



CHAPTER 5

MEASURING AND MANAGING FOR SUCCESS

Measuring and Managing for Success

Tahoe is unique not only in its natural beauty and quality of life, but in its transportation needs. Unlike most places, where morning and evening commutes define transportation priorities, travelling in Tahoe is much more variable defined by the seasons, recreation activities, and weather.

Knowing what is happening on Tahoe's roads, paths, and bus routes is important. That information is used to adapt planning approaches, respond to issues, and evolve projects and programs for better outcomes.

Adaptive management is how TRPA manages for success.

This chapter provides an overview of TRPA's performance measurement framework. It discusses how the transportation system is monitored using collected data, specified measures, and regional tools. It reviews key measures for the transportation system and links the information back to the planning that results in the regional transportation plan and future updates to it. Additional information on performance measurement can be found in Appendix I.

PERFORMANCE MEASUREMENT FRAMEWORK

Based on best available science and a recommendation from the Tahoe Science Advisory Council, TRPA recently adopted a system of best practices for measuring and evaluating Tahoe's transportation systems. As with other programs, TRPA's performance measurement framework for transportation is results chain based.

Policy Highlight

Policy 4.16: Maintain monitoring programs for all modes that assess the effectiveness of the long-term implementation of local and regional mobility strategies on a publicly accessible reporting platform (e.g., www.laketahoeinfo.org website).

Results chains link management actions to desired outcomes or goals. The results chain that TRPA uses to gather, structure, and adaptively manage planning include three different types of information: inputs, outputs, and outcomes. Inputs identify what

was done, for example the miles of paths that were plowed in the winter.

This type of information is necessary to demonstrate what actions are being taken.

Outputs are measures of the effectiveness of the inputs, for example, how many people rode the paths that were plowed in winter.

Finally, outcomes are the desired goals, for example, reduced reliance on the automobile. Sometimes outcomes are represented by a threshold, such as targets for Total Vehicle Miles Traveled, and sometimes by a supporting performance metric, such as goals for Non-Auto Mode Share (the percentage of trips taken not in a personal automobile).

The framework ensures that needed information is collected at each level so program managers can successfully evaluate the effectiveness of implemented programs and projects, reliably identify strategies that work, and change strategies that do not.

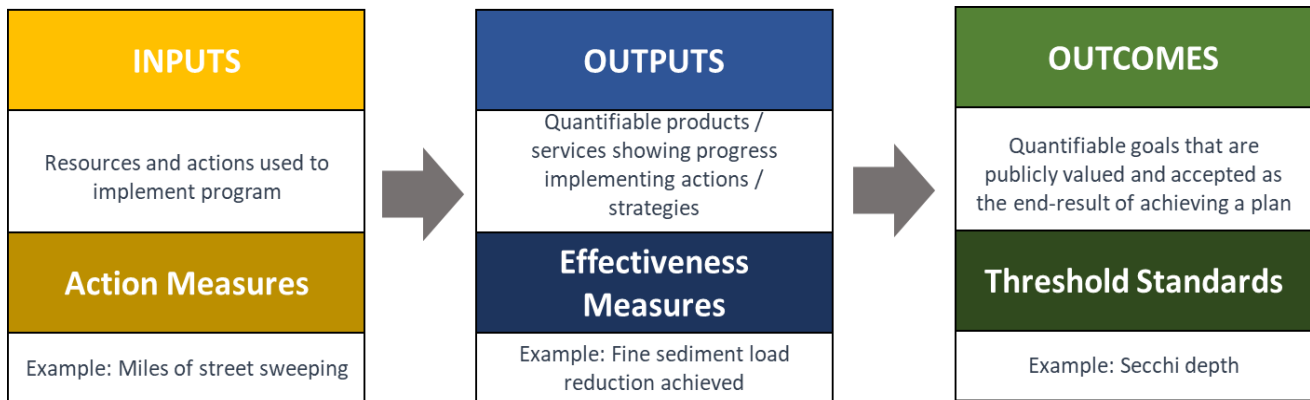


Figure 70: Performance Measure Framework

The example on the following page illustrates the framework and how it is used to continuously monitor progress toward achieving transportation goals:

TRPA identifies shared-use paths as an important approach to achieving the Bi-State Compact mandate to reduce reliance on the personal automobile.



Figure 71: Bike Trail Counter on the East Shore Tahoe Trail

TRAILS RESULTS CHAIN

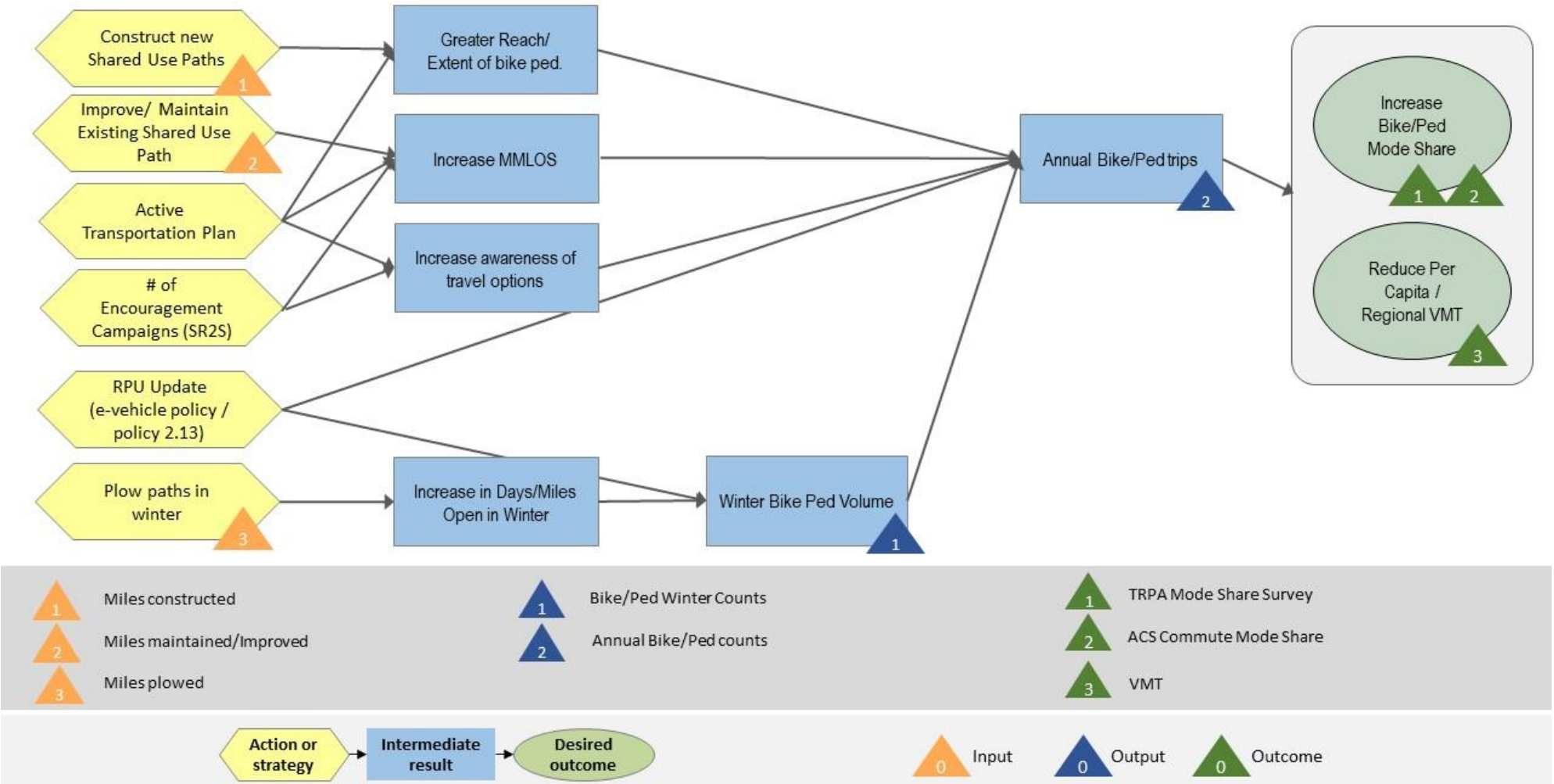


Figure 72: Trails Results Chain Demonstrating the Performance Measurement Framework

The measured impact of constructing trails is reflected in the plan's goal of building seven new miles of paths by 2025, 47 new miles of paths by 2035, and 110 new miles of path by 2045.

Establishing those goals in the Regional Transportation Plan results in projects that build shared-use paths being prioritized for funding, as well as programs that educate and encourage travelers to use the paths.

Every two years, TRPA measures the plan's progress by calculating how many miles of paths and trails have been built. This data is transparent and publicly reported at LakeTahoeInfo.org, the online information exchange for the Lake Tahoe Region.

The reason for building those shared-use paths, however, was to reduce reliance on the personal automobile. Progress toward that goal is also measured every two years through TRPA's travel survey and the Bicycle and Pedestrian Monitoring Protocol, each of which calculates the number of trips in Tahoe that are made by people walking and biking versus driving in a car.

This information, combined with data on the number of people riding transit buses, represents all travelers in Tahoe that use what is called a non-auto mode share, a performance measure discussed later in this section.

See Appendix I for more information on this framework and monitoring protocols.

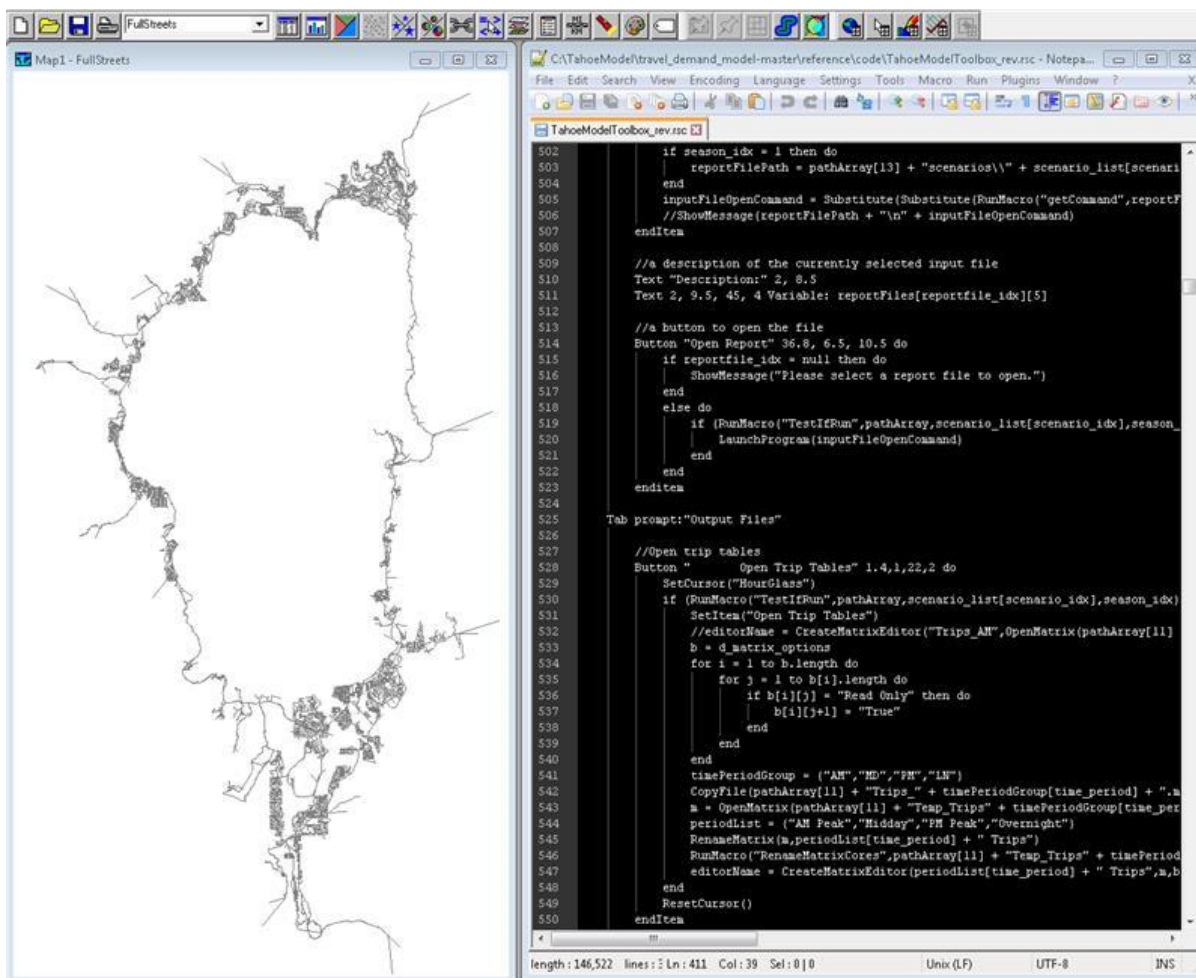


Figure 73: Transportation Model for Lake Tahoe

MONITORING THE SYSTEM

Tracking the performance of the roads, paths, and transit services in Tahoe happens in many ways. Transit surveys provide first-person information about people riding the bus — why they are riding, when, how often, and what would help their trips be even better. People biking and walking the many trails and paths in Tahoe are counted using infrared detection in many cases. Big data for traffic analysis provides real time congestion information for roads in the region.

Roadways are monitored and measured for congestion, but congestion-free roadways are not the goal of the Regional Transportation Plan. Instead, the Congestion Management Process (Appendix H) is used. It emphasizes using existing roadways in the region more efficiently and enhancing the entire transportation system through more travel options.

Policy Highlight

Policy 4.15: Establish a uniform method of data collection and forecasting for resident and visitor travel behavior and demographics

The interrelationships between the performance measurement framework, data collection, and analysis tools are discussed in the following sections.

Data Collection

TRPA collects data from a variety of sources. Since 2006, TRPA has conducted Basin-wide travel surveys every two years to better understand basic travel characteristics of both residents and visitors. The data collected — which includes how people are traveling, where they are travelling from and to, and why — is used for evaluating regional performance metrics, project planning, and travel demand modeling.

Demographic and socioeconomic data is gathered from the U.S. Census, counties,

states, and/or other organizations, such as the Nevada Gaming Control Board. These data provide more information about residents and employees in Tahoe, ensuring projects and programs best serve their needs.

Roadway congestion is analyzed using traffic analysis data from industry leader, Inrix. Intersection performance is evaluated every four years with the update to the Regional Transportation Plan. Big data from cellular phone service providers and vehicle location and navigation systems also creates new opportunities to better understand and evaluate roadway congestion and travel patterns in the region, for planning transit services, and more sustainable recreation travel options.

Partners

Data collected by partners in the region also informs transportation analysis. For example, Placer County collected vehicle trip generation (VTG) rates and parking inventories as part of its Resort Triangle Transportation Plan planning process. These Tahoe specific data are valuable for planning and implementing projects and programs that reduce automobile trips. Tahoe transit providers, TTD and TART, each survey riders which informs transit service planning. TRPA and its local partners developed the Bicycle and Pedestrian Monitoring Protocol and the Transit Monitoring Protocol to gather more detailed and more consistent information. See the Transportation System Management Section and Appendix I for more information on the protocols.

Tools

TRPA utilizes multiple tools to advance the performance measurement framework, each with distinct strengths that provide invaluable information for the plan.

Travel Demand Model

TRPA utilizes the Tahoe Travel Demand Model (Tahoe Model) to analyze travel behavior, estimate daily regional vehicle miles traveled (VMT) and greenhouse gas (GHG) emissions for a base year and future forecast periods. The model is activity-based, which means it estimates and forecasts travel behavior on the transportation system to provide a better understanding of travel behavior into and around Tahoe and roadway congestion in the region. It also provides the best available data and methods to determine compliance with required standards, including the regional VMT threshold standard, and GHG reduction targets set in California by CARB.

The Tahoe Model is designed to estimate VMT by various traveler types (residents, day and overnight visitors, external workers, etc.) and represent travel on a typical early or late summer weekday. The Tahoe Model is an aggregate of three separate models: A Resident Model, a Visitor Model, and an External Worker model.

Each model has slightly different activity and destination category options: Residents make work, school, and discretionary (eating, shopping, and recreation) trips; visitors, second-home owners, and guests make recreation, shopping, and other trips; and external workers make work commute trips. The model estimates the expected travel mode (e.g., auto, transit, walk, or bike) for each type of user and produces traffic projections for intersections and roadways on the model day and for peak periods during that day. Since these estimates are based on regional data, they are useful for understanding region-wide impacts.

The recently completed model update is the foundation for updating TRPA's project-level impact assessment to create consistency between redevelopment projects and regional transportation plan implementation through project level mitigations. This update also supports SB 743 requirements for the region's California jurisdictions. See Appendix G for more information on the model.



Figure 74: TRPA staff installs a bike counter along US 50

Transportation Model Update

To help guide future investments in the Tahoe Model, TRPA convened the Tahoe Model Working Group in 2019. The group included representatives from neighboring metropolitan planning organizations, non-governmental organizations, technical experts, and community stakeholders. The process was essential for more comprehensive analysis of project impacts, including accounting for VMT both in and outside the region, and realizing the suite of complementary GHG reduction targets established by each state (AB32, SB475, SB391, SB275) and associated executive orders (OPR 2018). The working group also coordinated investments in data collection and modeling tools.

The group prioritized several improvements to the Tahoe Model to support plan forecasting.

Highlights include:

1. **Incorporation of External Trip Lengths:** The Tahoe Model is designed to focus on trips and trip distances that occur within TRPA's jurisdictional boundary. It accounts for all vehicle trips that enter and exit the basin and has basic capability to account for trip lengths coming from outside the region. To update the model for more robust assessment of VMT resulting from inter-regional travel and SB 743 analysis, traffic analysis zones (TAZs) outside the region are being added to capture the full distances of travelers to and from Lake Tahoe.
2. **Updated Entry/Exit Traffic Volume Composition:** New external station count data was analyzed using Streetlight Data (smart phone and navigation-based data) to inform several key model parameters, including the percentage of through travel (passenger and truck), external worker, resident, visitor, and truck volumes that make up the daily external station traffic volumes.
3. **Updated Visitor Travel Patterns:** The visitor sub-model sample records were updated based on the 2018 Summer Travel Survey. The updates better represent recent changes in visitor composition and behavior. The frequency distributions of the patterns observed in the 2018 Summer Travel Survey were tabulated and compared with the calibrated patterns of the prior 2014 base year model run.
4. **Updated External Worker Travel:** The 2012-2016 five-year ACS Data and LEHD Origin-Destination Employment Statistics Data was used to update the travel patterns of external workers (in-commuters) and residents who work outside the region. StreetLight data was used to further refine worker flow patterns. The work included an update to the origin-destination matrix, and recalibration of the external worker sub-model.
5. **Updated Recreation Travel Patterns:** The model uses a "relative attractiveness score" for visitation location attractiveness to estimate how likely travelers are to visit a specific destination. Recreation travel is another area where TRPA has explored the use of big data sources, such as StreetLight, in conjunction with traditional parameters (e.g., venue capacity, parking availability, cost) to better represent visitor behavior. The visitor destination choice sub-model was calibrated using the newly collected data.

Interactive Tools

TRPA has developed multiple online and interactive tools to make it easier for anyone to find, download, and analyze Tahoe transportation information. These tools include:

LakeTahoelInfo.org: Provides details about all Environmental Improvement Program (EIP) projects, including plan projects.

LinkingTahoe.com: Provides links to regional transportation plans and transportation projects.

TRPA.gov/rtp: Interactive website for the plan.

Project Impact Assessment Tool

In the Tahoe Region, traffic congestion and parking shortages can be addressed by reducing the number of trips that are made by car and improving and incentivizing the use of other types of travel such as carpooling, transit, walking, and biking. To attribute impacts and mitigation requirements fairly and consistently to development and redevelopment projects, a state-of-the-art project level analysis tool is being developed to quantify the VMT generated by a project and the mitigations needed to offset its impact to the transportation system. These mitigations are the projects and strategies featured in the plan. As a result, private development helps to improve mobility in Tahoe and attain and maintain the VMT threshold standard. The project level analysis tool will coordinate with local governments to assess and mitigate new development and redevelopment project impacts to VMT uniformly seamlessly.

VMT Threshold Update

The VMT Threshold standard, which was established through the Bi-State Compact in 1982, is being updated. The threshold's origin was rooted in concerns over water quality and the standard itself established a goal of reducing NOx emissions from cars and trucks in the region by 10% from 1981 levels. The goal of the standard was accomplished over 20 years ago, and emissions continue to decline. While the current standard no longer serves the purpose for which it was created, the region has other goals for which VMT can still be used as a measure. The region's current goals include, reducing mobile source GHG emissions, reducing dependency on the personal automobile, and creating more sustainable communities, all of which can be measured with VMT per capita.

The proposed VMT threshold standard of VMT Per Capita will shift away from the old-NOx based threshold standard and promote attainment of both California and Nevada GHG reduction goals and furthers the desired future development vision of the Regional Plan by concentrating mixed-use development in town centers and connecting those town centers and recreation sites with biking, walking, and transit options. The VMT Threshold standard update is anticipated to be completed spring of 2021.

Mitigation Fee

Most development projects pay an air quality mitigation fee, which is being updated to a mobility mitigation fee to align with the project impact assessment tool and project and funding needs outlined in the plan. The fee will ensure that new development projects contribute their fair share of funding to promote regional mobility and implement the plan.

TRACKING GOALS THROUGH PERFORMANCE

Performance measures ensure the plan's goals and policies are advanced through its projects and programs. The plan identifies several measures for monitoring progress, including goals for how many people are walking, biking, and using transit. TRPA works closely with the two state DOTs on target setting and tracking of key safety measures, such as the number and severity of crashes, and roadway infrastructure, including pavement and bridge condition, to make sure routine maintenance is completed. These measures are collected and evaluated every one-to-four years, depending on the measure.

Leading performance measures are reviewed in this chapter. Additional supporting performance measures and analysis, including the remainder of the federal measures, are discussed in Appendix I.

Threshold Standards (Regional)

In 1982, TRPA adopted threshold standards in nine environmental threshold categories. These environmental standards indirectly define the capacity of the Tahoe Region to accommodate additional land development.

Two performance measures relate to transportation goals: Daily Vehicle Miles Traveled (VMT) and VMT per capita. See Appendix I for more performance measure information on VMT per capita.

Daily Per Capita VMT



VMT per capita is a measure of how far individuals travel each day. VMT per capita is a measure of efficiency of a transportation system in moving individuals between the places they need to be. Higher VMT per capita regions are those where individuals are traveling farther distances to get between home, work, shopping, etc. and are generally reliant on the automobile to move

between their destinations. Lower VMT per capita regions are those that are characterized by individuals travelling shorter distances between their desired destinations, and where there are options other than the car (e.g. bike paths, transit systems) that are chosen more frequently as a means of taking those trips..

VMT is also used to evaluate the effectiveness of land use and transportation policy decisions, such as the location of affordable and achievable housing; the effectiveness of travel demand management strategies that encourage employees to bike, walk, or carpool to work; the effectiveness of inter-regional transit services, for example the proposed Reno-Carson-Tahoe inter-regional transit service; and the value of sustainable recreation solutions, including transit service to Emerald Bay.

DAILY PER CAPITA VMT

**TARGET: 6.8% reduction
from 2018 by 2045**



**PERFORMANCE: No status,
proposed standard (2021)**

2018 Per Capita Daily VMT: 12.48

2045 Per Capita Daily VMT: 11.63

Figure 75: Daily Per Capita VMT

The existing threshold measure is calculated using the Tahoe Travel Demand Model. For more information on the Tahoe Model, see Appendix G.

Transit, Trails, and Communities

Multiple measures report progress toward meeting the goals of key focus areas in the plan: transit, trails, and communities. Some of these measures reflect goals that are specific to this region, while others are federal or state requirements. Collectively, these measures provide reliable information

needed to track progress, adapt planning approaches, and improve outcomes.

Non-Auto Mode Share



Mode share refers to the percentage of all trips made by on a typical summer day in Tahoe by each type of transportation: walking, biking, using transit, or driving a personal automobile. The plan tracks non-auto mode share, which is the proportion of all trips that are made by foot, bike, scooter, and transit. Tracking this performance measure guides planning and the implementation of trail and transit projects and travel demand management programs.

This performance measure is calculated using the average of the prior two TRPA travel surveys.

Non-Auto Mode Share Target

Improve average non-auto mode share.

NON-AUTO MODE SHARE

TARGET: Improve average non-auto mode share calculated from the two most recent TRPA travel survey results.

PERFORMANCE: ON TARGET



Figure 76: Non-Auto Mode Share

Note: TRPA will be reviewing its travel survey methodology to consider improvements to measuring non-auto mode share, including the potential for using real-time data to allow more frequent and more accurate measuring.

Safety



Maintaining a transportation system that is safe for everyone is one of the most important goals of the plan. Addressing transportation safety in Tahoe relies on collaboration among numerous partners; regular and consistent data collection, analysis, and reporting on key safety measures; and responding to identified safety needs in plans and project designs. Policy Highlight

Policy 3.1: Coordinate the collection and analysis of safety data, identify areas of concern, and propose safety-related improvements and user awareness that support state and federal safety programs and performance measures.

Rate of Serious Injuries per 100 million VMT

This performance measure is one of several national standards for tracking the safety of a region's roadways. See Appendix I for additional roadway safety measures.

TRPA and its partners collect and report on multiple additional crash performance metrics (Appendix I). This measure is tracked using the Tahoe Model and crash data provided by the California and Nevada departments of transportation and local jurisdictions.

Rate of Serious Injuries per 100 Million VMT Target

Reduce by 1.5% in California and .05% in Nevada the respective state targets, based on a five-year rolling average.

2020 Rate of Serious Injuries Per 100 Million VMT Performance

Auto rate is a 5-Yr. Rolling Average CA, 2011-2015 NV, 2012-2016

RATE OF SERIOUS INJURIES PER 100 MILLION VEHICLE MILES TRAVELED (VMT)

TARGET: Reduce serious injury crashes by 3.03% in California and 0.5% in Nevada (based on a five-year rolling average).

PERFORMANCE:

CA: NOT ON TARGET

NV: ON TARGET



	California:	Nevada:
Previous:	3.02	2.06
Current:	3.13	1.92
% change:	+3.6%	-7%

Figure 77: Rate of Serious Injuries

The Plan goal to increase safety and security of Tahoe's transportation system is built in to assist in implementation of this measure and the Lake Tahoe Safety Strategy framework, developed with a diverse group of stakeholders, addresses safety both proactively and reactively. The strategy, the draft 2022 FTIP safety projects, and this plan all contribute to reductions in crashes and injuries. Along the same lines, the TRPA Regional Grant Program continues evolving and incorporating performance-based planning by assessing projects based on criteria that includes the RTP/SCS goals which include improving safety.

Economic Vitality and Quality of Life



TRPA monitors a variety of performance measures to gauge how well the transportation system supports the region's residents, their economic vitality, and quality of life. See Appendix I for additional quality of life measures and Appendix F for more information on Environmental Justice.

This measure assesses how well the most vulnerable in Tahoe, including people living below the federal poverty line or that are disabled, can connect to needed services, such as health care and grocery stores, and to community resources such as schools, colleges, and employment centers.

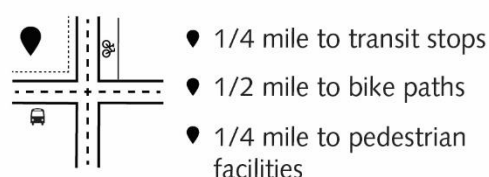
See Appendix F for more information on Environmental Justice. This measure is tracked using census data and land use and transportation geospatial map-based analysis.

Priority Communities' Transportation Access TO TRANSIT SERVICE (1/4 mile) AND Bicycle (1/2 mile), AND PEDESTRIAN (1/4-mile, Class I) INFRASTRUCTURE

Increase the proportion of access to each mode for each identified Priority Community in the region, with the goal of providing 100% access for each mode by 2045.

Priority Communities' Transportation Access in 2020 and in 2045 with implementation of the plan:

TRANSPORTATION ACCESS IN PRIORITY COMMUNITIES:



NEW TARGET: Increase access to each mode from Priority Communities to 100% by 2045.

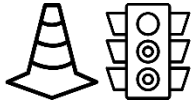
PERFORMANCE: ON TARGET



Figure 78: Transportation Access in Priority Communities

Note: Priority Communities are those that have three or more environmental justice criteria: low-income, minority, disabled, zero vehicle household, senior household. This is a new Performance Measure and so cannot be compared to prior measures.

Pavement Condition



Maintaining roadway pavement condition in a good condition is key to providing safe travel for people driving and bicycling on-street, ensuring the efficient movement of people and goods, and efficiently using public funds, because as roadways degrade, they become more costly to maintain.

Policy Highlight

Policy 2.23: In roadway improvements, construct, upgrade, and maintain active transportation and transit facilities along major travel routes. In constrained locations, all design options should be considered, including but not limited to restriping, roadway realignment, signalization, and purchase of right of way

The pavement condition performance measure provides key information about maintenance efforts and needs in the region and helps direct operations and maintenance plans and funding.

This measure is tracked using data from state departments of transportation and local jurisdictions.

PAVEMENT CONDITION

TARGET: Maintain levels for "Good" and "Poor" pavement conditions.

California: Nevada:

Good: $\geq 29.9\%$ $\geq 55.8\%$

Poor: $< 7.2\%$ $< 6.5\%$

PERFORMANCE:

California: **NOT ON TARGET**

Nevada: **ON TARGET**



California: Nevada:

Good: **30.7%** **79.4%**

Poor: **33.6%** **4.7%**

Figure 79: Pavement Condition

Appendix I includes the Federal System Performance Report that includes all federally required performance measures including Safety and Pavement Condition highlighted here.

MANAGING FOR SUCCESS

Transportation planning is a cyclical process, with lessons learned from performance monitoring informing future planning and funding. Adaptive management ensures that future transportation planning in Tahoe is responsive and evolves with changing transportation needs in the region.

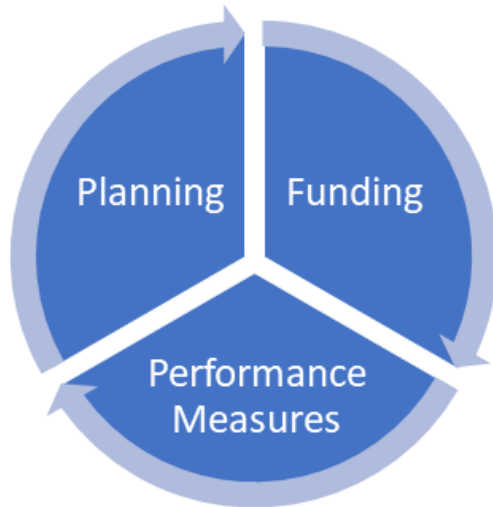


Figure 80: Plan-Fund-Measure Diagram

Transit Monitoring

TRPA distributes California Transportation Development Act (TDA) and Federal Transit Authority (FTA) funds and lends planning support and technical assistance to the region's public transit providers, TTD and TART. Per TDA Public Utilities Code (PUC) Section 99244, TRPA is required to "annually identify, analyze, and recommend potential productivity improvements, which could lower the operating costs of those operators who operate at least 50 percent of their vehicle service miles, as defined by subdivision (i) of PUC Section 99247, within the area under its jurisdiction."⁵

To fulfill the requirement, the transit productivity improvement program and the Lake Tahoe Region Transit Monitoring Protocol are part of the plan's

implementation. The protocol identifies transit performance measures, establishes targets, and outlines data collection methods for each transit operator. Funding allocations depend upon the operator implementing recommended improvements and meeting established performance measure targets. See Appendix I for more information about the transit monitoring protocol performance measures.

Bicycle and Pedestrian Monitoring

Since 2015, the Lake Tahoe Region Bicycle and Pedestrian Monitoring Protocol has been part of the plan's approach to managing for success.

The protocol established a system for the collection of year-round active transportation data that includes permanent counting stations, biennial count locations, and spot count locations, depending on need.

Partners across the region assist in monitoring bicycle and pedestrian activity throughout the region to understand high use areas, mode-split, and support grant applications and reporting. A monitoring report that analyzes historical trends, provides detailed information by location, and compares use at similar sites supplements the regional transportation monitoring report and supports the plan. For more information on the Bicycle and Pedestrian Monitoring Protocol see Appendix I.

Congestion Management Monitoring

A Congestion Management Process (CMP) is required by the FHWA for data collection and analysis once RTP projects and programs are implemented. The CMP guides evaluation and monitoring of the effectiveness of each RTP strategy. For more information on the CMP see Appendix H.

⁵ CA TDA PUC Section 99244