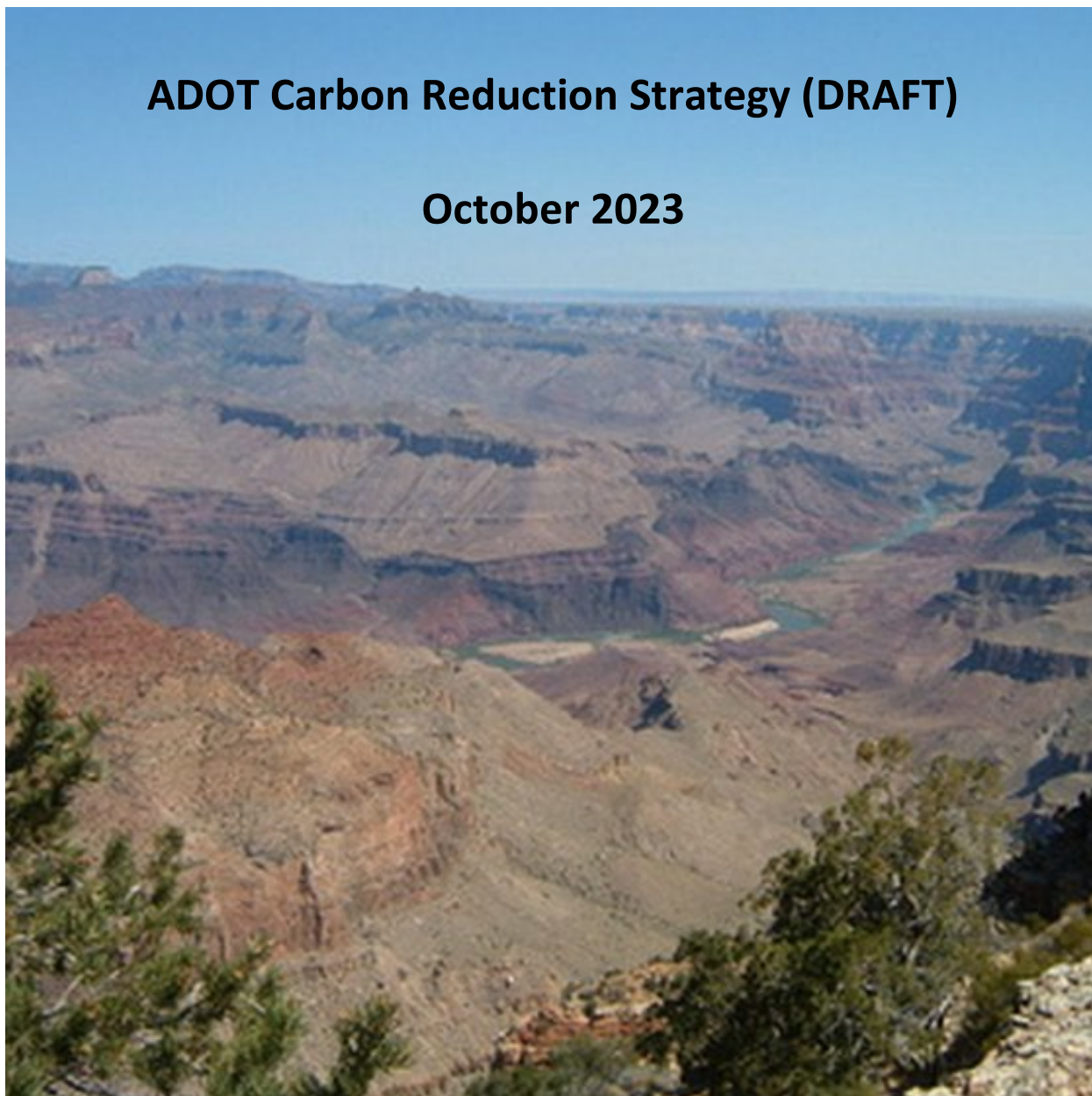


ADOT Carbon Reduction Strategy (DRAFT)

October 2023



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Acknowledgments

The Arizona Department of Transportation (ADOT) would like to sincerely thank our internal and external stakeholders for their continuous involvement and input of this Strategy.

Arizona COGs/MPOs

- Central Arizona Association of Governments (CAAG)
- Central Yavapai Metropolitan Planning Organization (CYMPO)
- Lake Havasu Metropolitan Planning Organization (LHMPO)
- Maricopa Association of Governments (MAG)
- MetroPlan (Flagstaff MPO)
- Northern Arizona Council of Governments (NACOG)
- Pima Association of Governments (PAG)
- Sierra Vista Metropolitan Planning Organization (SVMPO)
- Southeastern Arizona Government Organization (SEAGO)
- Sun Corridor Metropolitan Planning Organization (SCMPO)
- Western Arizona Council of Governments (WACOG)
- Yuma Metropolitan Planning Organization (YMPO)

ADOT

- MPD Regional Planning Team
- MPD Programming Team
- MPD Tribal Transportation Team
- Environmental Planning Group
- ADOT Research Center

Other Contributions

- FHWA – Arizona Division
- WSP (author of the ADOT 2050 Long Range Transportation Plan)
- Arizona Commerce Authority

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Chapter 1: Executive Summary

The Arizona Department of Transportation (ADOT) has developed this Carbon Reduction Strategy (CRS) to support efforts to reduce on road carbon dioxide (CO₂) emissions from the transportation sector in Arizona and in alignment with federal requirements and guidelines established in the Infrastructure Investment and Jobs Act (IIJA)/Bipartisan Infrastructure Law (BIL), Inflation Reduction Act (IRA), and other federal policies. This strategy will be reviewed by the Arizona's Metropolitan Planning Organization (MPO) partners during a review period (October 2023).

Carbon dioxide (CO₂) is the primary greenhouse gas (GHG) emitted from on-road vehicles. It is an important heat-trapping gas, also known as a greenhouse gas (GHG), that comes from the extraction and burning of fossil fuels. Three complementary pathways can help reduce emissions from on-road highway sources:

1. **Reduce total fuel consumption by on-road vehicles:** adopt policies and prioritize infrastructure that increase vehicle fuel efficiency, mitigate congestion, and promote the use of electric vehicles (which have no direct tailpipe emissions and low-carbon fuel formulations).
2. **Reduce vehicle miles traveled (VMT):** reduce the total number and length of passenger automobile trips by promoting a shift to transit and nonmotorized modes such as bicycling and walking.
3. **Reduce emissions from construction and maintenance activities.**

In addition, embodied emissions include emissions from manufacturing, material transport, construction, maintenance, and disposal of transportation infrastructure building materials. ADOT can support carbon efficient choices made by users of the transportation system by

planning, designing, and building safe and convenient infrastructure and services and through its policies and programs. ADOT can also lead by example by doing the following activities:

- Reducing carbon emissions from ADOT owned fleet and equipment.
- Transitioning to lower embodied carbon materials such as light-emitting diode (LED).
- Demonstrating ways to reduce emissions in highway projects using sustainable construction materials.
- Promoting active transport.

ADOT will face challenges in reducing carbon, with future population growth anticipated to increase an average of 1.1% annually over the next several decades resulting in a future 2055 population of 10.5 million (2020 State population is 7.28 million)¹. Future employment growth, as projected by the Arizona Office of Economic Opportunity, is anticipated to increase an average of 2.2% annually over the next decade resulting in a future 2030 employment of 3.75 million.

ADOT has identified five categories of activities that can support carbon reduction and detailed projects and strategies within each category.

1. **Truck Parking:** Strategies that support efforts to reduce the environmental and community impacts of freight movement.
2. **Transportation Alternatives:** Strategies that support activities as defined under the Moving Ahead for Progress under the 21st Century Act [23 U.S.C. 101(a)(29), as in effect on July 5, 2012]), including, but not limited to: the construction, planning, and design of on-road and off-road trail facilities for pedestrians, bicyclists, and other nonmotorized forms of transportation.

¹ AZ Commerce Authority, <https://www.azcommerce.com/oeo/population/population-projections/>

3. **Electric Vehicles, Alternative Fuels and Energy Efficiency:** Strategies that support electric or alternative fuel vehicle adoption or improve overall energy efficiency and low-carbon fuel formulations for the transportation network.
4. **Sustainable Pavements and Construction Materials:** Strategies that support sustainable pavements technologies that reduce embodied carbon during the manufacture and/or construction of highway projects.
5. **Technology Solutions:** Strategies that deploy advanced technology solutions for roadway operations and communications and improve traffic flow.

Carbon-reduction projects and strategies can be implemented through ADOT's existing long-range transportation vision, policy goals, and objectives. As part of the upcoming ADOT Climate Adaptability Study of the State Highway System, ADOT will be developing a carbon reduction performance measure to quantitatively assess carbon emissions from transportation investments and evaluate progress. In addition, ADOT is participating in an FHWA Climate Challenge project to address the following tasks:

- quantify the impacts of embodied emissions and sustainable pavements,
- demonstrate ways to reduce GHG emissions in highway projects using sustainable construction materials, and
- advance ADOT's Sustainable Transportation Program.

ADOT will implement the CRS through four specific actions:

1. Develop carbon reduction performance measures and targets.
2. Identify early opportunities for carbon reduction within the current statewide transportation improvement program.
3. Identify new opportunities for carbon reduction in each project and strategy category.

4. Integrate carbon reduction into the transportation planning process.

Chapter 2: Introduction

ADOT has developed this Carbon Reduction Strategy (CRS) to support efforts to reduce carbon dioxide (CO₂) emissions and identify projects and strategies to reduce these emissions within the state of Arizona. This report is developed in accordance with federal requirements and guidance. Chapter 10 details each requirement and the section that addresses the requirement within this report.

Carbon Reduction Program Overview

The Arizona CRS follows federal guidelines delineated in the Carbon Reduction Program (CRP), established within the Infrastructure Investment and Jobs Act (IIJA)/Bipartisan Infrastructure Law (BIL) of 2021 and codified in 23 U.S.C. 175. According to the federal legislation, the purpose of the CRP is to provide funds for projects designed to reduce transportation emissions, defined as carbon dioxide (CO₂) emissions from on-road highway sources.

Arizona received approximately \$114 million over five years under the CRP. ADOT is required to allocate 65% of these funds to urbanized areas in accordance with their relative share of the state population. The Arizona Transportation Management Areas (TMAs)² and Municipal Planning Organizations (MPOs)³ that received CRP allocation included:

- Central Yavapai Municipal Planning Organization (CYMPO)
- Lake Havasu Municipal Planning Organization (LHMPO)
- Maricopa Association of Governments (MAG – TMA region)

² A TMA is designated by the U.S. Secretary of Transportation for an urbanized area with a population of at least 200,000.

³ An MPO is a geographic area with a population of 50,000 or more, as determined by the Bureau of the Census.

- MetroPlan (Flagstaff MPO)
- Pima Association of Governments (PAG – TMA region)
- Sierra Vista Municipal Planning Organization (SVMPO)
- Sun Corridor Municipal Planning Organization (SCMPO)
- Yuma MPO (YMPO)

Key notes:

1. Arizona Council of Government (COGs) areas did not receive CRP allocations (per Federal Guidelines, COGs were not eligible for CRP allocations). Arizona COG areas include: Central Arizona Association of Governments ([CAAG](#)), Northern Arizona Council of Governments ([NACOG](#)), Southeastern Association of Governments ([SEAGO](#)), and Western Association of Governments ([WACOG](#)). There could be potential partnering opportunities with the COGs for CRP funded projects (i.e. with ADOT, MPOs). ADOT and the MPO partners will continue to collaborate with the COG partners on this matter.
2. CRP allocations for MPOs/TMAs have been processed onto their respective financial ledgers. Additionally, CRP is designated as a work element in the current work programs for all MPOs/TMAs.
3. MPOs that received CRP allocations prioritize their regional CRP project priorities through their respective local processes (as long as the selected CRP projects are eligible within the CRP Federal Guidance).
4. Per the recent 2020 Census, [Bullhead City](#) will be a new MPO in Arizona (pending Governor approval by end of 2023). Once the Bullhead City MPO is officially established, ADOT will distribute the applicable CRP funds to this region. The CRP project priorities and updates for this region will be reflected in the next ADOT CRP Strategy (scheduled for 2027).

ADOT has the flexibility to allocate the remaining 35% at the State’s discretion. Figure 1 illustrates Arizona’s COG/MPO/TMA areas.

Arizona COGs and MPOs

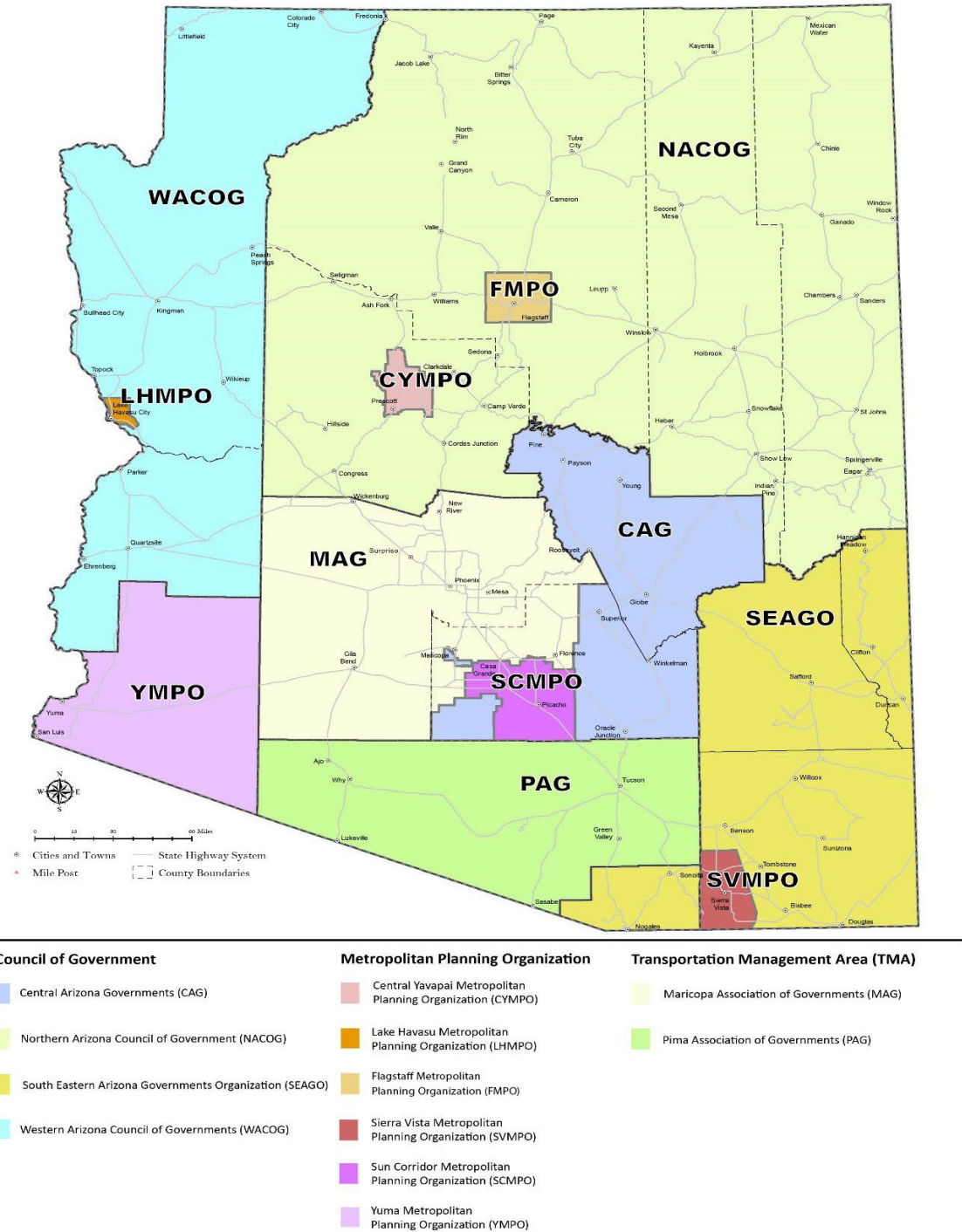


Figure 2-1 - Arizona COG/MPO/TMA Areas

The CRP requires each State to prepare a carbon reduction strategy that:

- Supports efforts to reduce transportation emissions.
- Identifies projects and strategies that will reduce transportation emissions.
- Is appropriate to the population and context of the State.

ADOT has developed this Arizona CRS to meet federal requirements and guidelines, while reflecting Arizona's unique path to meeting carbon reduction goals and targets.

Chapter 3: MPO/TMA Summary⁴

Maricopa Association of Governments (MAG)

Maricopa Association of Governments is the regional planning agency for Maricopa County and the northern portion of Pinal County, which includes the metropolitan Phoenix area, as shown in Figure 3-1. The MAG membership currently consists of the 27 incorporated cities and towns within Maricopa County and the contiguous urbanized area, the Gila River Indian Community, the Salt River Pima Maricopa Indian Community, Fort McDowell Yavapai Nation, Maricopa County, and Pinal County. Additionally, ADOT serves as an ex-officio member for transportation-related issues. The MAG region, which is Maricopa County and includes portions of Pinal County, comprises 10,655 square miles and had a 2020 Census population estimate of 4,704,697 residents.

In 1967, MAG was the first regional planning agency formed in the state of Arizona when local elected officials recognized the need for long-range planning and policy development on a regional scale. The governor designated MAG to serve as the principal planning agency for issues such as air quality, water quality, and solid waste management.

⁴ Information regarding MPOs & TMAs taken from the Arizona MPO & COG Guidelines and Procedures Manual, prepared by WSP, https://azdot.gov/sites/default/files/media/2020/12/ADOT_MPO_COG_Manual.pdf

Table 3-1: MAG Statistics

Maricopa Association of Governments (MAG) - https://www.azmag.gov/	
Year Established	1967
Hosted/Independent MPO	Independent
2020 Census Population	4,704,697
Counties	2 Maricopa, Pinal
Number of Municipalities	27
Tribal Partner Agencies	3 Fort McDowell Yavapai Nation, Gila River Indian Community, Salt River Pima-Maricopa Indian Community
Primary Travel Corridors	9 Interstate: I-8, I-10, I-17. US Routes: US 60. State Routes: SR 85, SR 101, SR 202, SR 303, SR 347.
Transit	Yes
Airport	Yes
Air Quality Nonattainment or Maintenance	Carbon monoxide (CO), Ozone (1 hr), Ozone (8 hr), PM10, PM2.5

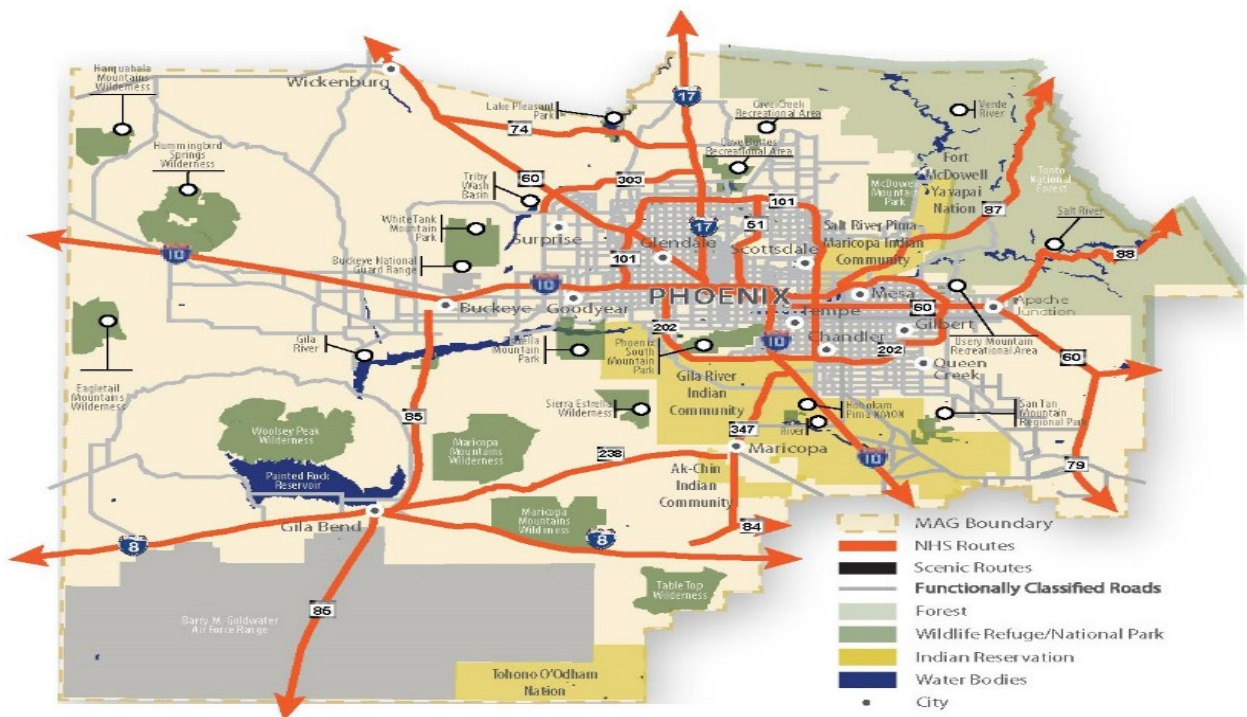


Figure 3-1 - MAG Regional Area

MAG Carbon Reduction Program Priorities Status

The MAG Region intends to use their CRP funds on a Regional Electrification Readiness Strategic Plan (plan website: <https://azmag.gov/Programs/Transportation/Regional-and-Subregional-Studies/Electrification-Readiness>). The Regional Electrification Readiness Strategic Plan will prepare the MAG region for an increasingly electric future. The strategic plan will include a range of recommendations and strategies to enhance electrification readiness for MAG and its member agencies. The study will accomplish these three main objectives:

1. Assess the current and future state of electrification and regional implications.
2. Define roles and responsibilities for applicable strategies.
3. Identify strategic funding opportunities and next steps for action.

Climate Pollution Reduction Grant Program

Another program of note for the MAG Region is the Climate Pollution Reduction Grant Program (CPRG). MAG has been chosen to participate in the EPA's CPRG program and lead in creating and implementing a regional plan to reduce greenhouse gas emissions and other air pollutants, including ozone. The EPA's CPRG program provides \$5 billion to states, local governments, tribes, and territories to tackle climate pollution and deliver cleaner air. MAG will be the lead agency with oversight and responsibility for managing funds, including developing the budget, climate action plans, coordinating contractor activities, and submitting deliverables to the CPRG program. More information regarding this Program can be found at: <https://azmag.gov/Programs/Environmental/CPRG>).

Pima Association of Governments (PAG)

Pima Association of Governments is the MPO that serves Pima County, including the Tucson metropolitan area in southern Arizona. PAG’s boundary is shown in Figure 3-2. PAG’s nine-member regional council has representatives from the county, five municipalities, the Pascua Yaqui and Tohono O’odham tribal governments, and the Arizona State Transportation Board (ASTB). The PAG region, which is Pima County, comprises 9,188 square miles and had a 2020 Census population of 1,043,433 residents.

PAG’s programs focus on cross-jurisdictional planning issues, such as air quality, water quality, energy, transportation, and population growth. PAG’s activities and services include traffic data collection, mapping, population projections, carpool matching, sustainability planning, public meetings, and publications. The governor has designated PAG to serve as the principal planning agency for issues such as: air quality, water quality, and solid waste management.

Table 3-2: PAG Statistics

Pima Association of Governments (PAG) – https://pagregion.com/	
Year Established	1972
Hosted/Independent MPO	Independent
Land Area (sq. mi.)	9,188
2020 Census Population	1,043,433
Counties	1 Pima
Number of Municipalities	5
Tribal Partner Agencies	2 Pascau Yaqui Tribe, Tohono O’odham Nation
Primary Travel Corridors	3 Interstates: 1-10, 1-19. State Routes: SR 86
Transit	Yes
Airport	Yes
Air Quality Nonattainment or Maintenance	PM 10



Figure 3-2 - PAG Regional Area

PAG Carbon Reduction Program Priorities Status

The PAG Regional Council-adopted FY 2023 and FY 2024 Overall Work Program (OWP) details projects/strategies within the Transportation Activities, Travel Reduction, Commuter Services, and Regional Modeling work elements in line with the ADOT CRP eligible projects list:

Work Element: 40 – Transportation Activities

Goal 20: Reduce auto emissions by providing a commuter assistance/rideshare program and promoting alternative transportation to employers and commuters. Shifting transportation demand to nonpeak hours or other transportation modes, increasing vehicle occupancy rates, or otherwise reducing demand for roads.

- **Strategy:** Provide resources for area employers to conduct worksite travel reduction initiatives.
- **Strategy:** Provide vanpool subsidies to reduce commute costs.
- **Strategy:** Conduct outreach to increase participation.

Goal 21: Establish and implement a Performance Management Program for advanced transportation and congestion management technologies and innovative mobility deployment.

- **Strategy:** Develop data collection and processing workflow to generate timely and useful metrics to monitor progress toward:
 - Regional Mobility and Accessibility Plan (RMAP) and Congestion Management Process (CMP) goals and targets.
 - Federally mandated performance measures and targets per FHWA and FTA regulations and rule makings (e.g., Transit Asset Management and Public Transportation Safety Action Plans, etc.).
 - Transportation Improvement Program (TIP) project development and selection.
 - Linking transportation investments to performance goals and targets of the RMAP.

Goal 22: Develop Multimodal Components of the long-range RMAP, including the construction, planning, and design of on-road and off-road facilities for pedestrians, bicyclists, and other nonmotorized forms of transportation.

- **Strategy:** Develop regional active modes component of the RMAP. Conduct regional bicycle and pedestrian mileage information, count data and other active modes analysis for input into the RMAP.

Goal 23: Enhance transportation systems operations and efficiencies – advanced transportation and congestion management technologies and innovative mobility deployment.

- **Strategy:** Work with member jurisdictions to identify methods to incorporate Intelligent Transportation Systems (ITS) and Transportation System Management and Operations (TSMO) strategies and best practices.

Goal 24: Plan for incident management and emergency response on a regional level for advanced transportation technologies to improve emergency evacuation and response by federal, state, and local authorities.

- **Strategy:** Participate as appropriate in recurring Traffic Incident Management Self-Assessment with transportation and emergency response personnel. As needed, coordinate emergency response planning among transportation providers and emergency services through dialogue, goal setting and performance tracking.

Goal 25: Enhance system performance and reduce traffic congestion.

- **Strategy:** Continue to implement and refine the regional Congestion Management Process (CMP) and system performance dashboard.

Goal 26: Apply developed activity-based model (ABM) to support PAG's planning efforts including the RMAP and TIP. Deploy advanced transportation and congestion management technologies such as transportation system performance data collection, analysis, and dissemination systems.

- **Strategy:** Apply the developed ABM with various sensitivity tests for RMAP and TIP planning options.
- **Strategy:** Develop an exploratory planning tool to consider uncertain future transportation system and environment.

Goal 27: Research and develop UrbanSim land use model.

- **Strategy:** Develop UrbanSim Land Use Model using both in-house resources and consulting services.

Goal 28: Conduct Transportation Improvement Program (TIP) and the 2055 RMAP modeling and Title VI Analyses, as needed.

- **Strategy:** Employ available modeling tools to develop current estimates and 5-year projections of traffic and transit ridership.

Goal 29: Evaluate the regional multimodal transportation performance through regional multimodal transportation system.

- **Strategy:** Evaluate regional multimodal data availability and develop regional multimodal performance measures.

Goal 30: Provide a resource where travelers can acquire real-time travel information. Deploy advanced transportation and congestion management technologies, including advanced traveler information systems.

- **Strategy:** Maintain TransView.org website and related applications, including live-streaming traffic video, alerts and news updates, real-time traffic incidents and photo-enforcement information and locations, construction and special events info.
- **Strategy:** Develop and manage PAG Regional Transportation Data Archive System.
- **Strategy:** Maintain Traffic Incident Reporting System [TIRS].

Additionally, PAG CRP goals and objectives relevant to the ADOT/FHWA-approved planning activities in the OWP are supported by consulting services in the following areas:

- Vanpool subsidies
- Regional Active Transportation Plan
- Exploratory planning tool development for uncertain future transportation system and environment
- Regional multimodal performance assessment
- Household Travel Survey
- Dynamic Traffic Assignment (DTA) model development for regional congestion mitigation and air quality model improvement

- Traffic volume counts
- Ortho Data Extraction
- Dial a Ride/Micro Transit Service Area Analysis

The projected outcomes of the programs aligned with CRP activities within the OWP are:

- Update the Regional Mobility and Accessibility Plan (RMAP) – develop multimodal components
- Pedestrian and bicycle count program activities
- PAG Regional Bike Map Update
- Regional Active Transportation Plan
- Interactive web-based carpool, vanpool matching system
- Sun Rideshare marketing efforts and create digital materials for TRP employer’s workforce education efforts
- Sun Rideshare Commuter Program
- Quarterly newsletter: Sun Rideshare News
- Exploratory planning tool and its development report for uncertain future system and environment

Safety and social equity are incorporated into the selected activities by the nature of reduced transportation pollutants and safety outcomes that result from congestion mitigation, increased vehicle occupancy rates, and increased active transportation mode use. Improved air quality and safety transportation modes that is gained through regional implementation of CRP strategies benefits the entire PAG region.

Central Yavapai Metropolitan Planning Organization (CYMPO)

The Central Yavapai MPO is a partnership of the jurisdictions that are within its planning area, which includes: the city of Prescott, town of Chino Valley, town of Dewey-Humboldt, town of Prescott Valley, Yavapai County, and ADOT. CYMPO’s purpose is to cooperatively plan the transportation future of the Central Yavapai region that falls within the 401 square miles of the MPO planning boundary. CYMPO’s boundary is shown in Figure 3-3.

Table 3-3: CYMPO Statistics

Central Yavapai Metropolitan Planning Organization (CYMPO) – https://www.cympo.org/	
Year Established	2003
Hosted/Independent MPO	Hosted by Yavapai County
Land Area (sq. mi.)	401
2020 Census Population	143,182
Counties	1 Yavapai
Number of Municipalities	4
Tribal Partner Agencies	1 Yavapai-Prescott Indian Tribe
Primary Travel Corridors	4 State Routes: SR 69, SR 89, SR 89A, SR 169
Transit	Yes
Airport	Yes
Air Quality Nonattainment or Maintenance	None

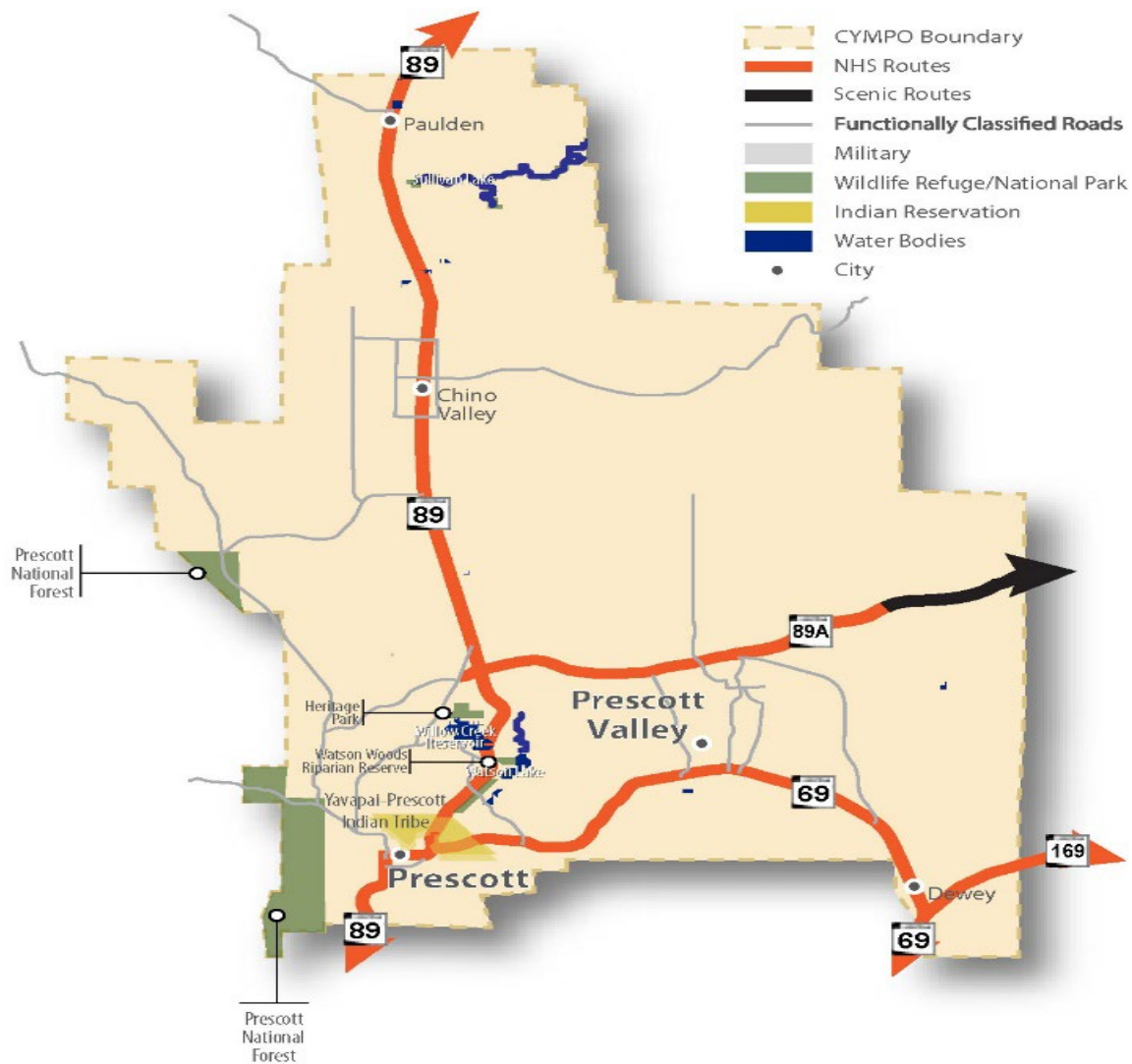


Figure 3-3 - CYMPO Regional Area

CYMPO Carbon Reduction Program Priorities Status

CYMPO is planning to utilize CRP funds on the following projects:

- Pioneer Parkway Trailhead
- 2050 CYMPO Regional Transportation Plan (applicable CRP portion of Plan)
- Environmental Needs Assessment
- Active Community Transportation – Unified Plan

Additionally, CYMPO plans to expend future CRP funds on:

- Transportation Alternative Projects (with a focus on habitat connectivity projects and trail planning, construction, and design).

MetroPlan – Flagstaff Metropolitan Planning Organization

MetroPlan (Flagstaff Metropolitan Planning Organization) is responsible for the planning, coordination, and integration of activities necessary to maintain a 3-C multiagency transportation planning program. Jurisdictions that make up MetroPlan include the city of Flagstaff, Coconino County, and ADOT. The MetroPlan boundary is shown in Figure 3-4. MetroPlan receives funding from federal, state, and local governments, and all these governmental agencies work closely together to oversee the expenditure of federal transit funds. Each year, the MPO evaluates and approves proposed surface transportation improvement projects. It also provides a forum for interagency cooperation and public input into how transportation funding is spent through a collaborative decision making processes. FMPO does business under the agency title MetroPlan.

Table 3-4: MetroPlan Statistics

MetroPlan (Flagstaff Metropolitan Planning Organization) – https://www.metroplanflg.org	
Year Established	1996
Hosted/Independent MPO	Independent
Land Area (sq. mi.)	525
2020 Census Population	95,835
Counties	1 Coconino
Number of Municipalities	1
Tribal Partner Agencies	N/A
Primary Travel Corridors	6 Interstate: I-17, I-40. US Routes: US 66, US 180. State Routes: SR 89, SR 89A.
Transit	Yes
Airport	Yes
Air Quality Nonattainment or Maintenance	None



Figure 3-4 - MetroPlan Regional Area

MetroPlan Carbon Reduction Program Priorities Status

MetroPlan is planning to utilize their CRP funds on the planning, development, and implementation of Transportation Demand Management (TDM) strategies in the region. The goal of these TDM strategies is to reduce transportation emissions including programs, projects and strategies for safe, reliable, and cost-effective options to reduce the use of single occupant vehicles. Examples of the work to be performed include, but not limited to:

- Implement projects for advanced transportation and congestion management, shifting transportation demand to nonpeak hours or other transportation modes, increasing vehicle occupancy rates, or otherwise reducing demand for roads.
- Develop, attend, and promote TDM events to promote sustainable mobility options, which may include Bike Month, demonstration and pilot projects, and other related events including coordinating staff, partners and volunteers.
- Develop TDM programming including working with K-12 schools to reduce school-related congestion and promote multimodal transportation choices.
- Integrate multimodal safety education into programs.
- Monitor legislation and policies related to TDM and provide input and recommendations as needed.
- Gather, compile, and analyze data to identify a variety of commuting and long-term planning options. Conduct program analysis to evaluate the attractiveness and effectiveness of TDM programs. Perform feasibility studies by modeling and forecasting a variety of transportation alternatives and issues. Collect travel mode data including administration of residential, visitor, and employer travel surveys.
- Support MetroPlan's goals in promoting diversity and social justice; provide solutions to address the needs of underserved and vulnerable populations via transportation options policy and program design.

Lake Havasu Metropolitan Planning Organization (LHMPO)

The Lake Havasu MPO is located in Mohave County in western Arizona, accessed by SR-95. The LHMPO boundary is shown in Figure 3-5. Located along the Colorado River between Yuma and Bullhead City, Lake Havasu City attracts recreationalists, retirees, and vacationers. Throughout the year, the population fluctuates, much like many of the Arizona destinations during the fall, winter, and spring months.

Table 3-5: LHMPO Statistics

Lake Havasu Metropolitan Planning Organization (LHMPO) – https://www.lhmppo.org/	
Year Established	2013
Hosted/Independent MPO	Hosted by Lake Havasu City
Land Area (sq. mi.)	101
2020 Census Population	60,424
Counties	1 Mohave
Number of Municipalities	1
Tribal Partner Agencies	N/A
Primary Travel Corridors	1 State Routes: SR 95
Transit	Yes
Airport	Yes
Air Quality Nonattainment or Maintenance	None

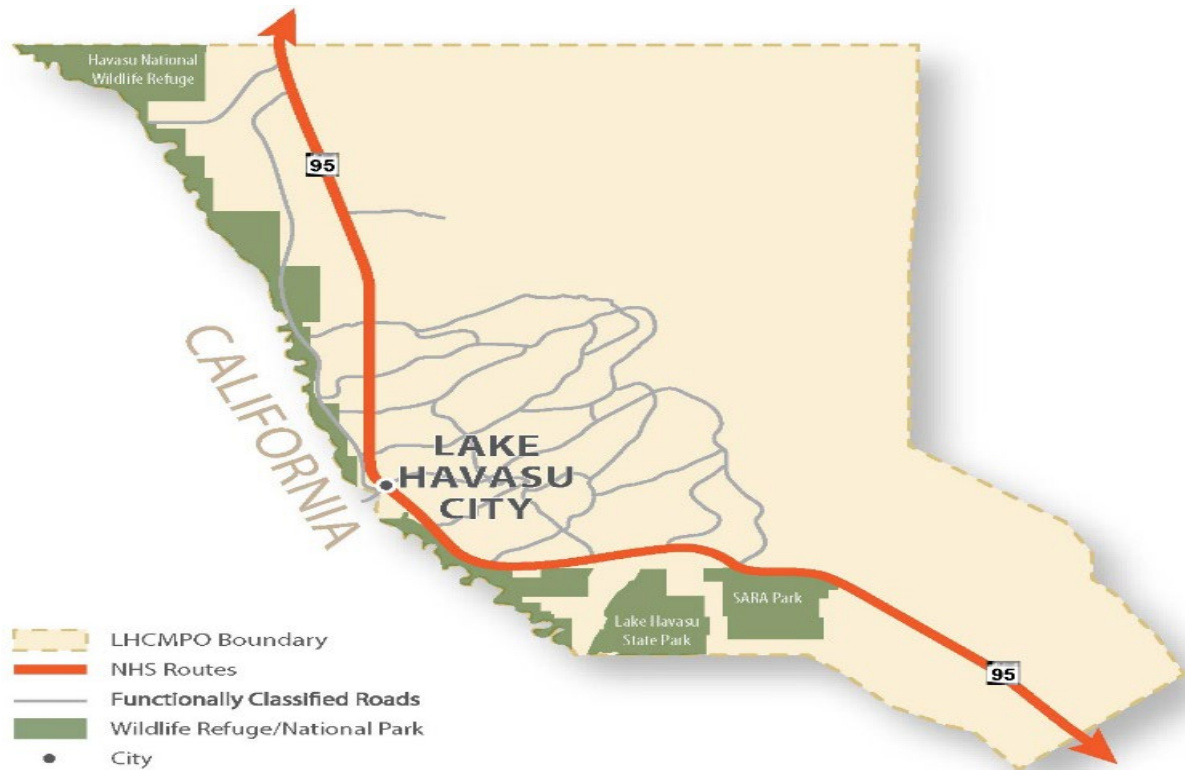


Figure 3-5 - LHMPO Regional Area

Lake Havasu MPO Carbon Reduction Program Priorities Status

Lake Havasu MPO is still determining which projects to prioritize their CRP funding towards. These prioritized CRP projects and updates will be reflected in the next ADOT CRP Strategy (scheduled for 2027).

Sun Corridor Metropolitan Planning Organization (SCMPO)

The Sun Corridor MPO is located in Pinal County, between the Phoenix and Tucson metropolitan areas. The SCMPO boundary is shown in Figure 3-6. Casa Grande and some of the neighboring communities formed the Sun Corridor MPO to conduct transportation planning for this region south of MAG in a rapidly developing area of Pinal County. Future planning efforts for I-10, I-8, the CANAMEX corridor, and the future North-South Freeway will play a critical role for the SCMPO.

Table 3-6: SCMPO Statistics

Sun Corridor Metropolitan Planning Organization (SCMPO) – https://scmpo.org/	
Year Established	2013
Hosted/Independent MPO	Hosted by City of Casa Grande
Land Area (sq. mi.)	1,155
2020 Census Population	112,011
Counties	1 Pinal
Number of Municipalities	3
Tribal Partner Agencies	N/A
Primary Travel Corridors	4 Interstates: 1-8, 1-10. State Routes: SR 79, SR 84, SR 87, SR 387.
Transit	Yes
Airport	Yes
Air Quality Nonattainment or Maintenance	PM10



Figure 3-6 - SCMPO Regional Area

Sun Corridor MPO Carbon Reduction Program Priorities Status

Sun Corridor MPO is proposing to use their CRP funding on the installation of new Dynamic Message Sign (DMS) structures at various locations within the region (advanced transportation and congestion management technologies). This project will be a partnering project with ADOT.

Sierra Vista Metropolitan Planning Organization (SVMPO)

The Sierra Vista MPO is located in Cochise County, from the Arizona/Mexico border in the south to 8 miles north of the SR 82/90 intersection. The SVMPO boundary is shown in Figure 3-7. It is approximately 30 miles east of the Nogales Port of Entry and 30 miles west from the Douglas Port of Entry. State Route 90 provides access to Interstate 10 to the north, State Route 92 to the south provides access to Douglas, and State Route 82 provides access southwest to the Nogales Port of Entry. The MPO includes the Fort Huachuca Army Base. The lands east and west of Sierra Vista include the San Pedro Riparian National Conservation Area and the Coronado National Forest, respectively.

Table 3-7: SVMPO Statistics

Sierra Vista Metropolitan Planning Organization (SVMPO) - https://www.svmppo.org/	
Year Established	2013
Hosted/Independent MPO	Hosted
Land Area (sq. mi.)	614
2020 Census Population	69,123
Counties	1 Cochise
Number of Municipalities	2
Tribal Partner Agencies	N/A
Primary Travel Corridors	3 State Routes: SR 82, SR 90, SR 92
Transit	Yes
Airport	Yes

Air Quality Nonattainment or Maintenance	None
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Figure 3-7 - SVMPO Regional Area

Sierra Vista MPO Carbon Reduction Program Priorities Status

FY 24/25 CRP Project Summary

After consultation with ADOT staff, two projects have been brought forward by the SVMPO to move forward with CRP funding in FY24.

- Signal Timing Study within the urbanized Sierra Vista area: This Study will look at 32 signals within the Region (pedestrian and emergency signals). The objective of this Study is to reduce idling, maximize vehicle flow, and reduce carbon emissions hot spots.
- Design phase of Skyline Drive Pathway: Gila Ave. to Edgewood St. in the Town of Huachuca City. FY24 Design and FY24/FY25 Construction of pathway serving low-income housing, access to Town & community services. Project provides an alternative mode option thus reducing the need for short vehicle trips.

Future CRP Project Summary

Identified prioritized projects that are potentially eligible for the CRP funding category that the SVMPO may consider for future CRP funding include:

- SR 92 Shared Use Path Extension: BST to Kachina Trail.
- Energy Efficient Lighting Upgrades on Theater Drive Project.
- Partnership with jurisdictions on purchase of electric charging station equipment.
- Connective bicycle, pathways and recreational trails in 2050 LRTP near/mid-term project lists.

Additional potential CRP projects may also be developed with future studies and plans that include the:

- Fall 2023 Joint Strategic Transportation Safety Plan

- Winter 2023/2024 Bicycle/Pedestrian/ Recreational Trail plan updates
- Theater Drive/Moson Road Design phases
- FY25-F29 Transportation Improvement Program
- 2050 Long-Range Transportation Plan update

Yuma Metropolitan Planning Organization (YMPO)

The Yuma MPO is the leader for coordinating regional transportation and land-use planning with innovative communication and solutions in Yuma County. The jurisdictions that compose the YMPO are: the cities of Yuma, Somerton, and San Luis; Yuma County; the town of Wellton; Cocopah Indian Tribe; and ADOT. The YMPO planning area also includes the Winterhaven community in Imperial County, California, across the Colorado River from the city of Yuma. Although Winterhaven and the Fort Yuma Indian Reservation (Quechan Tribe) are within the YMPO planning boundaries, they are not members of YMPO’s Technical Advisory Committee (TAC) or the Executive Board. YMPO’s boundary is shown in Figure 3-8.

The YMPO area experiences a major influx of part-time residents each year including: migrant workers, winter visitors, and military officials. Additionally, YMPO experiences border traffic including migrant workers, day laborers, freight traffic, visitors, and those crossing the border on bicycle or on foot. These factors create unique challenges for the planning, operation, and maintenance of the transportation system.

Table 3-8: YMPO Statistics

Yuma Metropolitan Planning Organization (YMPO) - https://ympo.org/	
Year Established	1983
Hosted/Independent MPO	Independent
Land Area (sq. mi.)	5,519
2020 Census Population	203,881
Counties	1 Yuma
Number of Municipalities	4
Tribal Partner Agencies	2 Cocopah Indian Tribe, Quechan Tribe of the Fort Yuma Indian Reservation
Primary Travel Corridors	3 Interstate: I-8. US Highway: US 95. State Route: SR 195

Transit	Yes
Airport	Yes
Air Quality Nonattainment of Maintenance	Ozone (8 hr), PM10



Figure 3-8 - YMPO Regional Area

Yuma MPO Carbon Reduction Program Priorities Status

Yuma MPO plans to use CRP funding on a Complete Streets Study for the region.

Identified projects that are potentially eligible for the CRP funding category that YMPO may consider for future CRP funding include:

- City of Yuma: Bus Pullouts/Transit
- City of Somerton: Redevelopment Program (Sidewalk for Trails Program, Pedestrian/Bicycle Projects)
- City of San Luis: Electrification of Truck Fleet (Greater Yuma Port Authority)

Chapter 4: Carbon Reduction Strategy Development

ADOT developed this Carbon Reduction Strategy by exploring the policy goals and objectives in Arizona’s Statewide Long-Range Transportation Plan (LRTP) to identify where current efforts already support the reduction of transportation emissions. ADOT also consulted with MPOs throughout the development of this strategy to better understand local planning contexts and priorities (see Chapter 3). In addition, ADOT has garnered a national leadership role through its’ [Sustainable Transportation Program](#).

Alignment with Arizona’s Transportation Planning Process

Federal requirements state the CRS must be updated at least once every four years. ADOT’s intent is to integrate future updates of the CRS into Arizona’s future LRTP (next LRTP Update scheduled for 2028). ADOT developed this strategy considering current policy goals and objectives, performance measures, and expected transportation trends identified in Arizona’s most recent LRTP (completed in 2023). Details on how this Carbon Reduction Strategy aligns with Arizona’s LRTP goals and objectives can be found in Chapter 7 (Alignment with LRTP Goals and Objectives).

Consultation with MPOs

ADOT developed this strategy in consultation with the metropolitan planning organizations (MPOs) in the State. ADOT met with all the MPOs in 1-on-1 meetings. The items that were discussed during these meetings included:

- Background of the Climate Reduction Program (Federal Guidelines)
- CRP Allocations for ADOT and the MPOs
- CRP Eligible Projects List
- ADOT CRP Project Priorities
- MPO CRP Project Priorities

- ADOT/MPO Collaboration

The 1-on-1 meetings took place on the following dates:

- 3/29/23 – Sun Corridor MPO
- 3/31/23- Lake Havasu MPO
- 4/3/23 – Sierra Vista MPO
- 4/5/23 – MetroPlan (Flagstaff)
- 4/7/23 – Central Yavapai MPO
- 4/7/23 – Yuma MPO
- 4/7/23 – MAG
- 4/11/23 – PAG

Tribal Consultation

ADOT efforts to address Arizona tribal transportation are based on the following major factors:

- There are 22 federally recognized Indian Tribes, Communities and Native Nations in Arizona with tribal land encompassing approximately 27,736,000 acres or 28% of the State land base. Figure 4-1 illustrates Arizona’s American Indian Reservation areas.
- There are seven Tribes located out-of-state with aboriginal and ancestral interests in Arizona.
- The State Highway System includes 6,148 centerline miles of which 1,235 traverse Tribal land.
- There are 14 Tribal airports and seven Tribal public transit systems situated within Tribal communities throughout Arizona.
- Both State and Tribal governments have the common goal of providing efficient transportation systems for the safety and welfare of the traveling public.

ADOT's Tribal Consultation Policy was initially adopted on September 1, 2006 and is reviewed and updated on a regular basis. It takes into consideration Arizona Revised Statute Section 41-2051, subsection C - Responsibilities of state agencies and Federal legislative requirements for state departments of transportation to consult with Native Nations and Tribal Governments in statewide and metropolitan transportation planning processes. Additionally, Section 106 of the National Historic Preservation Act requires that Tribes be consulted in any decisions affecting their historic and cultural legacy. This applies to all Tribes resident in Arizona and Tribes with aboriginal or ancestral interests in Arizona. Consultation guidelines outlined in the ADOT policy provide a basis for mutual understanding as appropriate partnerships and agreements are carried out to address State and Tribal transportation issues.

As part of the LRTP process, ADOT Tribal Transportation Planners reached out to all (22) Arizona Tribes for 1-on-1 ADOT LRTP Tribal Consultation Sessions. The purpose of the Tribal Consultation Sessions was to discuss an overview of the LRTP and open dialogue on challenges & issues for the specific Tribe. Notification for these requested meetings was sent in August/September of 2022. ADOT received (11) responses for the Consultation Sessions.

The 1-on-1 Tribal Consultation Sessions took place on the following dates:

- 10/3/22 - White Mountain Apache Tribe
- 10/6/22 - San Carlos Apache Tribe
- 10/7/22 - Colorado River Indian Tribe
- 10/11/22 - Pascua Yaqui Tribe
- 10/13/22 - Fort Yuma Quechan Tribe
- 10/14/22 - Fort Mojave Indian Tribe
- 10/17/22 - Pueblo of Zuni Tribe
- 10/28/22 – Tonto Apache Tribe
- 11/3/22 – Tohono O'odham Nation

- 11/15/22 – Hopi Tribe
- 4/19/23 – Navajo Nation DOT

Per the 1-on-1 Tribal Consultation Sessions, the five main Tribe issues from these meetings include:

- ADOT Engineering District communication on projects (design & construction)
- Roadway Lighting (CRP Eligible activity)
- Pedestrian safety measures (CRP Eligible activity)
- Widened Shoulders
- Crash Data Sharing

The Tribes are encouraged to coordinate with their respective MPOs on discussing their respective project priorities and challenges (especially CRP eligible projects). ADOT will continue to collaborate with the Tribes on these issues.

American Indian Reservations

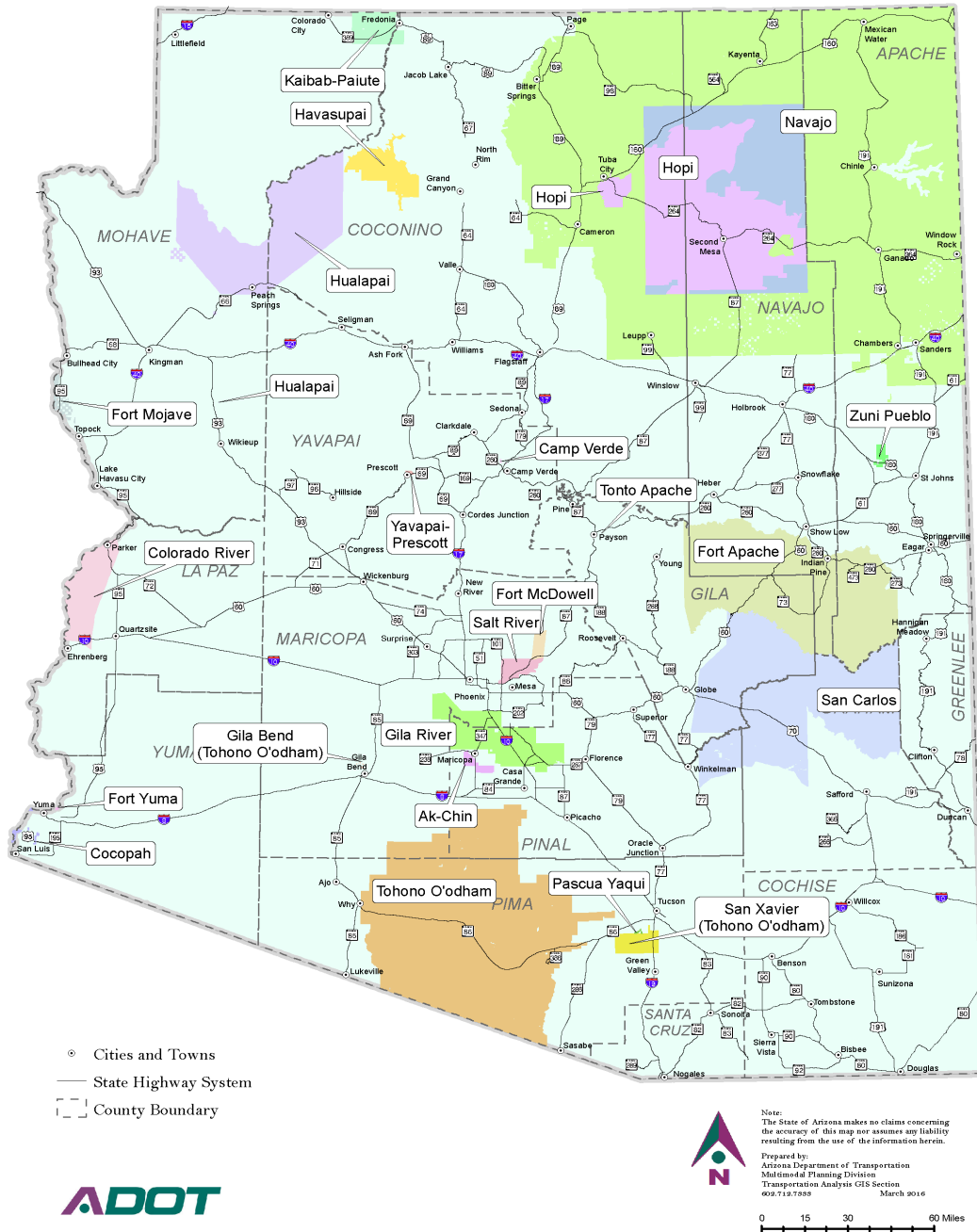


Figure 4-1 - Arizona's American Indian Reservations

Public Engagement

The Draft ADOT Carbon Reduction Strategy will be released for a public comment period in October 2023 through the ADOT CRP website (<https://azdot.gov/carbon-reduction-progam>).

Hard copies will be available at the ADOT MPD Office and can be mailed upon request.

Notification of the comment period will be made through the COG/MPO/TMA partners. **ADOT is requesting that COG/MPO/TMA partners share the public comment period with their stakeholders, directing them to the website for review and comment.** Environmental & Health Stewardship Theme public comments were collected during the ADOT LRTP Public Engagement period (Appendix A contains the collected comments).

Chapter 5: Carbon Reduction, Arizona Context

Carbon dioxide (CO₂) is the primary greenhouse gas (GHG) emitted from the transportation sector through two major source categories: tailpipe emissions and lifecycle emissions. Tailpipe emissions result from the combustion of carbon rich fossil fuels (coal, natural gas, and oil in the form of gasoline and diesel motor fuels). Lifecycle transportation sector emissions can come from many sources, including the emissions generated through the production and distribution of fuels, manufacturing of vehicles, or production of construction materials for infrastructure such as concrete and asphalt. Efforts to reduce transportation carbon emissions can have a variety of positive effects for the public and economy, from improving air quality and public health to enhancing energy efficiency and cost-savings for motorists and businesses.

Arizona Climate⁵

The State of Arizona has a warm climate with seasonally higher temperatures than other parts of the country. The National Oceanic and Atmospheric Administration (NOAA) National Center for Environmental Information identified three key future climate impacts for Arizona within their 2022 State Climate Summary for Arizona:

- Increasing temperatures
- Longer periods of drought
- Highly variable monsoon rainfall

Annual average temperatures in Arizona have already risen 2.5 degrees F since the beginning of the 20th century and are expected to continue, resulting in historically unprecedented

⁵ Source: 2050 ADOT Long-Range Transportation Plan, Vision and Goals, prepared by WSP.
<https://www.adot2050plan.com/pdfs/ADOT-LRTP-2050-Update-Vision-Report.pdf>.

temperatures for the state. Figure 5-1 shows how the maximum summer temperature for the State has increased since the early 1900s.

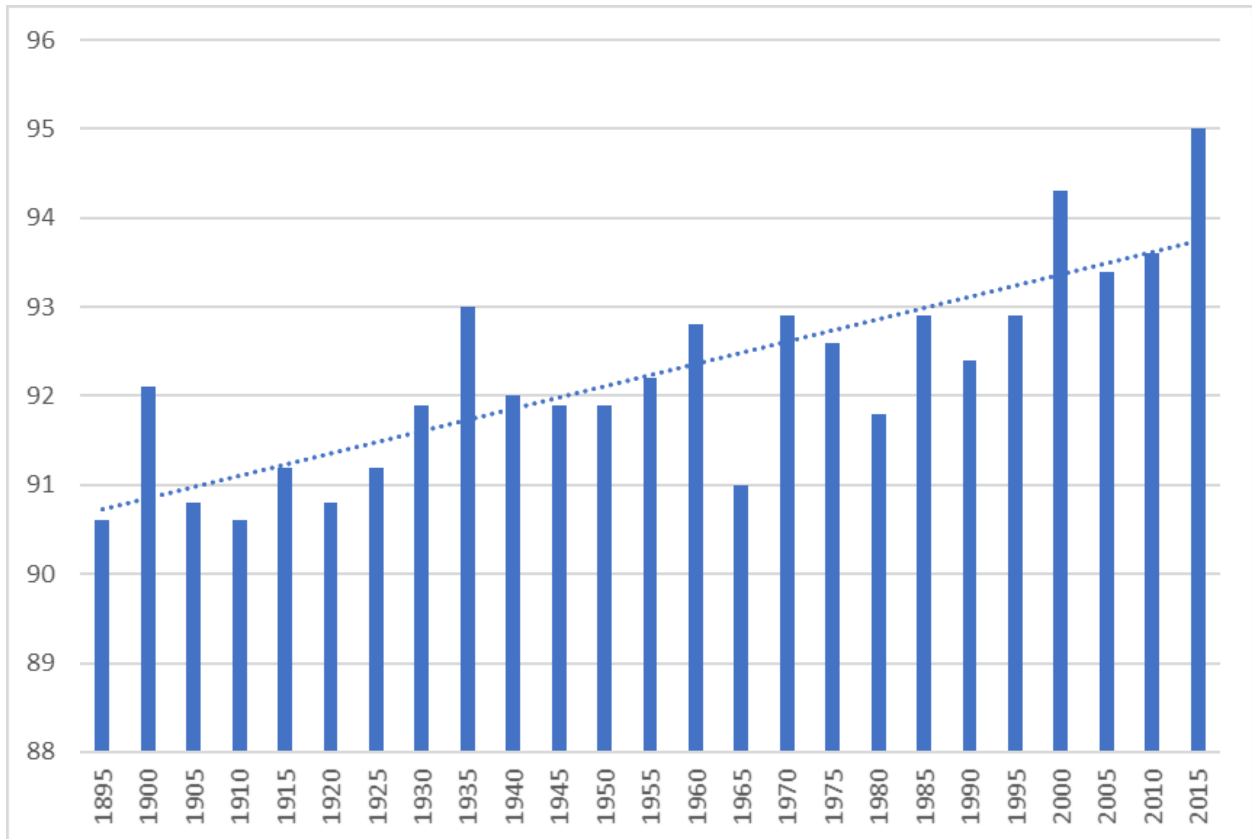


Figure 5-1 - Maximum Summer Temperature (Historic). Source: NOAA National Centers for Environmental Information; State Climate Summaries 2022: Arizona <https://statesummaries.ncics.org/chapter/az/>.

Additionally, there is a higher potential for extended periods of drought which can decrease the availability of water for environmental, agricultural, and social systems. Another resulting impact of extended droughts is the increased likelihood of large wildfires.

Much of Arizona’s rains come within relatively short periods of monsoonal weather. While monsoon rains provide much needed water for Arizona ecosystems, future trends for monsoon rainfall are predicted to be highly variable. While monsoon storms occur during the summer months, it is also projected that precipitation from the spring season will greatly decrease in the state.

Changing climate can impact the transportation network through more frequent wildfires, flooding, dust storms, and other natural events. These events will require increased focus on resiliency to ensure that transportation options remain available, safe, and efficient.

CO₂ Emissions – Arizona Context

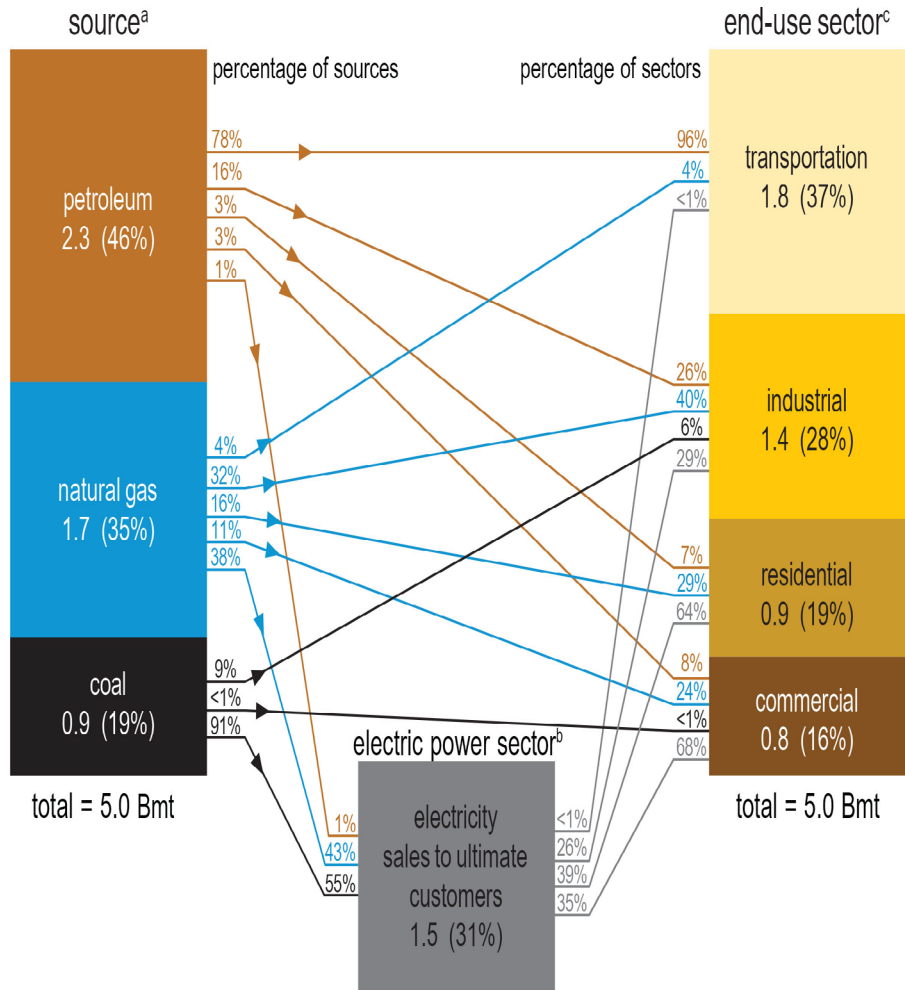
The U.S. has set a goal of net-zero GHG emissions by 2050, with an interim target of 50-52% reduction below 2005 levels by 2030⁶. The national framework also establishes a new national GHG performance measure that will be incorporated into the transportation planning process, with 2-to-4-year reduction targets set by individual states. In addition, FHWA through the IIJA and IRA Laws, has initiated numerous efforts to assist states in working toward net-zero emissions. In the U.S. 37% of total CO₂ emissions comes from the combustion of fossil fuels to transport people and goods (see Figure 5-2). For Arizona, 46.3% of the state's total CO₂ emissions results from the transportation sector due to the higher use of petroleum products⁷ (see Figure 5-3).

⁶ source: U.S. Department of State and Executive Office of the President. [The Long-term Strategy of the United States, Pathways to Net-zero Greenhouse Gas Emissions by 2050](#). November 2021.

⁷ Petroleum products, as they are consumed. Includes motor gasoline, distillate fuel oil (diesel), jet fuel, aviation gasoline, asphalt and road oil, hydrocarbon gas liquids (HGL), lubricants, kerosene, petroleum coke, petrochemical feedstocks, residual fuel oil, still gas (refinery gas), special naphthas, naphtha-type jet fuel, waxes, unfinished oils, and miscellaneous products. Excludes biofuels.

U.S. CO₂ emissions from energy consumption by source and sector, 2022

billion metric tons (Bmt) of carbon dioxide (CO₂)



Sources: U.S. Energy Information Administration (EIA), *Monthly Energy Review* (April 2023), Tables 11.1-11.6.

Note: Sum of components may not equal total due to independent rounding. Includes the relatively small amount of carbon dioxide (CO₂) emissions from geothermal and nonbiomass waste for electric power sector use not shown elsewhere. See EIA's *Monthly Energy Review*, Section 11. See "Extended Chart Notes" on next page.

^a CO₂ emissions from primary energy consumption. Each energy source is measured in different physical units and converted to metric tons of CO₂.

^b The electric power sector includes electricity-only and combined-heat-and-power.

(CHP) plants whose primary business is to sell electricity, or electricity and heat, to the public. CO₂ emissions from electricity sales to ultimate customers in each end-use sector are equal to the weighted average of fuels used to generate electricity and allocated proportionally to the amount of electricity sales to each end-use sector.

^c Industrial and commercial sectors include primary energy consumption by CHP and electricity-only plants in the sector. Includes the CO₂ emissions from the electricity sales allocated to each end-use sector.

Figure 5-2 - U.S. CO₂ Emissions from Energy Consumption by Source and Sector, 2022 Billion Metric Tons (BMT) of Carbon Dioxide (CO₂)

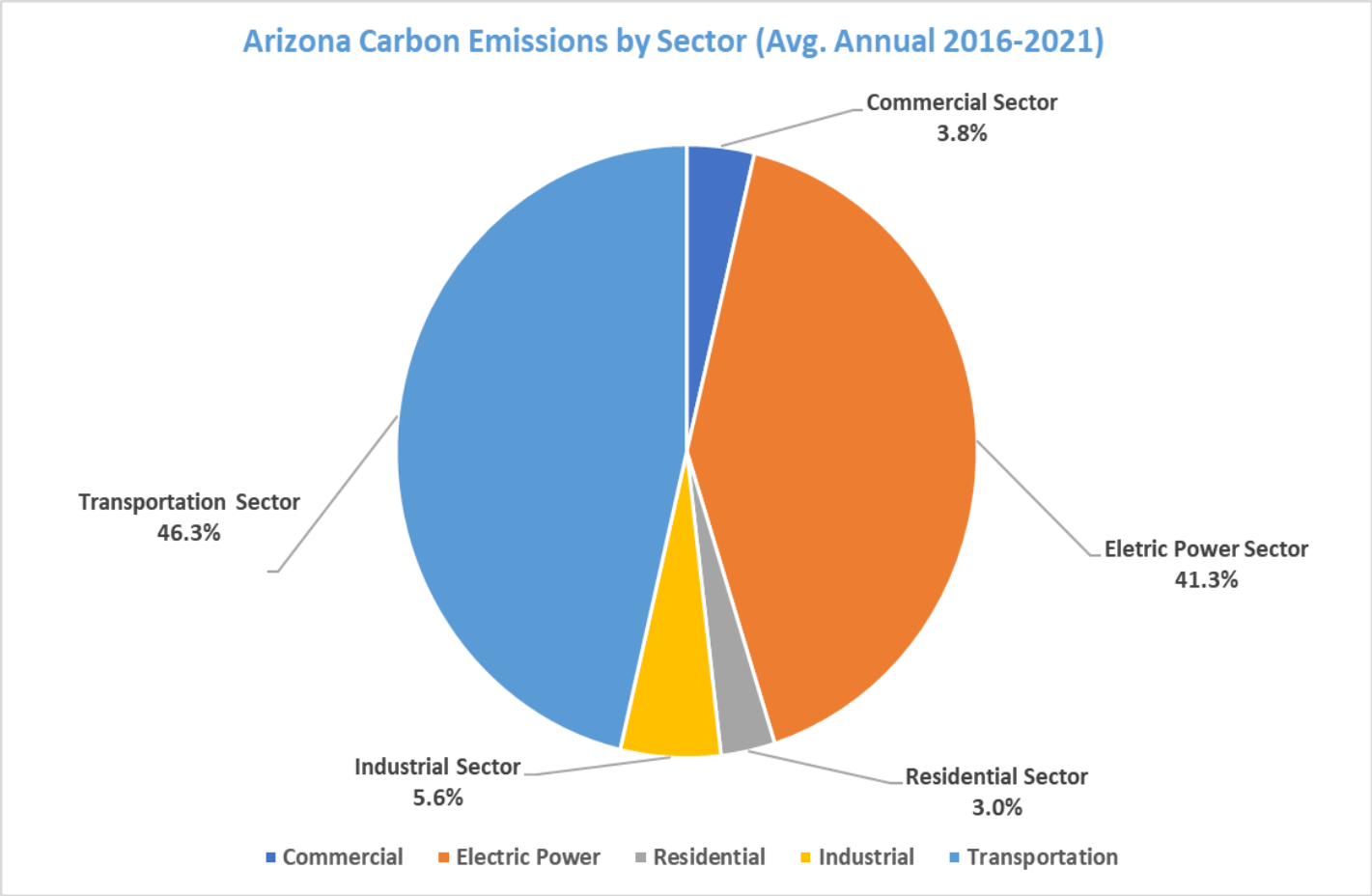


Figure 5-3 – Arizona Carbon Emissions by Sector (Avg. Annual 2016-2021). Source: HNTB graphic from US EIA Energy-Related CO2 Emissions Data Tables: Table 3: State Energy Related Carbon Dioxide Emissions by Sector, Average Annual Emissions 2016-2021.

While these total transportation sector CO₂ emissions include on-road, air, marine, and rail emissions, 58% of the transportation sector emissions nationally come from cars, trucks, and buses on the roads (see Figure 5-4).

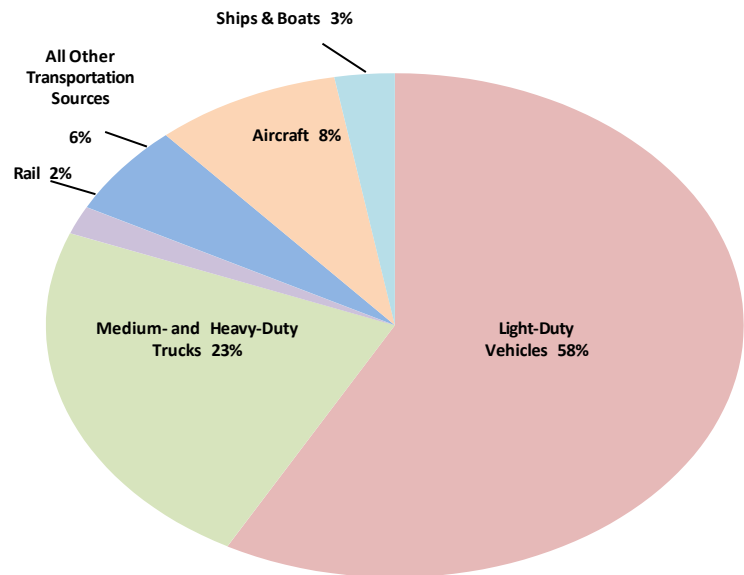


Figure 5-4 - National Transportation Emissions⁸ by Vehicle Type, 2021 (note: Totals may not add to 100% due to rounding)⁹

Recognizing the significant contribution of the transportation sector to CO₂ emissions in general, and the sizable contribution of on-road vehicles specifically, the federal Carbon Reduction Program aims to provide funding for projects that reduce on-road emissions, also known as tailpipe emissions. There are three complementary pathways to reduce total tailpipe emissions for on-road vehicles:

⁸ "Transportation" emissions in Figure 5-4 include CO₂, N₂O, CH₄, and HFCs from domestic transportation sources like highway vehicles, aircraft, ships and boats, rail, pipelines and lubricants. They do not include emissions from international bunker fuel use by aircraft and ships or from non-transportation mobile sources such as agriculture and construction equipment.

⁹ "Other" sources include buses, motorcycles, pipelines, and lubricants.

1. **Reduce total fuel consumption by on-road vehicles:** adopt policies and prioritize infrastructure that increase vehicle fuel efficiency, mitigate congestion, and promote the use of electric vehicles (which have no direct tailpipe emissions and low-carbon fuel formulations).
2. **Reduce vehicle miles traveled (VMT):** reduce the total number and length of passenger automobile trips by promoting a shift to transit and nonmotorized modes such as bicycling and walking.
3. **Reduce emissions from construction and maintenance activities.**

Emission reductions in transportation often depend on choices made by individuals or private businesses. For example, choosing to make a bicycle trip results in zero emissions while choosing to ride a bus or in a carpool with other riders can result in less total emissions than if everyone made the same trip in their own vehicle. Individuals or fleet programs could choose to purchase more fuel-efficient vehicles or go fully electric to produce zero direct emissions. Transportation agencies can support carbon efficient choices by planning, designing, and building safe and convenient infrastructure and transportation services and by providing incentives (i.e. solar incentives, renewable energy production tax credit) through policies and programs. Public agencies can also lead by example, implementing fuel saving programs for employee commutes and other work-related travel and switching to low or zero-emission public fleet vehicles.

In addition to user behaviors, system wide transportation emissions also depend on population growth and land-use policy trends that can increase the need for travel and the congestion on our roads. ADOT's LRTP anticipates future population growth to increase an average of 1.1% annually over the next several decades resulting in a future 2055 population of 10.5 million (2020 State population is 7.28 million). Future employment growth, as projected by the Arizona Office of Economic Opportunity, is anticipated to increase an average of 2.2% annually over the next decade resulting in a future 2030 employment of 3.75 million. Transport of goods

typically results in higher fuel consumption and emissions per vehicle mile than passenger transport. Given the significant growth that is expected in this sector, dedicated efforts to reduce freight emissions are needed to reduce overall CO₂ emissions in Arizona.

Chapter 6: ADOT Projects and Strategies

ADOT has identified five categories of transportation projects and strategies that can support carbon reduction in Arizona.

1. **Truck Parking**
2. **Transportation Alternatives**
3. **Electric Vehicles, Alternative Fuels, and Energy Efficiency**
4. **Sustainable Pavements and Construction Materials**
5. **Technology Solutions**

Each category includes specific projects and strategies detailed in Tables 6-1 through 6-5. These projects and strategies are the foundation of how Arizona will achieve carbon reductions in the transportation system. ADOT and its partners can use this list to identify new projects and strategies appropriate to each geographic area and to the unique needs of travelers in each area of the state.

Table 6-1: Truck Parking

Strategies that support efforts to reduce the environmental and community impacts of freight movement.	
State Truck Parking Plan	To address shortages in truck parking, ADOT has developed the Statewide Truck Parking Plan. This Plan will include recommendations to guide investments and prioritization of projects to address truck parking shortages along Arizona's National Highway System. The Plan will propose the construction of new parking facilities, improvement of existing facilities and technology to enhance the efficiency and safety of truck parking. Adding truck parking will minimize fuel consumption and reduce emissions from trucks by providing optimum places to park.

State Truck Parking Projects	ADOT has programmed funding for Truck Parking in the current FY24-28 Construction Program (\$50M total). Priority Truck Parking Projects will be identified out of the Truck Parking Plan.
State Freight Plan	ADOT updated the Arizona State Freight Plan in 2022. The plan establishes immediate and long-range plans for freight related transportation investments. As part of this Plan, truck parking priorities were identified.
Rest Area Study	The Statewide Rest Area Study provides a blueprint for how ADOT plans to preserve, rehabilitate, modernize and expand the state’s rest areas during the next 20 years. The Study recommends a prioritized list of improvements for the short term (0-5 years), mid-term (5-10 years) and long term (10-20 years) for the 19 state-owned rest areas. As part of this Study, truck parking expansion areas were identified at applicable Rest Area locations.

Important Note: Truck Parking was identified as one of the high priorities within the CRP Guidance. Per Carbon Reduction Program (CRP) Implementation Guidance Memorandum dated 4/21/22, FHWA:

“Truck parking shortages are a national concern affecting the efficiency of U.S. supply chains and safety for truck drivers and other roadway users. Jason’s Law, which was passed in 2012, established a national priority on addressing the shortage of long-term parking for commercial motor vehicles on the National Highway System (NHS).

Many Federal-aid highway funding programs have eligibility for truck parking projects, including the CRP. CRP funds may be obligated for a project on an eligible facility that reduces transportation emissions. FHWA anticipates that such projects may support progress toward the achievement of national performance goals for improving infrastructure condition, safety, congestion reduction, system reliability, or freight movement on the NHS. Advanced truck stop electrification systems are eligible under 23 U.S.C. 175(c)(1)(A) and projects that reduce transportation emissions at port facilities are eligible under 23 U.S.C. 175(c)(1)(M).

States should consider working with private sector truck stop operators and the trucking community in the siting and development of specific truck parking projects. States also are encouraged to offer opportunities for input from commercial motor vehicle drivers and truck stop operators through their State Freight Advisory Committees established under 49 U.S.C. 70201.”

Table 6-2: Transportation Alternatives

Strategies that support activities as defined under the Moving Ahead for Progress under the 21st Century Act [23 U.S.C. 101(a)(29), as in effect on July 5, 2012]), including, but not limited to: the construction, planning, and design of on-road and off-road trail facilities for pedestrians, bicyclists, and other nonmotorized forms of transportation.	
Transportation Alternatives Program (TAP)	The ADOT Transportation Alternatives Program provides funding to Greater Arizona (areas outside of MAG & PAG) through a competitive grant program and a distribution formula that allocates funding to communities based on population. This funding can be used for a variety of smaller-scale transportation projects and activities such as pedestrian and bicycle facilities; construction of turnouts, overlooks, and viewing areas; community improvements such as historic preservation and vegetation management; environmental mitigation related to stormwater and habitat connectivity; recreational trails; safe routes to school projects; and vulnerable road user safety assessments. ADOT has programmed \$18M per year (in current Five Year Construction Program) to fund projects selected within this Program.
Pedestrian & Bicycle Safety Action Plan	The Pedestrian & Bicycle Safety Action Plan is currently being updated as part of the Arizona Strategic Highway Safety Plan. The Pedestrian & Bicycle Safety Action Plan will provide a strategic plan that effectively focuses resources to reduce severe injury and fatal pedestrian/bicycle-motor vehicle crashes on the Arizona State Highway System.
Transit	Investments that support efficient transit operations and higher transit ridership. ADOT Examples of funding transit projects include: 5310 Enhanced Mobility of Seniors and Individuals with Disabilities and 5311 Rural Public Transportation Program.

Commute Trip Reduction	Programs that support commutes to work in higher occupancy modes such as carpools, vanpools, employer-based shuttles or employer subsidized transit programs. Work-from-home programs also remove the need to commute ¹⁰ .
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Table 6-3: Electric Vehicles, Alternative Fuels, and Energy Efficiency

Strategies that support electric or alternative fuel vehicle adoption or improve overall energy efficiency and lower carbon fuel sources for the transportation network.	
Electric Vehicles (EV) Adoption and Charging Infrastructure¹¹	Programs that support and incentivize adoption of EVs. Programs or projects that result in increased installation of EV charging infrastructure and support energy generation with lower carbon emissions (solar, wind, etc.). ADOT completed the ADOT Electric Vehicle Infrastructure Deployment Plan in 2022. ADOT is currently developing the 2023 EV Plan Update, which will expand the State’s EV charging network beyond the interstate highways to seven additional state highways nominated as alternative fuel corridors and thus, eligible for NEVI-funded charging stations.
Alternative Fuel Vehicle (AFV) and Infrastructure	Programs that support other alternative fuel vehicles and infrastructure such as hydrogen, natural gas, or propane, especially on heavy duty vehicles where no market ready options to electrify are available. Includes strategies that improve vehicle emissions for infrastructure construction programs.

¹⁰ The recent COVID pandemic resulted in widespread “work from home” and new methods for companies to accommodate staffing restrictions. While novel at the time, many of these accommodations continue after the pandemic effects have receded. The percentage of people working remotely has significantly increased over the past decade. This advancement may continue to impact people’s commuting needs/patterns and may ultimately impact long-term choices related to housing location and need for transportation services.

¹¹ Electric vehicles are significantly more widespread now than in previous years and are envisioned to continue to advance due to government incentives to consumers (ownership) and mandates on the manufacturers (fleet volume). While electric and other alternate fuel vehicles still make up only a small percentage of registered vehicles in Arizona, adoption rates are increasing, and the industry is continually expanding the necessary charging infrastructure.

Freight Emission Reductions	Strategies that support improved freight movement (without increasing single occupancy vehicle capacity). Projects that help freight vehicles reduce emissions and save fuel, including electric charging and alternative fueling facilities.
Emission Reduction at Port Facilities	Programs that reduce emissions from idling freight vehicles and port equipment (such as cargo handling equipment).
Diesel Engine Retrofits	Truck engine retrofits that improve fuel efficiency and reduce vehicle emissions.
Energy Efficient Lighting and Equipment	Projects that replace lighting and other on-road equipment with more energy efficient models. Programmed HPS to LED Lighting Conversion Projects (in the current Five Year Construction Program) include: Flagstaff area Lighting, Loop 202 (24 th Street to Scottsdale Road), US 60 (Mill Avenue to Loop 101).

Table 6-4: Sustainable Pavements and Construction Materials

Strategies that support sustainable pavements technologies that reduce embodied carbon during the manufacture and/or construction of highway projects.	
ADOT Sustainable Pavement Program	Program overseen by ADOT’s pavement team to consider sustainable pavements for its projects. ADOT’s pavement management system contributes to sustainability by optimizing pavement life cycles to reduce costs, the environmental impacts of construction, and material usage.
Sustainable Construction	Strategies that reduce on-road emission from construction equipment and use materials that require less carbon emissions to produce.
Calculated Carbon Reductions	Using proven methodologies (e.g., pavement lifecycle analysis and travel demand models) to calculate how changes in policies or programs will result in reduced carbon emissions in Arizona.

Table 6-5: Technology Solutions

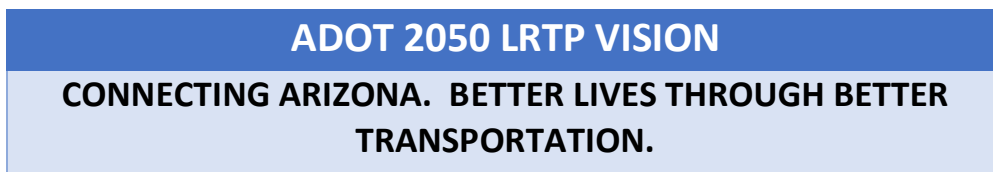
Strategies that deploy advanced technology solutions for roadway operations and communications and improve traffic flow.	
Intelligent Transportation Systems (ITS)	Infrastructure-based intelligent transportation systems capital improvements (i.e. traffic signal control systems, ramp metering, dynamic message signs, connected vehicle infrastructure).
Advanced Transportation Technologies	Advanced traveler information systems, collision avoidance technology, transportation management technologies, automated and connected vehicle infrastructure, integrated payment systems, shared-use and on-demand mobility applications, integration with energy systems, parking reservation systems, etc.
Traffic flow improvements that do not add vehicular (single occupancy) capacity	Intersection improvements (such as roundabouts or other operational improvements), breakdown and merging lanes, or other infrastructure improvements that can improve traffic flow and reduce congestion without adding general-purpose capacity or increasing single occupancy vehicles and VMT.

Equity Considerations

ADOT is committed to advancing an equitable transportation system for Arizona. Carbon reduction projects and strategies must be appropriate for and take into consideration the needs of vulnerable, historically disadvantaged, or underserved communities across the State. For example, low-income communities have less access to more expensive alternative fuel vehicles and rural communities might have fewer destinations accessible through active modes such as bicycle and transit. Ensuring carbon reduction projects are sensitive to the context and needs of each community is a critical equity consideration during project selection and development.

Chapter 7: Alignment with LRTP Goals and Objectives

Arizona’s 2050 Long Range Transportation Plan (LRTP) vision, goals, and objectives support reductions of on-road carbon emissions. **ADOT’s Vision to safely connect people and empower our economy** supports carbon emission reductions by creating a transportation network that can help Arizona travelers make low-carbon, fuel-efficient choices.



The 2050 LRTP Vision is designed to provide a broader foundation for the goals and objectives that will follow and increases reference to key elements in federal and state guidelines such as:

- Equity and equality
- Resilience
- Climate responsiveness
- Sustainability
- Multimodal emphasis

The 2050 LRTP vision is based on current ADOT vision statements and input received from ADOT and MPOs and COGs.

2050 LRTP Goals/Objectives

Seven policy goals (7.1 to 7.7) in the 2050 LRTP underpin the vision, each with specific objectives. Each of the policy objectives that support carbon emission reductions is highlighted

in blue. The CRP Strategy next to each objective illustrates which projects and strategy categories (see Chapter 6 - Projects and Strategies section) are aligned with each objective.

7.1 Preserve and maintain the system

To maintain, preserve, and extend the life and utility of prior investments in transportation systems and services.

Objectives

- Achieve and maintain a state of good repair of transportation assets within available resources. *CRP Strategy - Sustainable Pavements and Construction Materials.*
- Cost-effectively maintain, operate, and upgrade assets to maximize useful life. *CRP Strategy - Sustainable Pavements and Construction Materials.*
- Incorporate resiliency, adaptability, and redundancy in the transportation network, systems management, and operation. *CRP Strategy - Technology Solutions.*

The current [ADOT Transportation Asset Management Plan \(TAMP\)](#) supports the reduction of on-road emissions when carbon emission criteria are incorporated as part of the decision-making process to prioritize investments. The TAMP also decreases emissions in construction by extending the lifecycle of an asset and by minimizing work zone delays.

7.2 Enhance safety and security

To provide for and improve the safety and security of transportation customers and the transportation system.

Objectives

- Reduce the number of lives lost and injuries sustained on Arizona’s transportation network, striving for zero. *CRP Strategy – Transportation Alternatives.*
- Foster a community and workplace culture of safety first.
- Reduce vulnerability from various threats; protect physical assets, cyber assets, and transportation systems. *CRP Strategy – Technology Solutions.*
- Prepare for and implement efficient coordinated response and recovery to emergency and disaster events. *CRP Strategy - Technology Solutions.*

ADOT actively works towards its long-term goal of reducing crashes on the SHS, particularly those involving fatalities and suspected serious injuries. Safety is a primary consideration in the planning and implementation of all highway investments.

7.3 Improve mobility, reliability, and accessibility¹²

Improve the predictable movement of goods and people throughout Arizona with expanded travel choice and application of state-of-the-practice system designs and technologies.

¹² Mobility on the SHS refers to the ability of travelers to move via their mode(s) of choice efficiently and reliably through a well-connected transportation network with reasonable access to adjacent land. What constitutes a mobility need can vary substantially depending on SHS roadway classification and characteristics as mobility performance targets may have different values and thresholds for different facilities in the SHS (e.g., Interstates vs. Non-Interstates, urban vs. rural roadways, interrupted flow vs. uninterrupted flow, and roadways vs. pedestrian/bicycle facilities).

Objectives

- Advance access and connectivity between modes. *CRP Strategy - Technology Solutions.*
- Support accessible and equitable modal options for the movement of people. *CRP Strategy – Transportation Alternatives; Technology Solutions.*
- Mitigate travel delays and alleviate congestion to provide predictable, reliable travel times. *CRP Strategy – Technology Solutions.*
- Leverage technology, communications, and management strategies to maximize safety and operational efficiency of existing systems and keep up with major travel trends. *CRP Strategy – Technology Solutions.*
- Identify and close redundancy gaps in the network to support continued mobility in the event of disasters or other disruptions. *CRP Strategy – Technology Solutions.*

Improving mobility, reliability, and accessibility ensures safe and efficient movement of people and goods, which is key to achieving overall transportation system carbon reductions. Reducing congestion can help improve traffic flow and provide fuel savings. Improving freight movement and providing infrastructure that can help freight reduce emissions and transition to zero-emission options is of particular importance for reducing carbon emissions in Arizona. With that said, SHS expansion improvements will need to be evaluated carefully to prioritize investments that add efficient capacity for moving people and goods with less overall carbon emissions. Technology Solutions hold significant potential for improving congestion and traffic flow on the existing Transportation System.

7.4 Environmental and Health Stewardship

To enhance Arizona's quality of life through transportation investments that promote energy conservation, enhance healthy communities, and protect the environment while improving the quality, resilience, effectiveness, and efficiency of the transportation system.

Objectives

- Create opportunities for safe physical activity, equitable transportation choice, and community engagement. *CRP Strategy – Transportation Alternatives.*
- Support flexible and adaptable measures to the transportation system to accommodate anticipated climatic changes and potentially severe climatic events over time. *CRP Strategy - Electric Vehicles, Alternative Fuels, and Energy Efficiency; Sustainable Pavements and Construction Materials; Technology Solutions.*
- Plan, develop, and maintain transportation facilities in a manner that protects the natural, historic, and cultural environment and avoids or minimizes adverse impacts. *CRP Strategy – Truck Parking; Technology Solutions.*
- Pursue community-supportive transportation outcomes. *CRP Strategy – Transportation Alternatives.*
- Strive for cleaner, more efficient, and sustainable energy sources for transportation operations and facilities. *CRP Strategy - Electric Vehicles, Alternative Fuels, and Energy Efficiency; Technology Solutions.*

Carbon reduction is core to the goal of Environmental and Health Stewardship. ADOT's ongoing efforts to improve electric vehicle charging infrastructure support cleaner energy generation for transportation and are important to support the transition to cleaner vehicles. Carbon reduction can also be achieved during construction of transportation infrastructure.

7.5 Support Equitable Access to the State Highway System

To support all Arizonans in equitable and convenient access to the statewide transportation network to facilitate access to jobs, education, healthcare, services, recreation, and other destinations.

Objectives

- Improve access and choices for all Arizona residents by supporting transportation system access to job opportunity and training, health care, food availability, and recreation.
- Support transportation system accessibility to underprivileged populations without damaging community culture or neighborhood integrity. **CRP Strategy – Transportation Alternatives.**
- Identify & mitigate transportation burdens for low-income communities, communities of color, people with disabilities, and other disadvantaged groups.

Incorporating equity into plans, projects, and policies can ensure ADOT is equipped to create transportation alternatives that serve society fairly by elevating the priority of needs of the most disadvantaged members of our communities.

7.6 Strengthen partnerships

Develop and nurture partnerships that support coordination, integration, and preservation of ADOT's investment.

Objectives

- Look for opportunities to partner with the private sector to stretch public funds through public-private partnerships or coordinated program development.
- Work with appropriate specialists/experts during project development, design, and construction to optimize safety, community health, and climate responsiveness.

7.7 Support economic vitality

To promote and develop transportation systems that stimulate, support, and enhance the movement of people and goods to ensure a diverse and prosperous economy.

Objectives

- Pursue transportation asset and operational improvements that will expand access to economic opportunities, jobs, and core services. *CRP Strategy – Technology Solutions.*
- Improve transportation connectivity to established and emerging activity centers and tourist destinations. *CRP Strategy – Technology Solutions.*
- Strengthen partnerships throughout the State to encourage and support existing and new opportunities as the demographic base expands.

- Create and enlarge competitive advantage for Arizona supply chains through higher productivity and reliability in the state freight system, supporting economic growth, and strengthening economic resilience. *CRP Strategy – Truck Parking; Technology Solutions.*
- Coordinate transportation systems with land use for efficient and sustainable use of resources.

The ADOT CRS objective prioritizes a robust multimodal network that includes energy efficient and cost-effective travel options. Investing in multimodal travel options that are more carbon efficient than single occupancy vehicle (driving alone) can support reductions of overall transportation emissions while maintaining Arizona’s economic competitiveness and quality of life.

Note on LRTP Goals & Objectives

While the policy goals are shared statewide, the implementation strategies and actions to make the goals/objectives a reality may vary across the State. There is some degree of overlap among the transportation goals/objectives, and some strategies may help to achieve more than one goal/objective.

Chapter 8: Carbon Reduction Performance Measures

Performance measures provide a framework to measure and quantitatively evaluate success. ADOT uses performance measures and targets to quantitatively determine if policy goals and objectives are moving forward. ADOT currently estimates on-road mobile source emissions reductions through its air quality performance measure. Emission reductions (including carbon emission reductions) are calculated from air quality benefits provided through investments funded through the Congestion Mitigation and Air Quality (CMAQ) federal program.

In the future, ADOT expects to develop a Climate Adaptability Study of the State Highway System (SHS). This Study will define the Carbon Reduction Goals for the SHS and countermeasures to reduce projected CO₂ emissions on the SHS. The results of this Study will be reflected in the next ADOT CRS (scheduled for 2027).

ADOT also anticipates additional embodied carbon tracking and performance measures from the completion of the FHWA Climate Challenge. The Climate Challenge Initiative is part of an FHWA effort announced during Earth Week 2022 to encourage transportation agencies and others to identify innovative ways to reduce transportation sector greenhouse gas emissions. The challenge presents a unique opportunity to improve the sustainability of pavement structures and work towards net-zero emissions.

Chapter 9: Strategy Implementation

ADOT's Carbon Reduction Strategy details Arizona's challenges and viable solutions to reducing carbon from the transportation sector. ADOT will implement this strategy with the specific actions detailed in this section.

1. Develop carbon reduction performance measures and targets.

Performance measures are essential to understand the magnitude of the challenge and measure progress. ADOT is developing methodologies to assess carbon emissions from state transportation investments (as identified in the Statewide Transportation Improvement Plan). ADOT will also develop carbon reduction targets, as required by future federal policy. Once developed, the measurement framework will be integrated into future updates of the LRTP and help ADOT make informed decisions about future transportation investments.

2. Identify early opportunities for carbon reduction.

ADOT will perform an analysis of the Statewide Transportation Improvement Plan projects to identify projects that are eligible for Carbon Reduction Program funds. Each eligible project will be assessed with a qualitative (low – high) scale of carbon reduction potential (the methodology will be developed as part of the upcoming Climate Adaptability Study of the SHS). This information will help ADOT deliver future projects in alignment with carbon reduction goals and objectives.

3. Identify new opportunities for carbon reduction in each project and strategy category.

a. Truck Parking

- ADOT has programmed funding for Truck Parking in the current FY24-28 Construction Program (\$50M total). Priority Truck Parking Projects will be identified out of the Truck Parking Plan.

b. Transportation Alternatives

- ADOT has programmed \$18M per year (in current Five Year Construction Program) to fund Transportation Alternatives Program projects in the Greater Arizona region.

c. Electric Vehicles, Alternative Fuels, and Energy Efficiency

- ADOT is currently developing the 2023 EV Plan Update, which will expand the State's EV charging network beyond the interstate highways to seven additional state highways nominated as alternative fuel corridors and thus, eligible for NEVI-funded charging stations.

d. Sustainable Pavements and Construction Materials

- Program overseen by ADOT's pavement team to consider sustainable pavements for its' projects. ADOT views their Pavement Management System as contributing to sustainability by optimizing pavement life cycles to reduce costs, the environmental impacts of construction, and material usage.

e. Technology Solutions

- ADOT will continue to advance technology initiatives that will help improve traffic congestion and reduce carbon emissions, such as installing cameras and detection at every interchange, installing dynamic message signs at critical interstate diversion points, upgrading message boards throughout the state to provide more real-time information to drivers, and connecting all traffic signals on the state network for improved signal timing and issue detection.

4. Integrate carbon reduction into the transportation planning process.

ADOT will incorporate carbon reduction policy goals and objectives, projects and strategies, and performance measures included in this strategy within the next update of the LRTP. The coordination and public engagement process for the next LRTP update will begin in 2027.

Chapter 10: CRP Strategy Alignment with Federal Requirements

Requirement	Detail	Reference Section
Prepare Carbon Reduction Strategy (CRS) in Consultation with the MPOs	Met 1:1 with each of the MPO/TMAs. MPOs/TMAs will review the draft CRS and submit comments to ADOT CRP Manager.	Consultation with MPOs on page 42 .
Support efforts – and identify projects and strategies – to support the reduction of transportation emissions	This strategy details policy goals and objectives as well as projects and strategies that will support Arizona’s efforts to reduce transportation emissions.	Projects and Strategies on page 56 . Alignment with LRTP Goals and Objectives on page 62 .
Be appropriate to population density and context of the State.	This strategy describes Arizona’s unique context for carbon reduction, such as projected population and employment growth rates.	Carbon Reduction, Arizona Context on page 48 .
Develop CRS no later than 2 years after enactment of IJJA/BIL.	Strategy on schedule for submittal to FHWA on 11/15/23.	Report date on cover page.

Chapter 11: Conclusion

ADOT is committed to supporting national efforts to achieve a net-zero transportation system for the U.S. by 2050. Arizona's expected growth, limited transportation funds, and heavy freight activity across the state are some of the challenges ADOT will face in achieving this objective. ADOT is facing this challenge, focusing on leveraging technological advances and deepening partnerships with MPOs, logistics industry, transit agencies, and other key stakeholders to deliver a multimodal, safe, and efficient transportation network that leads to carbon reductions across Arizona's transportation system.

Appendix A: ADOT LRTP – Environmental & Health Stewardship Theme public comments

Name	Comment
Aliaa Abdel-Gawad	This is actually page 16. No option for competing on page 16? Promote future growth should be a non-starter. AZ cannot sustain future growth. Climate change and water instability means. It would be irresponsible to promote further growth. Fix what you have now. Make solar a standard requirement for all new homes, if there is growth. I get that you have to often be pragmatic, but I think there are better options than what you have in your quadrants now. Most importantly, it's time to slow growth. AZ simply cannot sustain the existing infrastructure. Adding to it would be irresponsible.
Andrew-John Araneta Torre	Keep it simple. Don't go outside your mandate. Don't engage in POLITICALLY MOTIVATED activities. Ignore climate change. It is a HOAX ISSUE. Stay away from smart technology. It confuses people and decreases safety.
Bill Sellers	Invest in existing rural r-o-ws that cannot be claimed or stopped later by the enviromentalists like Sierra Club, Center for Bio-Diversity, etc.
Carl S Weierbach	Please focus on environmental impacts
Heidi Ensrud	Future scenarios do not seem to consider the very real demands resulting from climate chaos and global heating.
Jeff Spellman	Please see my above comments on the use of native plants in the landscaping and the Urban Heat Island Affect considerations.
Jeff Spellman	Please see my above comments on the use of native plants in the landscaping and the Urban Heat Island Affect considerations.
Joan Murphy	Environmental and Health Stewardship is most important. This would entail getting people out of their cars, using transit in conjunction with walking/biking. Maintaining the existing system should be the next priority.
Joan Murphy	I'm sorry, this plan does not at all sound like a plan for the future. Have you noticed how hot it is this summer? Especially in Phoenix? You know what makes that worse? PAVEMENT. If you do not see the need to get rid of pavement, I don't know how to make it more obvious to you.
Julie Helsel	Perhaps the most important goal for any transportation plan should be how to deal with the issue of climate chaos and the disruptions it is currently bringing. Any plan must address the need to move away from fossil fuel powered vehicles and provide ways for citizens to travel without their cars.
Julie Helsel	The future will be much hotter and drier. The future will rely on electric transportation systems for commercial and public transit. This is missing from the report.
Kelly Kading	While it's great to say that one of ADOT's visions and goals is "environmental health and stewardship", widening and increasing the number of highways Arizona has to maintain

	does *not* match this goal. Adding to our highway simply exacerbates the climate emergency we are facing, and increases people's dependency on personal vehicles without considering the long-term consequences.
ken kortman	I think Environmental Health & Stewardship and Support Equitable Access are key here - and two things that can't necessarily be accomplished by individual cars alone. Robust - and affordable - public transit would easily hit those two goals...and all the others as well.
Lance Briley	I would like to see a specific bubble on reducing carbon emissions.
Robert Adrian	Charts 3 & 4 will end up being the most important of the strategies. Climate change is creating a new paradigm of future needs and norms. Embracing the needs of more EVs and mass transit will be game changers for the DOT and maintenance needs as a result of technology changes and climate change.
Ryan	Environmental health and stewardship is a top priority. I want all of the other goals to encompass this goal as an intrinsic part of ADOTs 2050 LRTP
Sandra Anderson	Nice high-level goals. Please consider enhancing alternative energy resources to power transportation infrastructure, such as solar farms to support electric vehicle chargins
Tony Montenegro	Fairly generic, almost don't say anything. The one that speaks most clearly and is most important is Environmental health and stewardship.
	Need cool pavement
	I am pleased by the focus on environmental stewardship and accessibility. With the increasing impact of climate change, it is more necessary than ever to address the climate impact of our transportation infrastructure.
	Please be sure to include the exclusive use of native plants to all the landscaping around these transportation projects. This use of native plants supports the Environmental Health and Stewardship goal by supporting the local flora and fauna and supports the goal of Preserve & Maintain the System by using native plants that require less maintenance and water. I would even encourage the use of native milkweed species in the landscaping plans to help the Monarch population which has declined by 90+% over the last decade. Please look into taking the Monarch Pledge with the National Wildlife Federation. https://monarchs.nwf.org/
	Seems like the vision and goals should embrace changes coming in the transportation area with more EVs, less fossil fuel vehicles, greater mass transit and preparation for the hazards and needs from climate change.
	Eliminate any plans for I-11. the route goes thru too many sensitive areas.
	While there is a mention of environmental considerations, the plan lacks any comprehensive approach to mitigating climate chaos and its obvious impacts on the communities and economy of Arizona.
	Save the Environment NOT you bank accounts.
	Invest in high country snow system where cinders are replaced with environmentally friendly materials. Cinders make a mess, bounce off cars, cause dents and windshield breaks.

	<p>3 Items not addressed: 1) Wildlife collisions & the wildlife linkages needed to mitigate. (2) Planning for pavement cooling/heat reduction as well as wildfire safety. (3) All roadways should consider line of sight and access management.</p>
	<p>For Page 19, first strategy on the page, with "Wildlife-Vehicle Conflict Study" - include implementing wildlife crossings if not already in the plans. These have been proven worldwide to prevent vehicle strikes. Providing a wildlife corridor will also help biodiversity survive changes, and greater genetic diversity for animals currently trapped by roadways/cities. Monitoring roadkill can help identify where these would help; Pima County has a monitoring program via iNaturalist which could be built upon for use in Maricopa Co. https://www.inaturalist.org/projects/csdp-safe-passages</p>
	<p>I see projects that require tier 1-2 environmental studies. By the time anything comes of it , land use changes and lapse of time creates another study.... how much expense has been on studies versus actual work ?</p>
	<p>Without reading the full plan (I'm traveling) - AZ needs it's cities rail and bus connected! Climate change is REAL!</p>
	<p>If ADOT really means the environment is important in OUR FUTURE, then I-11 will be built on I-10 already-developed right-of way, and not through the Avra Valley. Thanks!</p>