria pollutants, but not CO₂. In the same way, the System Performance measures assess percent of person-miles travelled on the interstate and non-interstate National Highway System (NHS) that are reliable, but not CO₂ emissions

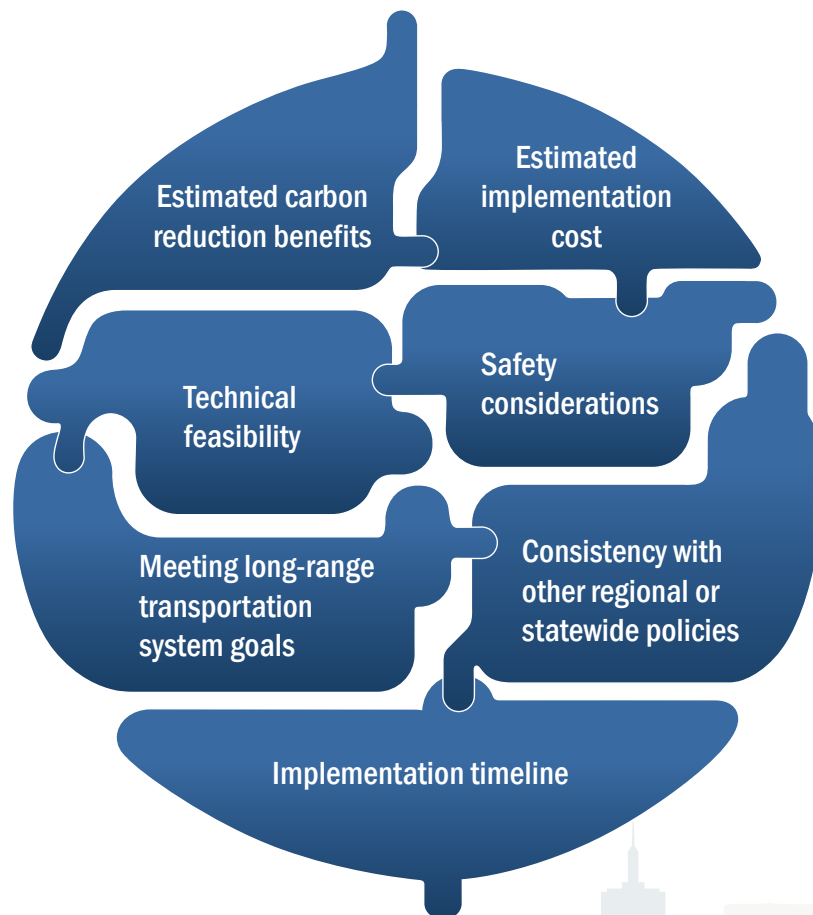
on the NHS. Although there are currently no federal program evaluation or performance reporting requirements for CRP-specific projects, existing data sources (e.g., U.S. Census Bureau [Data Center](#), U.S. Department of Energy [Alternative Fuels Data Center](#), TxDOT, and UMR) could be adapted to evaluate CRP-funded projects. Based on these existing resources, potential CRP-related performance goals and measures that could be considered by TxDOT and MPOs include those shown in Table 13.

Table 13. Potential Carbon Reduction Performance Goals and Measures

Performance Goal	Performance Measure
Increase charging/fueling infrastructure on Texas roadways	» The number of EV charging and alternate fuel (e.g., CNG, hydrogen) stations in Texas » Electricity and alternate fuel (e.g., CNG, propane) consumption in Texas
Reduction in single occupant vehicle (SOV) trips	» Transit ridership in Texas » Vehicle revenue miles in Texas » Percentage of the population using public transportation in Texas » Number of Texans using carpools, vanpools, and public transportation to commute to work
Increase in facilities to encourage lower emission modes	» Number of lane miles contracted for pedestrian and bicycle infrastructure
Reduction in delay and congestion	» Annual hours of delay » Annual truck delay » Delay per commuter » Planning time index » Travel time index » Commuter stress index » Annual congestion cost » Annual truck congestion cost » Congestion cost per commuter » Annual excess fuel consumed » Annual excess truck fuel consumed » Excess fuel consumed per commuter » Excess CO₂ from all vehicles » Excess CO₂ from trucks

» **Develop a Data-Driven Methodology for Incorporating Carbon Reduction as a Project Selection Criterion for CRP Eligibility** – The CRS has identified emissions-reducing strategies and projects that are candidates for CRP funds. A next step is to assess each eligible strategy and project on a quantitative scale based on their carbon reduction potential. This would be valuable to TxDOT and MPOs to program and deliver projects in alignment with the carbon reduction objectives of the CRS. Therefore, as part of the implementation plan for the CRS, TxDOT will consider developing a data-driven methodology to assess carbon reduction from transportation investments as a project selection criterion for CRP eligibility. This is necessary to determine whether and to what extent transportation emissions reduction will be incorporated as part of the decision-making process for CRP project selection. TxDOT has initiated this effort, looking into criteria that could be used to prioritize carbon reduction strategies and CRP-funded investments. Figure 12 provides the criteria, which can serve as a basis to start developing a data-based framework for evaluating CRP-funded strategies and projects in the future.

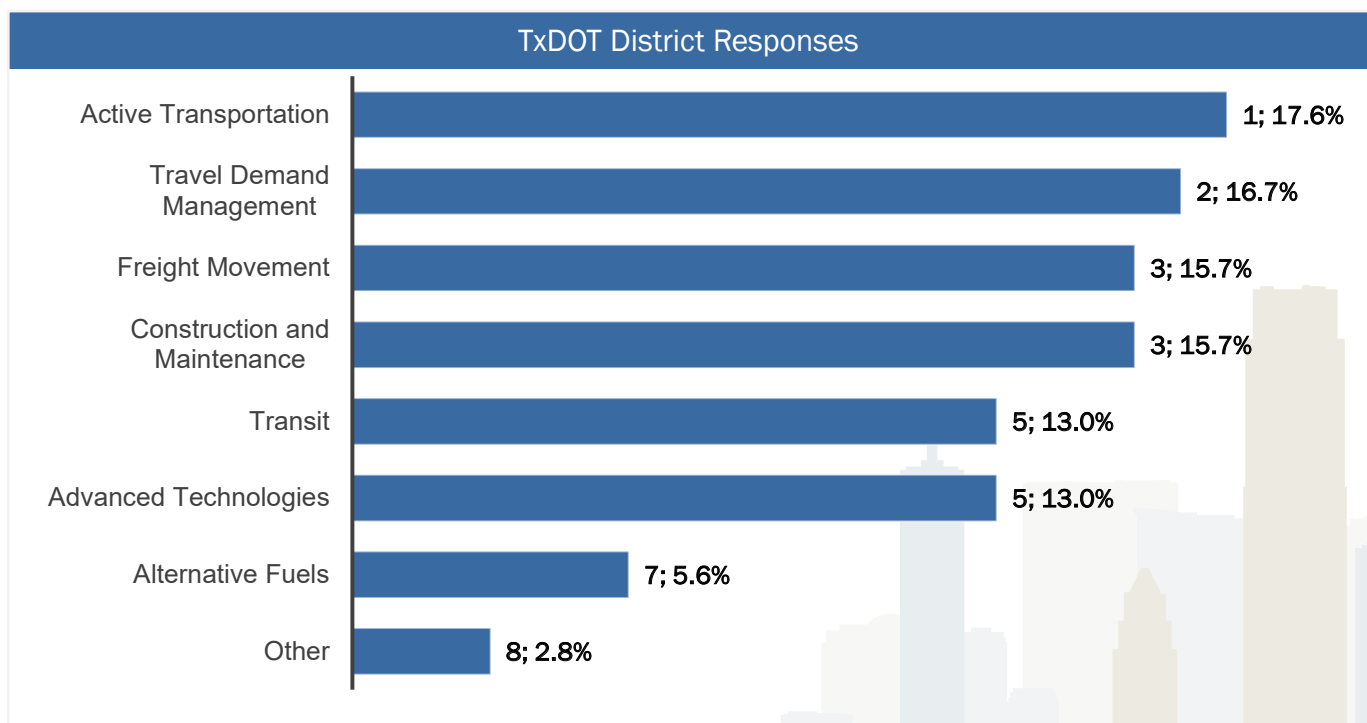
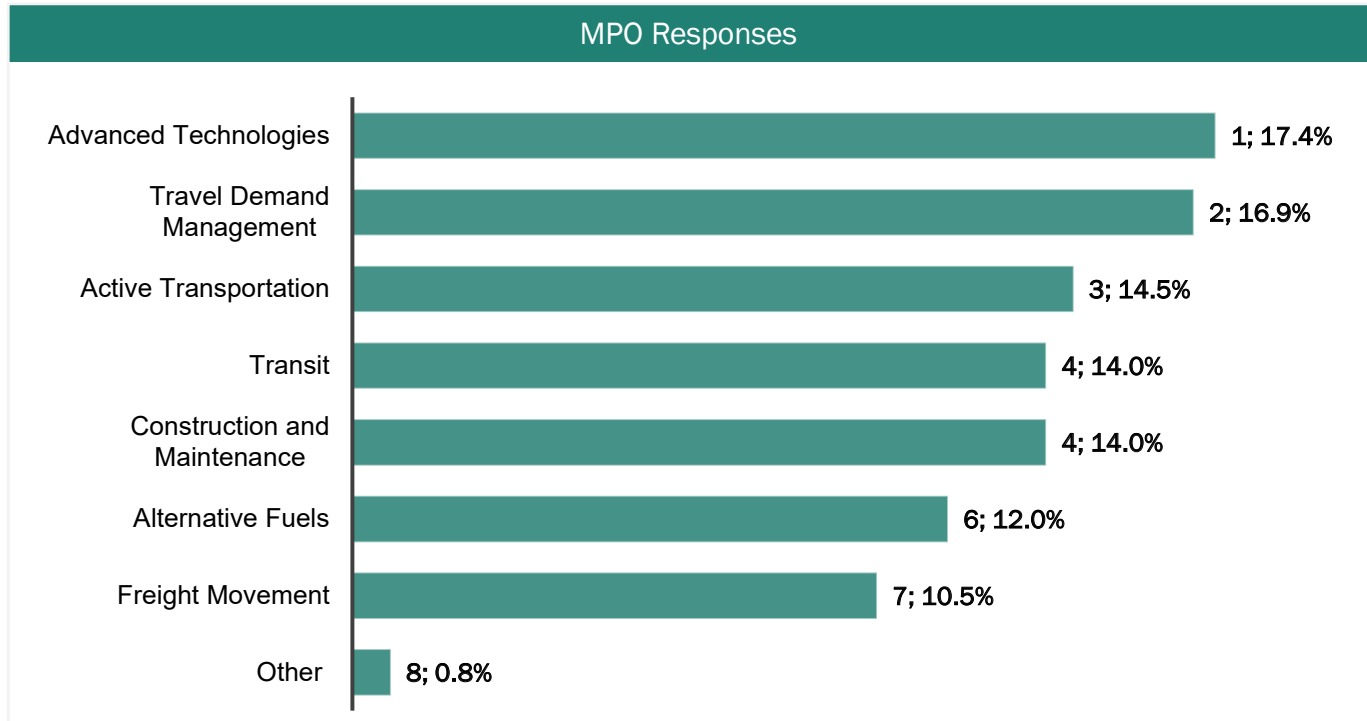
Figure 12. Criteria for Evaluating CRP-Funded Projects.



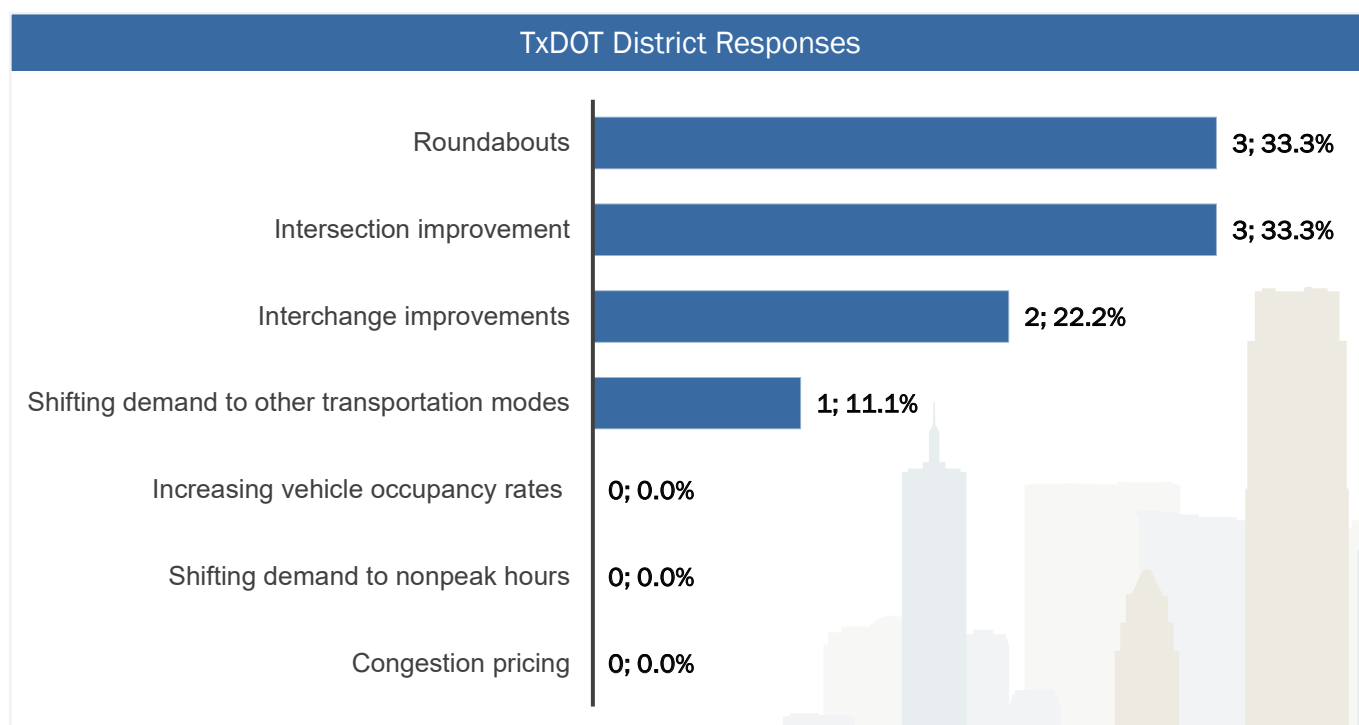
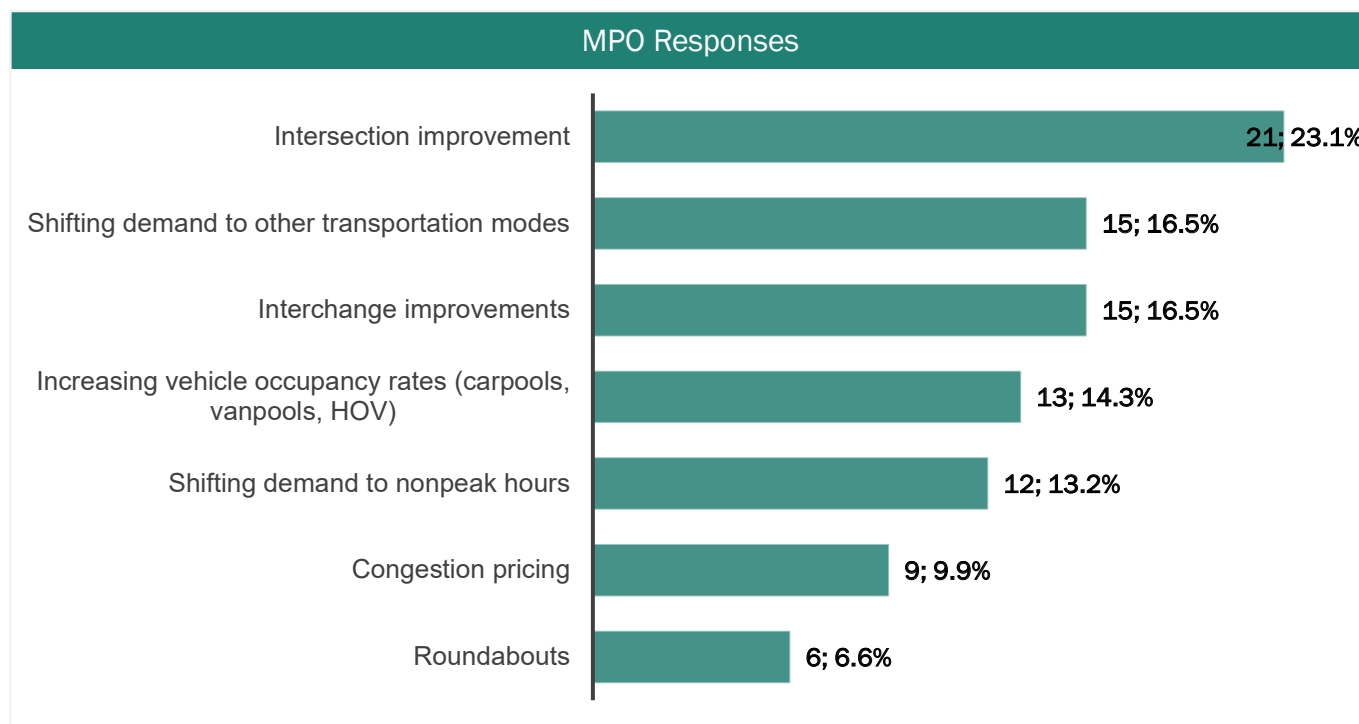
As part of implementation of this CRS, the strategies will be revisited through collaboration and coordination with MPOs and other stakeholders. Like the 2023 CRS, the 2027 CRS will support statewide and regional efforts to reduce transportation emissions, identify projects and strategies to reduce transportation emissions, support the reduction of transportation emissions in Texas, and be appropriate to the population density and context of Texas.

Appendix A: Summary of MPO and TxDOT District Survey Responses

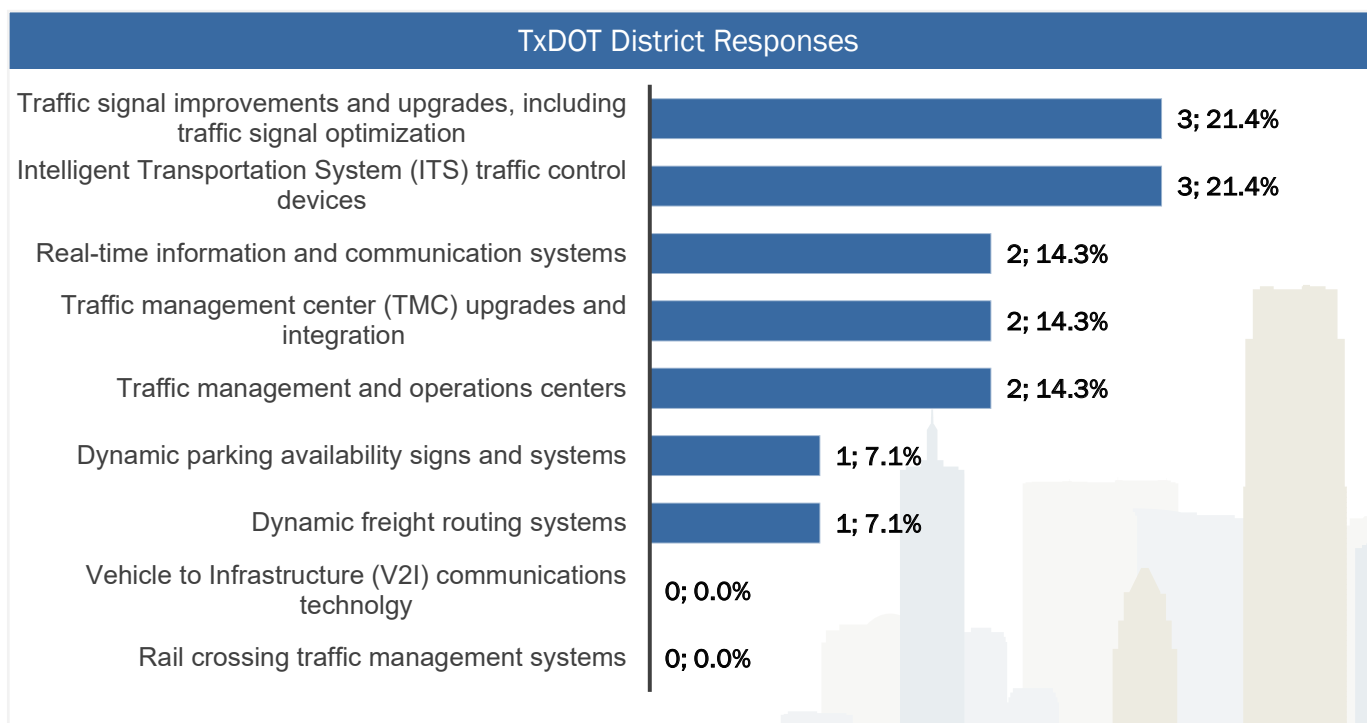
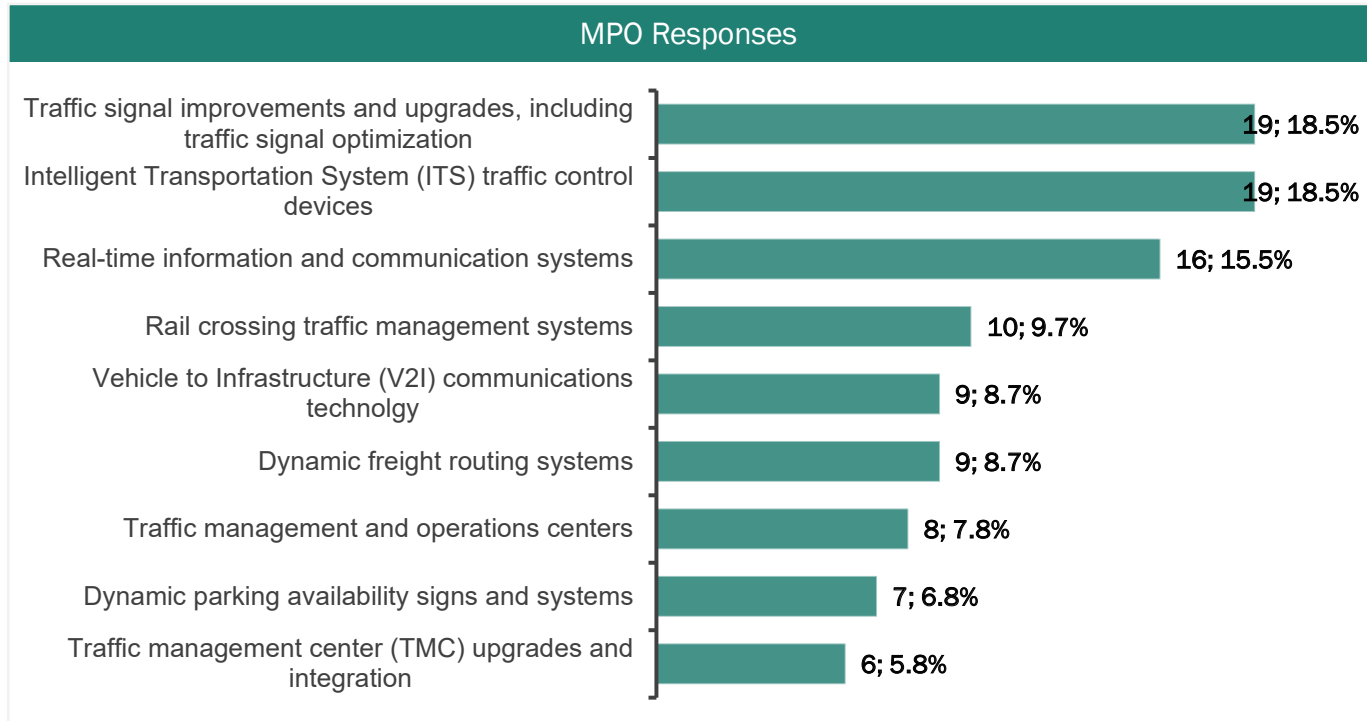
Q1. Please rank the following carbon reduction categories in terms of implementability (both in terms of feasibility and potential carbon emissions reduction/traffic benefits) in your region. Please rank the category with the best implementability first and the least implementability last by clicking and dragging the category in the appropriate order.



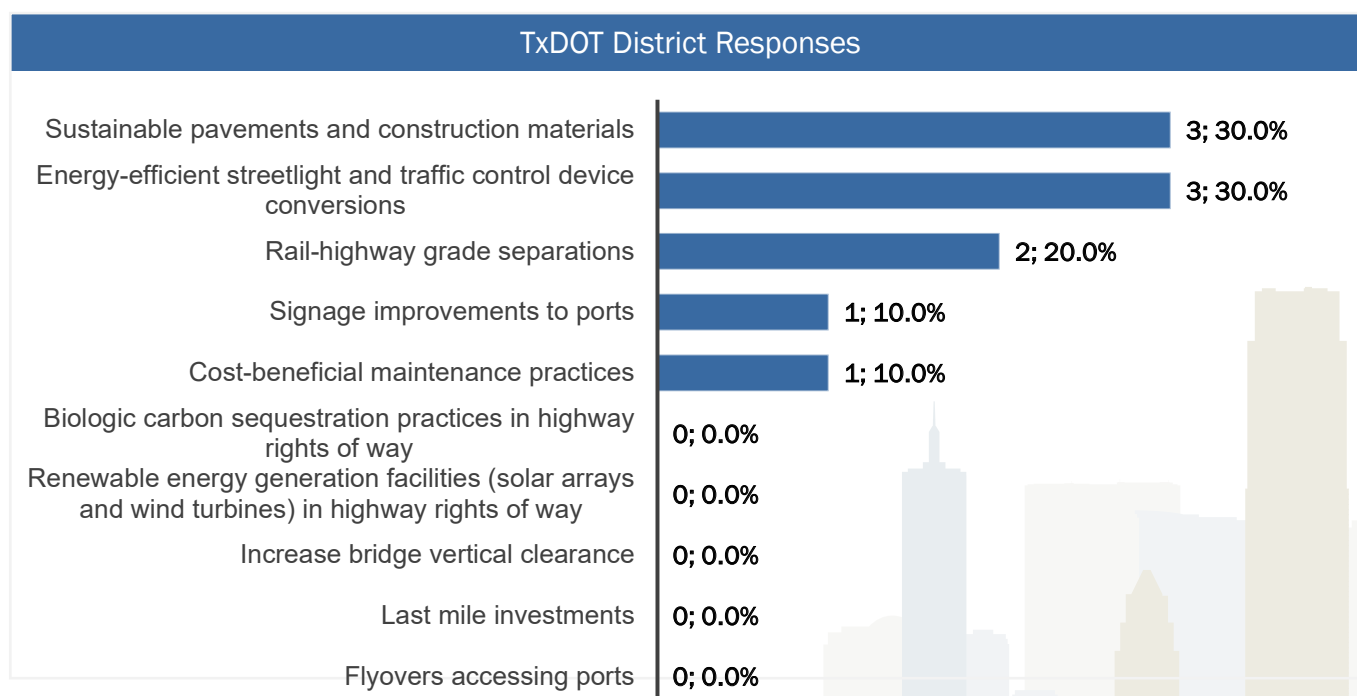
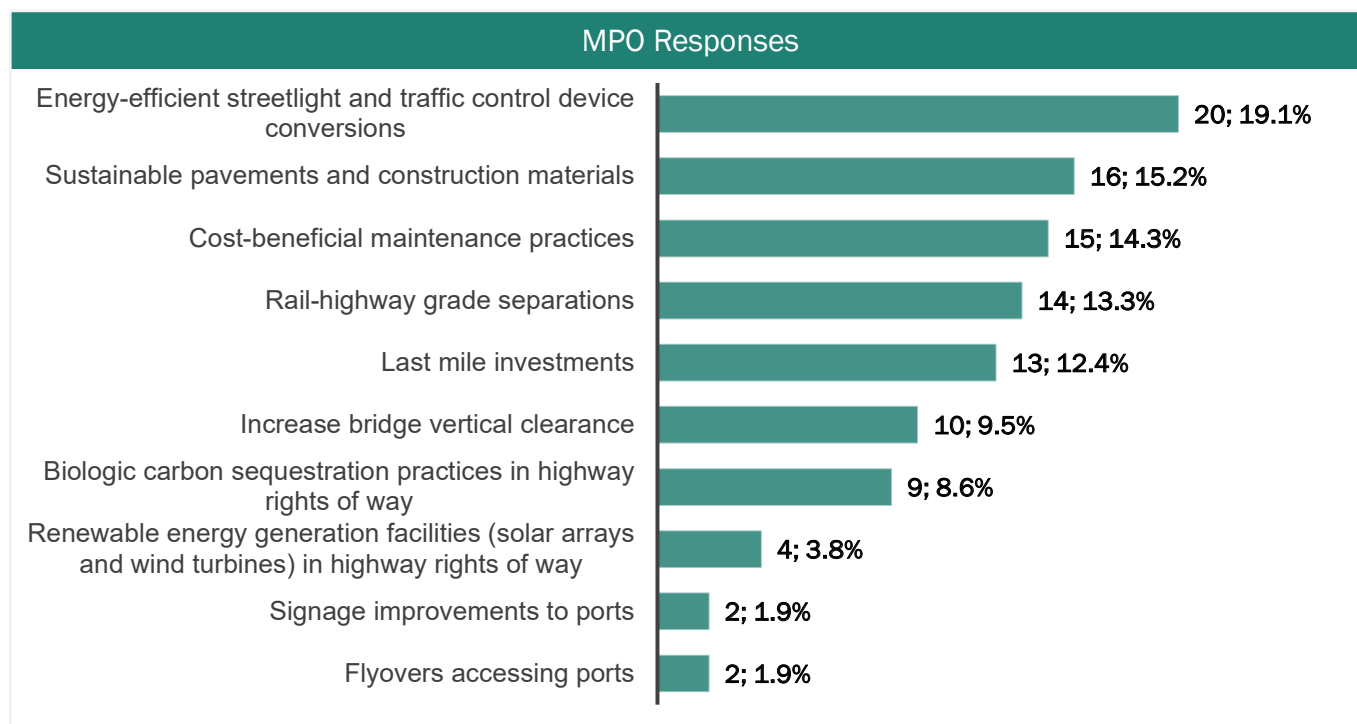
Q2. Please select the carbon reduction strategies under the Travel Demand Management category that are most implementable (both in terms of feasibility and potential carbon emissions reduction/traffic benefits) in your region. Please select all that apply.



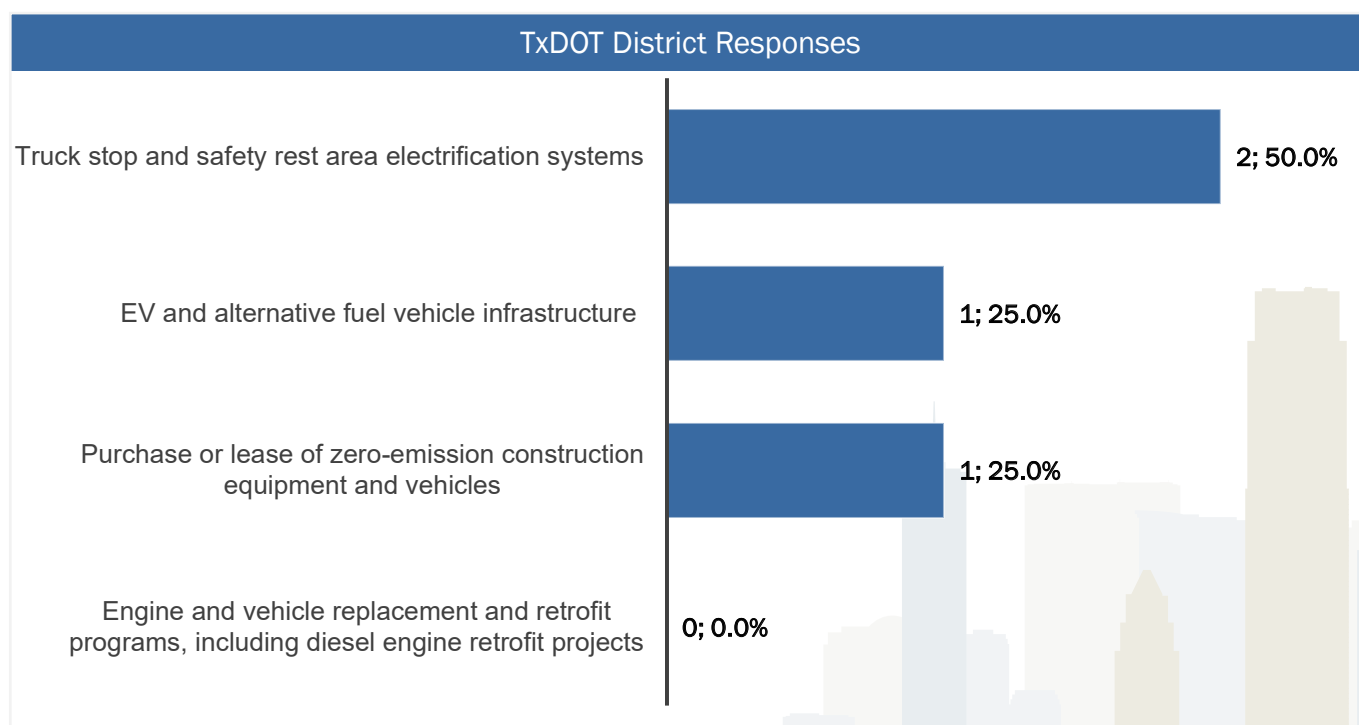
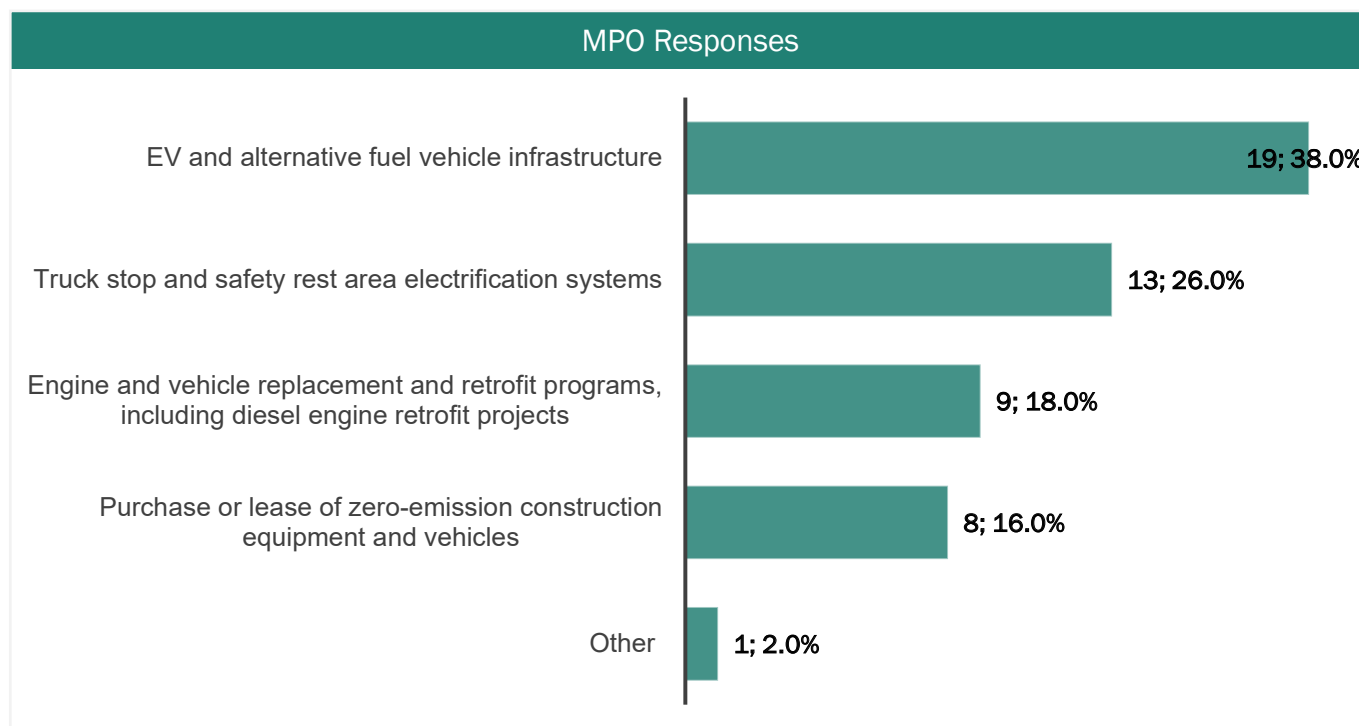
Q3. Please select the carbon reduction strategies under the Advanced Technologies category that are most implementable (both in terms of feasibility and potential carbon emissions reduction/ traffic benefits) in your region. Please select all that apply.



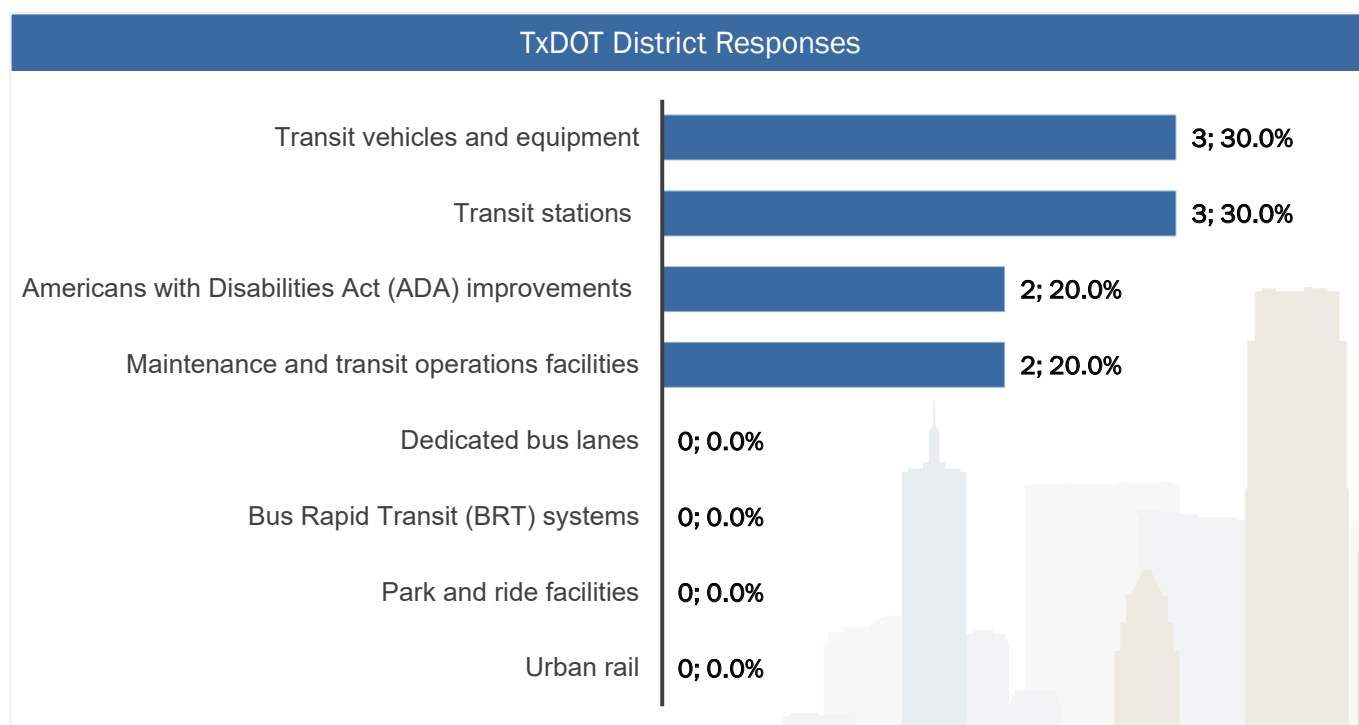
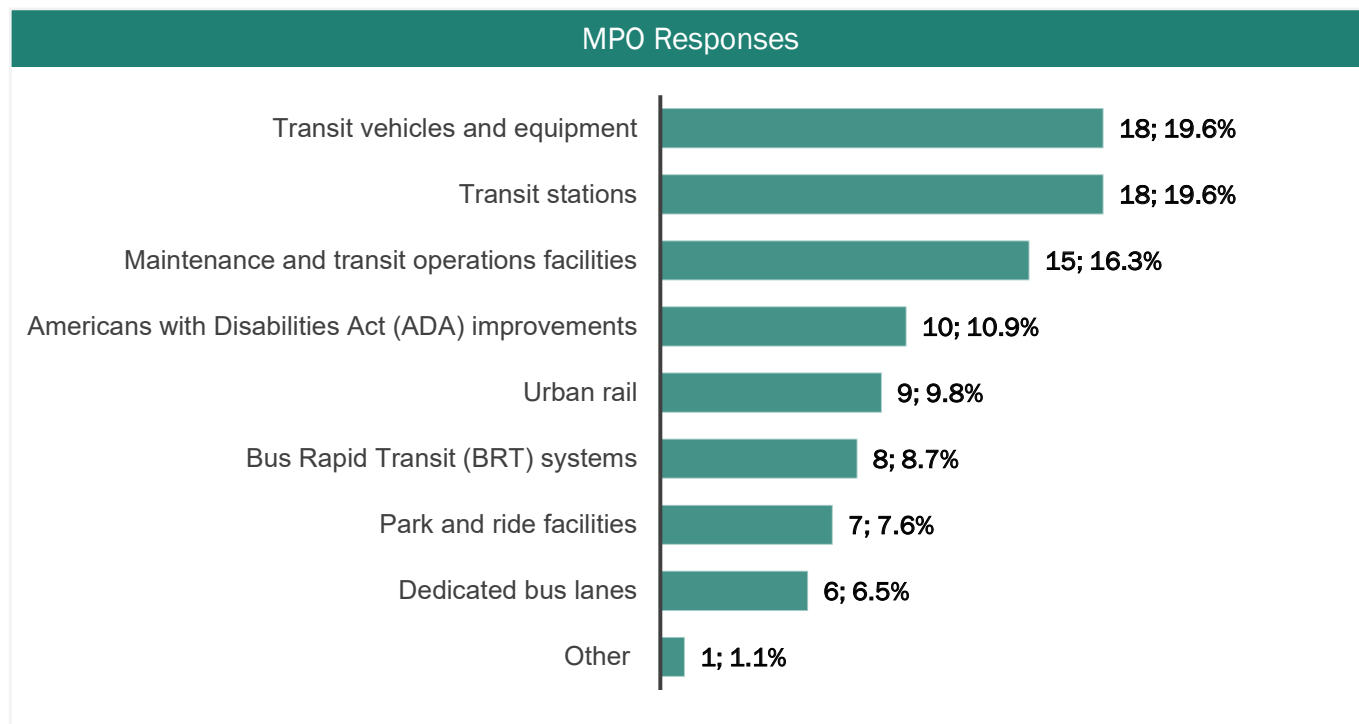
Q4. Please select the carbon reduction strategies under the Construction and Maintenance category that are most implementable (both in terms of feasibility and potential carbon emissions reduction/traffic benefits) in your region. Please select all that apply.



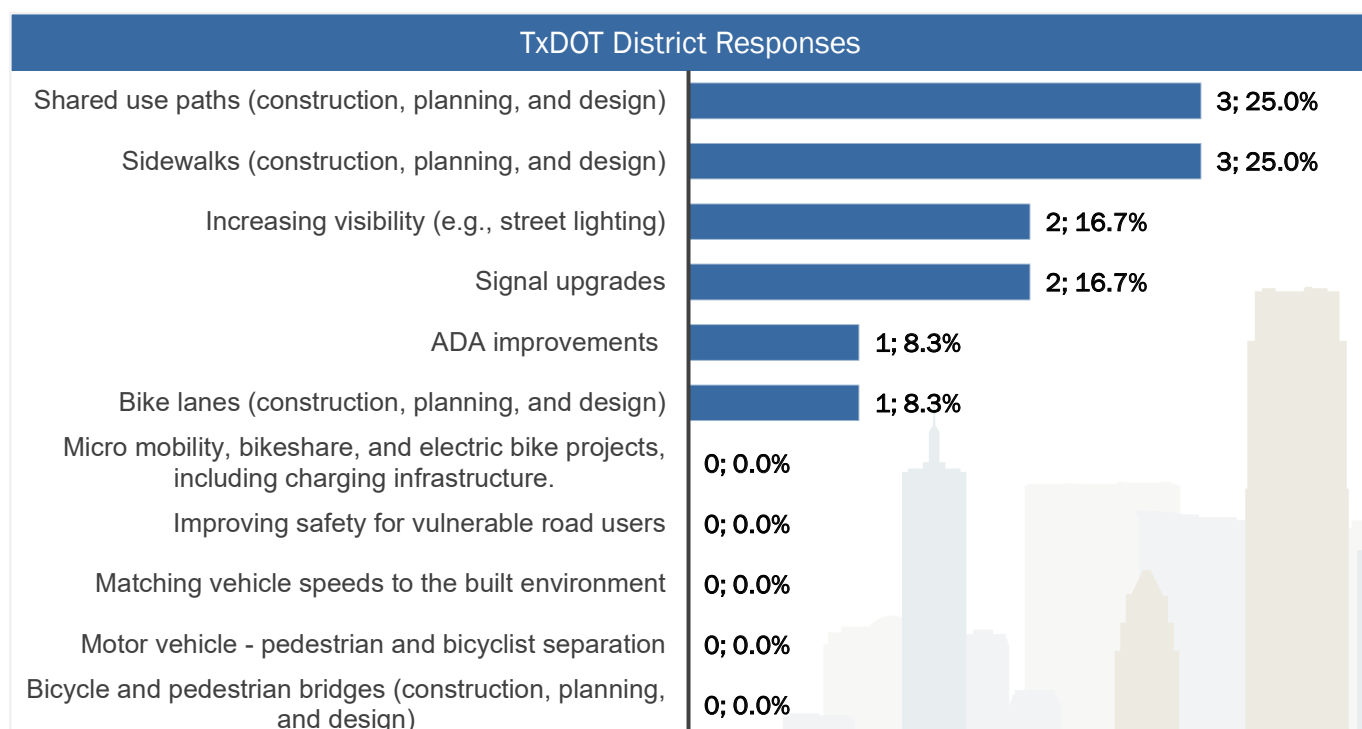
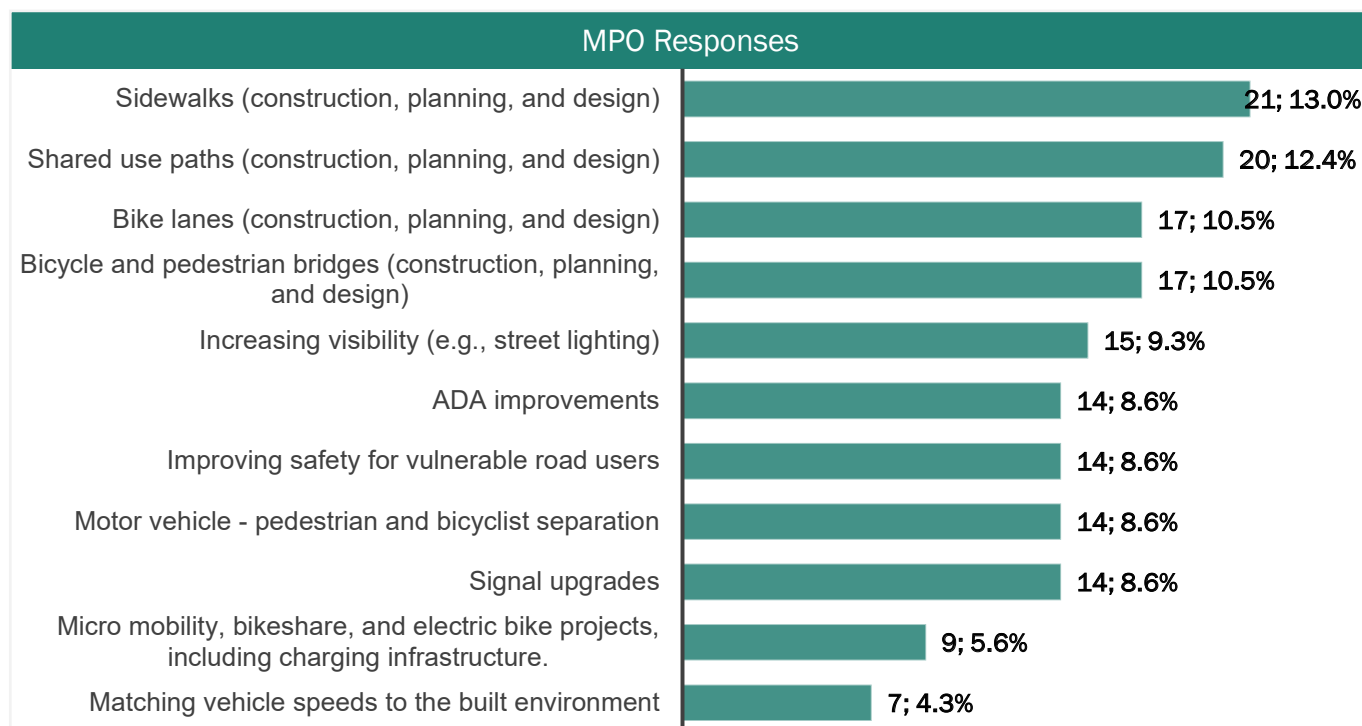
Q5. Please select the carbon reduction strategies under the Alternative Fuels category that are most implementable (both in terms of feasibility and potential carbon emissions reduction/traffic benefits) in your region. Please select all that apply.



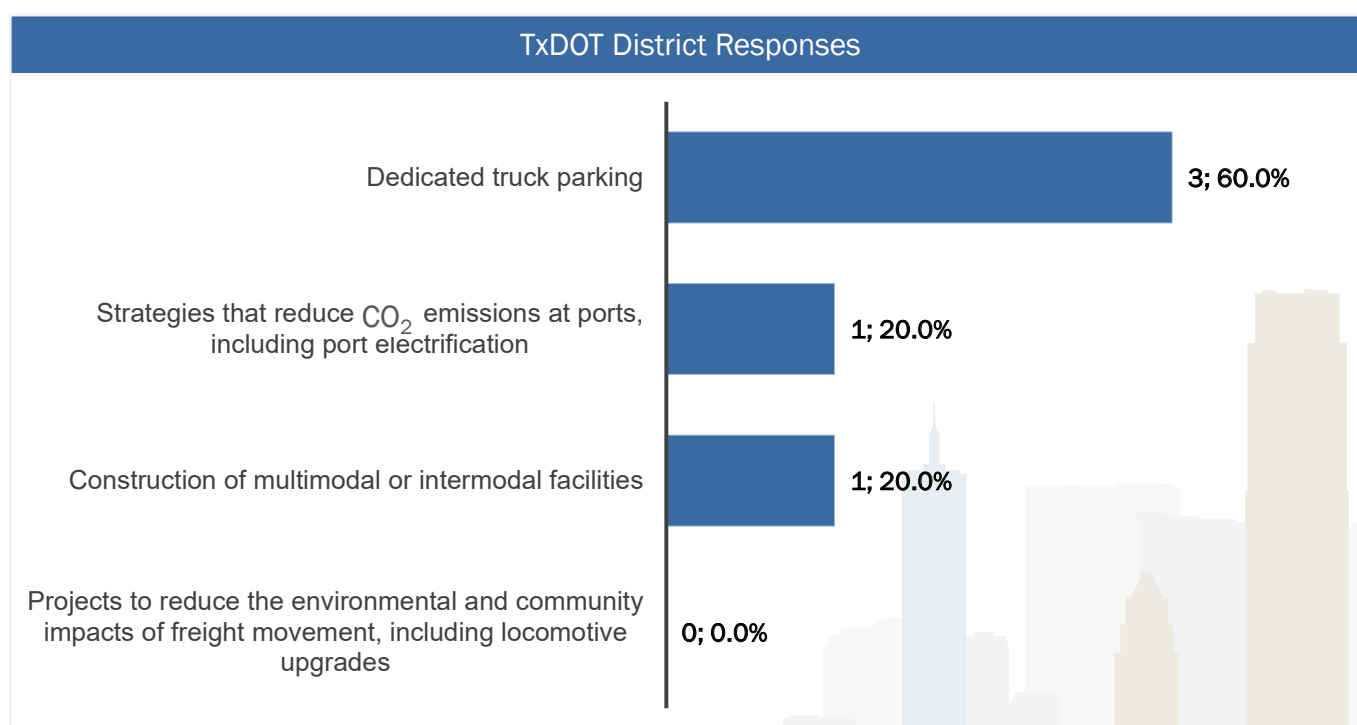
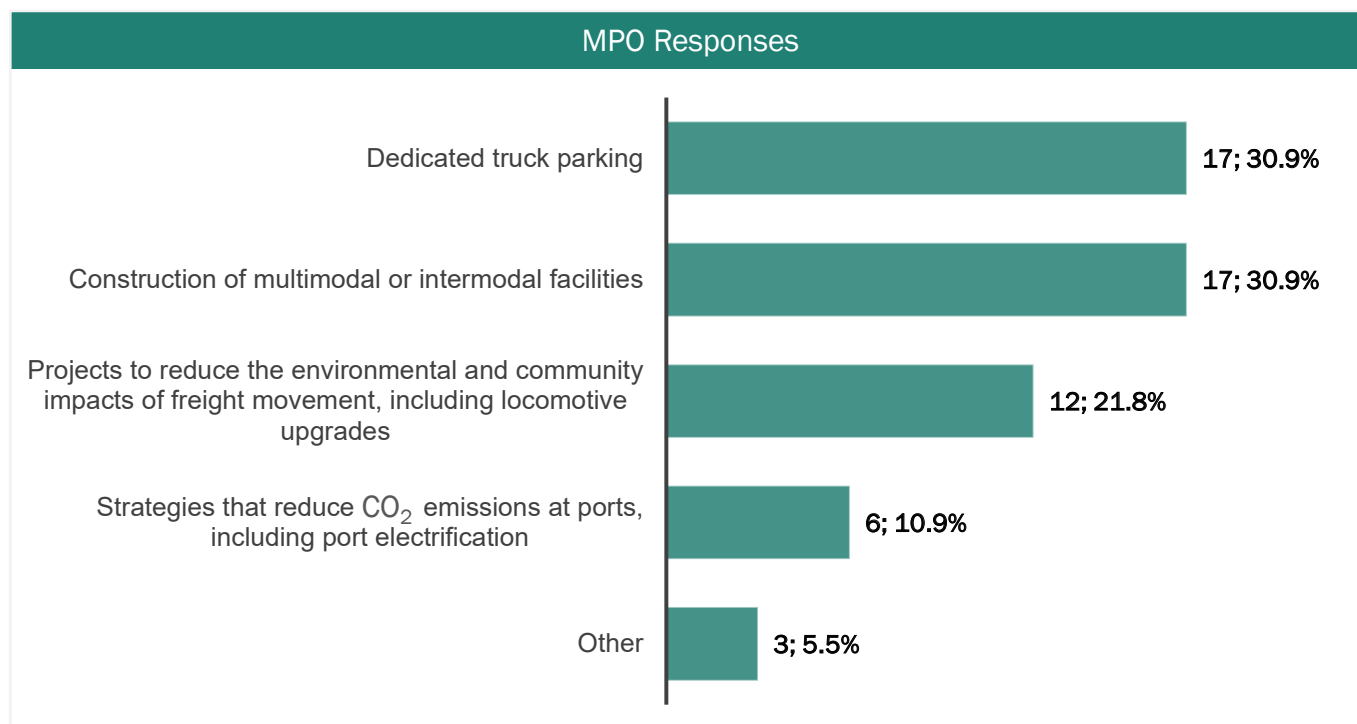
Q6. Please select the carbon reduction strategies under the Transit category that are most implementable (both in terms of feasibility and potential carbon emissions reduction/traffic benefits) in your region. Please select all that apply.



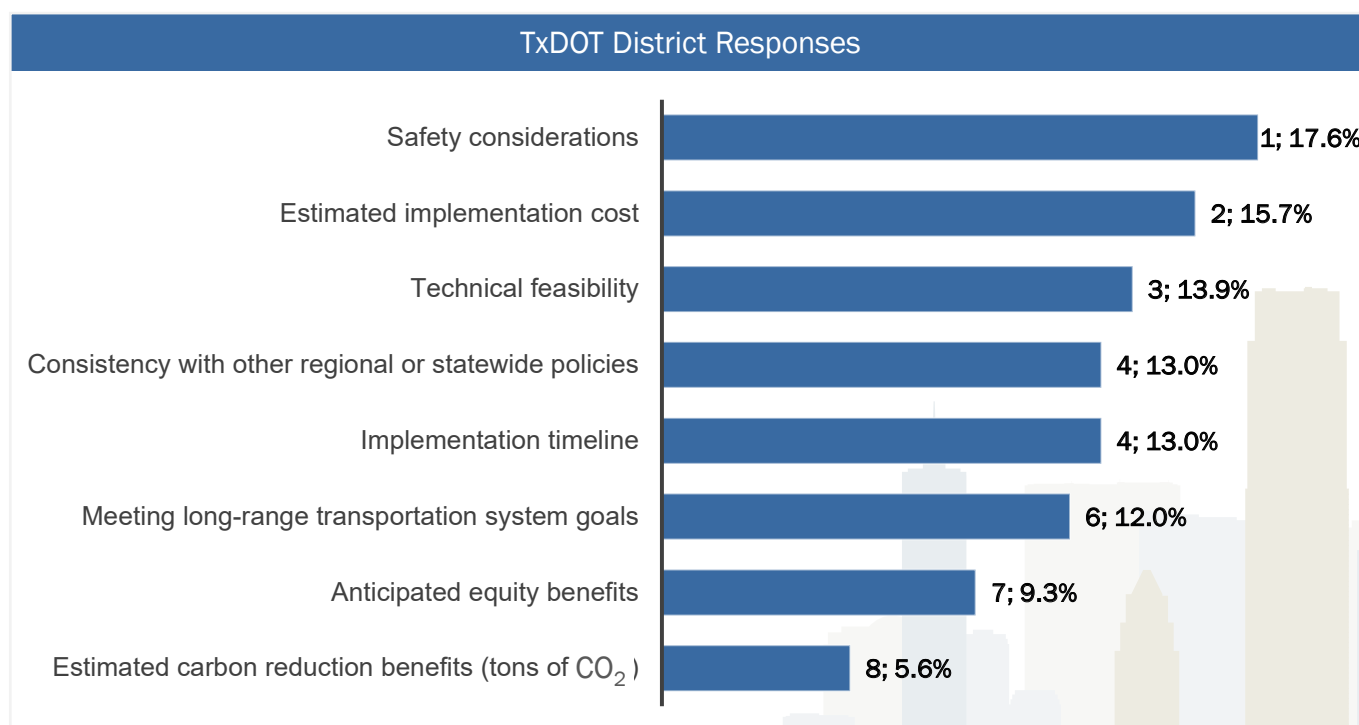
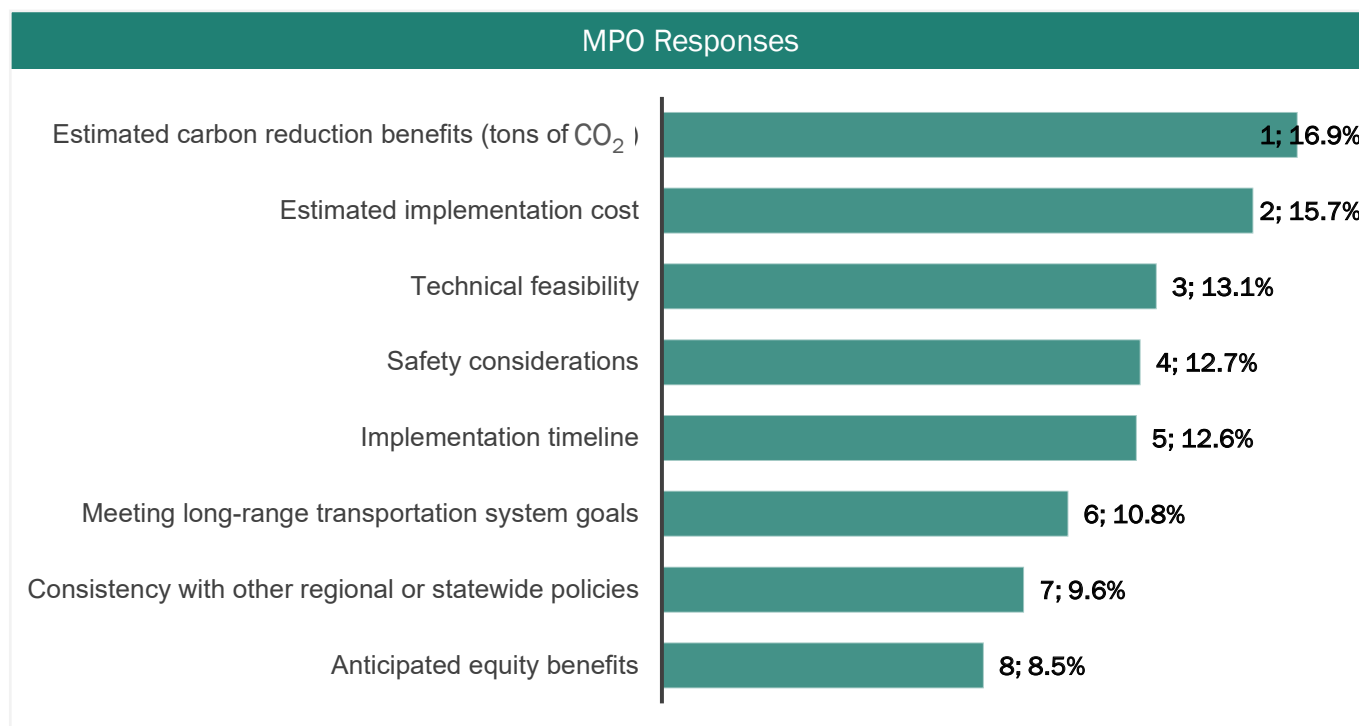
Q7. Please select the carbon reduction strategies under the Active Transportation category that are most implementable (both in terms of feasibility and potential carbon emissions reduction/traffic benefits) in your region. Please select all that apply.



Q8. Please select the carbon reduction strategies under the Freight Movement category that are most implementable (both in terms of feasibility and potential carbon emissions reduction/ traffic benefits) in your region. Please select all that apply.



Q9. Please rank the following criteria in terms of importance in prioritizing carbon reduction strategies for the CRS. Please rank the most important first and the least important last.



Appendix B: Summary of CRP-Funded Programmed Projects in the FY 2024 UTP

CSJ	Roadway	Project Description	Estimated Construction Cost	Let Date	Funding Source	Funding Amount
0027-12-168	IH 69	Replace high mast fixtures with LED fixtures	\$2,358,620	3/1/2026	10	\$2,358,620
0027-13-247	IH 69	Replace high mast fixtures with LED fixtures	\$3,710,896	3/1/2026	10	\$3,710,896
0028-02-109	US 90	Replace high mast fixtures with LED fixtures	\$1,344,000	3/1/2027	10	\$1,344,000
0049-09-092	BS 6R	Sidewalk, Shared Use Path, Signal Upgrades	\$6,009,411	8/7/2025	10	\$724,003
0050-01-094	BS 6R	Sidewalk, Shared Use Path, Signal Upgrades	\$20,778,298	8/7/2025	10	\$2,087,936
0050-06-104	US 290	Replace high mast fixtures with LED fixtures	\$2,283,787	8/7/2025	10	\$2,283,787
0050-08-103	US 290	Replace high mast fixtures with LED fixtures	\$1,142,880	8/7/2025	10	\$1,142,880
0050-09-098	US 290	Replace high mast fixtures with LED fixtures	\$1,649,333	8/7/2025	10	\$1,649,333
0089-09-091	US 59	Replace high mast fixtures with LED fixtures	\$314,483	3/1/2026	10	\$314,483
0110-04-208	IH 45	Replace underpass lighting and high mast fixtures with LED lighting/fixtures	\$4,264,000	5/2/2024	10	\$4,264,000
0110-05-134	IH 45	Replace underpass lighting and high mast fixtures with LED lighting/fixtures	\$3,848,000	5/2/2024	10	\$3,848,000
0110-06-162	IH 45	Replace high mast fixtures with LED fixtures	\$2,021,477	5/2/2024	10	\$2,021,477
0114-12-017	US 290	Construct Truck Parking	\$728,000	4/4/2024	10	\$728,000
0138-08-029	SS 63	Construct 5-foot wide pedestrian sidewalk to include ADA curb ramps. (MPO to confirm which side of roadway the sidewalk will be on)	\$285,843	3/1/2028	10	\$285,843
0138-08-030	SS 63	Construct 5-foot wide pedestrian sidewalk to include ADA curb ramps. (MPO to confirm which side of roadway the sidewalk will be on)	\$302,084	3/1/2028	10	\$302,084

CSJ	Roadway	Project Description	Estimated Construction Cost	Let Date	Funding Source	Funding Amount
0169-06-042	US 60	US 60 ADA Improvements in Pampa West	\$1,404,000	6/5/2024	10	\$1,404,000
0169-07-058	US 60	US 60 ADA Improvements in Pampa East	\$4,212,000	6/5/2024	10	\$4,212,000
0177-05-126	IH 69	Replace high mast fixtures with LED fixtures	\$3,848,848	5/1/2025	10	\$3,848,848
0177-06-093	IH 69	Replace high mast fixtures with LED fixtures	\$1,581,636	5/1/2025	10	\$1,581,636
0177-07-124	IH 69	Replace high mast fixtures with LED fixtures	\$6,134,102	5/1/2025	10	\$6,134,102
0177-11-162	IH 69	Replace high mast fixtures with LED fixtures	\$4,095,415	5/1/2025	10	\$4,095,415
0191-03-091	FM 2493	Construct Separated Bike Lanes and Sidewalks in Coordination with the FM 2493 lane widening project	\$1,456,000	8/1/2024	10	\$1,456,000
0226-05-072	US 385	US 385 ADA Improvements in Hereford	\$3,744,000	6/5/2024	10	\$3,744,000
0271-04-094	IH 10	Construct Truck Parking	\$2,376,000	11/6/2024	10	\$2,376,000
0271-06-137	IH 10	Replace high mast fixtures with LED fixtures	\$1,623,039	5/2/2024	10	\$1,623,039
0271-07-348	IH 10	Replace high mast fixtures with LED fixtures	\$2,744,961	5/2/2024	10	\$2,744,961
0271-16-166	IH 610	Replace high mast fixtures with LED fixtures	\$1,503,638	5/1/2026	10	\$1,503,638
0275-01-244	IH 40	IH 40 High Mast Lighting	\$10,670,400	6/5/2024	10	\$10,670,400
0356-01-108	SH 136	SH 136 ADA Improvements North Borger	\$1,979,245	12/5/2023	10	\$1,979,245
0379-01-047	SH 136	SH 136 ADA Improvements West Borger	\$1,305,543	12/5/2023	10	\$1,305,543
0500-03-652	IH 45	Replace high mast fixtures with LED fixtures	\$2,666,476	5/2/2024	10	\$2,666,476
0500-03-653	IH 45	Replace high mast fixtures with LED fixtures	\$12,544,000	8/1/2026	10	\$12,544,000
0502-01-247	SH 225	Replace high mast fixtures with LED fixtures	\$1,456,000	3/1/2027	10	\$1,456,000
0508-01-393	IH 10	Replace high mast fixtures with LED fixtures	\$6,720,000	3/1/2026	10	\$6,720,000

CSJ	Roadway	Project Description	Estimated Construction Cost	Let Date	Funding Source	Funding Amount
0675-08-115	IH 45	Replace underpass lighting and high mast fixtures with LED lighting/fixtures	\$2,392,000	5/2/2024	10	\$2,392,000
0675-08-123	IH 45	Construct Truck Parking	\$1,680,000	1/1/2026	10	\$1,680,000
0700-03-149	SH 71	Installation of Advance Traffic Management System	\$7,648,353	10/5/2023	10	\$8,750,000
0720-02-103	SH 249	Replace high mast fixtures with LED fixtures	\$380,657	8/7/2025	10	\$380,657
0720-03-155	SH 249	Replace high mast fixtures with LED fixtures	\$849,158	8/7/2025	10	\$849,158
0720-06-005	SH 249	Replace high mast fixtures with LED fixtures	\$174,186	8/7/2025	10	\$174,186
0905-06-105	UPLAND AVE	Pedestrian elements, illumination, and curb and gutter	\$1,722,053	11/1/2023	10	\$1,722,053
0909-36-173	CS	Construct 10 ft wide hike and bike trail along the Old Georgetown Railroad route between 31st and 5th St	\$1,121,705	8/3/2024	10	\$1,123,503
0909-36-185	RANCIER	Construct 6 foot wide concrete sidewalk with pedestrian signals, ADA ramps and crosswalks along W Rancier Ave	\$3,369,600	8/3/2024	10	\$3,499,200
0909-36-187	Various	Construct ADA accessible sidewalks adjacent to Williams Rd. from FM 2484 to W Village Rd	\$672,905	8/3/2024	10	\$698,786
0910-07-092	BIRDSONG	Construct 5-foot wide pedestrian sidewalk to include ADA curb ramps. (MPO to confirm which side of roadway the sidewalk will be on)	\$681,700	3/1/2028	10	\$681,700
0910-07-093	4TH ST	Construct 5-foot wide pedestrian sidewalk to include ADA curb ramps. (MPO to confirm which side of roadway the sidewalk will be on)	\$329,297	3/1/2028	10	\$329,297

CSJ	Roadway	Project Description	Estimated Construction Cost	Let Date	Funding Source	Funding Amount
0910-07-097	MARION DR	Construct 5-foot wide pedestrian sidewalk to include ADA curb ramps. (MPO to confirm which side of roadway the sidewalk will be on)	\$335,659	3/1/2028	10	\$335,659
0910-07-098	HUGHES ST	Construct 5-foot wide pedestrian sidewalk to include ADA curb ramps. (MPO to confirm which side of roadway the sidewalk will be on)	\$192,944	3/1/2028	10	\$192,944
0910-07-100	Various	Traffic Signal Improvements including the installation of updated signal detection within the Longview MPO limits. US 259 @ PENTACOST/ US 259 @ Stone Rd(FM 2204)/US 259 @ Kilgore St/ US 259 @ Lantrip St/US 259 @ North St. (C COMMENTS FOR REST OF LIST)	\$312,000	8/1/2024	10	\$312,000
0910-16-185	Various	FY 25 TRF Signal Upgrades. Construct traffic signal upgrades to optimize coordination at various intersections inside the City of Tyler. (SEE ROADWAY LIST IN PROJECT COMMENTS)	\$992,845	8/7/2025	10	\$992,845
0910-16-186	Various	FY 26 TRF Signal Improvements. Traffic signal improvements including the installation of updated signal detection within the Tyler MPO Limits. (SEE ROADWAYS LISTED IN PROJECT COMMENTS)	\$560,000	8/1/2026	10	\$560,000
0912-00-698	Various	Replace Navigational lights with Solar Navigational Lights	\$1,456,000	1/4/2024	10	\$1,456,000
0912-00-700	Various	Dynamic Message Sign Upgrade - IH 45, IH 10 & IH 610	\$9,568,000	4/4/2024	10	\$9,568,000
0912-00-701	Various	Install SpAT Signals	\$16,200,000	11/6/2024	10	\$16,200,000

CSJ	Roadway	Project Description	Estimated Construction Cost	Let Date	Funding Source	Funding Amount
0914-00-501	Various	Develop a comprehensive and practical emissions reduction plan for the six-county CAMPO region.	\$1,000,000	8/1/2023	10	\$1,000,000
0918-00-436	Various	COLLABORATION, EVALUATE IMPACTS, AND DEVELOP RESOURCES ADDRESSING ELECTRIC GRID IMPACTS ASSOCIATED WITH ELECTRIFICATION OF TRANSPORTATION, AND DEPLOY STRATEGIC ELECTRIFICATION INFRASTRUCTURE TO ASSESS IMPACTS AND FILL GAPS; INCLUDES NCTCOG STAFF TIME	\$500,000	8/3/2024	10	\$500,000
0918-00-437	Various	COLLABORATION, EVALUATE IMPACTS, AND DEVELOP RESOURCES ADDRESSING ELECTRIC GRID IMPACTS ASSOCIATED WITH ELECTRIFICATION OF TRANSPORTATION, AND DEPLOY STRATEGIC ELECTRIFICATION INFRASTRUCTURE TO ASSESS IMPACTS AND FILL GAPS; INCLUDES NCTCOG STAFF TIME	\$0	8/2/2025	10	\$900,000
0918-00-438	Various	COLLABORATION, EVALUATE IMPACTS, AND DEVELOP RESOURCES ADDRESSING ELECTRIC GRID IMPACTS ASSOCIATED WITH ELECTRIFICATION OF TRANSPORTATION, AND DEPLOY STRATEGIC ELECTRIFICATION INFRASTRUCTURE TO ASSESS IMPACTS AND FILL GAPS; INCLUDES NCTCOG STAFF TIME	\$0	8/1/2026	10	\$950,000
0920-00-170	Various	TRUCK PARKING (FY 24)	\$3,640,000	8/1/2024	10	\$3,640,000

CSJ	Roadway	Project Description	Estimated Construction Cost	Let Date	Funding Source	Funding Amount
0920-00-171	Various	TRUCK PARKING (FY 25)	\$0	5/1/2025	10	\$1,272,152
0920-00-172	Various	TRUCK PARKING (FY 26)	\$0	5/1/2026	10	\$1,297,597
0920-00-173	Various	TRUCK PARKING (FY 27)	\$0	5/1/2027	10	\$1,247,696
0921-02-423	TL 23	CONSTRUCT COMMERCIAL VEHICLE STAGING SITE	\$8,740,683	8/3/2024	10	\$11,439,844
0921-02-522	Various	Signal Improvements	\$1,080,000	8/1/2025	10	\$945,000
0921-06-289	CS	Construct 10' Concrete Hike and Bike Trail	\$1,013,180	10/3/2024	10	\$2,500,000
0921-06-334	Various	CONSTRUCT HIKE AND BIKE (LOS FRESNOS HIKE AND BIKE TRAIL)	\$3,390,352	1/2/2026	10	\$3,000,000
0921-06-360	Various	Construct 10' Concrete Hike and Bike Trail	\$2,438,389	8/2/2025	10	\$1,000,000
0921-06-361	Various	Construct 10' Concrete Hike and Bike Trail	\$2,267,661	8/2/2027	10	\$4,000,000
0921-06-370	STENGER ST	Construct 10' Shared Use Path	\$1,820,162	8/3/2024	10	\$1,750,156
0921-06-371	Various	Signal Improvements	\$1,020,600	8/1/2025	10	\$945,000
0921-06-372	Various	Construction of bus passenger loading areas and facility improvements	\$1,030,400	8/1/2027	10	\$920,000
1415-02-054	FM 1464	Install New Continuous Safety LED Lighting	\$3,221,320	4/1/2027	10	\$3,221,320
1685-05-141	SH 6	Install New Continuous Safety LED Lighting	\$2,590,048	1/1/2027	10	\$2,590,048
1685-06-046	SH 6	Install New Continuous Safety LED Lighting	\$1,697,744	3/1/2027	10	\$1,697,744
2158-01-028	FM 2275	Construct Sidewalk and Shared Use Path.	\$1,188,000	9/5/2024	10	\$1,188,000
2158-01-029	FM 2275	Construct Sidewalk and Shared Use Path.	\$961,200	3/4/2025	10	\$961,200
3256-02-117	SL 8	Replace high mast fixtures with LED fixtures	\$560,000	3/1/2027	10	\$560,000
3465-02-013	FM 3272	Construct 5-foot wide pedestrian sidewalk to include ADA curb ramps. (MPO to confirm which side of roadway the sidewalk will be on)	\$581,513	3/1/2028	10	\$581,513

Appendix C: Methodology for Developing and Refining the CRS

The CRS is the result of a process led by TxDOT to identify strategies and projects aimed at reducing transportation emissions. The development of the CRS involved discussions with peer state DOTs, coordination with MPOs, and input from internal and external stakeholders, including the public, as shown in Table 14.

Table 14. CRS Development Schedule.

Date	Milestone
February 17, 2023	Coordination with MPOs
April 2023	Complete peer state DOT interviews
June 2023	Identify carbon reduction strategies and project types
July 14, 2023	Coordination with MPOs
July 2023	Coordination with TxDOT Districts
July – August 2023	Online survey of MPOs and TxDOT Districts
July – August 2023	Obtain feedback and draft CRS
October – November 2023	Public comment period

This level of engagement went above and beyond federal requirements due to best practices learned early in the CRS development process and TxDOT’s understanding that stakeholder involvement and input are essential to delivering the agency’s mission. Engaging stakeholders, including the public, is the essence of public service and the foundation for fulfilling TxDOT’s mission and core values. Comments and input from MPOs, TxDOT Districts, and the general public are essential because they lead to a more transparent, informed decision-making process. TxDOT recognizes that meaningful engagement — where the department provides ample opportunity for Texas transportation system users to provide input, actively listens to comments and suggestions, and works together to create plans — is the cornerstone of quality customer service.

Identification of Strategies and Projects

The strategies and projects presented in this CRS were identified through a review of best practices based on interviews with peer state DOTs, as well as a review of local, MPO, and TxDOT planning and programming documents.

Review of National Best Practices in Identification and Prioritization of Carbon Reduction Strategies

Through interviews with peer state DOTs, TxDOT gathered national best practices to reduce transportation emissions. Prior to conducting the interviews, TxDOT identified criteria for selecting comparable peer state DOTs to interview. The peer state DOTs were selected based on whether they: (1) had developed a draft CRS or, alternatively, a Climate or Carbon Reduction Plan prior to the IIJA; and (2) were similar to Texas in terms of land use in the state (with large metropolitan areas and rural areas) and demographic and transportation system characteristics in the state (based on an analysis of 2020 population, land area, average annual daily traffic [AADT], average annual daily truck traffic [AADTT], lane miles, VMT, and CO₂ emissions from the transportation sector).

Based on the criteria analysis, TxDOT identified 14 peer state DOTs, of which seven were available for an interview. The interviewed state DOTs included Indiana, California, Michigan, Pennsylvania, Oregon, Washington, and a state DOT that wished to remain unidentified. The interviews identified national best practices in terms of identifying and prioritizing carbon reduction strategies, which are summarized in Table 15.

Table 15. National Best Practices in Identifying and Prioritizing Carbon Reduction Strategies

National Best Practice	Description
Avoid Duplicate or Redundant Programming Processes	Use strategies, projects, and programs that are already in existence as a basis for creating the CRS, including those from the Transportation Alternatives and Congestion Mitigation and Air Quality (CMAQ) programs, strategic plans, L RTPs, and MPO plans. TxDOT should also consider incorporating elements from local climate plans. These resources can aid in creating a comprehensive document that is in line with other emission reduction plans and programs in the state.
Include VMT Reduction as a Key Strategy and Metric	Reducing VMT is a key strategy and metric in many states' carbon reduction planning documents and project selections that TxDOT should consider adopting. ¹
Measure Performance	Consider adapting tools provided by the CMAQ or other programs to measure transportation emission reductions from identified strategies and projects. Funding should not be an issue since staff and equipment costs for data analysis, performance, and evaluation are eligible expenses for CRP funds. The tool or model should be easy and not onerous for operations and district personnel to use since they will be the ones responsible for timely delivery of CRP-funded projects
Target CRP Funds Towards Projects that Meet Multiple Needs	Prioritize projects that not only contribute to reducing carbon emissions, but other departmental or statewide goals as well. Provide MPOs discretion to prioritize projects funded through their urbanized area allotments on their own but give them a broad framework of guidance to assist in making those decisions.
Pay Attention to Equity	Develop the CRS through equitable public involvement methods, consider using equity as a criterion for selecting CRP projects, and pay early and consistent attention to issues of racial equity, workforce development, economic development, and removing barriers to opportunity.
Plan for the Next CRS	State DOTs expected that their 2023 CRS will be a minimum viable product due to time constraints. However, some of the states interviewed for this project noted that it may be wise to prepare for the next round. So, consider preparing for the CRS revision that will be due in four years (2027). The benefit of a regular four-year cycle is that it could help coordinate all the climate-related work being done on varying, non-coordinated schedules at the state and federal levels. To prepare for the 2027 CRS revision, consider establishing a statewide guidance document (like Michigan's MI Healthy Climate Plan, California's Scoping Plan, Washington's State Energy Strategy, and Pennsylvania's Climate Action Plan) to serve as its basis and settle any potentially controversial proposals or elements outside TxDOT activities and before the CRS is revised.

¹ Others to consider include supporting EV or alternative fuel vehicle adoption and infrastructure, deploying advanced technology solutions, active transportation, and leveraging existing resources.

Review of Planning and Programming Documents

TxDOT identified and catalogued potential carbon reduction strategies and projects associated with the Texas transportation sector for further evaluation and prioritization by: (1) examining local climate plans for information regarding strategies and any over-arching policy priorities that could be considered for inclusion in the CRS; (2) reviewing MPO planning and programming documents for information regarding project categories that could be considered for inclusion in the CRS; and (3) analysing TxDOT planning documents to identify goals, objectives, strategies, and projects that could be applied to the CRS. Based on the review of local, MPO, and TxDOT documents, proposed strategies and project categories were developed for feedback from MPOs as part of the collaboration and coordination process.

An analysis of local climate action plans revealed equity as a core value to addressing emissions from all sectors, including transportation. The scan also found shared common carbon reduction strategies that could be integrated into the CRS, such as:

- » EV technology adoption for personal and business EV use.
- » Reducing VMT.
- » Access to transportation options through bicycle and pedestrian improvements and networks, as well as programs and policies that reduce barriers to non-SOV driving options.
- » Land use strategies such as transit-oriented development.
- » Green infrastructure and energy-efficient assets such as streetlighting and traffic signals.

A high-level scan of MPO planning documents revealed that approximately 40 percent of the projects within those plans would qualify as eligible activities under the CRP. Most of these project types could be applied to strategies in the CRS, including:

- » Transportation alternatives, or active transportation improvements that reduce vehicle travel lanes or install trails, bike lanes, shared use paths, and crosswalks, Americans with Disabilities Act (ADA)-compliant infrastructure, sidewalks, medians, and shoulders.
- » CMAQ-eligible traffic operations projects that do not involve construction of new capacity, such as traffic signal improvements and upgrades, roundabouts, turn lanes, diverging diamond interchanges (DDI), single-point urban interchanges (SPUI), and access management turn lanes.
- » Transit projects such as bus stops.
- » Freight projects such as grade separations and railroad relocation projects.

A review of recent TxDOT planning documents found shared goals among the statewide plans. The commonalities amongst goals and objectives from the [Texas-Mexico Border Transportation Master Plan 2021](#), [Texas Delivers 2050: Texas Freight Mobility Plan](#), and the [Texas Transportation Plan 2050](#) (the state's current long range transportation plan²) are shown in Table 16.

² TxDOT is currently updating the TTP 2050. TxDOT will engage the public to better inform planning and prepare for projected growth and future transportation trends. The update will include a statistically valid survey on transportation attitudes filtered by key demographics and geographic location, as well as in comparison with national trends. The update will incorporate information from TxDOT's Statewide Resiliency Plan that will discuss strategies to build a more resilient transportation system as Texas experiences extreme weather and human-made events that impact the transportation network. The TTP 2050 will also incorporate information from TxDOT's modal plans, such as the Texas Freight Mobility Plan, in developing the multimodal vision for TxDOT and to support the continued development of the state's multimodal transportation system.

Table 16. Common Goals in TxDOT Plans.

Goals	Texas Delivers 2050	Texas-Mexico Border Transportation Master Plan 2021	Texas Transportation Plan 2050
Stewardship and Sustainability	Manage environmental and TxDOT resources responsibly.	Consider environmental and community impacts in investments and decision-making.	Integrate environmental considerations into all TxDOT activities.
Resiliency	Develop and maintain a resilient multimodal system that can withstand and respond to various sources of disruption.	Maintain system capacity to facilitate continued operations after disruptions and emergency events.	NA
Mobility and Reliability	Reduce congestion and improve system efficiency and performance.	Address congestion and improve system efficiency and performance.	Develop and operate an integrated transportation system that provides reliable and accessible mobility and enables economic growth.
Safety	Improve system safety, efficiency, and performance.	Address multimodal transportation safety and security.	Champion a culture of safety that reduces crashes and fatalities through the five “E’s” of Evaluation, Engineering, Encouragement, Education, and Enforcement.
Economic Competitiveness	Improve the performance of the network to enhance the contribution of transportation infrastructure to economic competitiveness, productivity, and development throughout the state.	Align investments in transportation infrastructure to support economic competitiveness.	NA
Asset Preservation	Maintain, preserve, and modernize assets to support multimodal movement of people and goods.	Maintain and preserve infrastructure that supports the movement of people and goods.	Deliver cost-efficient preventive maintenance for the transportation system that keeps Texas roads, bridges, and other infrastructure and technology in good repair.

Based on these findings, potential carbon reduction strategy categories were identified and presented to Texas MPOs as part of the consultation and coordination process.

MPO Consultation and Coordination

Under federal law, states are required to develop their CRS in consultation with any MPO designated within the state. States are also encouraged to develop their CRS as an integral part of statewide and regional transportation planning processes in coordination with MPOs. TxDOT met these requirements and guidelines by consulting early and often with MPOs throughout the development of the CRS to coordinate on apportionments of CRP funds, prioritize proposed carbon reduction strategies, and understand regional perspectives on the draft CRS.

TxDOT engaged the state's MPOs on three separate occasions during the development of the CRS. In February 2023, TxDOT provided MPOs with an overview of the CRP, including the requirement to develop a CRS. The meeting focused on CRP funding apportionments as well as those for urban areas that provide authority to MPOs to allocate their urbanized area share of CRP funds, including the non-federal match. The coordination event was an opportunity to summarize federal limits and requirements for the funds, including obligation limitations and eligible activities.

Following the February 2023 meeting with MPOs, TxDOT identified a framework for structuring the information to be presented in the CRS. The framework took the form of a set of strategy categories associated with objectives and specific strategies, which were identified from the best practices review and examination of shared goals, strategies, and project types in local, MPO, and TxDOT plans and programs (described in the previous section). This structure simplified the taxonomy for the CRS by focusing on specific strategy categories. The revised CRS structure comprised seven categories of strategies: travel demand management, advanced technologies, construction and maintenance, alternative fuels, transit, active transportation, and freight movement (see sidebar).

In July 2023, TxDOT presented the proposed framework for the CRS to the MPOs, including the draft carbon reduction strategies and project types to be included in the CRS. An online survey was used as a tool to receive feedback and input on the strategies. The survey consisted of ten questions that asked MPOs to:

- » Rank the proposed carbon reduction categories in terms of regional feasibility and potential carbon emissions and traffic reduction benefits.
- » Select carbon reduction strategies under the Travel Demand Management, Advanced Technologies, Construction and Maintenance, Alternative Fuels, Transit, Active Transportation, and Freight Movement categories that are most implementable in their region.
- » Rank criteria in terms of importance in prioritizing carbon reduction strategies for the CRS.
- » Determine whether the MPO plans on developing a regional CRS in the near future.

TxDOT's Statewide Planning Branch also made a presentation on the CRP and the development of the CRS to TxDOT's districts. A slightly revised survey was sent to TxDOT's districts. The purpose of this was to seek internal feedback on the proposed carbon reduction strategies to inform the development of the draft CRS. Appendix A provides the survey questions and responses.

MPO and TxDOT district responses to the survey were valuable in the development of a prioritized list of carbon reduction categories and strategies for inclusion in the draft CRS, which TxDOT presented to MPOs in August 2023 at the third coordination and collaboration meeting. MPO feedback was gathered and integrated into the draft CRS that was presented to the public for comment in October 2023.

Public Engagement

The public comment period for the CRS was influenced, in part, by the best practices review, which found that other state DOTs had conducted or were planning to make their draft CRS available for public comment, but, more significantly, by TxDOT's own processes for public involvement. Though a public comment period for the CRS is not a federal requirement, it is a best practice in line with longstanding policies and practices. Public involvement and public input are key components of the development of all TxDOT plans, programs, and projects. In 2011, the Texas Transportation Commission established TxDOT's Public Involvement Policy, which provides that:

"The Texas Department of Transportation (TxDOT) commits to purposefully involve the public in planning and project implementation by providing for early, continuous, transparent and effective access to information and decision-making processes. TxDOT will regularly update public involvement methods to include best practices in public involvement and incorporate a range of strategies to encourage broad participation reflective of the needs of the state's population." Texas Transportation Commission Minute Order No. 112555, January 27, 2011.

The draft CRS was available for a two-week public review and comment period from October 25 through November 8, 2023 through TxDOT's website. Anyone in the public was able to send feedback via email to TxDOT's Transportation Planning and Programming Division. The public comments were considered in developing the final CRS submitted to FHWA in November 2023. A public comment summary is included in Appendix D.

Appendix D: Summary of Public Comments

To obtain feedback on the Carbon Reduction Strategy, TxDOT made the draft report available for public comment from October 25 through November 8, 2023. Though not a federal requirement, soliciting public comment is a best practice and ensures that the public is made aware of and has the opportunity to contribute thoughts and opinions about important initiatives. TxDOT received a total of 36 comments from individuals, advocacy organizations, special interest groups, and elected officials.

Without exception, the comments aligned along one major theme: opposition to the expansion of highways (e.g., added lane miles) as part of the Carbon Reduction Strategy. All comments raised concerns that building more lane miles will increase Vehicle Miles of Travel (VMT) and therefore actually increase carbon emissions, working against the objective of the program. Feedback insisted TxDOT invest in infrastructure and programs to support alternatives to driving, like public transportation, bike lanes, and sidewalks. Several comments suggested adopting a VMT reduction goal, comparing rail and highway performance and impact (per the rail-related strategy), and promoting urban density instead of urban sprawl. The majority of comments also included opposition to the practice of flexing funds out of the Carbon Reduction Program (CRP).

Elected officials, advocacy groups, or special interest groups who frequently collaborate with policy makers, public agencies, and regulators to arrive at mutually beneficial solutions also expressed support for the overall strategy framework, in light of TxDOT's great responsibility to its many citizens. With one exception, those commentators also expressed opposition to the flexing of funds out of the CRP and investing further in vehicle lanes. One commentator from a partner agency also called attention to Texas rural transit projects as ideal candidates for CRP funding. These comments also included calls for:

- » Converting “free” lanes to congestion-priced lanes
- » Pursuit of Transit Oriented Development
- » Replacing urban freeways with surface-grade boulevards
- » Working to change transportation demand with proven demand reduction strategies
- » More robust public engagement and longer public comment period on this issue
- » Using innovative construction technologies such as precast pavement, low-carbon concrete and cementitious material/blends
- » Developing electrification transportation infrastructure
- » Reevaluating congestion mitigation as a planning goal as it has proven ineffective
- » Eliminating the Texas Clear Lanes program because it undermines carbon reduction efforts

A robust dialogue with the Texas public is a priority in TxDOT's efforts to ensure that it serves all Texans. The more commentary TxDOT can collect about Texans' transportation needs, the richer a database it can establish to guide planning and decision-making into the future. The valuable feedback regarding the CRS will be taking into consideration when the strategy is next updated.

Appendix E: UTP Projects Eligible for CRP Funds

The tables in this Appendix present projects from the TxDOT’s 2024 UTP that are eligible for CRP funding. They are shown to demonstrate TxDOT’s commitment to targeting federal funds to projects that most feasibly address transportation emissions in the state. Note that that the projects identified in the tables include CRP-eligible components, but may not ultimately be funded through the CRP.

The information presented in Table 17 through Table 23 are divided into three sections:

- » The left column provides a list of planned strategies under the category.
- » The middle columns provide descriptions of examples of funded projects that TxDOT and MPOs have programmed in the UTP. These columns provide the project’s location and UTP project identification number (CSJ). In cases where no projects associated with the specific strategy are programmed in the UTP, the TxDOT document that proposed the specific strategy is referenced.
- » The right column indicates whether the project is supported with CRP funds.



Table 17. Advanced Technologies Strategies.

Advanced Technologies Strategies – Employ advanced ITS technologies and traffic monitoring, management, and communications systems to improve traffic flow and operations along the highway network.

Strategies	Project	County/ Highway	Project ID Number (CSJ)	CRP Funding
Traffic signal improvements and upgrades, including traffic signal optimization	Upgrade existing 2 lane roadway with center turn lane to 4 lane divided with traffic signals and pedestrian improvements	Williamson-RM 2243	2103-01-036	
	Install Signal Phase and Time (SpAT) Signals	Various	0912-00-701	✓
	Traffic signal improvements including the installation of updated signal detection - US 259 @ PENTACOST/US 259 @ Stone Rd. (FM 2204)/US 259 @ Kilgore St./US 259 @ Lantrip St./US 259 @ North St.	Various (Longview MPO Limits)	0910-07-100	✓
ITS traffic control device installation and upgrades	ITS deployment	Travis-SH 71	0265-02-043	
Real-time information and communications system installation and upgrades	Installation of closed-circuit television (CCTV) and dynamic message signs (DMS)	El Paso- US 62	0374-02-124	
	DMS upgrades	IH 45, IH 10 & IH 610	0912-00-700	✓
Rail crossing traffic management system installation and upgrades	Rail crossing improvements (Union Pacific Railroad Company) DOT# 427311J	Harris-SS 330	0508-07-292	
Vehicle to Infrastructure (V2I) communications technology installation and upgrades	*Recommendation in Texas Delivers 2050 – Texas Freight Mobility Plan			
Dynamic freight routing system installation and upgrades	*Recommendation in Texas Delivers 2050 – Texas Freight Mobility Plan			
Traffic management and operations center upgrades and integration	Upgrade city's TMC and traffic signal controller equipment, phase 5	El Paso-Various	0924-06-569	
	TMC upgrade Phase 4: The project included the upgrade of the city of El Paso TMC and traffic signal controller equipment citywide. Phase 1 is the design phase. Phases 2 to 5 are implementation and construction phases.	El Paso-Various Harris-SS 330s	0924-06-568	
Dynamic parking availability signs and systems installation and upgrades	Install Dynamic Parking Availability Signs (DPAS) for Truck Parking Availability System (TPAS)	Bexar-Various	0915-00-268	

Table 18. Travel Demand Management Strategies.

Travel Demand Management Strategies – Reduce congestion, invest in intersection improvements, and implement innovative traffic demand management strategies to improve the operational efficiency of the transportation system.

Strategies	Project Description	County/ Highway	Project ID Number (CSJ)	CRP Funding
Intersection improvements	Intersection Improvements	Harris-SH 6	1685-05-105	
	Traffic signal upgrades to optimize coordination at various intersections in the City of Tyler	Various intersections in the City of Tyler	0910-16-185	✓
Shifting demand to other transportation modes	City of San Antonio Transportation Demand Management program to support efforts in vanpool, carpool, telecommuting and education.	Bexar-Various	0915-12-676	
Interchange improvements	Improve cloverleaf interchange	Washington-US 290-	0186-06-082	
Increasing vehicle occupancy rates (carpools, vanpools, HOV)	Expand from four to 10 lane expressway-including 2 HOV-special use lanes and four frontage roads. Intersection operational improvements, including turnarounds.	Bexar-SL 1604	2452-03-113	
Shifting demand to nonpeak hours	Construct a four-lane freeway with two additional lanes to be tolled during peak hours. An accompanying frontage road system of either four or eight lanes will also be developed. *(Source: NCTCOG-MTP)	NCTCOG-SH 121/NTE Connection	MTP ID: 11.80.3	
Implementation of Congestion pricing	Managed lane with dynamic pricing. *(Source: Inventory of Managed lane facilities)	I-35 – Capital Express (Future) RM 1431 to SH 45 Southeast		
Roundabout installation and improvements	Install single lane roundabout.	Harris-Pinemont Dr	0912-72-665	

Table 19. Active Transportation Strategies.

Active Transportation Strategies – Support access, availability, and safety of bicycling and walking.

Strategies	Project Description	County/ Highway	Project ID Number (CSJ)	CRP Funding
Sidewalk improvements (construction, planning, and design)	Construct new sidewalks, pedestrian lighting, and landscaping within the district.	Tarrant-SH 180	0008-07-034	
	Construct 5-foot wide pedestrian sidewalk to include ADA curb ramps.	SS 63	0138-08-030	✓
Shared use path improvements (construction, planning, and design)	Expand from 2 to 4 lanes with median, sidewalks and shared use path	Guadalupe-FM 725	0215-09-029	
	Construct Los Fresnos Hike and Bike Trail	Various	0921-06-334	✓
	Construct 10-foot-wide hike and bike trail along the Old Georgetown Railroad route between 31St and 5th St.	College Station	0909-36-173	✓
Bike lane improvements (construction, planning, and design)	Widen road to 3-lane section, drainage improvements, and bicycle and pedestrian facilities	Brazos-FM 1688	1560-02-019	
Bicycle and pedestrian bridge improvements (construction, planning, and design)	Construct Cap Metro railroad and pedestrian bridges and structural retrofit.	Travis-IH 35	0015-13-432	
Project to increasing visibility (e.g., street lighting)	Reconstruct and widen sidewalks, install pedestrian/streetlights, and reconstruct/upgrade crosswalks and associated traffic signal infrastructure	Dallas-Camp Wisdom Rd	0918-47-368	
ADA improvements	Reconstruct with concrete, add bike lane, upgrade for ADA compliance	Parker-US 180	0008-03-123	
	Construct 5-foot-wide pedestrian sidewalk to include ADA curb ramps	FM 3272	3465-02-013	✓
Projects improving safety for vulnerable users	AM Pate elementary safe routes to school - construct new sidewalks	Tarrant-Eastland St	0902-90-293	
Motor vehicle – pedestrian and bicycle separation projects	Construct separated bike lanes and sidewalks in coordination with the FM 2493 lane widening project	Smith-FM 2493	0191-03-091	
Signal upgrades	Reconstruct roadway with raised medians, drainage, signal improvements and sidewalks.	Harris-FM 2920	2941-02-056	
Micromobility, bikeshare, and e-bike projects, including charging infrastructure	These funds will support the purchase of electric bikes and additional batteries to augment the bike share program. Users ride e-bikes at a higher rate and longer duration than traditional bikes which allows users to ride to further destinations.	El Paso-Various	0924-06-695	
Projects to match vehicle speeds to the built area	Construct new and reconstruct existing sidewalks, crosswalks, and crossing safety improvements. construct new signage, traffic calming treatments, and lighting.	Tarrant-Timberline Dr	0902-90-199	

Table 20. Transit Strategies.

Transit Strategies – Increase the attractiveness and efficiency of public transit systems.

Strategies	Project Description	County/ Highway	Project ID Number (CSJ)	CRP Funding
Transit vehicle and equipment purchases and upgrades	Establish transit service to provide a more efficient, single, seamless, transit system in El Paso County, Horizon City, Town of Vinton, Anthony, San Elizario, Clint, and the City of Socorro	El Paso-Variou	0924-06-612	
Transit station improvements	Identify and construct bus stop upgrades including, concrete foundations, overhead shelters, lighting, seating, real-time schedule information	Tarrant-Variou	0902-00-372	
	Construction of bus passenger loading areas and facility improvements	Various	0921-06-372	✓
Maintenance and operations facility improvements	City of Round Rock Transit Operations. *(Source: CAMPO MTP)	Williamson- Various	MPO ID :73-00077-00	
ADA improvements	Construct segments of 10-foot or 12-foot wide concrete shared use paths along Hwy 5, the edge of North Park, along Tolson St and in an easement to the westside of DART RR connecting to the Van Alstyne Park; includes ADA ramps, beacons, and street crossing.	Grayson-SH 5	0047-03-100	
Urban rail system establishment, expansion, or preservation	DART regional rail construction from DFWIA Terminal A/B to Shiloh	NCTCOG- Silver Line (formerly Cotton Belt)	MTP ID : TR1-10314.0 à	
BRT system establishment, expansion, or preservation	3rd year of Montana BRT-RTS operations.	El Paso-Variou	0924-06-541	
Park and Ride facility establishment, expansion, or preservation	Create a park-and-ride site in far west El Paso in the area of I-10 and Transmountain	El Paso-Variou	0924-06-610	
Dedicated bus lane improvements	Construct multi-modal BRT busway including grade separation and connection to HOV lanes and transit center	Harris-IH 10	0271-07-336	

Table 21. Construction and Maintenance Strategies.

Construction and Maintenance Strategies – Support construction and maintenance of infrastructure using carbon reducing practices, materials, and technologies.

Strategies	Project Description	County/ Highway	Project ID Number (CSJ)	CRP Funding
Energy-efficient streetlight and traffic control device conversions	Replace underpass lighting and high mast fixtures with LED lighting/fixtures	Montgomery-IH 45	0110-04-208	✓
	Replace navigational lights with solar navigational lights	Various	0912-00-698	✓
Promote the use of carbon reducing construction equipment and materials	*(Recommendation in Texas Asset Management Plan 2022)			
Cost-beneficial maintenance practices	*(Recommendation in Texas Asset Management Plan 2022)			
Rail-highway grade separation improvements	Construct 2-lane on new location with railroad grade separation.	Brazoria-FM 528	1414-02-016	
Last mile investments	Reconstruct last mile of Franklin St. at port gates for heavy haul. *(Source Texas Delivers 2050)	Port of Beaumont	NA	
Increasing bridge vertical clearance	Improve bridge vertical clearances along SH 380 *(Source Texas Delivers 2050)	Port of Beaumont	NA	
Biologic carbon sequestration practices in highway rights of way	Plant wildflowers on right of way--Cass-Various-10-2410GR	Cass -Various	0919-00-093	
Installing renewable energy generation facilities (solar arrays and wind turbines) in highway ROW	Wind turbine in Culberson County safety rest area (near Pine Springs)	Culberson- US 62/180 Eastbound	NA	
Signage improvements to ports	Widen existing access roads to Velasco Terminal and pave, construct two new access roads, add directional signage and lighting, and pave a truck queuing area (Rider 37)	Brazoria-Various-	0912-31-337	
Installing or upgrading flyovers accessing ports	Connect Fulton Ave/Lee St to SH 380 with a flyover. *(Source Texas Delivers 2050)	Port of Beaumont	NA	

Table 22. Alternative Fuels Strategies.

Alternative Fuels Strategies – Facilitate the transition towards low-carbon fuels and support the widespread adoption of and infrastructure for EV and other alternative fuel vehicles.

Strategies	Project Description	County/ Highway	Project ID Number (CSJ)	CRP Funding
EV and alternative fuel vehicle infrastructure installation and upgrades	Purchase of electric vehicles and related infrastructure for implementation of service; construct sidewalks and crosswalks near the VA medical center and light rail station; traffic signal improvements; purchase of transit passes.	Dallas-Various	0918-47-437	
	Collaboration, evaluation of impacts, and development of resources to address electric grid impacts associated with electrification of transportation and deployment of strategic electrification infrastructure.	NA	0918-00-436	✓
Implementation of engine and vehicle replacement and retrofit programs, including diesel engine retrofit projects	Replace 20 40-foot heavy duty diesel buses or diesel/electric hybrids with 20 all electric buses; purchase 10 all electric "cutaway" buses; purchase necessary recharging stations	Harris-Various	0912-00-639	

Table 23. Freight Movement Strategies.

Freight Movement Strategies – Reduce the environmental and community impacts of freight movement.

Strategies	Project Description	County/ Highway	Project ID Number (CSJ)	CRP Funding
Dedicated truck parking projects	Construct truck parking	Wise-US 81	0013-07-087	
	Construct truck parking	IH 45	0675-08-123	✓
	Construct truck parking	IH 10	0271-04-094	✓
Construction of multimodal or intermodal facilities	Reconstruct to 4 lane roadway with intersection, safety, multimodal and drainage improvements	Harris- Fondren Rd	0912-72-381	
Projects to reduce the environmental and community impacts of freight movement, including locomotive upgrades	Add northbound and southbound non-tolled managed lanes, reconstruct ramps, improve frontage road and freight movements, and add auxiliary lanes	Williamson- IH 35	0015-09-178	
Support and collaborate on mode shift to rail.	Coordinate with railroads and ports to support rail connections to the international border and maritime ports.*			

*(Source Texas Delivers 2050)

Texas Carbon Reduction Strategy

