Integration Plan for the Mid-Region Council of Governments

Central New Mexico Climate Change Scenario Planning Project

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13. ABSTRACT (Maximum 200 words)

This Integration Plan for the Central New Mexico Climate Change Scenario Planning Project (CCSP) provides useful information on strategies that the Mid-Region Council of Governments (MRCOG) and its partners can pursue over the next five years to adapt regional policies, programs, and data collection procedures to further the goals of environmental protection, climate change mitigation, climate change adaptation, and resiliency. These strategies will help MRCOG further integrate these goals into its next MTP.

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1. Introduction

The Central New Mexico Climate Change Scenario Planning Project (CCSP) was a multi-agency collaboration to research the potential impacts of climate change on the Central New Mexico region's land use development and transportation system to inform regional planning.[1] As part of the CCSP, the project team analyzed strategies that the region could take to adapt to climate change, increase its resiliency, and mitigate greenhouse gas (GHG) emissions. As part of the CCSP, the Mid-Region Council of Governments (MRCOG), the metropolitan planning organization for the Albuquerque Metropolitan Planning Area, used the CCSP team's analysis of potential future climate change impacts to evaluate the relative resiliency of its land use and transportation planning scenarios for its metropolitan transportation plan (MTP), the *Futures 2040 MTP*.[2]

The purpose of this Integration Plan is to provide useful information on strategies that MRCOG and its partners can pursue over the next five years to adapt regional policies, programs, and data collection procedures to further the goals of environmental protection, climate change mitigation, climate change adaptation, and resiliency. These strategies will help MRCOG further integrate these goals into its next MTP.

This Integration Plan explores potential implementation strategies for the following policy focus areas. For each focus area, the Plan provides examples of similar policies and programs in other regions, as well as recommendations for the role that MRCOG could play in supporting these implementation strategies.

- Transportation Climate Change Adaptation Assessment: identifies strategies to fill existing data gaps to better understand present and potential future flood, heat, and wildfire vulnerability for the region's transportation assets.
- Mitigating GHG Emissions from Electricity Generation: identifies two primary strategies for reducing GHG emissions from transportation facilities – retrofitting streetlights to light-emitting diode (LED) technology and installing renewable energy generation facilities in transportation rights-of-way.
- Incentivizing Transit-Oriented activity centers: analyzes land use and transportation strategies to support the development of "activity centers" with concentrated development near transit.
- Regional Support for Travel Demand Management: analyzes potential regional strategies the region could adopt to use travel demand management (TDM) to incentivize reductions in vehicle miles traveled.
- Open Space Preservation Programs and Policies: identifies several potential strategies for preserving regional open space to increase resiliency to flooding and wildfires and protect critical habitat areas.
- Green Infrastructure Investments: analyzes potential strategies to build or incentivize green stormwater infrastructure investments, which could help the region increase flood resiliency, protect wildlife habitat, and reduce the urban heat island effect.

[1] http://www.volpe.dot.gov/transportation-planning/public-lands/central-new-mexico-climate-change-scenario-planning-project

[2] Mid-Region Council of Governments, 2014, Draft 2040 MTP Released – Accepting Public Comments, http://www.mrcog-nm.gov/latest-news/1.191-draft-2040-mtp-released.

2. Transportation Climate Change Adaptation Assessment

The CCSP project provided helpful information about climate change impacts and effects in the region as well as potential vulnerabilities. To go deeper, MRCOG may wish to consider a more detailed climate vulnerability and adaptation assessment. FHWA has a range of resources available to assist: http://www.fhwa.dot.gov/environment/climate_change/adaptation/.

One of the major challenges that the CCSP encountered in assessing the vulnerability of transportation infrastructure and developed areas within Central New Mexico to flooding from climate change was shortcomings in current regional data about current flood control infrastructure. The project team found that the region needs better data about infrastructure locations, elevations, capacities, designs, and vulnerabilities to flooding in order to identify vulnerable assets. This, in turn, is a necessary step to developing adaptation strategies to reduce regional climate change vulnerability.

Current data limitations in the region include:

- Lack of data on the locations, depths, or extents of past floods
- Limited data about the locations, elevations, and design standards of local transportation infrastructure
- Limited data about the maintenance and repair needs of existing transportation infrastructure (e.g., spots that have a history of damage due to flooding)
- Inability to model future flood risks based on projected precipitation changes

2.1 Data Collection Recommendations

To fill these data gaps, MRCOG should work with its partners to collect the additional data discussed below. In many cases, some of these data may already exist, but not in sufficient detail or formats that are necessary for regional vulnerability assessments. One role MRCOG can play is to convene local governments and other regional partners to develop shared data collection plans and data format conventions to develop a more robust regional dataset.

Another important role for MRCOG to play is to develop a subset of the regional transportation system that forms the "critical" network for study in a vulnerability assessment. Critical assets could include high-volume roadways, primary access roads, or evacuation routes. This will help MRCOG and its partners reduce the scope of its analysis to the most critical transportation assets in the region. The FHWA's *Assessing Criticality in Transportation Adaptation Planning* report provides a methodology for prioritizing transportation assets prior to undertaking a vulnerability assessment.[3]

2.1.1 Data on Flood Events

MRCOG could play a convening role in helping regional stakeholders develop standard data collection and management protocols and to create a clearinghouse for local flood data. MRCOG should also work

[3] FHWA, 2011, *Assessing Criticality in Transportation Adaptation Planning*, http://www.fhwa.dot.gov/environment/climate_change/adaptation/publications_and_tools/assessing_criticality/index.cfm.

with its regional partners to improve the data about recent, current, and future flood events as they occur. Specifically, the region should collect the following data:

- Records of flooding events
  - Location, flood elevation, and extent of flooding
  - Localized precipitation amounts and timeframe associated with flooding
  - Data on locations, frequency, and severity of flood events' effects on transportation infrastructure (e.g., damage, temporary closures, reduced capacity)[4]

This data can help MRCOG and regional stakeholders understand where flooding currently occurs and what impact flooding has on the transportation systems. Through this analysis MRCOG may begin to identify spots where flooding impacts the infrastructure on a repeated basis.

Local weather stations already provide data on precipitation. However, one challenge for Central New Mexico is the high variation of precipitation amounts over small areas; summer thunderstorms often result in intense precipitation falling over small, localized areas for short amounts of time.

Municipalities, local resource agencies, or State or Federal agencies could augment their data collection by monitoring stream elevations in the arroyos throughout the region and by collecting consistent data on flood elevations and areas impacted by flooding in storms. Transportation infrastructure owners, such as the New Mexico Department of Transportation (NMDOT), counties, and municipalities, should record the locations and severity of impacts on local transportation infrastructure from heavy precipitation events. Some of this data collection and analysis could be conducted in partnership with local universities. Central New Mexico should begin collecting data on flooding to enable future analyses, but it would also benefit from historical data. Currently, historical data on flooding of transportation assets is limited in this area. Opportunities to collect data on historical storms could include searching media accounts of storms, interviewing transportation maintenance staff or local land-owners with memories of previous flooding events, or reviewing past insurance claim data.

2.1.2 Data on Infrastructure Vulnerability

To understand the impact that flooding events may have on regional transportation and land use, it is important to have better data on local flood control and transportation infrastructure. This is because vulnerability is not just determined by whether flood events occur in a location (exposure), but also on whether the infrastructure in that location is designed in a way that it would be damaged by exposure to flooding (sensitivity).[5]

2.1.2.1 Flood Control Infrastructure

Most developed areas in the region are protected by various flood control structures. To adequately model the impacts that future heavy precipitation or streamflow flood events would have on developed

[4] Categories from Washington State Department of Transportation, 2011, Climate Impacts Vulnerability Assessment: http://www.wsdot.wa.gov/NR/rdonlyres/B290651B-24FD-40EC-BEC3-EE5097ED0618/0/WSDOTClimateImpactsVulnerabilityAssessmentforFHWAFinal.pdf.

[5] http://www.fhwa.dot.gov/environment/climate_change/adaptation/publications_and_tools/vulnerability_assessment_framework/

areas or transportation assets, it is necessary to have reliable data on the location of flood control structures and the intensity of flood events they are designed for. MRCOG should work with infrastructure owners and managers, including the U.S. Army Corps of Engineers, U.S. Bureau of Reclamation, and local arroyo and flood control districts, to develop regional data on flood control that can inform flood risk models and vulnerability assessments.

2.1.2.2 Transportation Infrastructure

Although the CCSP project team was not able to map flood vulnerabilities under potential future climate conditions, the team did provide a simplified analysis of current vulnerabilities by mapping where transportation infrastructure is located within the current 100-year floodplain.[6] However, the team did not have data about the elevations of transportation assets or any associated flood management design features because this data did not exist. To better model which transportation assets are most vulnerable to flooding, MRCOG needs better data regarding:

- Elevations of infrastructure (including bridges or raised road structures)
- Locations and sizes/capacities of culverts and other stormwater infrastructure
- Design standards for existing transportation assets
- Any evidence that drainage structures are underperforming, such as culvert scouring or erosion along roads

MRCOG could play a convening role to encourage local transportation asset owners (e.g., NMDOT, counties, and municipalities) to collect this more detailed data for their assets. Based on similar work that has been completed by the FHWA adaptation pilots, MRCOG and its partners could develop a set of data standards to allow for a vulnerability analysis of the region's critical transportation network. MRCOG could also work with local partners to collect other types of information on asset damage and maintenance needs due to other climate-related causes, such as extreme heat. MRCOG can use the climate futures work performed by the Volpe Center to determine how assets may be impacted by extreme heat in the future, specifically days over 100 degrees F and the number of consecutive days over 100 degrees F, since these events can degrade some pavement types significantly. The region can then make decisions on what asphalt mix and paving materials to use in the future to be more resilient to these types of extreme heat.

2.2 Modeling Climate Change Impacts and Future Flood Vulnerabilities

The data collection strategies outlined above will help MRCOG and its partners improve their understanding of present-day flood and extreme heat vulnerabilities in the region, which is a crucial first step to understanding future vulnerabilities due to climate change. Additionally, climate change projections show that heavy precipitation events may increase in frequency and intensity in Central New Mexico, which could lead to increased flood risk in areas already at risk or expanded risk to areas that currently do not experience flooding.

There are substantial challenges to modeling future flood vulnerability from climate change. First, there is substantial uncertainty in the precipitation projections in downscaled global climate models (GCMs)

[6] http://ntl.bts.gov/lib/54000/54900/54982/CCSP_Project_Report_Final_Report.pdf

for Central New Mexico. Second, the models do not predict extreme precipitation events well due to modeling assumptions and limitations. Third, many of the intense storms in the region that cause flash flooding are small and localized, and therefore are not captured well at the resolution of the GCMs. And fourth, the models provide projections at a resolution of 24-hour precipitation amounts, but current flood risk models use higher-resolution, 6-hour precipitation data.[7]

These challenges make it impossible to predict precise flood risks in the future. However, some agencies in the U.S. have developed models that provide some information on future vulnerabilities despite modeling limitations:

- In New Mexico, the Southern Sandoval County Arroyo and Flood Control Authority (SSCAFCA) modeled the change in peak flows and inundation that would result from a range of changes in the 100-year design storm for a particular watershed to illustrate how small changes in future precipitation events can have larger impacts on potential inundation zones given current flood control infrastructure.[8] Minnesota DOT and Iowa DOT completed similar analyses but for larger regions and multiple watersheds.[9]
- The New Jersey Transportation Planning Authority (NJTPA) used a regression analysis to model potential future floodplains based on downscaled GCM precipitation projections.[10] NJTPA completed this work as part of a 2010 FHWA climate change adaptation pilot project.

MRCOG can work with local partners and researchers to develop a methodology that provides insight about potential future flood vulnerabilities from climate change. The results of this effort will still be uncertain but would provide more information than is currently available to help MRCOG and its partners better assess future flood risks.

2.3 Workshop-based Approach: Relying on Stakeholders and Institutional Knowledge for Qualitative Climate Adaptation Assessment

Perhaps prior to the more detailed, data driven approach described above, MRCOG could take a qualitative, workshop-based approach. This could provide a mid-level assessment of key risks and adaptation options and help narrow down which data sources are most important to gather for further analysis. MRCOG could convene NMDOT district-level operations and maintenance staff, transit agency operations and maintenance staff, flood control authorities, the U.S. Geological Survey, Bureau of Reclamation (BOR), local jurisdictions, emergency management agencies, and others.

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[7] http://ntl.bts.gov/lib/54000/54900/54982/CCSP_Project_Report_Final_Report.pdf

[8] http://www.volpe.dot.gov/transportation-planning/public-lands/central-new-mexico-climate-change-scenario-planning-project

[9] http://www.fhwa.dot.gov/environment/climate_change/adaptation/ongoing_and_current_research/vulnerability_assessment_pilots/2013-2014_pilots/index.cfm

[10] New Jersey Transportation Planning Authority, 2012, *Climate Change Vulnerability and Risk Assessment of New Jersey's Transportation Infrastructure*: http://www.njtpa.org/Planning/Regional-Studies/Recently-Completed-Studies/Vulnerability-and-Risk-Assessment-of-NJ-Transporta/FHWAConceptualModel/CCVR_REPORT_FINAL_4_2_12_ENTIRE.aspx.

At a first workshop, MRCOG staff could display climate data and maps developed for the project as well as from other sources such as the climate futures analysis, maps overlaying roads with the current 100-year flood plan, maps overlaying roads with wildfire risk areas, the BOR Upper Rio Grande Study conclusions, the SSCAFCA analysis of increased heavy precipitation impact on a small watershed, and other relevant information. Participants could be asked to identify on detailed system maps where current problems occur and where future problems may occur based on the climate change narratives. Participants can be asked to characterize impacts and level of risk based on a set scale.[11]

At a later workshop, participants can be asked to discuss adaptation options for those impacts with the highest likelihood and magnitude of consequence. The discussion should focus on identifying transportation and land use policies and adaptation strategies that are either:

- Robust under all climate scenarios,
- Reduce risk or serve as insurance against the worst case scenario,
- Can be adjusted over time as more information is available, or
- Prevent incidents for which the region has low risk tolerance.

Participants can also provide information on which data sources they have available to support further assessment.

[11] For example, see Table 4 here: FHWA, 2012, *Climate Change and Extreme Weather Vulnerability Assessment Framework:* *http://www.fhwa.dot.gov/environment/climate_change/adaptation/publications_and_tools/vulnerability_assessment_framework/*.

3. Mitigating GHG Emissions from Electricity Generation

Here the project team explores two primary strategies that MRCOG's partners in Central New Mexico can employ to reduce the consumption of electricity and generate renewable energy to power their facilities. These strategies are retrofitting streetlights to light emitting diode (LED) technology and using available real estate to install solar panels to power agency operations. There are many examples of cities currently switching to LED technology to illuminate streets, and the cost of this technology has dropped, making it a cost-efficient strategy.

Transportation agencies using real estate for renewable solar energy generation is less widespread as a practice, but there are a few examples that agencies within New Mexico can look to if they are interested in pursuing this option. MRCOG can support these kinds of efforts by coordinating the various agencies and public utilities necessary to enact them, and can incorporate energy consumption and electricity generation as performance measures in its MTP and project selection criteria. Applying energy conservation measures, in addition or in place of GHG emissions, may communicate to the public the benefits of these strategies such as resource conservation and higher resiliency to absorb energy price increases. Focusing on energy consumption in these terms can help people realize that investing in renewable energy and pursuing conservation will improve their own bottom line interests, as well as make a contribution to reducing global GHG emissions.

3.1 LED Retrofit Strategy

The City of Los Angeles implemented programs to replace older model streetlights with more energy-efficient LED streetlight fixtures. Los Angeles has nearly completed these retrofits, which are expected to continue to deliver cost savings beyond the seven years it is expected to take to pay for itself. This effort is also reducing carbon dioxide emissions by about 40,000 tons per year. The program was paid for through a combination of loans and city funds.

Los Angeles followed the steps below to implement its switch to LEDs for streetlights. Though Los Angeles is much larger than the street-owning jurisdictions in Central New Mexico, a similar approach, tailored to local resource constraints and opportunities, could work in this region.

The City first developed a business case for the program that included an economic analysis. This analysis revealed that the program to switch to LEDs would result in operational cost savings that would exceed the cost of the program after seven years. This business plan generated interest from financial institutions to finance the program. However, as the City further developed its business plan, it ultimately decided to provide the funds itself with a structure based on energy savings and utility rebates. The City secured a seven-year loan from utility and City funds at a rate of 5.25 percent to be repaid through energy and maintenance savings.

The program was implemented in five years. It targeted cobrahead street light fixtures on all residential streets, most of which were sodium vapor, metal halide, mercury vapor, and incandescent fixtures. LED technology is well-adapted for application on these types of fixtures.

Los Angeles has completed the world's largest street light retrofit to LEDs. However, other cities are switching to LED street lights, including:

- Brisbane, California
- Needles, California
- Yountville, California
- Burlingame, California
- Ann Arbor, Michigan
- Anchorage, Alaska
- Phoenix, Arizona

There are other advantages to switching to LEDs besides energy savings. An LED is a semiconductor light source and multiple LEDs are networked together in a single fixture or in combination to generate appropriate light outputs for different applications. LEDs are therefore more conducive to wireless technology so that they can be programmed in the future to be more energy efficient. A handful of pioneering cities, such as Copenhagen, are using them beyond just for lighting purposes. They can be programmed to only turn on when oncoming traffic is present, or may be used for other purposes such as sensing traffic congestion and helping to optimally time traffic signals.

In Los Angeles, the Bureau of Street Lighting deployed a limited remote monitoring system for its street lighting system. This remote monitoring system reports real-time performance data for all light fixtures, and these measurements can be applied to the Bureau of Street Lighting's GIS system. This allows the Bureau to track equipment failures and allows centralized control that can reduce energy consumption and enable performance monitoring.

Another benefit to LEDs for streetlight fixtures is reduction of light pollution. LEDs provide more illumination on the ground but the illumination is targeted and little light escapes where it does not belong. Proponents of "dark sky" practices may support a switch to LEDs for this reason, provided the illumination levels are modest.

Bernalillo County and the City of Albuquerque have some experience with these technologies. The primary barrier to a widespread program being implemented is financing the upfront cost of the retrofit. With the cost savings enabled by LED streetlights, Albuquerque and Bernalillo County can learn from early adopter cities like Los Angeles about the best technology available on the market and develop a business plan to finance the retrofit program using either internal financing sources, as Los Angeles did, or by soliciting interest from private sector financial institutions.

The agencies within the Central New Mexico region that should be charged with switching street lights to LEDs are those that own, operate, and finance street lights and their maintenance. These are the region's road authorities like the City of Albuquerque, Bernalillo County, and NMDOT. The City of Albuquerque likely has the largest cost burden from street lights for the multitude of residential streets that must be illuminated, so it would likely be the best jurisdiction to first switch to this technology. It would be a simpler process for each road-owning jurisdiction to finance and manage its own retrofit program, but MRCOG and NMDOT may wish to convene a regional committee to investigate ways to help communities finance a retrofit.

3.2 Using real estate assets to generate renewable electricity

The FHWA Office of Real Estate Services has created a website and map[12] that compiles information on existing highway renewable energy projects across the country, as well as a resource[13] discussing the use of highway right-of-way to support energy generation. In a related project, New Mexico DOT was a partner in an earlier pilot on using highway right-of-way for carbon sequestration in 2009. Roadway-owning authorities, such as NMDOT, could first assess their land holdings and then partner with the electric utility to discover any potential locations for solar electricity generation. The road authority can then lease this available land to the electric utility to install a solar array to power nearby highway operations and sell off any excess power generated during the day. A few State DOTs have also installed solar panels to power facilities such as highway rest areas without the involvement of an electric utility. There are only a handful of examples today by State DOTs who have tried either approach. This is a rapidly evolving innovation as solar electricity generation becomes increasingly cost-efficient for utility companies. Some of the more ambitious programs of this type are found in the developing world. The State of Gujarat in India is piloting a program to install structures outfitted with solar panels over portions of highway and irrigation canals.

The City of Salt Lake City developed a transportation energy and sustainability plan[14] as part of its Salt Lake City Green initiative, which includes energy conservation as a primary goal for the City. The City tracks its performance in all of its goal areas including increasing its use of renewable electricity. The City increased its use of renewable energy partially by installing solar panels to power several public buildings using City-owned land or building rooftops.

Oregon initiated the nation's first solar highway project that uses ground-mounted solar panels situated at an interchange south of Portland. The power generated by the solar array offsets over one-third of the cost of providing energy needed for illumination of the interchange. A partnership between Oregon DOT (ODOT) and Portland General Electric (PGE) developed the project with PGE owns and operates the array, which feeds energy into the grid during the day, allowing ODOT to gain credits to offset the cost of its electricity demand at night. ODOT and PGE are exploring other sites and opportunities for collaboration by evaluating several properties that have characteristics supportive of a solar array that are otherwise not planned for any sort of use by ODOT. So far, the partnership has found three additional sites to potentially construct similar projects.

Public transportation agencies have realized strong returns on investment by working in partnership with private companies to install solar panels on top of maintenance facilities and large bus storage lots. Santa Clara Valley Transportation Authority and Los Angeles Metro provide examples. The Federal Transit Administration (FTA) Report, *Transit Investments for Greenhouse Gas and Energy Reduction Program*, describes the costs and benefits of multiple transit agency energy reduction projects, including fourteen transit agency solar panel projects across the country, including in the states of CA, CT, DE, GA, IL, MA, and WA. While the FTA grant program under which these were funded is no longer active, the market has matured and there are several options for purchasing panels with a reasonable return on investment time period and for leasing panels that do not require an upfront investment and split savings between the parties. Rio Metro has already installed several solar panels at Rail Runner stations, which were mostly funded using external grants.

[12] http://www.fhwa.dot.gov/real_estate/right-of-way/corridor_management/alternative_uses.cfm
[13] http://www.fhwa.dot.gov/real_estate/publications/alternative_uses_of_highway_right-of-way/rep03.cfm
[14] http://www.slcdocs.com/slcgreen/ETSP_Full_Plan_11_1_11_draft.pdf

The United States Department of Energy's (DOE) Energy Efficiency and Conservation Block Grant (EECBG)[15] Program provided funding for energy upgrades for buildings, installation of LED street lights and traffic signals, traffic signal timing, and installation of solar systems among other energy conserving strategies by local and State government. This program has concluded, but a Final Report on its efficacy is expected in late 2015. The recommendations that come out of this report may inform future DOE energy efficiency programs, which may provide future funding and technical support to innovative projects in New Mexico.

3.3 Incorporating energy in the region's Metropolitan Transportation Plan

As part of the CCSP, MRCOG identified a goal to reduce GHG emissions from transportation sources. In a future update to its MTP, it could also include energy consumption as a performance measure. This performance measure would respond in a similar direction as the measure of estimated GHG emissions but would also communicate the impact of transportation policy and planning decisions on the region's energy security and resilience to potential energy price shocks. Some policymakers may feel more moved by this rationale to support investing in energy conservation/emissions reduction strategies than to mitigate GHG emissions.

The Genesee Transportation Planning Council's (GTPC) long-range transportation plan included a goal to protect and enhance the natural environment, cultural heritage and community appearance, and promote energy conservation with an objective that the transportation system should encourage the efficient use of non-renewable energy resources and the exploration of renewable alternatives. The GTPC tracks the region's performance on this objective by including energy consumption (in BTUs) as a performance measure; it uses its travel demand model to make the calculation, using vehicle miles traveled (VMT) to determine energy use.

Energy efficiency can also be incorporated into secondary evaluation criteria for the selection of projects in the Transportation Improvement Program (TIP). Inputs that could go into performance measures to track energy consumption include vehicle miles traveled and travel speeds that would result from the proposed project. While these performance measures may be used to track progress or regress in other goals related to air quality and congestion, tying them instead to energy consumption can improve the understanding of the public about energy systems and the impact that transportation decisions have on them.

Several other MPOs have used "sensitivity testing" of their travel demand models to test how different future price levels of gasoline could affect regional travel. UNM used a similar methodology to test the effects of increasing the price of fuel on regional travel for its exploration of a tax on VMT in New Mexico. The travel demand model is a useful tool to estimate the community's resiliency to possible fuel price shocks in the future. MRCOG can also use it to calculate the resiliency of households to changes in fuel costs. Measuring the region's energy resiliency is not the same as climate change resiliency but the two are similar in that they both anticipate the uncertainty of future conditions and the region's ability to withstand potential shocks to its natural and engineered resources.

[15] http://energy.gov/eere/wipo/about-energy-efficiency-and-conservation-block-grant-program

4. Incentivizing Transit-Oriented Activity Centers

A key piece of MRCOG's preferred scenario is to concentrate future development in several identified "activity centers." In order to support these activity centers, the public sector can provide incentives for development that is supportive of major transit investments, such high-frequency bus service or bus rapid transit (BRT). Transit-supportive development is broadly defined as higher-density development that has a pedestrian-orientation with a mix of commercial and residential uses. While some of the planned activity centers are not connected to high-capacity, high-frequency transit routes, those that are should be the location of the highest density development in the region in order to connect walkable transit-oriented neighborhoods via transit and thereby reduce automobile travel.

Regional agencies like MRCOG and Rio Metro can work with the City of Albuquerque, local neighborhoods and ABQ Ride to facilitate this kind of development through aligning policies to support a funding application for high frequency transit, developing station area plans, amending the zoning code, and evaluating the effectiveness of existing or potential economic development incentive tools. The region has already identified three corridors for future BRT development. These include the University of New Mexico/Central New Mexico Community College/Sunport corridor, the Central Avenue corridor, and Paseo Del Norte.

4.1 Transit investments to support high-density land use

The first major transit investment envisioned for the region is the Central Avenue BRT project, called Albuquerque Rapid Transit (Figure 1). This line is in the project development phase and the region expects to submit a Small Starts application to the FTA this summer with the goal of beginning service in September 2017. The second corridor under consideration is the University of New Mexico/Central New Mexico Community College/Sunport BRT corridor (Figure 2). These investments provide a good place to prioritize planning for transit-oriented development.

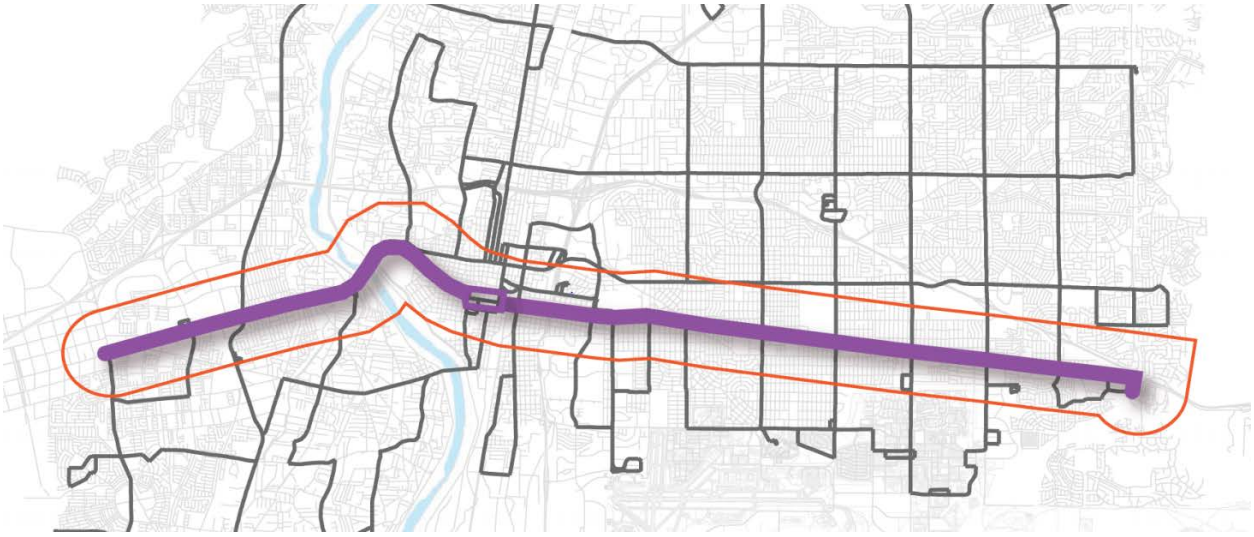


Figure 1: Central Avenue BRT Corridor

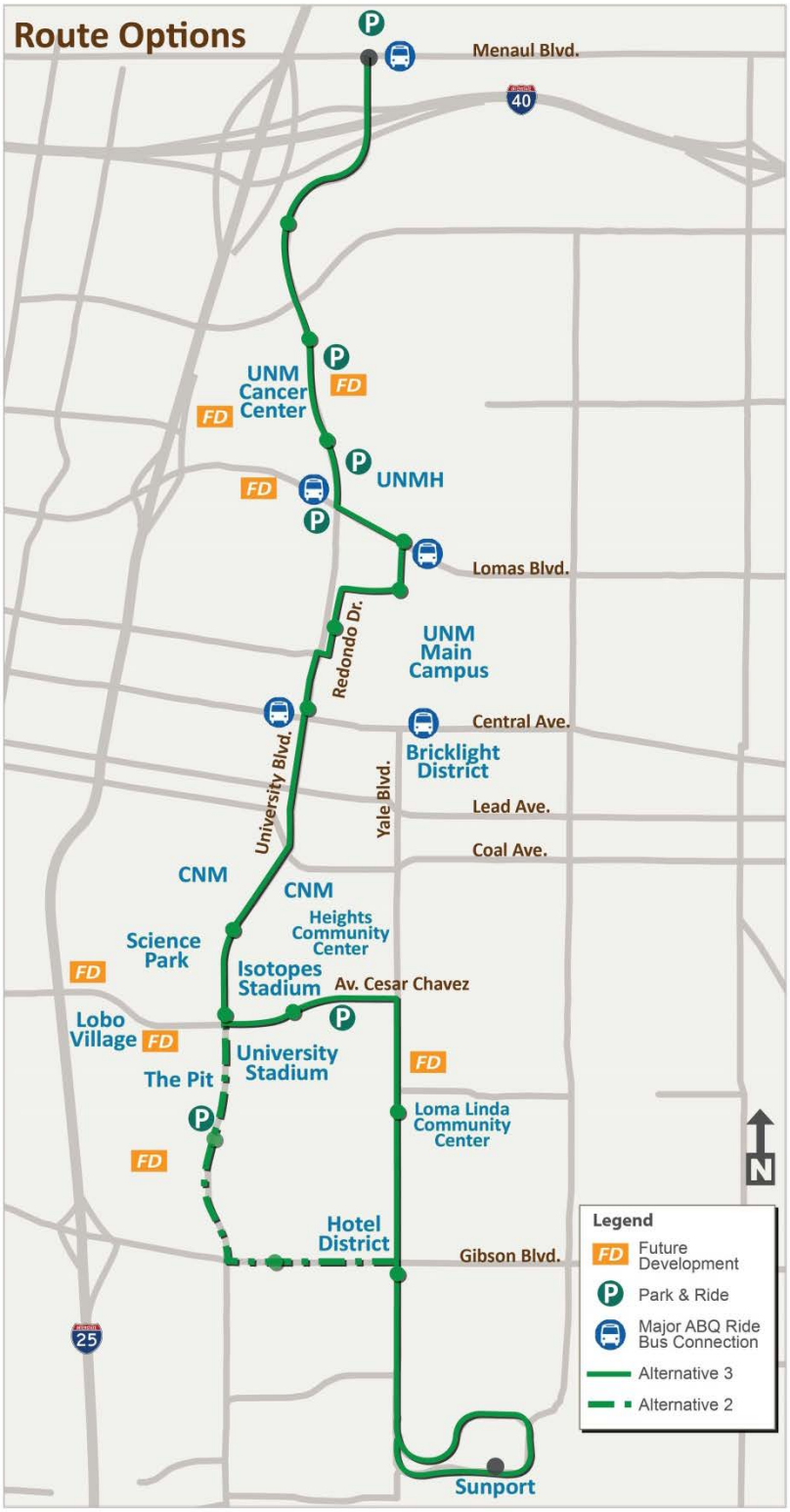


Figure 2: UNM/CNM/Sunport Corridor Alternatives

For this project, some of the design concepts for implementation of the transit service in the UNM/CNM/Sunport BRT alternatives analysis include stations located in the middle of a wide four-lane divided highway. While this type of station design may be the least complicated way to provide a transit

station and easy mobility for buses, it is not ideal for land use development because it is not a pedestrian-friendly transit station design. BRT stations should be central to the fabric of the neighborhoods they serve in order for them to be an attractive alternative to driving and should not require the crossing of several lanes of traffic. Detailed designs for the provision of this service should keep these design attributes in mind as the project progresses.

Along with supportive zoning changes and the City of Albuquerque's transition to a form-based zoning code, the region could develop additional station area plans along the corridor that are similar to those for the Rail Runner Express corridor. In addition, the Rail Runner station plans could be updated following the Comprehensive Plan update and Unified Development Ordinance. Each station plan could inventory the half-mile radius around the proposed stations and identify opportunity sites for transit-supportive development. Developing station area plans for the BRT corridor is a necessity for a successful application for FTA Small Starts funding. Currently, one-third of the evaluation of New Starts and Small Starts applications is based on land use and economic development criteria. Because the existing density is relatively low in this and other corridors in the region, an application for FTA funds will be much more competitive if significant planning and policy activity is taking place to facilitate the redevelopment of the corridor to transit-supportive densities and uses, reducing or eliminating parking requirements, and requiring pedestrian-friendly design for new developments.

Additionally, if the corridor has a higher proportion of affordable-restricted housing units than the rest of the region, it will also enhance the rating for a FTA New Starts/Small Starts proposal under current criteria (in 2015). Providing incentives for building and preserving affordable housing within the corridor will further improve the prospects of the proposal.

Rio Metro and MRCOG should work with the City of Albuquerque to designate transit-oriented development districts for the Central Avenue and Sunport corridors that have ambitious land use density objectives. The region can improve its chances of receiving a relatively high rating on its application if it explicitly allows at least 20 to 25 residential units per acre or higher within one-half mile of many or all stations on the corridor. Station area plans should supplement zoning allowances demonstrating a coordinated effort to encourage this type of development on opportunity sites. Some other ways that the City can demonstrate its support for higher density development (in addition to allowing it) is through incentives like expedited design review procedures, covenants for high density or affordable housing, and tax incentives.

In addition to development densities being relatively low in the region, the street environment is not always pedestrian-friendly. The region can also improve its competitiveness if zoning ordinances also include provisions to enhance transit-oriented character and pedestrian access, as well as provisions for reduced parking and traffic mitigation. Zoning that encourages transit-supportive design may include zoning for mixed-use buildings and sites; low minimum and/or maximum building setback requirements (up to 10 feet in commercial districts, and up to 20 feet in residential districts); design requirements to create human-scale, active facades; requirements for entrances oriented towards streets, sidewalks, and other public areas; and site design requirements that require rear parking. These design guidelines, codified in zoning, should be described in station area plans. MRCOG can assist in putting together an FTA application by providing technical assistance in inventorying pedestrian conditions, suggesting improvements to circulation, and collecting data.

4.2 Station Area Plans

There are many methods available to conduct station area planning and there are local examples of such plans in Albuquerque. It would be best, however, to have a consistent process for conducting a plan for each station area on a corridor to ensure that all elements of successful transit-oriented development (TOD) are considered at an early stage in the process.

Step One: Define TOD Districts/Activity Centers

- Create district boundaries
- Establish a typology of district profiles (related to community character)
- For TOD Districts, establish zones based on proximity to the station that have different density and design character objectives

Step Two: Develop a TOD Action Plan

- Identify opportunity parcels of unused or under-utilized land
- Establish excellent pedestrian connectivity/quality
- Establish urban design guidelines
- Address affordable housing in housing-oriented TOD districts
- Assess infrastructure needs/costs
- Conduct a real estate market analysis
- Develop financial tools to lower costs to development
    - Shared parking districts
    - Land assembly
    - Finance implementation
- Create regulatory tools
    - Zoning adjustments within the district
    - Road design requirements within the district
    - Urban design requirements

Prior to these steps, the region should establish a planning committee for each area. Such a committee should include private and public sector stakeholders from the neighborhood, the city, and the region.

4.3 Rezoning and the Upcoming Unified Development Ordinance

Albuquerque's Unified Development Ordinance will be written during the next couple of years. This process provides an opportunity to codify policies and incentives to spur the right kind of development in transit-connected activity centers. These policies and incentives could only be applied to transit corridors or to various activity centers, but focusing on the TOD districts would be the most effective in terms of reducing VMT and re-orienting growth in the region to create the kind of region envisioned in the preferred scenario.

The new form-based zoning code for the City of Albuquerque is well-suited to the creation of activity centers and transit-oriented development. This zoning code guides new development in Albuquerque with development principles of high density and pedestrian-orientation. Each station area could apply to be designated as TOD-MAC in the current Albuquerque Comprehensive Plan. This designation is for a

Transit-Oriented Development Major activity center form-based zoning district, which mandates a minimum height of 26 feet with no height maximum and requires development character that ensures an attractive pedestrian environment. Albuquerque's form-based zoning code is permissive of transit-supportive densities if the activity center is designated as an identified "Center" or "Corridor" in the Comprehensive Plan.

Downtown Albuquerque is identified in the preferred scenario as a regional activity center that deserves the most consideration for providing development incentives. As the center of the region's transportation system, the area already has a built-in historic grid pattern as well as a large number of opportunity sites for development. Downtown development is guided by a recent Rank Three Development Plan that will be subject to review as part of the Unified Development Ordinance. The Downtown Development Plan identifies the Downtown Sector as a Major Redevelopment Area, allowing tax increment financing to fund programs, infrastructure, and facilities.

All regional activity centers identified in MRCOG's Preferred Scenario or activity centers along major transit corridors that need encouragement for higher-density development would benefit from a similar development plan as that which was undertaken for Downtown Albuquerque. MRCOG and the City of Albuquerque can prioritize these activity centers based on expected regional impact on VMT and re-orienting development as well as ease of implementation. The areas with the most impact on VMT are likely to be those that are located near Rail Runner stations or along the three identified BRT lines. The UNM/CNM/Sunport corridor and the Central Avenue corridor would appear to be the clearest candidates for future redevelopment and densification.

4.4 Economic Development Tools

Finally, most economic development tools that have been used successfully by other cities throughout the country are enabled by State legislation. For instance, Tucson used Arizona enabling legislation to create a Government Property Lease Excise Tax Incentive (GPLET) once it defined its downtown area as blighted. This program allows new development projects that meet certain criteria to be exempt from property tax payments for eight years through an ownership swap with the City. Essentially the City owns the property for its first eight years and then transfers ownership through an agreement to the deeded property owner, after which time the property will be subject to tax.

MRCOG could initiate a dialogue among its member governments and advisory committees about the efficacy of existing enabling legislation for economic development incentive tools in New Mexico. Such a dialogue could lead to innovative packaging of existing available tools, such as Tax Increment Financing (TIF), or an organized effort to enact new State legislation that would be more supportive of the redevelopment process in the region's activity centers, such as that which has been used in Arizona.

5. Regional Support for Travel Demand Management

The application of TDM strategies can play a significant role in providing transportation incentives that reduce driving. There are several strategies that may have a lot of potential in the Albuquerque region. Many of these strategies must be applied locally, but the regional coordination and funding capabilities of MRCOG can provide a major incentive to have a strategic framework for TDM in the region. There are a few examples of successful regional TDM programs and strategies administered by other MPOs in the United States. MRCOG can follow the lead of some of these examples to provide more leadership in this area.

5.1 Possible TDM strategies for the Albuquerque region

Of the TDM strategies listed in the *Transportation-Related Greenhouse Gas Mitigation Strategies and Potential Applications in Central New Mexico* guide that the Volpe Center prepared for MRCOG during the CCSP, the following have the most promise of being enacted in this region:

- **High Occupant Vehicle (HOV) facilities**: Include HOV lanes on freeways and provide carpool incentive programs at parking garages. HOV lanes are not priced and are only available for use by vehicles that have a certain number of occupants. Some regions have 2-person HOV lanes, while others have 3-person HOV lanes. The severity of congestion on the corridor typically determines the passenger threshold of an HOV lane. HOV lanes are also used by transit vehicles. Because most vehicle travel is by single-occupant vehicles, the HOV lane is typically a more reliable and faster alternative to the general purpose lanes.

  HOV lanes have been studied at the project level by NMDOT on various occasions along portions of the Interstate system in the Albuquerque metro area. They concluded that HOV facilities on a finite portion of the Interstate would not be appropriate. However, if the region were to develop a plan for a connected HOV network to handle projected travel demand increases, implementation would be more feasible and allow for it to occur on an incremental basis if necessary. MRCOG's regional travel demand model could be used to identify the most feasible HOV network based on projected traffic and congestion levels.

  NMDOT is considering managed lanes as an option on I-40 through Albuquerque due to the high level of projected demand, particularly for freight travel. Signage would indicate depending on the time of day if lanes are open to all users, trucks only, or potentially HOV only.

- **Parking management and parking pricing** strategies are similar to that of road pricing in that they use market feedback principles to result in a more efficient use of space, in this case for parked cars rather than cars traveling along the roadway. Parking spaces are not free to build or to maintain but this cost is not always passed directly on to users of parking spaces for various reasons including zoning code regulations that require developers of buildings to include a minimum number of free parking spaces. Such policies effectively encourage driving by subsidizing a portion of the trip for single-occupant vehicles (SOVs). Cities could instead adopt

policies and regulations that reverse this incentive. An emerging policy idea includes "performance-managed parking" in which the availability of unoccupied spaces is at 15 percent during peak periods through variable pricing and "smart parking" in which technologies provide drivers real-time information on space availability. San Francisco and Berkeley are two cities that have instituted this technological approach and continue to see benefits from it. Seattle has used a similar concept to manage parking but instead relies on annual studies of parking demand, which inform how the City adjusts the various parking rates at different times of the day and at different locations. In Albuquerque, Downtown Main Street is exploring a parking benefit district for downtown Albuquerque.

Parking management and pricing strategies likely have a mixed record in terms of reducing GHG emissions. These strategies are necessary components of transit-oriented developments (as described above) and encourage more dense development. Reducing parking availability may marginally increase emissions if it results in drivers spending more time searching for parking, but this may be able to be managed with other services like real-time information.

Managed parking is appropriate in TOD districts, downtowns, universities and any other location with a high demand for travel and little space for parking. This is a strategy that can go along with a TOD plan. The most logical locations for parking management programs in the Albuquerque metropolitan area are the UNM/CNM district and Downtown. In particular, the Downtown 2010 Sector Development Plan, which covers development requirements in the Downtown District, already eliminates all parking requirements within the planning area. However, parking is still requested by developers and lenders. Other employment centers and shopping districts feature a generous supply of parking.

A more structural approach to parking management could be to reduce required parking demands for new development region-wide or eliminate parking requirements altogether, thus limiting oversupply and making overall parking management strategies more effective. In addition, incentives could be offered to redevelop existing surface lots. It would be beneficial to have such a program in place for a regional application for FTA Small Starts funding.

- **Car sharing** is a successful recent phenomenon in the United States but its adoption rates vary considerably by location. There are several models of car sharing (such as Zipcar and Car2Go) but they all share in common the use of one or more vehicles by members of a car sharing organization. Car sharing effectively reduces the demand for car ownership by allowing individual members of a car sharing organization the ability to forego the purchase of a car or by providing multiple driver households an alternative to purchasing a second vehicle. These arrangements can save households significant amounts of money and can support the use of alternative travel modes like transit and bicycling since members of these organizations do not drive as often as car owners. Car sharing is a service provided by the private sector but the public can help these organizations succeed by offering incentives such as free municipal parking spaces.

  Car sharing companies have some small operations in Albuquerque, such as Enterprise at the University of New Mexico. A few apartment complexes even offer car sharing among tenants. The City of Albuquerque could help to create better market conditions for more car sharing in the region by offering car sharing services free parking spaces in busy areas and at transit stations. Government agencies can also participate as employer members of car sharing services

in place of an agency vehicle fleet.

- **Bike sharing** programs are flourishing in communities throughout the United States. These systems allow users to purchase a subscription or a daily pass that gives them access to a fleet of bicycles located within a defined area of a city. There are a handful of bike sharing models (like Nice Ride Minnesota, which employs different models in different parts of the state), but most are public-private partnerships that cities and regions can facilitate through funding and/or supporting the installation of infrastructure.

  Bike sharing systems, like some car sharing systems like Car2Go, are only successful when there is a high enough density of bicycles in its service area. The region may want to explore supporting the development of a bike sharing program in Downtown and the university area. Eventually, the transit system could be integrated with a bike share program in TODs so that transit riders can use the bikes to complete the last segments of their journeys. Bay Area Bike Share has a program that is oriented toward solving the last mile of transit trips with bike share docking stations at commuter rail stations and major destinations in communities.

  Albuquerque has just begun a pilot project using e-lock bikes by Zagster. MRCOG partnered with Downtown Main Street with the goal of expanding the program across the region if it is successful.

- **Ridesharing** is the sharing of one vehicle by more than one individual and takes many forms (such as carpools, vanpools, or private transit "jitney" services). Public agencies can encourage ridesharing through the implementation of HOVs and road pricing which gives drivers an incentive to carry passengers during peak hours. The most widespread ridesharing in the United States occurs along toll corridors such as the Bay Bridge in Oakland-San Francisco, California. There are a handful of ridematching software tools available such as Zimride, which matches users in an online platform, or Carma Carpool, which is available in a handful of cities and can be plugged in to the mode integrating application Ridescout, which already operates services for Albuquerque.

- **Employer commuter programs or transportation management associations**: Public agencies can directly provide or encourage ridesharing and other travel modes by coordinating and funding various activities of transportation management associations (TMA). TMAs are associations of employers in an area that has congestion and/or limited parking. These organizations promote TDM strategies to employers to encourage ridesharing, the use of transit and other alternatives to SOVs through incentives such as free or reduced-cost parking for carpools, incentives for buying transit passes, and other programs aimed at easing the transition to commuting by alternative modes. Some states, such as Washington, require large employers to enact a commute trip reduction program using these kinds of incentives.

  Areas with high demand for parking and limited space may provide special rates or free or entrance-adjacent parking spaces to registered carpools. These kinds of programs are typically managed by a TMA and are also common on university campuses where the university controls transportation and land use. These programs offer lower rates to registered carpools at preferred parking locations.

  ABQ Ride and Rio Metro operate Smart Business Partnership programs, which both incorporate

many TDM-related components. The programs began as a partnership but progress has not been made on creating a unified TDM program between the two agencies.

The Rio Metro Smart Business Partnership program includes over 60 employers and offers three levels of participation. Businesses are asked to provide transit information and/or bike maps, alternative transportation options, incentives for carpooling, and other measures in exchange for free advertising on the Rail Runner and other forms of recognition. The program does not include discounted passes or a guaranteed ride home program for transit commuters. Rio Metro is in the process of updating its Smart Business Partnership program and increasing emphasis in newly served markets. Ticket processing is also being updated which may allow for more flexibility in passes, including discounts and special offers.

ABQ Ride offers discount passes to employers through its version of the Smart Business Partnership program. The program, which has 161 participating government agencies and private businesses, only requires interested parties to sign-up but does not require any additional efforts to participate. ABQ Ride does offer a guaranteed ride home program for regular transit users who need alternative transportation in the case of an emergency.

Other Rio Metro efforts include marketing to increase transit ridership, a bike locker program, a summer youth pass, and special events. The bike locker program includes 130 units across 6-8 stations which are available for $25 for six months. Usage rates vary with a wait list in several locations. The summer youth pass offers a highly discounted pass for riders age 10-17 during the summer months on ABQ Ride, the Rail Runner, and Santa Fe Trails transit systems. Participation was low in 2013 but the pass will be reestablished in 2014. Special events include National Train Day, a Christmas-themed ride to Santa's Village, and additional service for events such as the Bernalillo Wine Festival. Rio Metro is currently developing a vision for its TDM program for 2014.

The City of Albuquerque also operates a bicycle TDM program and a bicycle safety education program to encourage use of alternative modes. The TDM program installs bike lockers and provides bicycle route maps to area businesses and installs other bicycle parking facilities in public spaces.

It may be advantageous for the businesses from the downtown area to the Central Avenue corridor to develop a locally-oriented commuter services program to market ridesharing, transit, bicycling, and walking. The cities or county can also develop an ordinance to require large employers or building developers to institute commute trip reduction programs to maintain a certain level of vehicle trips as a condition for development approval.

5.2 Examples of regional strategies to promote travel demand management

USDOT has produced a series of documents related to incorporating travel demand management into the transportation planning process. FHWA released a report called *Integrating Demand Management into the Transportation Planning Process: A Desk Reference*[16] that included a section describing

[16] http://ops.fhwa.dot.gov/publications/fhwahop12035/chap6.htm

recommended steps that MPOs can take to integrate TDM into their planning processes and funding programs. This report describes how, in general, most MPOs that have made TDM a cornerstone of their planning processes are large MPOs that cover regions with a history of extensive congestion or air quality problems. Other MPOs that have sophisticated TDM programs are those that cover jurisdictions required to initiate TDM programs because of State or local mandates, such as Washington, Arizona, and many counties in California. For medium-sized MPOs operating in areas without commute trip reduction mandates, such as MRCOG, the report recommends:

- Setting aside funding for TDM initiatives in the MTP
- Including TDM in the Congestion Management Process
    - Demonstrate that demand management programs have been given due consideration prior to recommending projects that add general purpose capacity to a given roadway corridor.
    - Provide a way to analyze TDM and operational strategies for projects that result in an increase of SOV travel. Travel demand reduction and operational management strategies should be incorporated into any project that increases capacity for SOV travel.
    - Define specific TDM and Travel System Management (TSM) strategies for the region's most congested facilities and prioritize potential TDM and TSM strategies for each facility.
- Developing TDM-specific strategic plans to help guide (1) long-range pursuit of TDM initiatives or (2) shorter-term operation of in-house TDM operations.
    - TDM-focused Task Forces/Working Groups – To further refine TDM-related initiatives, organize specific TDM committees, task forces, or advisory boards to help guide the overall planning process related to TDM.
    - Articulate regional TDM goals by (1) recommending TDM activities to meet these goals, (2) guiding investments in TDM activities, (3) defining an administrative structure to oversee the regional TDM program, and (4) establishing evaluation measures.

MRCOG has already gone quite far in identifying several TDM strategies in its CMP, and identifying specific TDM strategies[17] for the 30 most congested corridors in the region. The CMP establishes a basis for the region to be able to set aside funding to implement these strategies. MRCOG could fund some of these strategies as stand-alone projects or require that any project considered for Surface Transportation Program (STP) funds along the identified corridors funded with STP funds include the TDM strategies identified for it in the CMP. Some of these strategies, however, need champions within the region and MRCOG can play a role in helping to initiate them.

Volpe produced a report for FHWA titled *Developing a Regional Approach to Transportation Demand Management and Nonmotorized Transportation: Best Practice Case Studies*[18]. This report used four case studies to illustrate some good common practices that MPOs use to support TDM. The report identifies the following factors for success in developing an integrated regional approach to TDM by MPOs:

- Identify internal and external champions
    - The Pima Association of Governments (PAG) in Tucson, Arizona, provides oversight and coordination of local employer-based TDM programs.
- Proactively coordinate the work of local partners

[17] http://www.mrcog-nm.gov/images/stories/pdf/transportation/CMP/Strategies_Matrix_-_2012_Final.pdf
[18] http://www.planning.dot.gov/documents/regional_Approach_report.pdf

    - Sacramento Area Council of Governments (SACOG) maintains four special funding programs that fund TDM and nonmotorized investments in member communities. Project selection criteria are aligned with the goals in the MTP and are consistent with the region's focus on incentivizing and enabling more compact land uses.
    - SACOG, Denver Regional Council of Governments (DRCOG) and the Metropolitan Council of the Twin Cities are all MPOs that developed a TDM strategic plan that identified specific roles, responsibilities and performance measures for evaluating TDM activities. MRCOG could begin such a process by listing actors within the region that provide these types of services and identify ways that these services could be better coordinated or enhanced.
- Engage the private sector
    - DRCOG conducts outreach to employers in areas of the region not served by transportation management organizations (TMOs).
    - SACOG convenes a regional TDM Task Force which provides a forum for the regional coordination of TDM services and the sharing of best practices.
- Incorporate TDM performance measures in the decisionmaking process
    - As a requirement of its Congestion Management Plan, PAG requires that project sponsors include an analysis of TDM alternatives and identify TDM elements in TIP project proposals. PAG assigns projects with TDM elements additional points in project selection scoring formulas.
    - The Metropolitan Council funds a regional TDM program divided between the transit agency and three TMOs using CMAQ funding. This program is coordinated through a regional TDM plan that identifies roles, responsibilities, and performance measurements for all entities receiving funding.
- Implement data-collection programs for TDM
    - PAG performs an annual bicycle traffic count at over 100 locations to assess changes in bicycle ridership over time and collects and analyzes data from all employer-based TDM service providers in the region.
- Create a direct link between TDM and land use planning and between TDM and nonmotorized transportation planning
    - SACOG provides member communities with guidelines, technical assistance, and analysis tools to envision the impacts of future land use and transportation decisions at the local level. SACOG also maintains dedicated funding programs for community design and streetscape improvements.

5.3 Recommended actions for MRCOG to take to establish TDM programs

MRCOG is the ideal organization within the region to coordinate and expand TDM efforts. Being co-located with Rio Metro, which operates the Smart Business Partnership program, MRCOG could convene Rio Metro with other TDM players such as the City of Albuquerque, ABQ Ride and the University of New Mexico. MRCOG could provide staff support to work with a committee of these organizations to create a regional TDM plan that assigns roles, responsibilities and performance tracking methods to all players within the region. Future allocations of CMAQ, STP or other Federal funding for these programs could be tied to the performance of existing programs and the priorities identified collectively by the committee in the TDM plan. DRCOG and Metropolitan Council are two examples of MPOs that used this approach

to develop TDM plans in order to shed light on TDM activities for the benefit of policymakers responsible for programming Federal funds. After engaging in this effort, both regions identified the structure of their regional TDM programs and have provided guidance for monitoring and cooperation as the programs mature.

MRCOG could follow the example of PAG and require that all highway projects proposed for TIP funding demonstrate an analysis of TDM alternatives and include TDM components to their projects, where possible. MRCOG could develop selection criteria that would favor those projects that include strategies to manage travel demand. These strategies could include bicycle and pedestrian facilities, transit service, as well as other strategies described earlier.

6. Open Space Preservation Programs and Policies

Open space preservation can support several of MRCOG's long-term planning goals related to increasing Central New Mexico's resiliency to climate change:

- Protect critical habitat and preserve wildlife corridors
- Reduce future development in vulnerable areas, such as areas at risk for flooding or wildfires
- Support more concentrated development in transit-oriented activity centers

There are several different strategies for open space preservation that MRCOG could pursue to achieve these goals. These strategies may be employed at the state, local, or individual land-owner level and include the following implementation methods:

- Fee simple purchase of conservation land
- Conservation easement programs
- Agricultural preservation tax incentive programs
- Transfer of development rights (TDR)

Given the development pressures in Central New Mexico and limited land conservation budgets, it is important for MRCOG and its partners to coordinate their resources and develop clear regional priorities for open space preservation. For example, MRCOG and regional partners should develop a shared understanding of priority wildlife corridors and high-value conservation lands to target in their preservation efforts and collaborate to achieve their goals. This chapter ends with a discussion of how MRCOG could play a convener role in developing a regional vision and relating it to transportation and land use decision-making.

6.1 Implementation Strategies

6.1.1 Fee Simple Purchase of Conservation Land

Fee simple purchase of land to preserve as open space is the simplest form of land conservation and provides the largest level of environmental protection for the land preserved. However, it is also the most expensive and therefore would preserve a smaller area of land with limited preservation budgets. Land purchasers may include local, State, or Federal land management agencies or private land trusts. Other purchasers may include other public agencies, such as water or flood control agencies, which have missions that complement open space preservation.
In Central New Mexico, there are several sources available to purchase new conservation land, as shown in Table 1.[19]A couple of expired sources are listed as examples, too.

[19] Information compiled by the Trust for Public Land, http://www.conservationalmanac.org/secure/almanac/southwest/nm/programs.html.

Table 1: Potential Land Acquisition Funding Sources in Central New Mexico

Funding Source / Acquisition Agency	Jurisdiction	Conservation Funds	Notes
Land and Water Conservation Fund	Federal Program; disbursed through State grants and Federal acquisitions	National budget cap of $900 million per year	
State land acquisition	New Mexico Department of Game and Fish	Varies by year (no dedicated funds)	State land acquisition from the state's general fund and proceeds from nongame tax check-offs on income tax forms
State parks land acquisition	New Mexico State Parks	Varies by year (no dedicated funds)	State Parks purchases land through capital outlays and private donations
Bernalillo County Conservation Ballot Measure (2014)	Bernalillo County	$28.8 million	15-year property tax levy of $0.20 per $1,000 of assessed property value for open space and other areas acquisition and maintenance
Santa Fe County Parks Bond (2008)	Santa Fe County	$3.5 million	Bond for parks, open space, and trail acquisitions and improvements
Albuquerque Municipal Parks Bond (2007)	City of Albuquerque	$6 million	Bond for parks and recreation capital improvements including land acquisition

One example of a regional collaboration to purchase land that contributed to several local open space preservation, environmental, and flood control goals is the Valle de Oro National Wildlife Refuge in Bernalillo County. Beginning in 2012, the U.S. Fish and Wildlife Service purchased this property with financial assistance from the Trust for Public Land (a private, non-profit land trust), the U.S. Bureau of Reclamation, the State of New Mexico, the Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA), and Bernalillo County. This refuge is currently in the planning stages and will encompass 570 acres, of which 488 acres have been acquired.

6.1.2 Conservation Easements

Conservation easements are voluntary agreements between a landowner and a government agency or qualified non-profit that restrict future development and/or subdivision of a property. These easements become binding restrictions on the property's title, which transfer with ownership. Different easements can specify different levels and types of allowable development. Conservation easements can be permanent title restrictions or they can last for a set period of time.

Landowners may sell conservation easements to qualifying public or private entities or they may donate easements to receive Federal and State tax benefits. The Federal government and many States offer tax breaks for land under conservation easements. In New Mexico, the Land Conservation Incentives Act (2003) allows landowners to receive income tax credits in an amount equal to 50 percent of the fair

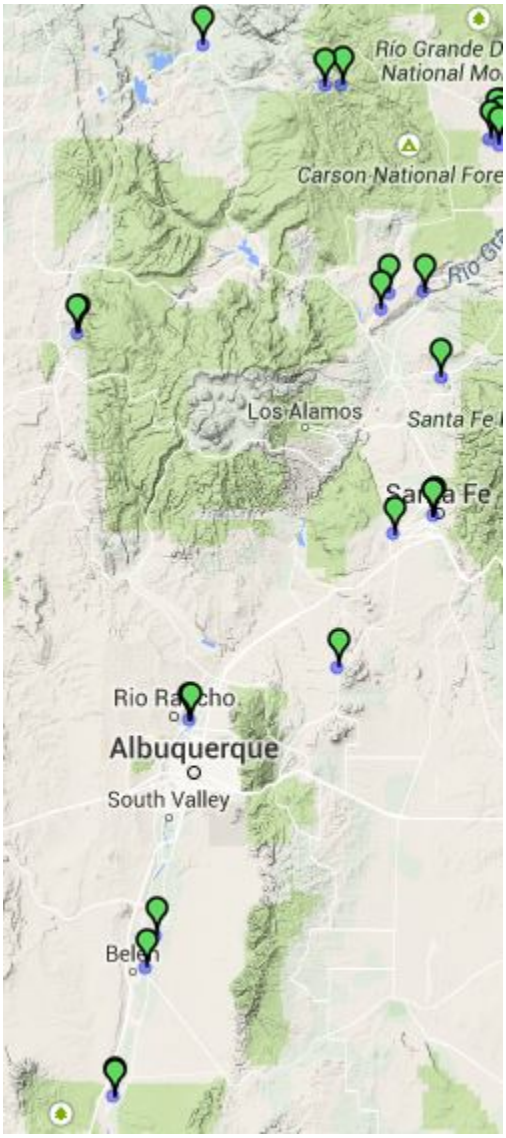
market value of their land or interest in their land that is conveyed through donation or conservation easements for open space to a public or private conservation agency. The amount of the credit may not exceed $250,000 and is transferable.

Conservation easements are useful because they provide a mechanism for preserving open space land without purchasing it outright, which allows conservation organizations to protect more land with their finite budgets. However, they can also be expensive, so they may not always be cost-effective. In addition, some landowners are unwilling to enter into binding restrictions on future land decisions, limiting their willingness to participate.

Figure 3 shows the locations of existing conservation easements in the CCSP study area.[20] To maximize the impact of conservation easements for open space preservation in Central New Mexico, MRCOG could work with county, municipal, State, Federal, and non-profit partners to develop targeted outreach and develop relationships with landowners in high-priority conservation areas.

[20] National Conservation Easement Database, http://conservationeasement.us/browse/map.

Figure 3: Conservation Easements within the CCSP Study Area



6.1.3 Agricultural Preservation Tax Incentives

Tax incentive programs for agricultural land reduce tax burdens for landowners by offering tax credits or deductions in exchange for continuing agricultural land use. These programs have two main goals: reduce financial pressure on farmers to develop land and provide a financial incentive maintaining agricultural uses.[21] Programs vary based on the amount and type of tax break and the presence or absence of a time commitment for agricultural conservation. In general, programs that require a commitment to maintain land in agricultural production are more effective in preserving open space. One notable example is California's Williamson Act (1965). Under the Act, landowners receive reduced

[21] Agricultural use itself has environmental impacts and may not be resilient to climate change impacts. For example, irrigated agriculture requires substantial amounts of water for its operations and is not as resilient to water scarcity as rangeland agriculture.

property tax rates by entering into binding 10-year contracts, which continuously renew until the landowner files for non-renewal. At that point, restrictions against developing the property remain for nine years, during which taxes gradually increase until the contract expires. A recent survey of rangeland property owners in California found that the Williamson Act had the most participants of any conservation program, at 19 percent of the sample.[22]

Programs like the Williamson Act can be an effective way to preserve agricultural land, but they may also be vulnerable to abuse by landowners who establish a "token" agricultural use to qualify for lower taxes. New Mexico currently does not offer tax breaks for maintaining agricultural land, so MRCOG and its partners would have to lobby for enactment of agricultural preservation tax legislation if they chose to pursue this strategy.

6.1.4 Transfer of Development Rights

Transfer of Development Rights (TDR) is a land use strategy for using market forces to help preserve land in areas with high conservation value and create more concentrated development in other areas where infrastructure can support it. Usually TDR programs allow landowners in "sending areas" (areas with high conservation value) to sell development rights to developers in "receiving areas" (areas where more development is encouraged), who can then build higher densities than would otherwise be allowed under zoning. This provides a market incentive for open space preservation and more concentrated development patterns.

One successful example of a regional TDR system is the Tahoe Regional Planning Agency's (TRPA) TDR Exchange, which facilitates TDR within the Lake Tahoe region in California and Nevada. The TRPA's online marketplace connects buyers and sellers of development rights in the four-county region. The TRPA incentivizes participation by allowing landowners to transfer development at a rate greater than 1:1 if the transfer supports regional planning goals. For example, landowners can gain bonuses on a sliding scale up to a 1:3 development ratio (allowing 3 units on the receiving site for every one unit not built on the sending site) depending on the level of sensitivity of the sending site or the proximity to transit of the receiving site.

Other examples of implemented TDR systems include:

- Boulder County, CO
- Long Island Pine Barrens, NY
- Montgomery County and Calvert County, MD
- Collier County, FL

There are a number of conditions that are generally required for a successful TDR program:[23]

- Clearly identified resource areas for protection
- Consensus regarding the location and extent of receiving areas
- Infrastructure that can support increases in density in receiving areas
- A clearly written bylaw
- Strong market conditions (e.g., demand for increased development in receiving areas)

[22] Ferranto, S., L. Huntinger, et al., 2011. "Forest and rangeland owners value land for natural amenities and as financial investment." *California Agriculture* 65(4): 184-191.
[23] Commonwealth of Massachussetts, 2008. Massachusetts Smart Growth / Smart Energy Toolkit: http://www.mass.gov/envir/smart_growth_toolkit/pages/mod-tdr.html.

- A sophisticated reviewing/permitting authority
- Open communication between local agencies

Typically, establishing a TDR system requires the following implementation steps:[24]

1. **Conduct a Real Estate Market Analysis (REMA)** to understand local market demand. Specifically, the REMA should analyze local land values, quantify the value of development rights from the sending areas, and assess whether there is sufficient market demand and rate of development in the receiving areas to support a TDR market.
2. **Draft a Bylaw or Ordinance** for the TDR system. This may also require review of existing state and local land use laws to identify potential constraints or conflicts.
    a. **Designate Sending and Receiving Areas**, based on conservation priorities and areas planned for higher density development in regional plans or local comprehensive plans.
    b. **Create a formula for allocating rights in the sending areas and determine the value of a credit in the receiving areas.** As with the example above, credits could have one uniform value or could be valued differently depending on the nature of the sending and receiving sites.
    c. **Establish administrative / permitting procedures**, such as recording of deed restrictions and tracking of credits.

If MRCOG decides to pursue a TDR strategy in Central New Mexico, it should start by conducting a REMA to understand its viability and to design a successful TDR system given local real estate markets. MRCOG could share this information with the municipalities and counties that have zoning authority to support them in developing TDR ordinances. MRCOG could also convene the local governments in the region to develop a regional TDR system similar to the TRPA's, and it could play a facilitating role in the process of designating sending and receiving areas informed by regional land use priorities. The TRPA example above may be most applicable to MRCOG, since the TRPA TDR program is regional in scale and spans several jurisdictional boundaries in two states.

6.2 Regional Visioning and Collaboration

To be most effective in achieving regional planning goals, all of the strategies above require regional collaboration and strategic implementation based on established regional priorities. It is important for MRCOG and its partners to develop clear priorities for open space preservation based on their goals (such as climate change resilience, preserving wildlife corridors and key habitats, and reducing development at risk of flooding or wildfires). This will allow decisionmakers in the region to maximize their impact by focusing their limited funds on the areas most important to preserve.

Two examples of collaboration to create open space visions and coordinate implementation strategies on a regional scale are the Bay Area Open Space Council in California and the Chicago Wilderness Alliance in Illinois. Both organizations convene local, state, and Federal governments in their regions as well as conservation non-profits to develop regional open space visions, coordinate policies, and provide technical assistance to members.

Central New Mexico could benefit from similar regional collaboration. The Middle Rio Grande Urban Waters Federal Partnership, a regional collaboration between Federal, State, and local partners for

[24] Ibid.

conservation and community planning along the Middle Rio Grande, may provide an appropriate forum for this collaboration, or MRCOG could build off this effort. A group of conservation stakeholders for the region could work to establish priorities for all of the implementation strategies listed above, such as priority conservation land, conservation easement strategies, legislative changes, and designing a viable TDR marketplace.

One initial step would be to articulate goals and objectives for open space preservation and a set of criteria for evaluating the conservation value of different land areas. The group could then use GIS analysis to identify the areas that best meet those goals, which could inform conservation spending or TDR area designation. One informative example is the Bay Area Open Space Council's Conservation Lands Network, a map of tiered priority conservation areas in the region based on geospatial analysis. MRCOG also has the unique opportunity to consider the role that regional transportation projects would have on these open space preservation efforts. For example, MRCOG could develop scoring as part of its project selection criteria for the next MTP that would give additional points to projects that support regional development goals and deduct points from projects that undermine them by facilitating development in priority conservation areas.

7. Green Infrastructure Investments

Another area with potential to increase Central New Mexico's resiliency to climate change impacts and reduce the environmental impacts from regional development is green infrastructure. Green infrastructure is a general term for infrastructure, such as transportation, public utility, or land use developments, which incorporates design elements to reduce environmental impacts or even perform environmental services, such as mitigating flood risk, improving water quality, or enhancing habitat. This section of the Integration Plan focuses on green stormwater infrastructure that can help MRCOG achieve its goals of increasing flood resiliency and improving habitats, including:

- Green stormwater drainage infrastructure
- Porous pavements and other surfaces
- Parks and open space

This infrastructure's primary purposes are to reduce, slow, and clean urban runoff from precipitation on impervious surfaces, such as roads, parking lots, or buildings. This can reduce risks of flash flooding, sewer overflows, and pollution from urban runoff. An additional benefit of some of these approaches, such as vegetated swales, parks, and reducing paved surface area, is that they can help reduce the urban heat island effect, which is another MRCOG goal to increase the region's resiliency.

The City of Los Angeles[25] articulated the following green infrastructure principles, which are relevant to MRCOG's goals in Central New Mexico:

- Decentralize and manage urban runoff to integrate water management throughout the watershed by having many small, local sites for stormwater retention rather than relying on one large sewage treatment system
- Preserve or restore the ecosystem's hydrological functions
- Reduce impervious surface ground cover and building footprint
- Maximize infiltration on-site or capture water for filtration and/or reuse

7.1 Types of Green Infrastructure

This section provides information on a few designs and strategies for green stormwater infrastructure. For a more in-depth analysis, see the U.S. Environmental Protection Agency's (EPA) Stormwater Best Management Practices website. The EPA also published an analysis of green infrastructure costs and benefits, including case studies, which can provide more information on potential project costs.[26]

7.1.1 Green Stormwater Drainage Infrastructure

[25] City of Los Angeles, 2009, *Green Infrastructure for Los Angeles: Addressing Urban Runoff and Water Supply Through Low Impact Development*, http://www.environmentla.org/pdf/LID-Paper_4-1-09_530pm.pdf.
[26] U.S. Environmental Protection Agency, 2007, *Reducing Stormwater Costs through Low Impact Development (LID) Strategies and Practices,* http://water.epa.gov/polwaste/green/upload/2008_01_02_NPS_lid_costs07uments_reducingstormwatercosts-2.pdf.

Examples of green stormwater drainage infrastructure include vegetated swales, rain gardens, and other natural stormwater retention structures. These structures generally function by reducing or replacing impervious surface areas or creating pervious areas where water can collect and slowly infiltrate into the soil, rather than flowing rapidly off-site and overwhelming traditional sewer systems. For example, Los Angeles and the City of Ventura, CA, have developed "green streets" programs which incorporate vegetated swales into streetscape designs, such as in strips between sidewalks and roads or in curb bump-outs.

Costs to construct vegetated swales and similar structures vary based on design and vegetation used, but the EPA estimates that they usually cost less to construct than curbs and gutters or underground storm pipes.[27]

7.1.2 Porous Pavements and Other Surfaces

Another strategy for reducing storm runoff from development is to increase the porosity of traditionally impervious surfaces. One primary method is the use of porous pavements. Porous pavement requires regular maintenance to vacuum build-up from its pores. Generally, porous pavement is most appropriate for low volume and low speed roadways, parking lots, or sidewalks. Costs range from $0.50 to $1.00 per square foot.[28]

Another method to increase the porosity of transportation infrastructure is to use permeable pavers or vegetated pavers where appropriate (such as driveways, sidewalks, or parking lots). These surfaces allow water to infiltrate through crevices between paving blocks and do not require vacuuming.

7.1.3 Parks

Preserving or restoring open space land also contributes to green stormwater infrastructure by reducing the land area covered by impervious surfaces and providing large areas of porous land with natural drainage. For example, the Valle de Oro National Wildlife Refuge, recently dedicated in Bernalillo County, plays a dual role as wildlife habitat and flood protection infrastructure.[29] The Open Space Preservation Programs and Policies section of this document provides more information on potential implementation strategies for increasing park land.

7.2 Implementation Strategies

Green stormwater infrastructure can be constructed on public facilities, such as public road and municipal parking lots, or private development. The City of Los Angeles[30] lists the following strategies for implementing green stormwater infrastructure:

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[27] EPA, 2002, Stormwater Technology Fact Sheet: Vegetated Swales, http://water.epa.gov/scitech/wastetech/upload/2002_06_28_mtb_vegswale.pdf.

[28] EPA, 2014, Water Best Management Practices: Porous Asphalt Pavement, http://water.epa.gov/polwaste/npdes/swbmp/Porous-Asphalt-Pavement.cfm.

[29] U.S. Fish and Wildlife Service, 2014, "Innovative Regional Partnerships: Valle de Oro National Wildlife Refuge," http://www.volpe.dot.gov/sites/volpe.dot.gov/files/docs/RegionalPartnersCS_090514_FINAL.pdf.

[30] City of Los Angeles, 2009.

- **Low-Impact Development (LID) Ordinance:** Municipalities with zoning authority can adopt land use ordinances requiring private developments above a certain size to incorporate green stormwater infrastructure into their designs. For example, Los Angeles County has adopted a LID ordinance.[31]
- **Green Streets Policies:** The City of Tucson, AZ, has recently adopted a Green Streets Policy, which requires the City to incorporated green stormwater infrastructure into all new public streets or street reconstruction projects.[32]
- **Municipal or state bonds:** Cities or states can pursue bonds to fund green stormwater infrastructure projects.
- **Raising Stormwater Pollution Abatement Fees:** Municipalities can raise funding for green stormwater infrastructure by raising existing stormwater pollution abatement fees.
- **Individualized Drainage Fees:** Stormwater utilities, such as municipal water departments or flood control districts, can change their billing structures to charge property owners based on the area of impervious surface on their property rather than the number of units or parcel size. This change can have two main implementation benefits: 1) it may raise additional revenue for green stormwater infrastructure and 2) it creates an economic incentive for property owners to implement green infrastructure solutions to reduce their impervious surface area. Cities that have adopted individualized drainage fee structures include Seattle,[33] Minneapolis,[34] and Philadelphia.[35]
- **"One Percent for Green Streets" Fund**: The City of Portland, OR, has a fund that collects one percent of the construction budget for projects within the city's right-of-way, which the city uses to fund green streets projects throughout the city.
- **Parks funding:** See the Open Space Preservation Programs and Policies section for more information on potential implementation strategies.

Implementation partners within Central New Mexico include land management agencies (local, State, or Federal), transportation agencies, municipalities, and water management districts. MRCOG could play several roles to catalyze implementation. These include:

- **Conduct research** to inform local partners. Other cities and regions that have adopted green infrastructure policies and programs, such as Tucson or Los Angeles, could provide valuable insights on their challenges and successes. Potential research topics include:
    - the financial and legal viability of different implementation strategies,
    - the feasibility of different green infrastructure designs in the Southwest, and
    - appropriate vegetation choices for Central New Mexico's climate (such as native, drought-tolerant species).
- **Provide technical assistance** to local partners.
- **Develop a Best Management Practices Manual** with information on locally appropriate implementation options.

[31] Los Angeles County Department of Public Works, 2014, Low Impact Development (LID) website, http://dpw.lacounty.gov/wmd/dsp_LowImpactDevelopment.cfm.
[32] City of Tucson Department of Transportation, 2013, Green Streets Policy, http://tdot.tucsonaz.gov/files/transportation/Green_Streets_APG_Signed_by_Director.pdf.
[33] City of Seattle, 2015, Drainage Rates, http://www.seattle.gov/util/MyServices/Rates/DrainageRates/index.htm/.
[34] City of Minneapolis, 2015, Minneapolis Stormwater Utility Fee, http://www.ci.minneapolis.mn.us/publicworks/stormwater/fee/index.htm.
[35] City of Philadelphia, 2015, Stormwater, http://www.phila.gov/water/wu/stormwater/Pages/default.aspx.

- **Develop Green Infrastructure Policies** in collaboration with local governments.
- **Support Pilot Projects,** either financially or with technical assistance, to test and demonstrate the success of different green infrastructure options in the region.

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