

APPENDIX F: PERFORMANCE MEASURES

Using the policy framework outlined in Chapter 2.0, MARC established data and measurements to track, encourage and facilitate meaningful progress toward transportation goals over time. The measurements and the historical data outlined in this chapter help us understand existing conditions, identify strategies necessary to move these indicators toward stated goals, and measure progress since *Transportation Outlook 2040* was first implemented in 2010.



	Framework goals	Measures
Vibrant	Economic Vitality	Freight Movement Transportation Costs Activity Centers
	Placemaking	Multimodal Options
	Equity	Environmental Justice
Connected	Transportation Choices	Transit Service Bicycle/Pedestrian Accessibility
	Safety and Security	Crash Fatalities Disabling Injuries
	System Condition	Bridge Condition Pavement Condition
	System Performance	Travel Speeds Congestion Travel Time Observed-to-Posted Speeds
Green	Public Health	Ozone Pollution Physical Health Physical Inactivity
	Environment	MetroGreen Network
	Climate Change and Energy Use	Vehicle Miles Traveled Vehicle Occupancy



Economic Vitality

Support an innovative, competitive 21st-century economy.

The regional transportation network should create and sustain high-quality places for commerce, provide access to jobs, make strong connections between economic centers (inside and outside the region) and foster innovation without regard to shifts in the national economy. The region's economic vitality is strongly influenced by its location in the center of the United States and at the intersection of four major interstate highways.

Activity Centers

Activity centers are focal points and key destinations within each community. They are vibrant areas where people shop, work, live and gather. Activity centers can include housing, retail, offices, restaurants, recreation, medical care and many other services. The scale can range from large, regional centers to mid-size community centers, to neighborhood-level convenience centers. For transportation planning, activity centers require a variety of mobility options and connections to help people reach their desired destinations. Because they are hubs of activity for many people, transportation investments in these centers can often have a greater impact than in other locations.

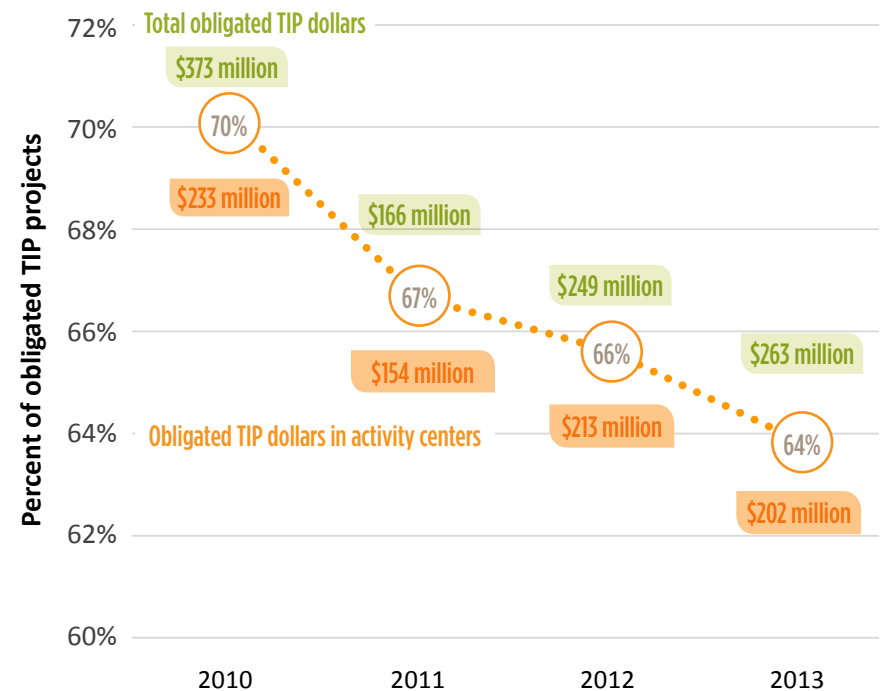
Desired trend: Increase the percentage of TIP projects within activity centers.

Current trend: The percentage of TIP projects in activity centers increased by 75 percent from 2011 to 2012.

Investment in activity centers

The region's investment in local activity centers represents a significant portion of all projects funded. These investments help residents connect to the goods and services they need.

Figure F.5:
Percent of TIP projects in activity centers



Source: MARC Transportation Improvement Program (TIP) Database

Freight Movement

The Kansas City region is a vital hub for national freight movement and an important center for truck, rail, barge and air freight industries. This region is an important center for truck, rail, barge and air freight industries. The metropolitan area currently ranks as the second largest rail center in the nation, based on the number of car loads, and has the largest amount of pass-through tonnage. The region is also among the top five trucking centers in the country, and Kansas City International airport ranks as one of the most important air freight hubs in a six-state region, in terms of aggregate volume.

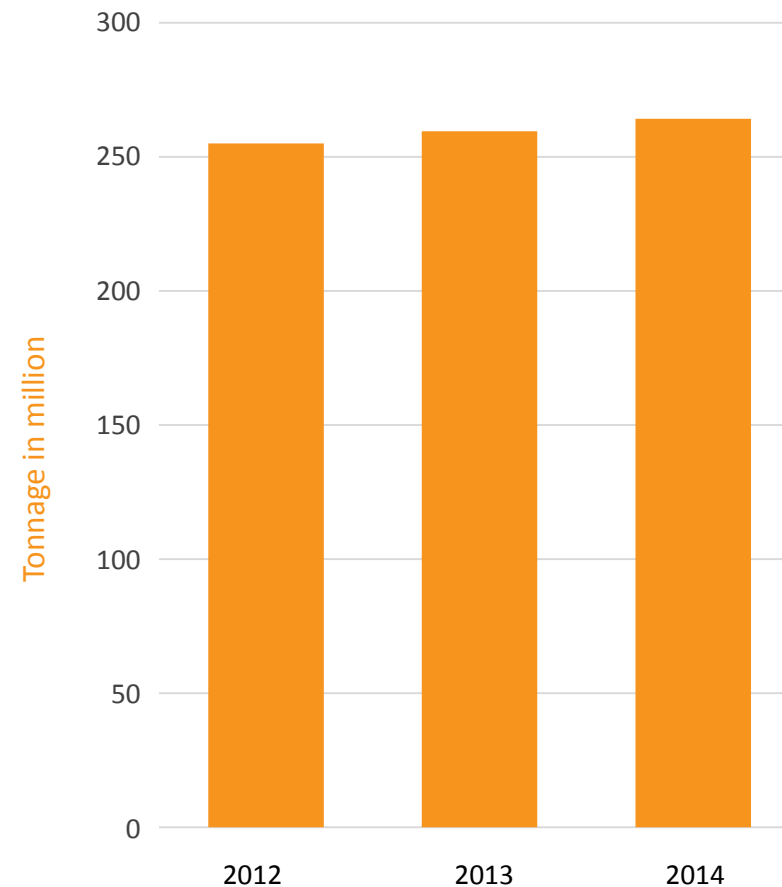
Desired trend: *Increase the tonnage of goods moved in/through the region.*

Current trend: *The region is experiencing significant increases in freight movement.*

Goods movement in the Kansas City region

The region has seen a large increase in freight movement as it recovers from the Great Recession. In 2007, before the recession, the amount of goods moved daily was 62.27 million tons. In 2010, when *Transportation Outlook 2040* was implemented, the average daily total was 59.8 million tons. Recent years have seen daily tonnage that exceeds 250 million.

Figure F.1: Tonnage of goods moved daily in the Kansas City MSA



Source: Mid-America Regional Council (MARC) — Import/Export Freight Analysis Framework (FAF3)

Transportation Costs

Owning and using a personal automobile for transportation purposes can be expensive and time consuming. In addition to the vehicle purchase price, a driver must pay for insurance, maintenance and fuel. Commuters spend significant amounts of time behind the wheel. Congestion on roadways causes slower travel, resulting in even more lost time and fuel consumption. High transportation costs can impact the economic vitality of the region. An efficient transportation network allows vehicles to travel closer to optimal free-flow travel speeds, helping people travel to their homes, places of work and other important destinations more quickly.

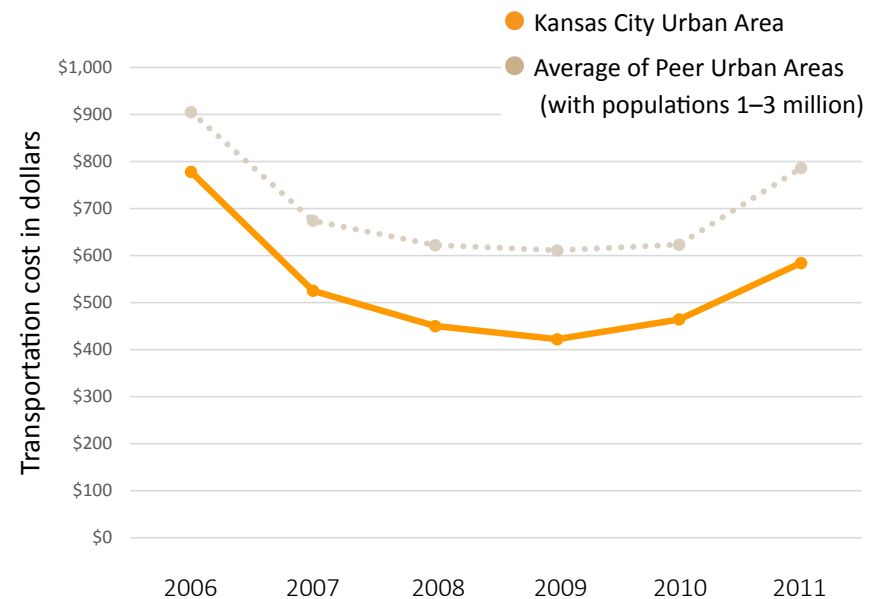
Desired trend: *Decrease in annual cost of congestion per auto commuter.*

Current trend: *Data shows a cost of \$584 per commuter, a one-year increase of 25.86 percent.*

Trend of transportation costs

Although Figure F.2 shows a current upward trend in transportation costs for commuters, costs dipped lower during the Great Recession. Current costs are still lower than six years ago, but higher than *Transportation Outlook 2040's* 2010 implementation.

Figure F.2: Annual cost per commuter in the Kansas City region



Source: Texas Transportation Institute (TTI), 1983–2012 Urban Mobility Reports
Methodology change in 2011 to 2012



Placemaking

Coordinate transportation and land-use investment along the region's corridors and centers as a means to create vibrant places and strengthen the quality of the region.

By encouraging pedestrian connections, promoting transit-supportive development and developing links to activity centers, the transportation system can have a strong impact on our sense of place. Vibrant, mixed-use centers and corridors accommodate the mobility needs of residents, enhance the character of a community and help sustain neighborhood longevity.

Multimodal Options

Multimodal options are the key to a well-rounded transportation network that includes a mix of choices to suit the needs of the region's residents. With alternative transportation options — such as carpooling, biking, walking and public transportation — residents are less dependent on automobile ownership.

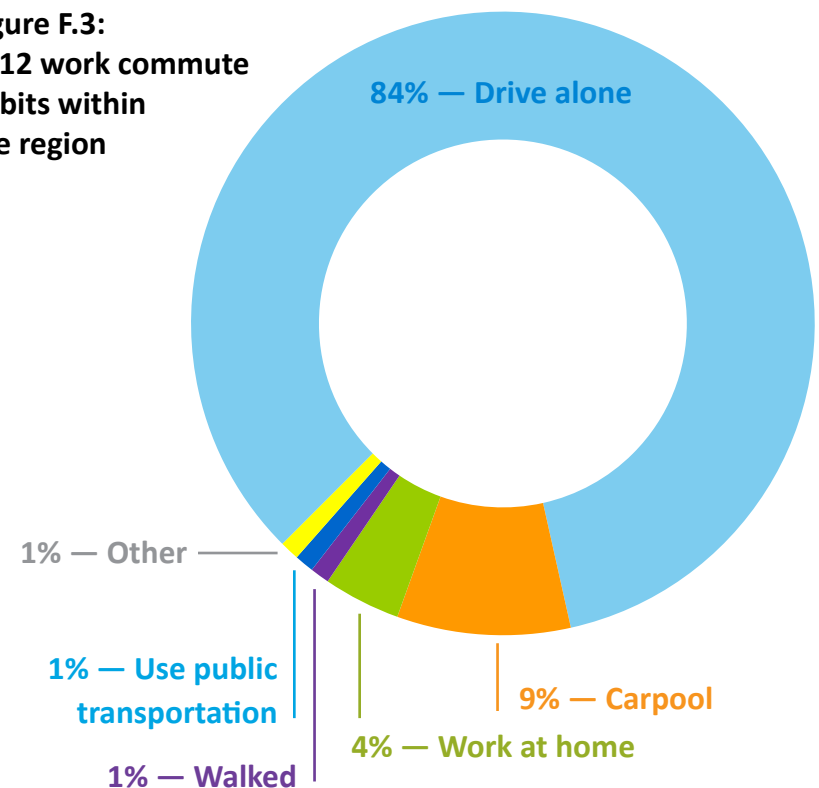
Desired trend: *Increase in percent of alternate modes used for work trips and a decrease in people driving alone to work.*

Current trend: *The region has not seen any significant changes in commuting habits.*

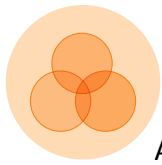
Work commute in the region

Residents in the Kansas City region still depend on driving alone as their dominant work commute mode. Alternate modes only made up 16.56 percent of trips, down 0.43 percent from 2011.

Figure F.3:
2012 work commute habits within the region



Source: American Community Survey (ACS), 2006-2012 ACS 1-year estimates



Equity

Ensure all people have the opportunity to thrive.

Achieving social equity for all members of the community requires constant striving to correct structural disparities that are at the root of inequity.

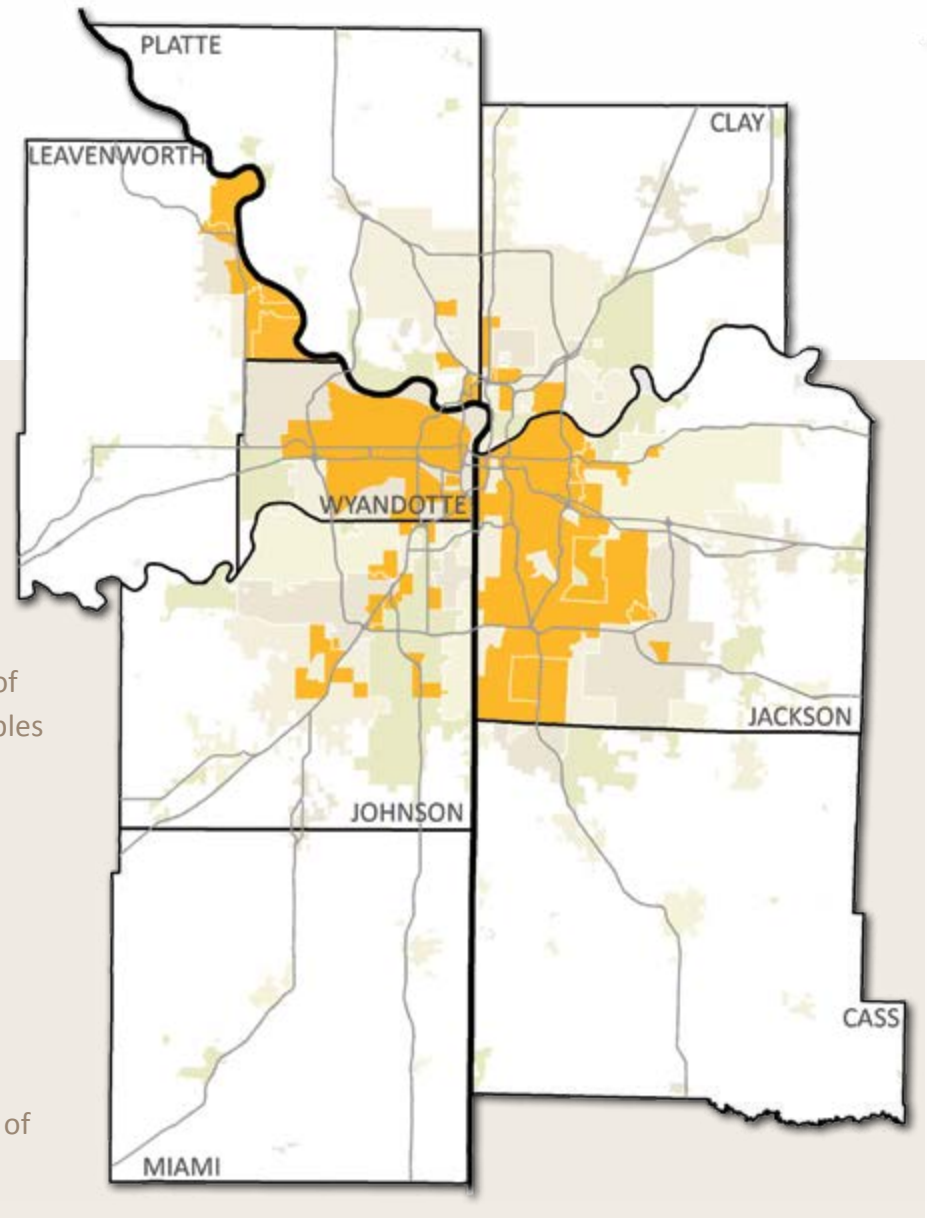
Transportation can play a key role in providing equitable access, connecting low-income and minority residents to jobs and other services and opportunities.

About Environmental Justice

In 1994, Presidential Executive Order 12898 mandated that federal agencies incorporate environmental justice analysis in their missions by analyzing and addressing the effects of all programs, policies and activities on minority and low-income populations. Drawing from the framework of the Title VI of the Civil Rights Act of 1964 and the National Environmental Policy Act (NEPA) of 1969, the U.S. Department of Transportation established three principles to ensure nondiscrimination in federally funded activities:

- Avoid, minimize or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority populations and low-income populations.
- Ensure the full and fair participation by all potentially affected communities in the transportation decision-making process.
- Prevent the denial of, reduction in or significant delay in the receipt of benefits by minority and low-income populations.

Figure F.4: Environmental Justice Tracts in Greater Kansas City



Environmental Justice

Nondiscrimination is a vital part of regional transportation planning and programming processes. MARC’s Public Participation Plan identifies strategies to involve minorities and other traditionally underserved populations in the transportation planning process. The Transportation Improvement Program (TIP) includes an analysis of how transportation funding in environmental justice tracts — those census tracts with higher-than-average minority populations and more than 20 percent of residents living in poverty — compares to overall funding.

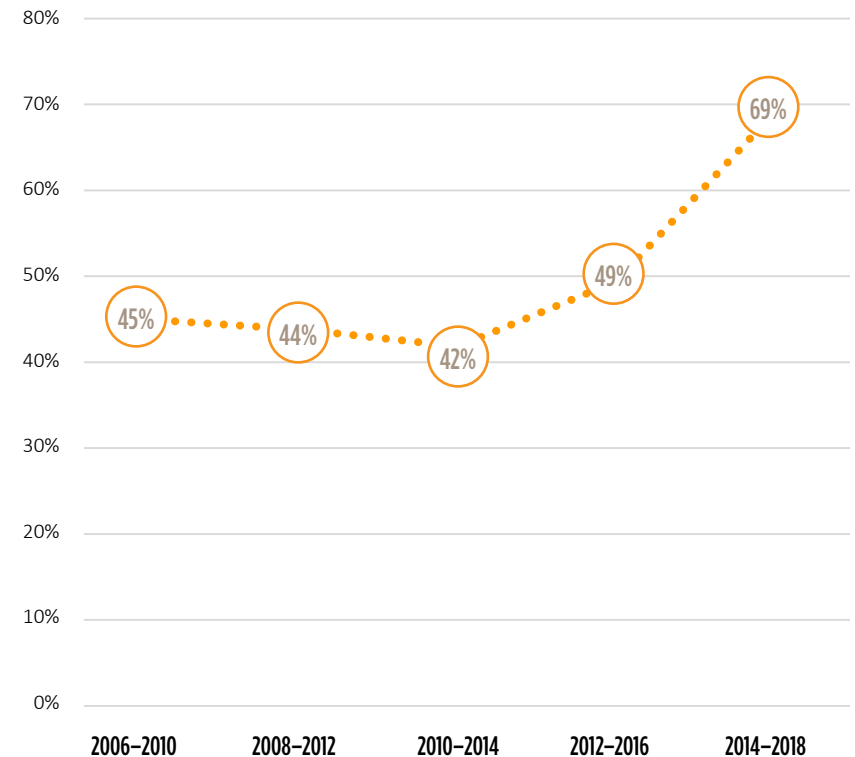
Desired trend: *Ensure a fair portion of federal transportation funds are invested in environmental justice tracts.*

Current trend: *In the 2014–2018 TIP, 69 percent of projects are located within EJ tracts — a 20 percent increase from the previous TIP.*

Increase of TIP projects in EJ tracts

As the figure below illustrates, the latest 2014–2018 TIP has a substantial increase of projects in Environmental Justice tracts over the previous planning periods.

Figure F.4: Percent of TIP projects in Environmental Justice tracts





Transportation Choices

Expand affordable accessible, multimodal transportation options in order to better connect residents and visitors to jobs and services.

Expanded transportation choices provide residents with better access to a variety of goods, services and destinations. The range of travel options available, the transportation system’s connectivity and ease of movement are all keys to accessibility. In addition, increased use of public transit can help improve air quality and reduce roadway congestion.

Transit service

The transit services measure quantifies the number of travelers who use transit service in the region and the efficiency of the system. The two specific measures reviewed are:

- Hours of service provided by public transportation vehicles serving passengers.
- Total passenger boardings onto public transportation vehicles.

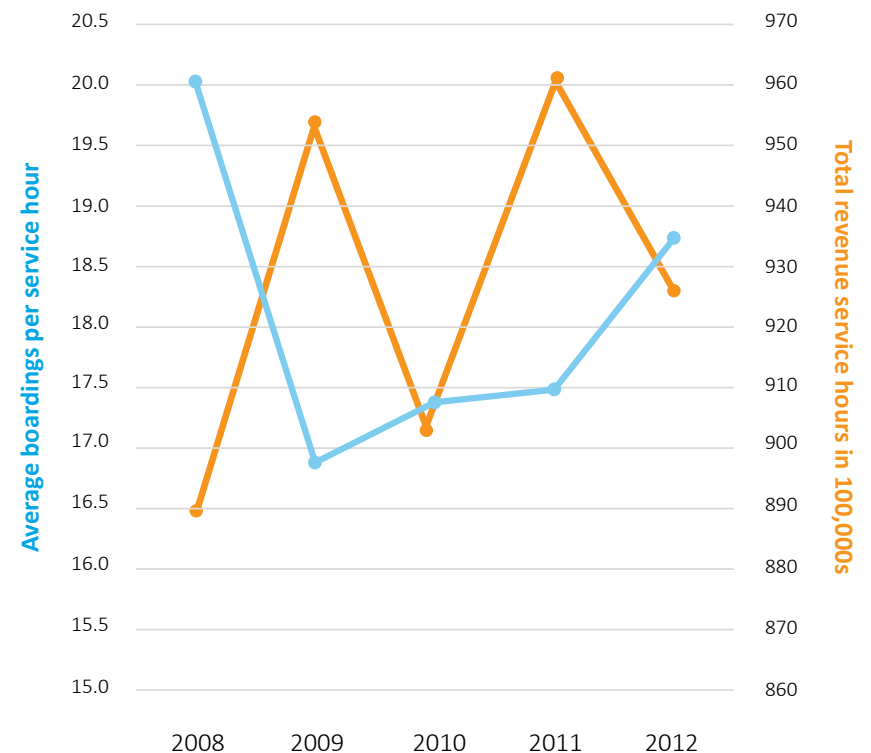
Desired trend: *Increases in revenue service hours and average transit boarding per service hour.*

Current trend: *Although boardings have modestly increased, revenue service hours have decreased.*

Transit service in the region

In 2011 and 2012, average transit boardings slightly increased, by 7.18 percent, in a year-over-year comparison. For the same time frame, total revenue service hours saw a decrease of 3.58 percent.

Figure F.6: Transit service hours



Source: National Transit Database (NTD), Annual Transit Profiles Combined data that includes Kansas City Area Transportation Authority, Johnson County Transit and Unified Government Transit service providers.

Bicycle/Pedestrian Accessibility

Convenient access to bicycle and pedestrian facilities increases the viability of these modes as alternative transportation choices. Bicycling and walking are environmentally friendly modes of transportation that do not contribute to roadway congestion or air pollution. Bicycle and pedestrian facilities can connect residents to activity centers, transit routes and recreational opportunities. They can also minimize hazards at major barriers to non-motorized travel, such as rivers or highways. These facilities are valuable components of livable communities.

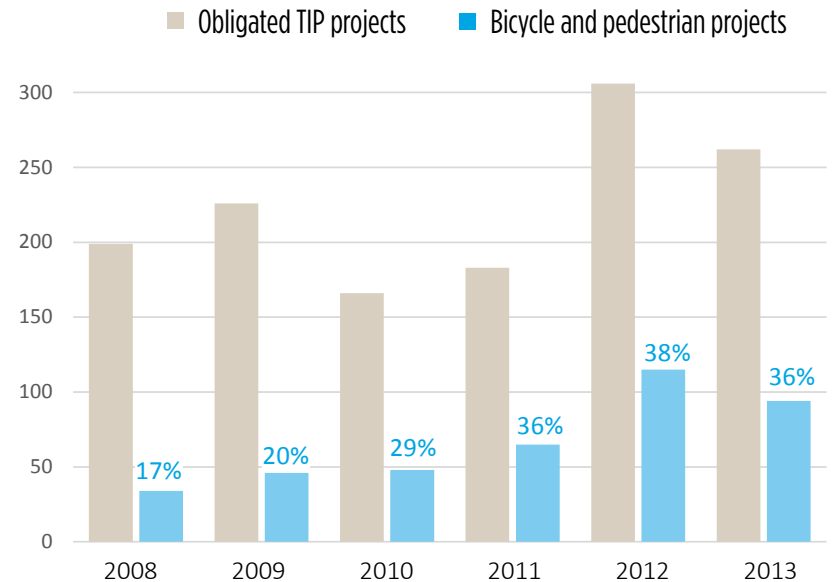
Desired trend: *Increase in number and percentage of TIP projects that incorporate bike/pedestrian elements.*

Current trend: *The number of projects and percentage of TIP projects has recently decreased.*

Bicycle and pedestrian accommodations

Although the number and percentage of TIP projects decreased in 2013, after an increase in 2012, alternative connections are important to the region. The metro area has seen better integration of bike and pedestrian elements in surface transportation projects such as bridges over the past several years.

Figure F.7: Number of total TIP projects and with bicycle and pedestrian facilities



Source: MARC Transportation Improvement Program (TIP) Database



Safety and Security

Improve safety and security for all transportation users.

Transportation infrastructure, education, enforcement, engineering and emergency service strategies all play important roles in improving safety and security for the traveling public. One specific performance measure is the number of roadway fatalities and disabling injuries that occur in crashes on the transportation network.

Crash fatalities and disabling injuries

Ideally, roadways on the transportation network would be completely safe, but unfortunately automobile crashes occur daily across the region. Traffic crashes can involve multiple contributing factors, including infrastructure-related and behavior-related factors. Roadway crashes have tremendous financial consequences and human tolls. Tracking fatalities and injuries helps inform efforts by area planners and policy makers to combat a range of crash causes.

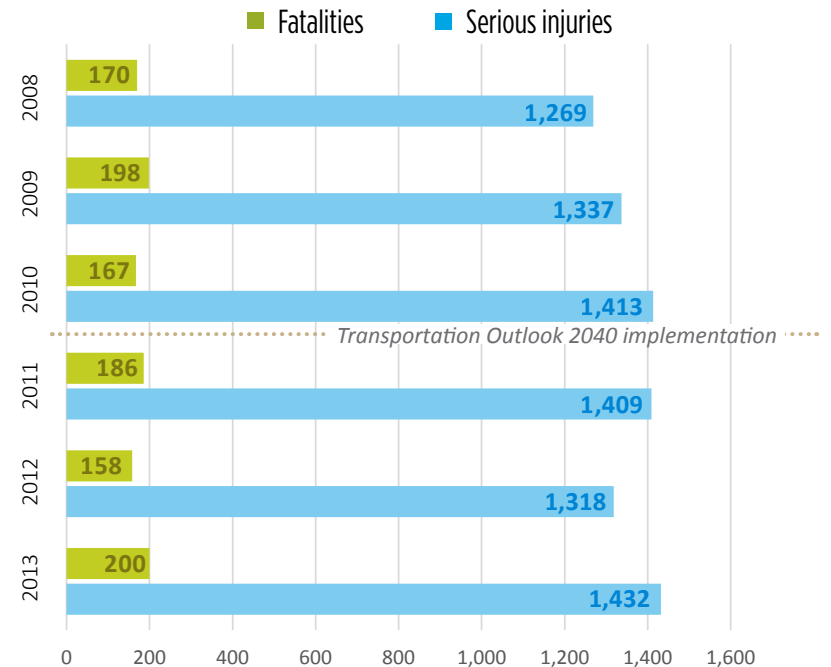
Desired trend: *Decrease by half the annual crash fatalities and annual disabling injuries by 2040.*

Current trend: *From 2012 to 2013, the region saw a one-year reduction of 14.1 percent in fatalities and 5.1 percent in disabling injuries.*

Transportation safety

The plan calls for the reduction of fatality and disabling-injury crashes by half through the plan's maturation in 2040. In 2010, bistate crash fatalities totaled 186, making the 2040 goal of 93 fatalities or lower. The number of disabling injuries in 2010 in the region was 1,409; the 2040 goal is 704 or lower.

Figure F.8: Roadway fatalities and serious injuries in the Kansas City region



Source: Kansas Department of Transportation and Missouri Department of Transportation



System Conditions

Ensure transportation systems are maintained in good condition.

A quality transportation network ensures efficient performance and reliability in moving users from place to place. A system that is not well maintained can pose barriers to performance and safety. The plan supports maintaining the good condition of the region's transportation infrastructure in order to improve performance and avoid higher maintenance costs associated with deterioration.

Bridge conditions

The bridge conditions measure quantifies the relative condition of federal-aid highway system bridges that are part of the National Bridge Inventory (NBI). Federal regulations require states to maintain an inventory of these bridges and follow National Bridge Inspection Standards (NBIS) inspection procedures for reporting bridge-condition data. Pavement and bridge conditions on the transportation network directly impact safety, performance and economic vitality in the Kansas City region. Data is collected and shared to help planning partners and state and local agencies manage and maintain the regional system in good condition.

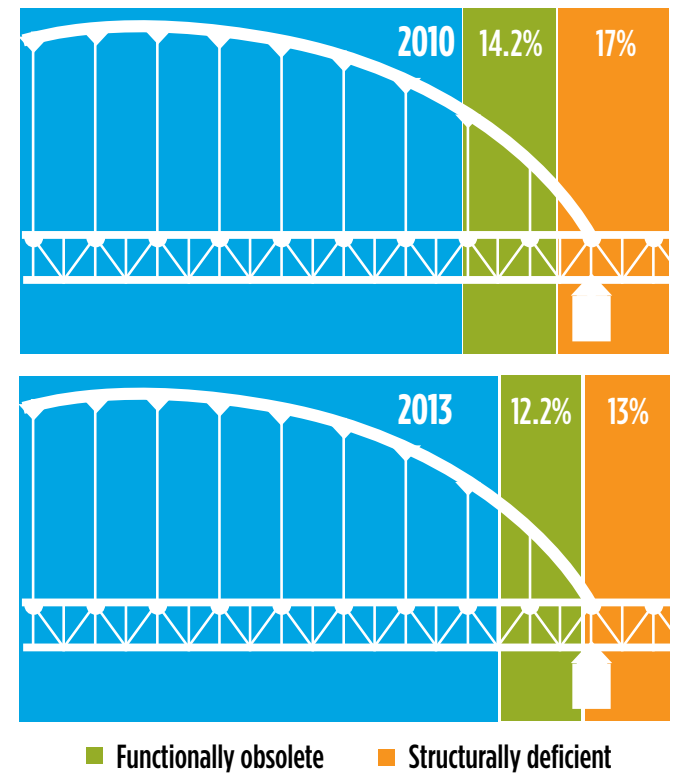
Desired trend: *Decrease the percentage of regional bridges that are in poor or outdated condition.*

Current trend: *The region has seen a one-year reduction of 1 percent in the number of structurally deficient and functionally obsolete bridges.*

Kansas City metro bridges

Although the majority of area bridges are in excellent condition, it is important to regularly review, rehabilitate and replace bridges as needed. The Kansas City area has fewer structurally deficient and functionally obsolete bridges than in 2010, the plan inception year.

Figure F.9: Bridge conditions



Source: Federal Highway Administration (FHWA), 2000-2013 National Bridge Inventory

Pavement Condition

Accurate and timely data on pavement condition is used to assess system performance and deterioration, identify maintenance and reconstruction needs, and determine financial needs. The Kansas Department of Transportation (KDOT) and Missouri Department of Transportation (MoDOT) determine whether highway pavement is in acceptable condition.

- KDOT uses three different distinctions for pavement condition: good, fair and poor. KDOT examines and rates the entire state system of roads.
- MoDOT uses two distinctions to determine the pavement condition: good and not good. Missouri data measures the state's extensive highway network.

Both KDOT and MoDOT have established targets that they would like road pavement conditions to meet or exceed. KDOT's targets for good pavement conditions are 85 percent of interstates and 80 percent of non-interstate roads; MoDOT's target is for 85 percent of major highways percent to be rated good.

Desired trend: *Reduce the percentage of Kansas roads in "poor" condition and Missouri roads in "not good" condition in the MARC region.*

Current trend: *Kansas had a minor decrease in the number of "poor" (0.1 percent) and Missouri had an increase of "not good" (0.2 percent) pavement conditions when comparing 2012 and 2013 data.*

Bistate pavement conditions

The majority of the roads in the region are good or fair conditions. However, the number of roads in poor or not-good condition has increased slightly since the plan's adoption.

Figure F.10: Pavement conditions in the bistate Kansas City region

Kansas	2010	2012	2013
Good	89%	90.5%	88.9%
Fair	10%	8.9%	11.0%
Poor	0%	0.6%	0.1%

Missouri	2010	2012	2013
Good	82.1%	87.9%	87.7%
Not good	17.9%	12.1%	12.3%

Source: Kansas Department of Transportation (KDOT) and Missouri Department of Transportation (MoDOT)



System Performance

Ensure transportation systems are maintained in good condition.

Managing system performance includes monitoring the network and its individual parts, identifying malfunctions and inefficiencies and addressing any inefficiencies. The transportation system is a complex, interwoven network with millions of moving parts — capacity, congestion and travel delay all affect system performance.

Travel speeds

The travel speed measurement evaluates the average speeds that vehicles experience on roadways during free-flow travel conditions. Ideally, traffic flow on high-capacity interstates, freeways and expressways should move at higher speeds compared to roadways on the system hierarchy with less capacity. High-capacity roadways typically have limited access and merge lanes that allow for high travel speeds and steady traffic flow at entry points. In addition, pedestrian and non-motorized traffic is usually prohibited on these roadways, reducing some safety concerns. The plan strives to improve reliability and system performance of the Kansas City region's transportation system by improving travel speeds on its high-capacity roadways.

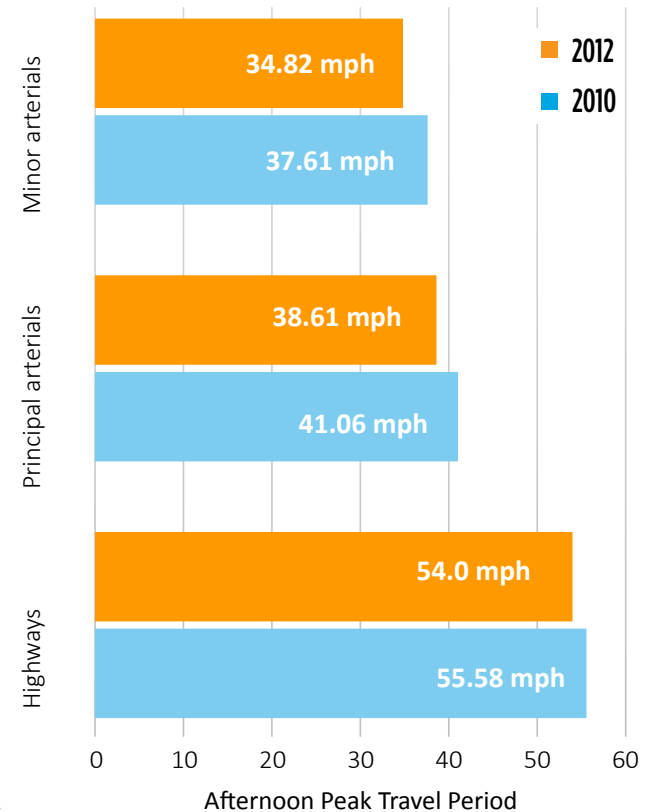
Desired trend: *Increase in average travel speed (miles per hour) on the MARC region's Congestion Management Network (CMN).*

Current trend: *When comparing 2010 and 2012 data, the number of congested miles on the CMN decreased by 2.84 percent.*

Travel speeds within the region

Figure F.11 shows the 2010 and 2012 comparisons of travel speeds in the region by roadway types. All roadway types have seen some reduction in speed, but the decreases are less than 10 percent in all categories.

Figure F.11: Regional travel speeds



Source: MARC, Travel Time Data

Congestion

Congested areas of the transportation network are those where the average travel speeds of traffic are less than desirable.

Congestion has two general causes:

- Non-recurring incident congestion, such as construction, accidents or inclement weather.
- Recurring incident congestion, including peak period travel demand, atypical travel demand fluctuations or poor signalization.

The negative effects of congestion include traffic bottlenecks, reduced roadway capacity and increased air pollution as a result of vehicle idling. The plan supports the Congestion Management Process (CMP), a coordinated effort to monitor and address traffic congestion throughout the Kansas City region. The process targets congestion by requiring transportation project applicants to incorporate congestion-mitigation strategies listed in the CMP. Funding priority is given to projects located on congested segments of the transportation network and to those projects that include multiple congestion-mitigation strategies.

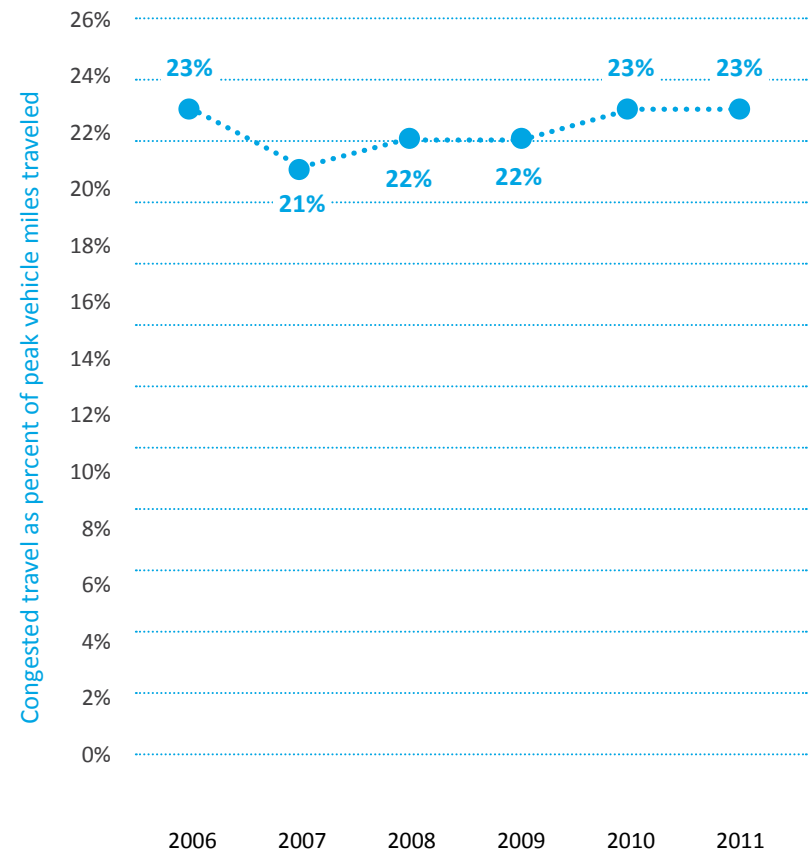
Desired trend: *Decrease in the percentage of congested roadways in the eight-county MARC region.*

Current trend: *Comparison of 2010 and 2011 data showed no change in congestion measurements.*

The Kansas City metro area enjoys a low rate of congestion.

The region's level of congestion is quite low when compared to metropolitan areas of similar size and population. After a three-year modest reduction in congestion, levels have returned to 2006 levels.

Figure F.12: Recent levels of congestion



Source: Texas Transportation Institute (TTI), Urban Mobility Reports

Travel Time

Travel time measures the average time in minutes that it takes for automobiles to travel specific roadway routes during peak periods. The capacity of the roadway network, system congestion and travel delay can each affect this measurement. Travel time data is collected to assess the current level of service and inform efficiency improvements. Travel time data measures hours of delay — that is, the difference in the amount of time taken to reach a destination in free-flowing traffic moving at the posted speed limit and the observed travel time. The delay calculations are performed at individual roadway sections, for each hour of the day and each day of the week.

The plan strives to improve the reliability and system performance of the regional transportation network by collecting delay data and sharing it with regional planning partners. The data also supports CMP efforts and other transportation planning and programming processes, such as the region's Transportation Improvement Program. This measure displays delay statistics and reliability indices for the Kansas City metropolitan statistical area.

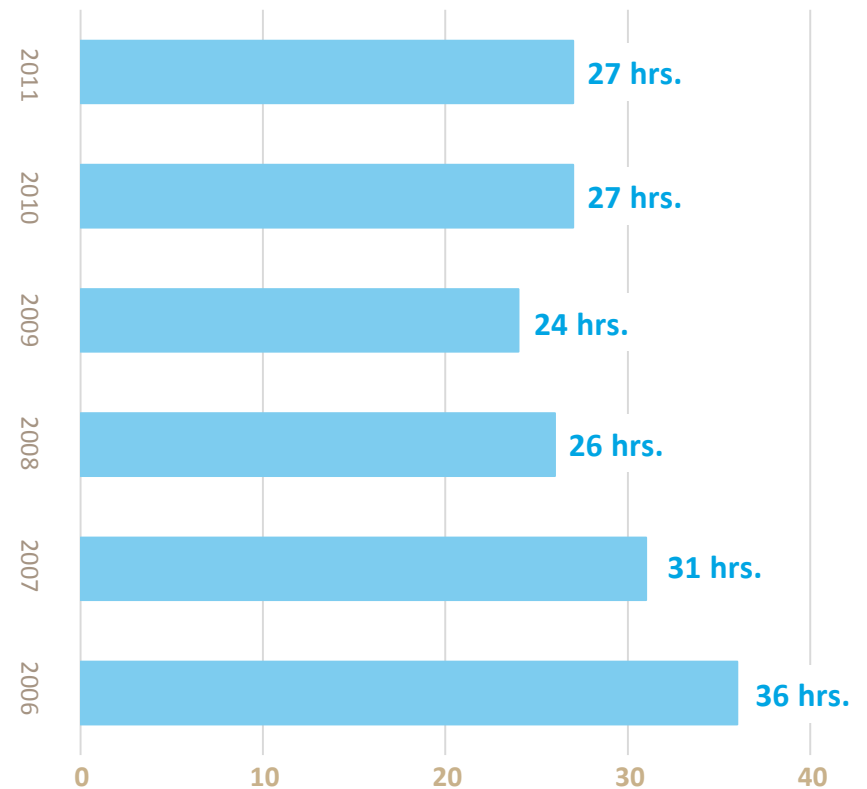
Desired trend: *Decrease in annual hours of delay per auto commuter.*

Current trend: *There was no change in the commuter delay data from 2010 and 2011.*

Regional travel times

The 2011 and 2010 data show an average 27-hour delay per commuter. This is an increase over 2008 and 2009 data, but significantly lower than 2006 data, with 36 hours of delay.

Figure F.13: Annual hours of delay per commuter



Source: Texas Transportation Institute (TTI), Urban Mobility Reports

Travel Speeds

The observed-to-posted speed ratio equals the average observed speed divided by the posted speed limit. Segments with observed-to-posted speed ratios of 50 percent or less are considered to be heavily congested. This performance measure focuses specifically on the Congestion Management Network (CMN), using data derived from an annual Travel Time Study published by MARC. The 2012 CMN has a larger portion of its network with observed-to-posted ratios greater than 100 percent, or low congestion, during the a.m. peak period when compared to 2010 data. The percentage of segment length with ratios between 76 and 100 percent is about the same for 2010 and 2012.

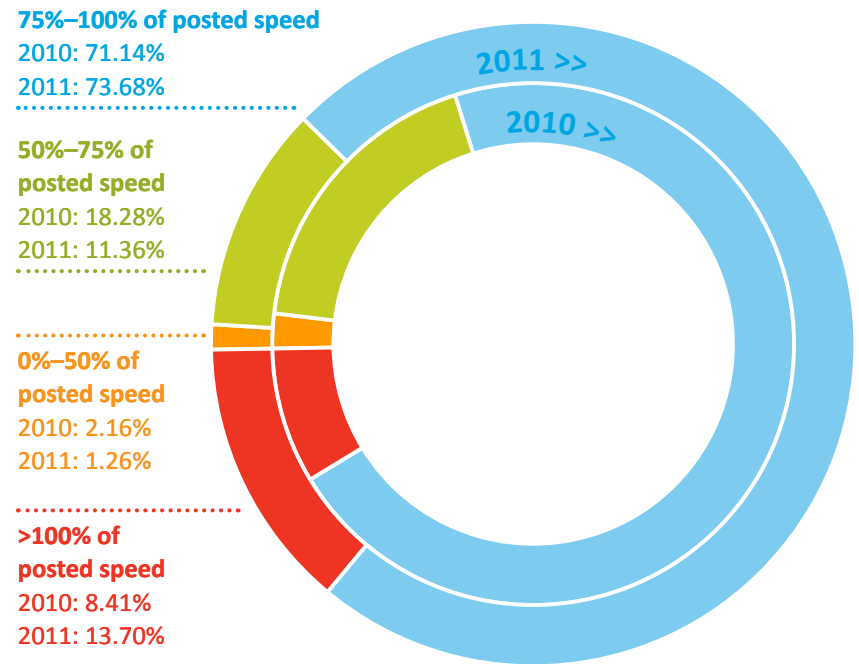
Desired trend: *Decrease in miles of highly congested routes on the CMN.*

Current trend: *Since 2010, there has been a 38.24 percent reduction of congested routes on the CMN.*

Observed-to-posted speed for the region

As illustrated in Figure F.14 below, the majority of the region's traffic is able to travel at speeds that are at least 75 percent of posted speeds, allowing for good free-flow movement for area commuters.

**Figure F.14: Peak period (4–6 p.m.)
Free-flow of Traffic Measurements**



Source: MARC, Travel Time Study Reports



Public Health

Facilitate healthy, active living.

Encouraging design patterns and development standards that support active modes of transportation, such as bicycling and walking, supports active, healthy lifestyles and helps protect air quality.

Ozone pollution

Ozone is formed by the reaction of sunlight with hydrocarbons and nitrogen oxides in the air. Ozone is harmful when breathed and long-term exposure can cause adverse health effects. While it is not a direct pollutant of automobile engines, ozone is a byproduct of vehicle emissions. Ozone is not only influenced by the region's transportation system, but also by land use decisions that shape the region's built environment. The plan includes a number of ground-level ozone reduction strategies that target the region's air quality.

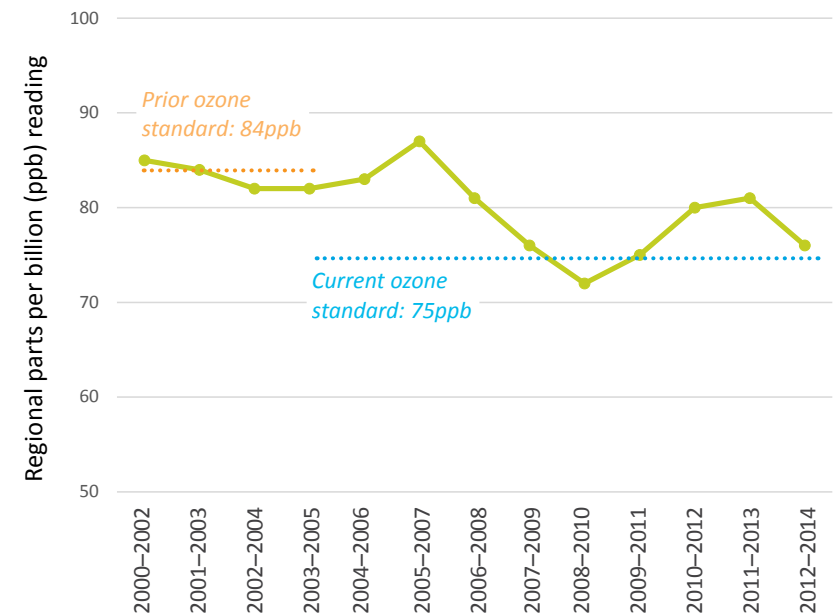
Desired trend: *Decrease in the three-year average of ground-level ozone readings and federal ozone pollution violations.*

Current trends: *The region has experienced a 6.17 percent reduction in ozone readings, with only one ozone violation in 2013.*

Ozone pollution standards

The illustration below shows that the Kansas City region has been in violation of the EPA's ozone standard for several years. EPA is expected to issue an even stricter standard in the coming year.

Figure F.15: Three-year averages of ozone readings



Source: MARC, 2002-2013 Air Quality Reports — Ozone Season Summaries

Physical health

Physical health is affected by the amount of exercise and physical activity people incorporate into their daily lives. The plan supports active modes of transportation — specifically bicycling and walking — that encourage people to use healthier alternatives to driving personal automobiles. Performance measures include the percentage of physically inactive adults in the region (those who report no leisure-time exercise in the past 30 days) and the percent of adults in the region categorized as obese.

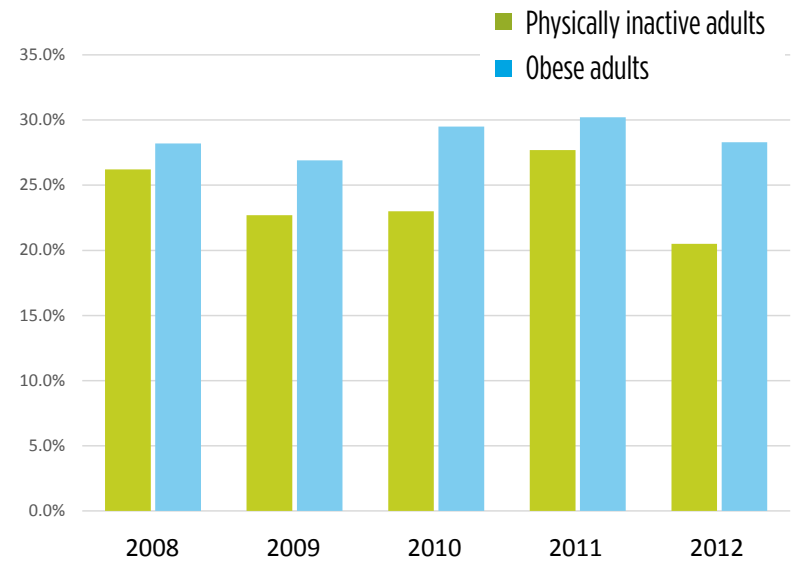
Desired trend: *Decrease the percent of obese adults and physically inactive adults in Kansas City region.*

Current trends: *In the one-year comparison of 2011 and 2012 data, there were reductions in the region's obese (1.9 percent) and physically inactive (7.2 percent) adults.*

Physical health

The region has seen a one-year decrease in both the percent of obese adults and physically inactive adults in the region. However, the level of obese adults in the region is fairly consistent over several years.

Figure F.16: Percentage of physically inactive and obese adults in the region



Source: Centers for Disease Control and Prevention (CDC) — SMART: BRFSS City and County Data



Environment

Protect and restore our region’s natural resources (land, water and air) through proactive environmental stewardship.

The transportation system can help sustain the region’s built environment and natural resources through investments in trails and greenways and efforts to reduce harmful emissions.

MetroGreen® Network

The MetroGreen network is a planned 1,144-mile system of interconnected public and private natural areas — green infrastructure that provides an alternative transportation network and promotes non-motorized travel options. The MetroGreen network includes trails, greenways, stream buffers and other natural corridors that help sustain native landscaping, protect water quality and reduce the urban heat island effect. This measure quantifies the miles of MetroGreen network trails and greenways completed each year.

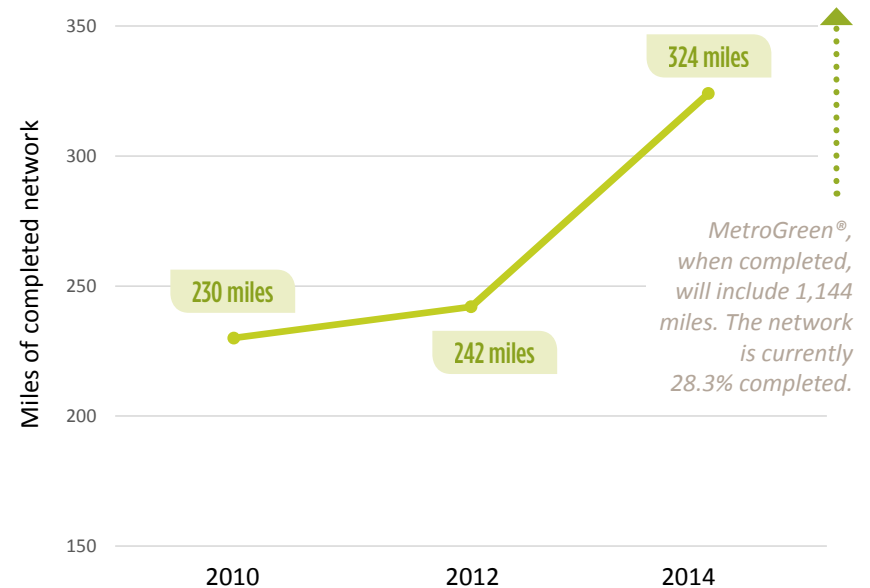
Desired trend: *Increase in completed miles of the MetroGreen® network.*

Current trend: *In 2014, the number of completed network miles was 33.9 percent higher than in 2010.*

Completing the region’s MetroGreen® network

As of 2012, 324 miles of trails, or 28.3 percent of the planned network, were completed. Since its launch in 2002, the network continues to see modest growth each year.

Figure F.17: Progress on the MetroGreen network



Source: MARC - Environmental Services Department MetroGreen® database



Climate Change/Energy Use

Decrease the use of fossil fuels through reduced travel demand, technology advancements and a transition to renewable energy sources.

Reducing fuel consumption and emissions can have a positive impact on climate change. Two key measures of how the transportation system is affecting climate change and energy use are vehicle miles traveled and vehicle occupancy.

Vehicle Miles Traveled

Vehicle miles traveled (VMT) quantifies the extent of motor vehicle operation on roadways. Increases in VMT typically correlate to a region's growth in population and economic development, but also contribute to traffic congestion and air pollution. Because population growth affects total VMT, we measure performance using per capita VMT. As the Kansas City region continues to grow, the plan supports policies and alternative modes of transportation that can reduce per capita VMT, improving air quality and reducing congestion on the region's roadways.

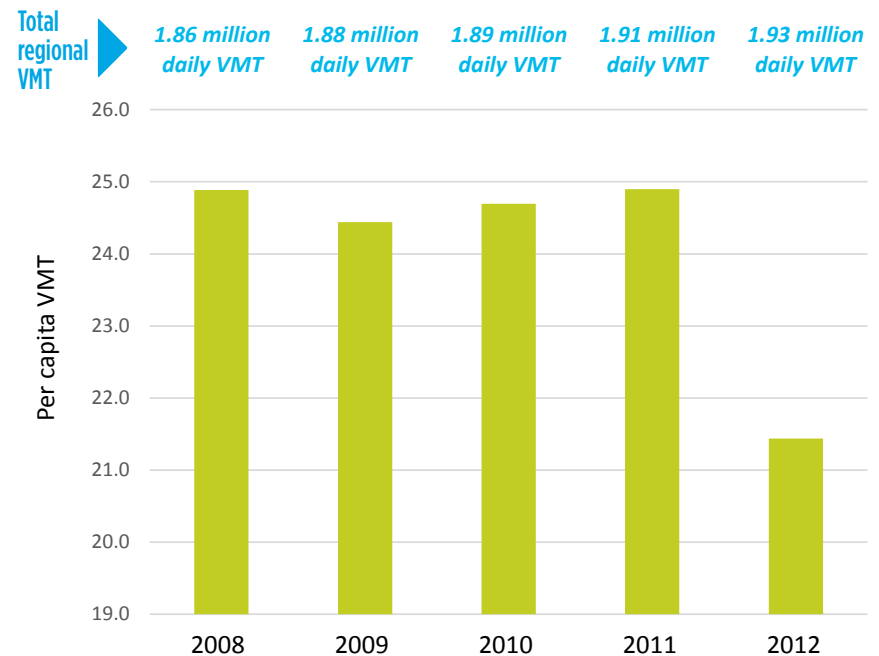
Desired trend: *Decrease the number vehicle miles traveled (VMT) per capita.*

Current trend: *A comparison of 2011 and 2012 shows a 14 percent decrease in per capita VMT.*

Vehicle mile travel patterns within the region

Although total VMT in the region continues to increase, the region saw a decrease in per capita VMT for 2012.

Figure F.18: Vehicle miles traveled in the MARC region



Source for daily VMT: Kansas Department of Transportation and Missouri Department of Transportation

Vehicle occupancy

Vehicle occupancy measures the number of persons traveling in each vehicle on area roadways. It is a simple indicator that broadly affects the sustainability of our transportation system. A higher vehicle occupancy rate indicates that more people are traveling in fewer vehicles, resulting in a transportation network that operates more efficiently with fewer greenhouse gas emissions. Additionally, a higher vehicle occupancy rate suggests a more affordable transportation system, since sharing a ride is typically less expensive than driving alone. The plan influences vehicle occupancy by supporting public transportation services, special transportation services, alternative modes of transportation, ridesharing services (such as carpooling and vanpooling), and programs that help people find shared rides to a common destination (such as ride-matching websites).

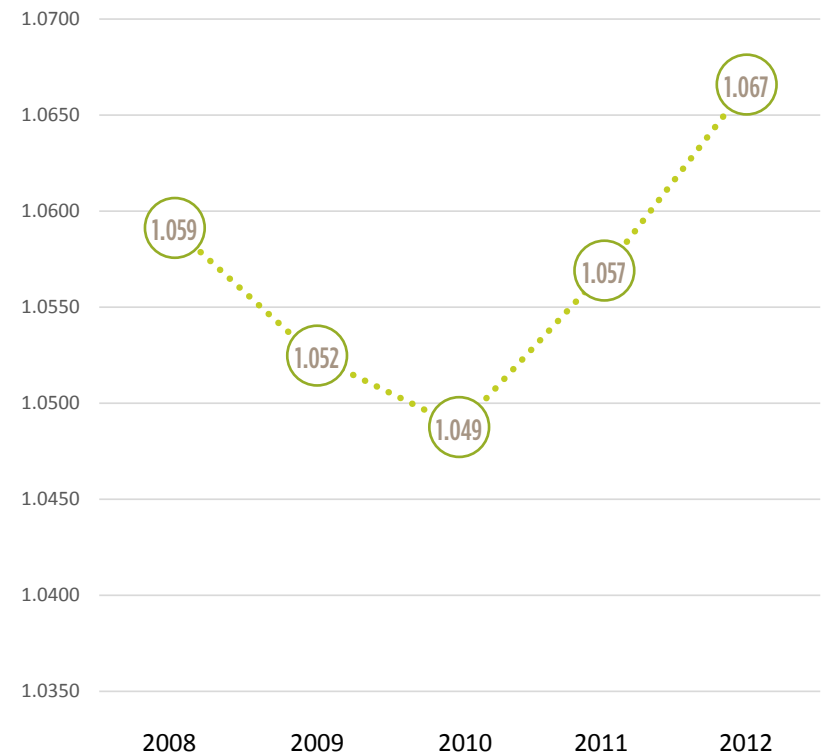
Desired trend: *Increase in the number of occupants per vehicle.*

Current trend: *There was no significant change in the average number of occupants per vehicle.*

Regional vehicle occupancy average

As Figure F.19 illustrates, there is no significant change year-to-year in vehicle occupancy data. This confirms the information in Figure F.3 that shows that 84 percent of commuters drive to work alone.

Figure F.19: Average number of persons per vehicle for work trips



Source: American Community Survey, 1-Year Estimates