

September 2018

MOBILITY
PLAN2040
CONNECTING
PEOPLE
AND
PLACES

MobilityPlan 2040

CONNECTING PEOPLE AND PLACES

The Mobility Plan 2040 is the long-range transportation plan for the Knoxville region. Based on input from regional residents, stakeholders, and elected officials, it guides transportation decision-making in the region over the next two decades.

CONTENTS

Introduction.....	4
About the TPO	5
Federal Requirements	7
Chapter 1: Regional Issues	9
Investing in the Future	9
A Growing, Changing Region	10
Regional Planning is Important	11
Transportation in the Region: Where Are We? Where Are We Headed?.....	16
Chapter 2: Transportation Goals, Objectives, and Performance Measures	42
1. Maintenance and Efficiency	44
2. More Options.....	45
3. Safety and Security.....	50
4. Health and Environment	57
5. Equitable Access.....	61
6. Congestion Reduction	66
7. Preservation of Places	71
8. Economy and Freight.....	72
Chapter 3: Summary of Planned Investments	76
Overview.....	76
Project Selection.....	76
Air Quality Conformity.....	82
Chapter 4: Implementation and Monitoring	84
Chapter 5: The Financial Plan	85

APPENDIX

The appendices are in a separate document available online at www.knoxmobility.org.



INTRODUCTION

Transportation, housing, land development, and other essential services are the foundations of regional economic growth and prosperity. To ensure our future well-being and quality of life, we need to plan thoughtfully to make the best use of our resources and opportunities as we improve and expand our key services and facilities.

What is the Mobility Plan?

It's our region's vision for how people and goods will travel in the Knoxville Region over the next 23 years.

Residents say they envision a region with more connected communities, more transportation choices, and a transportation system that is maintained and managed efficiently.

Mobility Plan 2040 calls for both greater correlation between regional transportation investments and community development and land use, and greater investment in our transportation system to provide the choices the region's residents need for the future.

To achieve that vision, our region needs to take these steps:

- Improve intermodal connections to help move freight to and through the region; reduce delay on major freight corridors.
- Support business attraction and retention.
- Reduce rates of crashes with serious injuries and fatalities; reduce the region's vulnerability to incidents and threats.
- Improve access to services and employment with transit, bicycle, and pedestrian projects.

- Minimize negative impacts on the environment and public health, and increase access to active transportation/physical activity for all ages.
- Preserve the natural areas (mountains, open space, farmland, viewsheds) that make our region unique.
- Connect communities to opportunities and services throughout the region, particularly areas with high proportions of low income, senior, and/or minority populations.
- Preserve and maintain our existing infrastructure through repaving projects and bridge replacements.
- Use our system more efficiently through technology like traffic signal coordination, real-time traffic info, and emergency response vehicles.

Mobility Plan 2040's goals are based on an extensive and innovative public engagement program. Information gathered from three statistically significant phone surveys, several web-based surveys, and community meetings was used to identify the most common themes for residents' desired future. This input builds on the public input foundation established through the Plan East Tennessee (PlanET) effort.

Residents throughout the region were given a variety of ways to participate during the Plan's development. People had the opportunity to join the discussion and express their opinions via online and paper surveys, Mobility Plan booths at community events, and public workshops. Surveys were made available online and printed copies were available by request in English and Spanish. The Mobility Advisory Committee (MAC) also provided input and guidance to the process. The MAC is a stakeholder group consisting of regional experts representing diverse perspectives, from freight and economic development practitioners to public health representatives and greenway advocates. This group met for a series of workshops throughout the plan development process. More information about the TPO's engagement program can be found in Appendix D.

About the TPO

The Knoxville Regional Transportation Planning Organization (TPO) is the Metropolitan Planning Organization (MPO) for our area. An MPO is a transportation policy-making organization composed of representatives of local government (Executive Board) as well as local engineers and planners (Technical Committee). All urbanized areas with more than 50,000 residents are required to have an MPO to ensure that federal transportation funding is spent based on a planning process that meets regional and national goals. The MPO approves the use of these funds within its planning area for highways, transit, bicycle, and pedestrian projects.

The TPO planning area includes all or parts of the following cities/towns and counties: Anderson, Blount, Knox, Loudon, Sevier, Roane, Knoxville, Maryville, Oak Ridge, City of Alcoa, Lenoir City, Farragut, Clinton, and Loudon. Due to the strong commuting ties between Union County and the counties in the TPO planning area, Mobility Plan 2040 includes Union County in discussion and analysis.



TPO PLANNING AREA

The TPO is housed within the Knoxville Knox County Metropolitan Planning Commission (MPC), and staffed by MPC transportation planners and engineers. The 18-member TPO Executive Board is made up of elected and appointed officials from the TPO planning area. They are responsible for setting regional transportation policy, and adopting plans and programs. The 24-member TPO Technical Committee consists primarily of planners and engineers from the cities and counties of the TPO. The committee reviews plans and policies before they are sent to the Executive Board, and assists with implementation of plans and programs.

The TPO's work plan is set each year by a Transportation Planning Work Program (TPWP). The TPWP details the planning activities and work products the TPO and the public transit providers will conduct or complete in the upcoming year. This work includes regional greenways planning, transit planning, travel demand modelling, review of development proposals, and partnerships with health departments and other stakeholders.

The TPO is responsible for developing a long-range mobility plan, which is updated every four years. The plan identifies and prioritizes improvements for all types of transportation over the next 20 to 30 years. Project costs cannot exceed the funding that is expected to be available. A proposed transportation project must meet the goals of the Plan in order to be selected for funding.

The TPO also develops a four-year schedule of projects that is updated every three years. The Transportation Improvement Program (TIP) provides a description of each project and the cost for each phase (e.g. design/engineering, right-of-way acquisition, construction) that will occur within the timeframe of the TIP.

The TPO is a planning agency and does not design or implement projects. Projects are managed by the jurisdiction in which the project is located or by who oversees the facility (e.g. a city, a county, or TDOT).

Federal Requirements

This plan includes key elements that comply with federal requirements for transportation planning. In particular, this plan contains the first phase of new requirements to use performance standards in transportation planning, as well as new planning factors recently adopted as part of the Fixing America's Surface Transportation (FAST) Act. The FAST Act is the bill that controls how federal transportation dollars are allocated throughout the country. The planning factors are described in Table 1-1: Federal Planning Factors and on page 43.

Table 1-1: Federal Planning Factors

1	Support the economic vitality of the metropolitan area, especially by enabling global competitiveness, productivity, and efficiency.
2	Increase the safety of the transportation system for motorized and non-motorized users.
3	Increase the security of the transportation system for motorized and non-motorized users.
4	Increase the accessibility and mobility of people and freight.
5	Protect and enhance the environment, promote energy conservation, and improve quality of life, and promote consistency between transportation improvements and State and local planned growth and economic development patterns.
6	Enhance the integration and connectivity of the transportation system, across and between modes, for people and freight.
7	Promote efficient system management and operation.
8	Emphasize the preservation of the existing transportation system.
9	Improve the resiliency and reliability of the transportation system and reduce or mitigate stormwater impacts of surface transportation.
10	Enhance travel and tourism.

In addition to incorporating all 10 of the Federal Planning Factors, Mobility Plan 2040 provides support for the US Department of Transportation's (USDOT) "planning emphasis areas" (PEAs). Table 1-2 illustrates how the work of the TPO and development of Mobility Plan 2040 incorporates the planning emphasis areas.

Table 1-2: USDOT Planning Emphasis Areas

Transition to Performance - Based Planning and Programming	
Begin to integrate the measurement and reporting of transportation system performance into the MPO's planning process, in preparation for the federal requirements to be issued.	Mobility Plan 2040 identifies key performance measures for each of our 8 goals. These performance measures can be found in Table 2-1 on page 41. The measures were developed based on the best available data. They will be modified as additional guidance is provided by the TDOT and FHWA. ETindex.org, our online data indicators site, provides an opportunity for the TPO to provide transparent and timely information on the status of our performance measures.
Promote Regional Cooperation	
Improve the effectiveness of transportation decision-making by encouraging coordination and communication among MPOs, RPOs, state DOTs, transit operators and similar agencies.	The TPO works closely with a number of different organizations to promote regional cooperation such as the Rural Planning Organizations (RPO), East TN Development District, and local and regional transit providers. The TPO provides staff support to a regional Mayor's Caucus that meets on a quarterly basis to discuss key issues and opportunities in a 16-county region. The TPO staff also participates in the Great Smoky Mountains Regional Greenway Council.
Ladders of Opportunity	
Ensure access to essential services such as employment, health care, education and recreation. Identify gaps in transportation connections to these services, particularly for traditionally underserved populations.	For the 1st time, project selection criteria for the Mobility Plan includes equity and access to opportunity. In conjunction with the Ladders of Opportunity initiative, the TPO seeks to fund transportation projects that connect communities to centers of employment, education, and services. These projects can also stimulate long term job growth, especially in economically distressed and historically disenfranchised areas. See page 61 for more information.

The Plan seeks to meet environmental justice requirements but also exceed them by taking into consideration equity and priority populations in the evaluation of all project applications. Priority populations are characterized by those living in areas (represented by census tracts) with less opportunity, less accessibility to safe places for being active, and greater vulnerability (see page 57 for more details).

The plan reflects an emphasis on transportation planning and project programming that is consistent with not only the FAST Act but also with the Clean Air Act Amendments (CAAA) of 1977 and 1990, the American's with Disabilities Act of 1990, and the Rehabilitation Act of 1973, Section 504.

REGIONAL ISSUES

Investing in the Future

As we look ahead, we will need to invest sufficiently in our transportation system to ensure continued growth in our region's livability and prosperity.

Mobility Plan 2040 identifies the funding we expect our region to receive and defines how it will be spent. The Mobility Plan is updated every 4 years, so the region's transportation needs are reviewed regularly.

The Mobility Plan includes all projects within the TPO Planning Area that are planned to be implemented utilizing federal transportation funds. A total of approximately \$3.5 billion worth of investment in the Region's transportation system is programmed between now and 2040. There are a mix of multimodal projects included that will address identified needs for our roadway, transit and active transportation systems.

The largest amount of funding has been designated to our Region's roadway network at approximately \$2.5 billion system-wide. Of that total, the largest category of funding at \$1.3 billion is directed to projects addressing needs on the most important roadways that have been designated under the "National Highway System", which includes the Interstates and other principal arterial routes.

For transit, approximately \$900 million in funding is anticipated through 2040 that will be dedicated for supporting the existing transit system, including regular-route buses. Within that funding, there are some limited dollars available for expansion and modernization of the system and support facilities.

Investment in active transportation projects is estimated to be approximately \$100 million over the life of the Plan. However, this does not include those types of accommodations included as part of a major transportation improvement of a street or highway.

A Growing, Changing Region

With nearly a million people, diverse industries and businesses, and outstanding natural and cultural amenities, the Knoxville region is a thriving place to live, learn, work, and do business.

The region includes a wide range of communities – small towns and rural areas, growing communities, suburban neighborhoods, and active urban districts.

Ours is a growing region. This presents tremendous opportunities for additional prosperity and innovation. It also creates challenges for our transportation system. Transportation-related challenges and opportunities in the region include:

- Aging infrastructure will not meet the demands of a growing population without significant investment in the near future—including roads, bridges, locks, and transit.
- There are inadequate financial resources to address the region's infrastructure needs.
- Climate change and related extreme weather events will likely increase and continue to stress our existing transportation system.
- Diminishing groundwater supplies, impaired water quality, and threats to ecological resources will continue to increase.
- Population and job growth will increase traffic congestion within the region.
- Disparities will continue to persist in income, employment, poverty, homeownership, education, and access to opportunity.
- The number of people over age 65 will double by 2040.

Each of the Plan's goals includes strategies to address these challenges and performance measures to assess progress toward meeting the goal.

Regional Planning is Important

The TPO provides a forum for collaboration, coordination, and education among community members, state leaders, and federal officials.

A cornerstone of this partnership is working with state and local governments responsible for planning and implementing the land use and infrastructure needed to support the Mobility Plan. The Mobility Plan also supports the comprehensive plans of many jurisdictions in the planning area.

To help communities in the region plan in an orderly, efficient, and economic way, and plan for transportation infrastructure that serves both local and regional development, Mobility Plan 2040 emphasizes the importance of regional coordination and varying scales of centers (from rural crossroads to downtowns). This Plan also encourages local governments to plan for more infill development and a diversity of uses across the region. Focusing development in our existing towns and cities and along corridors supports a greater efficiency and resiliency in the transportation system (see map on page 14, Centers and Corridors Concept).

The TPO continues to make an effort to include areas outside of the base Metropolitan Planning Area boundaries in the greater Knoxville Region in the development of the Mobility Plan. Following are some of the major factors driving this need for greater regional inclusion:

- **Air Quality Planning** – In June 2004 the EPA designated the Knoxville Region as a “nonattainment” area for the 1997 8-Hour Ozone Standard. A large portion of the 6-county nonattainment area was outside of the designated TPO Planning Area and also overlapped with an adjoining Metropolitan Planning Organization – the Lakeway Area Metropolitan Transportation Planning Organization (LAMTPO). A Memorandum of Agreement (MOA) was entered into between the TPO, TDOT and LAMTPO, which formalized the responsibilities of each agency and designated the Knoxville TPO as the lead agency to conduct the required transportation conformity analyses for the entire nonattainment area. Fortunately, the region’s air quality has improved dramatically and many of the counties in the original ozone nonattainment area are no longer subject to transportation conformity although it is possible that as air quality standards continue to be further strengthened by EPA that areas could return to nonattainment status in the future.
- **Travel Demand Forecasting** – As a result of the need to conduct the transportation conformity analysis for the entire ozone nonattainment area, the TPO developed a 10-county regional travel demand forecasting model. The model encompasses all nonattainment counties as well as the entire LAMTPO planning region. A separate standalone subarea model was also

developed to allow modeling of just the LAMTPO area and the TPO is maintaining that model on behalf of LAMTPO for its use in developing its own regional transportation plan. The TPO coordinates with the LAMTPO staff, TDOT and the East Tennessee South RPO to ensure that all regionally significant transportation projects are represented in the model as well as in the development of the future land use projections that are used as input to the model.













- Tourism – Although the TPO Planning Area only includes a small portion of Sevier County known as Seymour which is primarily a bedroom community for Knoxville, it is recognized that the areas in Sevier County outside of the TPO serve a tremendous amount of tourism largely generated by the Great Smoky Mountains National Park along with attractions located in the gateway communities themselves such as Dollywood. The TPO has led efforts in the past to investigate ways to manage the significant amount of traffic congestion that is generated by this tourist activity both in terms of managing demand through analyzing transit alternatives and also in maximizing efficiency through development of an Intelligent Transportation Systems (ITS) Master Plan. The TPO is participating as a stakeholder in the current Advanced Traffic Management System (ATMS) deployment effort currently underway for the cities of Sevierville and Pigeon Forge under a CMAQ funding grant.
- PlanET – A cornerstone in our regional planning efforts was the coordination of Plan East Tennessee (PlanET). PlanET was a 30-month process that began in 2011 and focused on the following:
 - Fostering ongoing citizen involvement in planning for the region's future
 - Developing a regional playbook to share strategies and provide guidance for local policy
 - Increasing local capacity for dialogue and action

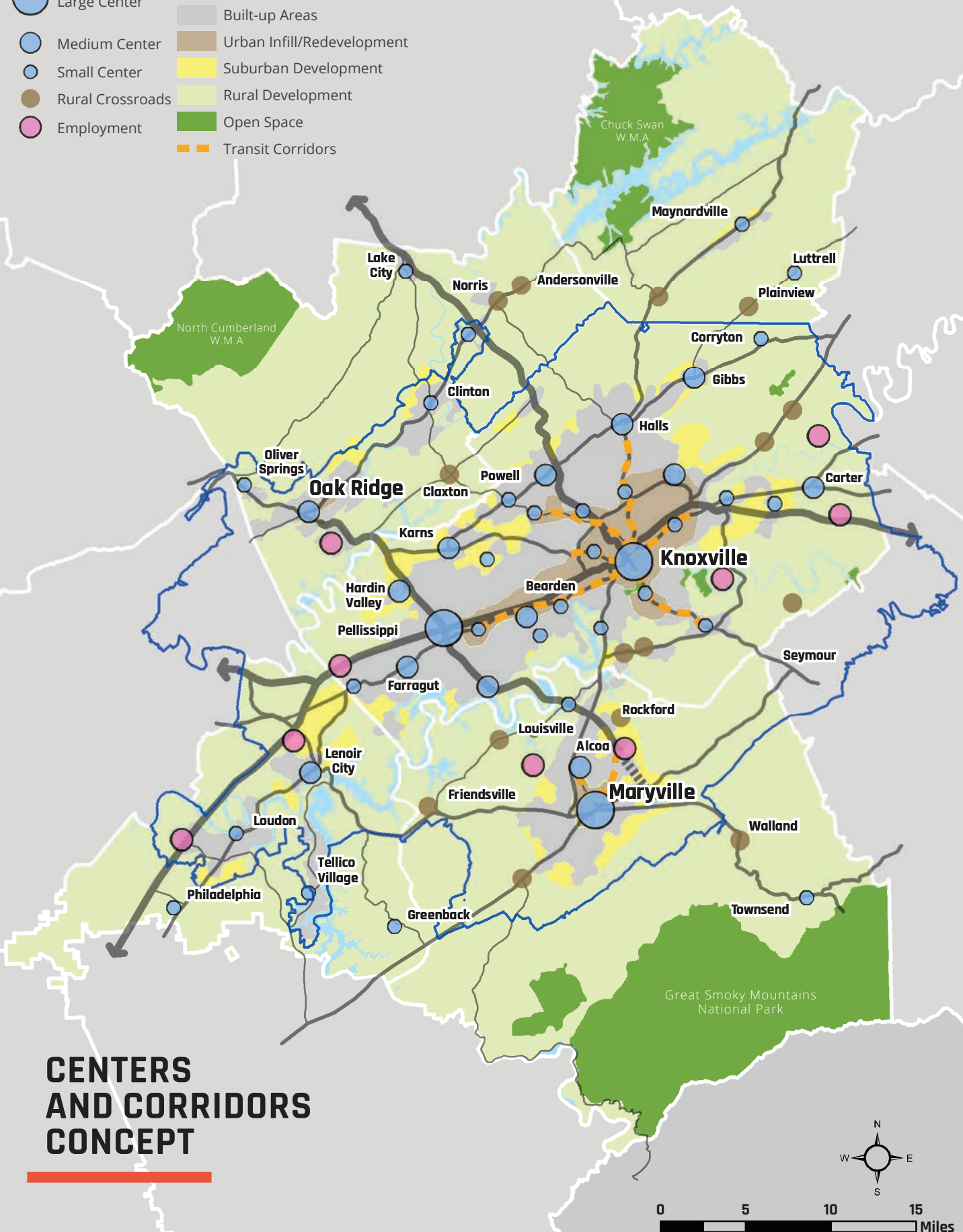
PlanET included a five county area encompassing our TPO Planning Area and included over 30 partners and thousands of people across our region. We continue to move forward the work of PlanET through this Plan, our partnerships, our leadership of the East Tennessee Regional Mayors Caucus, and staff participation in groups such as East Tennessee Quality Growth and the Smoky Mountain Regional Greenway Council.



Open Streets 2016, Central Street, Knoxville, TN

LEGEND

- | | | | |
|---|------------------|---|----------------------------|
|  | Large Center |  | Knoxville Regional TPO |
|  | Medium Center |  | Built-up Areas |
|  | Small Center |  | Urban Infill/Redevelopment |
|  | Rural Crossroads |  | Suburban Development |
|  | Employment |  | Rural Development |
| | |  | Open Space |
| | |  | Transit Corridors |



The centers and corridors concept is built around a hierarchy of centers ranging in size, scale, and function.

This approach to accommodating the region's growth maximizes transportation and housing choice, minimizes impacts to our prized natural resources, makes efficient use of existing infrastructure, and benefits from existing economic and social capital.



Large Centers

These are the commercial and economic centers of the entire region. Here one would expect to find significant employment opportunities, specialized healthcare, and premium transit service, such as bus rapid transit.



Medium Centers

Good employment opportunities and specialized services can be found in these centers, but emphasis is on serving specific areas rather than the region as a whole. Good local transit service and walking and cycling opportunities abound.



Small Centers

These centers are focused on meeting daily needs, such as grocery shopping and schools. Think of traditional, small downtowns located in the center of walkable neighborhoods.



Rural Crossroads

Located in rural areas, usually at the convergence of major roads, these centers serve basic needs while having minimal impact on the landscape.



Employment Nodes

Although most of our region's employment growth is focused in centers, business and industrial parks will continue to be present in suburban and rural settings.

Transit Corridors ■ ■

Some of the region's traditional corridors are targeted for reinvestment and intensification, linking one or more large centers along their length. These corridors are complemented with investment in high-quality transit that features dedicated stations and lanes, high frequency, and fast service. If you live, work, or shop in one of these corridors, you will have good access to convenient and reliable transit.

Urban Infill ■

Many places within our region's larger cities have suffered from years of disinvestment. Suburbanization pushed our development footprint outward, leaving vacant and underutilized spaces in its wake. In the coming decades, however, rising transportation and infrastructure costs and increased demand for land near centers will make these locations ripe for rebirth and reinvestment.

Suburban & Rural Development ■ ■

Many residents of East Tennessee prefer a more rural or suburban lifestyle. Our shared vision includes continued accommodation of these options, balanced with a host of other lifestyle opportunities, whether it be a downtown high-rise, walkable neighborhood, or small town, making East Tennessee a place that truly has something for everyone.



Transportation in the Region: Where Are We? Where Are We Headed?

Yesterday

Images like these depict vibrant streets with streetcars, automobiles, and pedestrians. However, the streets which served all types of users started to look and function differently in the mid-twentieth century. As more people moved away from the urban centers, communities began putting the needs of automobiles first in roadway design.



Gay Street looking south from Commerce Avenue ca. 1920. The traffic tower regulated stopping and starting traffic before traffic lights became available. Fountain City streetcar in the foreground. Calvin M. McClung Historical Collection, Knox County Public Library

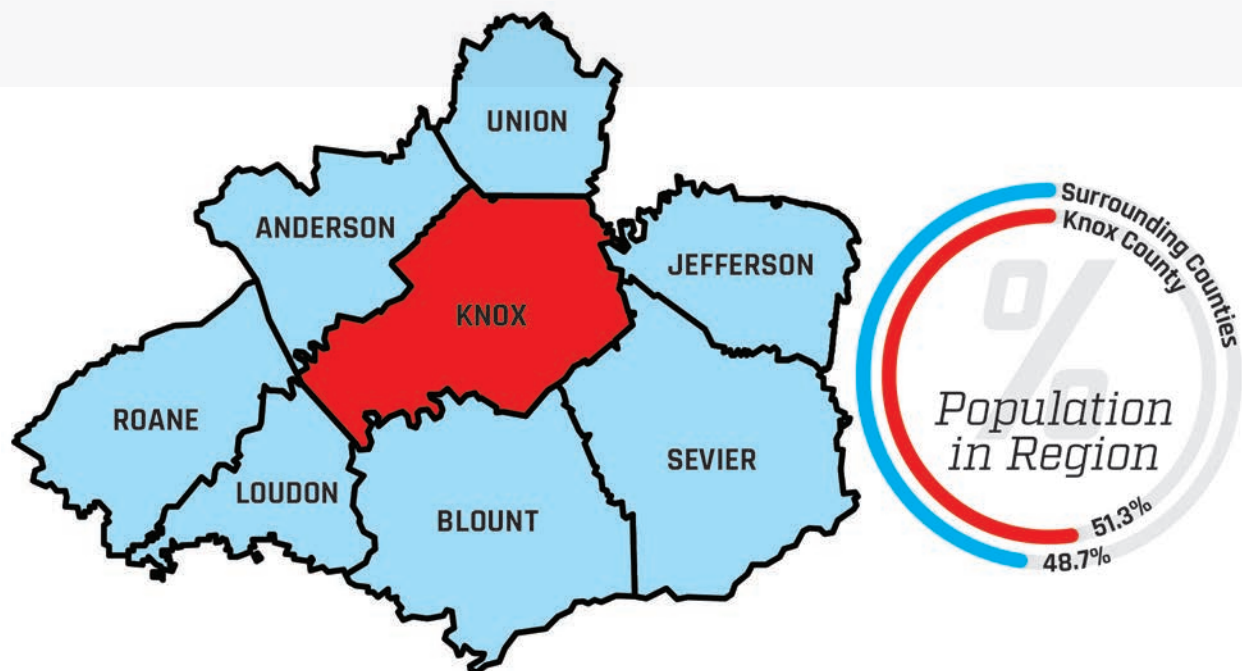
Today

Our region consistently ranks high when compared to peer regions in quality of life, including natural beauty, greenways, and lack of traffic congestion. But there is always room for improvement, especially when it comes to transportation access for historically underrepresented communities, economic vitality, and addressing effects of transportation on communities and the natural environment.

Transportation and People

Along with moving goods, the primary role of the regional transportation system is to serve the needs of close to a million people who live in our eight-county region. Between 1980 and 2014, the population of the region increased by 47%, higher than the national growth rate of 41%. Counties like Sevier and Loudon have seen the greatest increases in population over that time period, while Roane and Anderson have had the lowest increases. Between 2010 and 2014, Roane County actually saw a decrease in population – the only county in the region to experience a decline.

Nearly half of the region's population resides in Knox County.



Our population has grown rapidly for several decades. However, even more significant is how much land area has urbanized¹ as the population has grown. The U.S. Census Bureau measures urbanized land area every 10 years, showing where neighboring clusters of people have settled. The designation of urbanized area is of particular importance in transportation as it determines the scope of TPO planning areas.

Anticipated growth is expected to bring 300,000 additional residents by 2040, which presents tremendous opportunities for the region. A related challenge is the necessary balance between the needs of those new residents and the needs of the residents already here.

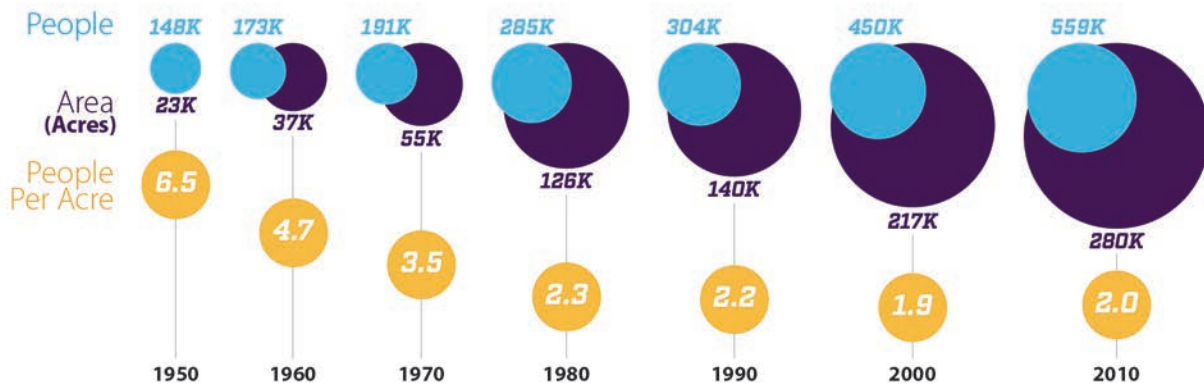
¹ The Census Bureau's urban areas represent densely developed territory, and encompass residential, commercial, and other non-residential urban land uses. The Census Bureau delineates urban areas every 10 years. The Census Bureau identifies two types of urban areas:

- Urbanized Areas (UAs) of 50,000 or more people.
- Urban Clusters (UCs) of at least 2,500 and less than 50,000 people.

"Rural" encompasses all population, housing, and territory not included within an urban area.

KNOXVILLE URBANIZED GROWTH PEOPLE AND AREA

Source: U.S. Census Bureau Urban and Rural Classification 1950, 1960, 1970, 1980, 1990, 2000, and 2010



From 1950 to 2010, population in the urbanized area grew nearly 380%, but the amount of land increased more than 1,200%. This means we take up more than three times more space per person than we did in 1950. As a result, people in the region are more dispersed and dependent on motor vehicles for daily travel (e.g. work, school, errands). Low density makes it difficult to fund frequent, fixed-route transit service or to walk to many destinations like stores and restaurants. Finally, more money is spent on roads spanning across a much larger area.

The evolution of the region's growth over time illustrates several key relationships between transportation and land use:

- Until the late 1940s, the region grew in a compact, traditional neighborhood form.
- The introduction of the automobile and freeways greatly increased mobility and access to affordable, developable land.
- The rapid expansion of the region's developed area in an auto-centric manner has resulted in longer average trips and the diminished attractiveness of non-auto modes for regional travel.
- The freeway-building era growth patterns are unsustainable. Congestion and a desire for convenient access to jobs, activities, and amenities are beginning to challenge continued expansion of the urban area through new land development.

The nature of the suburban land form (i.e., lack of density) makes it impossible to cost-effectively serve every neighborhood, development, or suburban employer with transit. More frequent and efficient transit service to suburban job centers supported by local bicycle and pedestrian systems would create greater prosperity for all, particularly benefiting low-income populations who may not be able to afford a personal vehicle or could otherwise spend their limited resources on other expenses, such as housing.

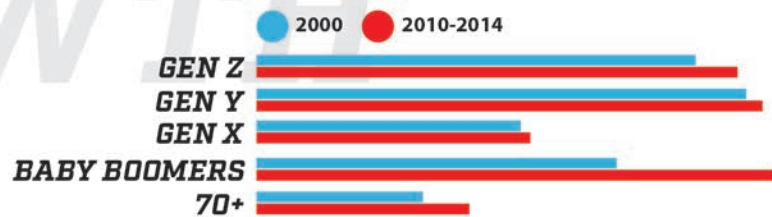
REGIONAL POPULATION GROWTH

by Generation

Compact Communities

Anticipated growth in the number of people older than 65 and Millennials (people born after 1979) also suggests additional demand for more compact communities with easy access to amenities and transportation options. Both of these populations are expressing a preference for a less car-dependent lifestyle and for living in well-connected, walkable neighborhoods that are well served by transit, or transit-supportive development. Other populations that would greatly benefit from living, working, and attending school in more walkable neighborhoods are people with disabilities, with limited incomes, and the young.

In public meetings, workshops, surveys, and open houses throughout the region, residents, businesses, and leaders have expressed a desire for more and better choices in housing and transportation – both of which have tremendous impacts on a person's quality of life. They want more connected communities with more transportation options.



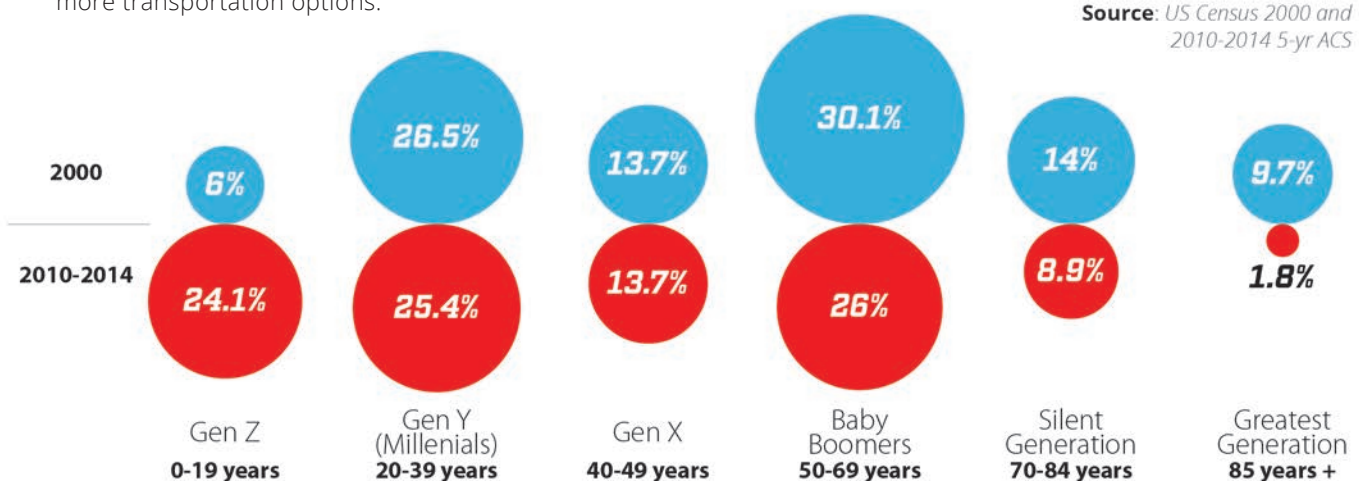
Source: US Census 2000 and 2010-2014 5-yr ACS

We hear a lot about the increasing numbers of Baby Boomers, but when you look at the share of population instead, you can see that Gen Z and Millennials make up nearly half of the population.

Generation Shares [%]

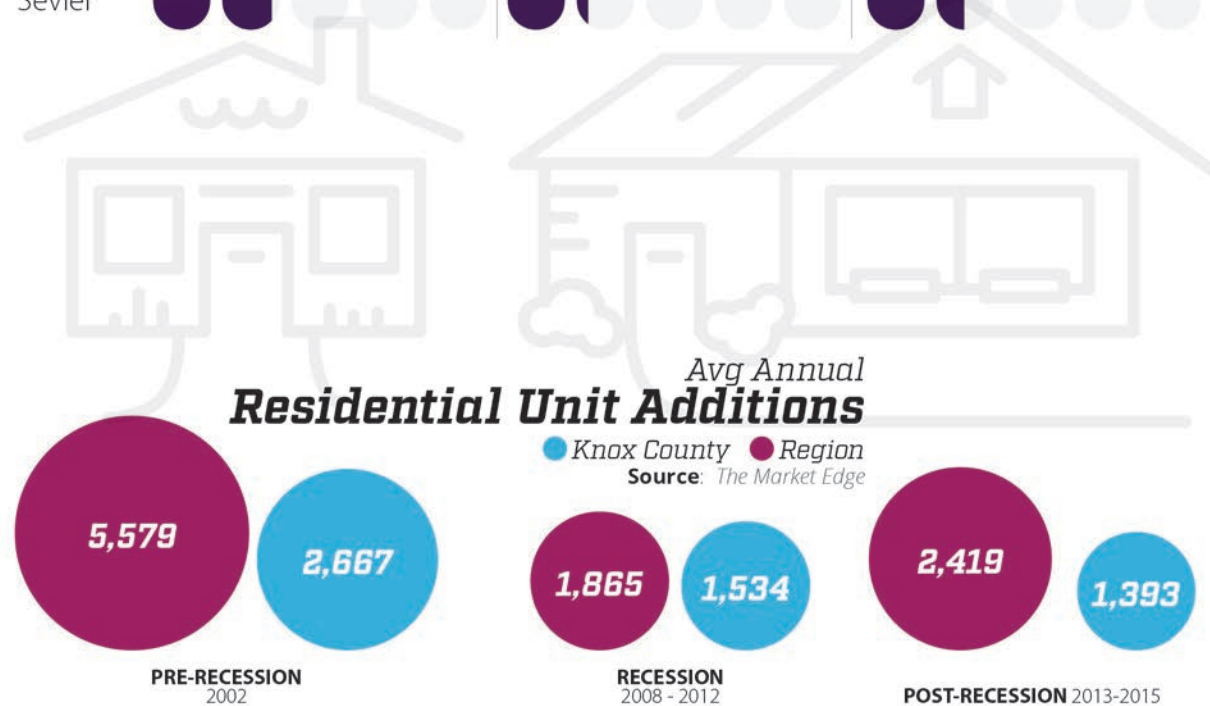
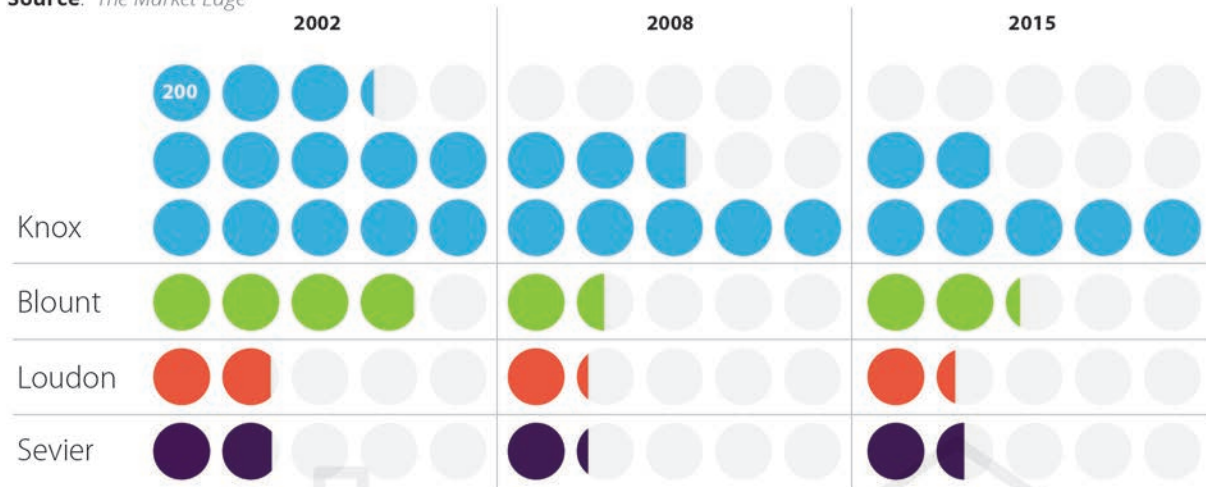
of Total Population 2000 to 2010/2014

Source: US Census 2000 and 2010-2014 5-yr ACS



Residential Building Permit Activity

Source: The Market Edge



The growth of the region stalled temporarily during the 2008 recession, with a significant downturn in new construction. However, the region has begun growing again, though at about half of pre-recession levels. The two exceptions are Loudon and Sevier counties, which are recovering more quickly, perhaps because of tourism.

Roadways

Our region's road network is responsible for the movement of people and goods. With the junction of three interstates and several large tourist attractions, our region sees considerable traffic.

There are more than 10,000 miles of public roadways in the eight-county Knoxville Region. Roads have a Functional Classification based on the type of service they provide: Arterial (including Interstates & Expressways), Collector, and Local. This hierarchy of roadways is based on access and mobility, which often compete with one another. The more mobility a roadway offers, the less access to adjoining land uses it typically provides and vice versa. Think of an interstate, which allows high speeds, but does not have connections to adjacent businesses (high level of mobility) versus a neighborhood street, which has many driveways for houses, but slow speeds (high level of access). Arterials are commonly assumed to be more about mobility than access, but when you consider how many destinations (e.g. stores, restaurants, and offices) are located on arterial roads, you can see that being able to reach those destinations (access) is very important.

When considering accessibility versus mobility, there are questions to consider: are you planning for people or are you planning for cars? Should streets be designed to increase the speed of motor vehicles, or to improve conditions for walking and bicycling? Should destinations like schools, parks, shopping, and workplaces have convenient access by car, transit, and walking?



Table 1-1: Highest Traffic Growth Locations 2005 – 2015

RANK	COUNTY	LOCATION	2005 AADT	2015 AADT	% Growth 2005 - 2015
1	Sevier	Veterans Blvd (SR-449) north of Jayell Rd	8,938	22,610	153%
2	Knox	Hardin Valley Rd west of Pellissippi Pkwy (SR-162)	8,457	17,620	108%
3	Blount	Pellissippi Pkwy (SR-162) east of Alcoa Hwy (SR-115)	8,809	14,970	70%
4	Sevier	Wears Valley Rd (SR-73) south of Waldens Creek Rd	6,443	10,550	64%
5	Knox	Middlebrook Pk (SR-169) east of Lovell Rd	10,520	17,000	62%
6	Sevier	Teaster Ln north of Ridge Rd	10,924	16,250	49%
7	Knox	Callahan Dr east of Clinton Hwy	16,658	23,950	44%
8	Blount	Old Knoxville Hwy (SR-33) north of Hunt Rd	11,449	16,430	44%
9	Sevier	Newport Hwy (SR-35) west of Flat Creek Rd	7,317	10,460	43%
10	Knox	Norris Frwy (SR-71) south of Emory Rd (SR-131)	9,970	14,010	41%
11	Knox	Emory Rd (SR-131) west of Norris Frwy	12,304	16,870	37%
12	Blount	Calderwood St south of Bessemer St	18,516	25,170	36%
13	Sevier	Winfield Dunn Pkwy (SR-66) south of Gists Creek Rd	29,557	39,270	33%
14	Knox	Emory Rd (SR-131) west of Heiskell Rd	12,893	16,830	31%
15	Knox	I-40 east of Gallaher View Rd	147,202	190,850	30%
16	Knox	Washington Pk north of I-640	15,090	19,530	29%
17	Knox	Alcoa Hwy (SR-115) south of I-40	60,256	77,480	29%
18	Knox	I-40 west of Alcoa Hwy (SR-115)	109,453	139,840	28%
19	Knox	Campbell Station Rd south of Parkside Dr	20,163	25,240	25%
20	Knox	Watt Rd north of Kingston Pk	8,088	10,000	24%

Source: *Tennessee Department of Transportation*

Knox County has the lowest average commute time of the region, with **21.4** minutes.

Union has the longest, at **34.1** minutes, due to the majority of workers commuting to other counties.

2010-2014



191,108
of the region's
398,252 workers
live and work in
different counties

2002
41%

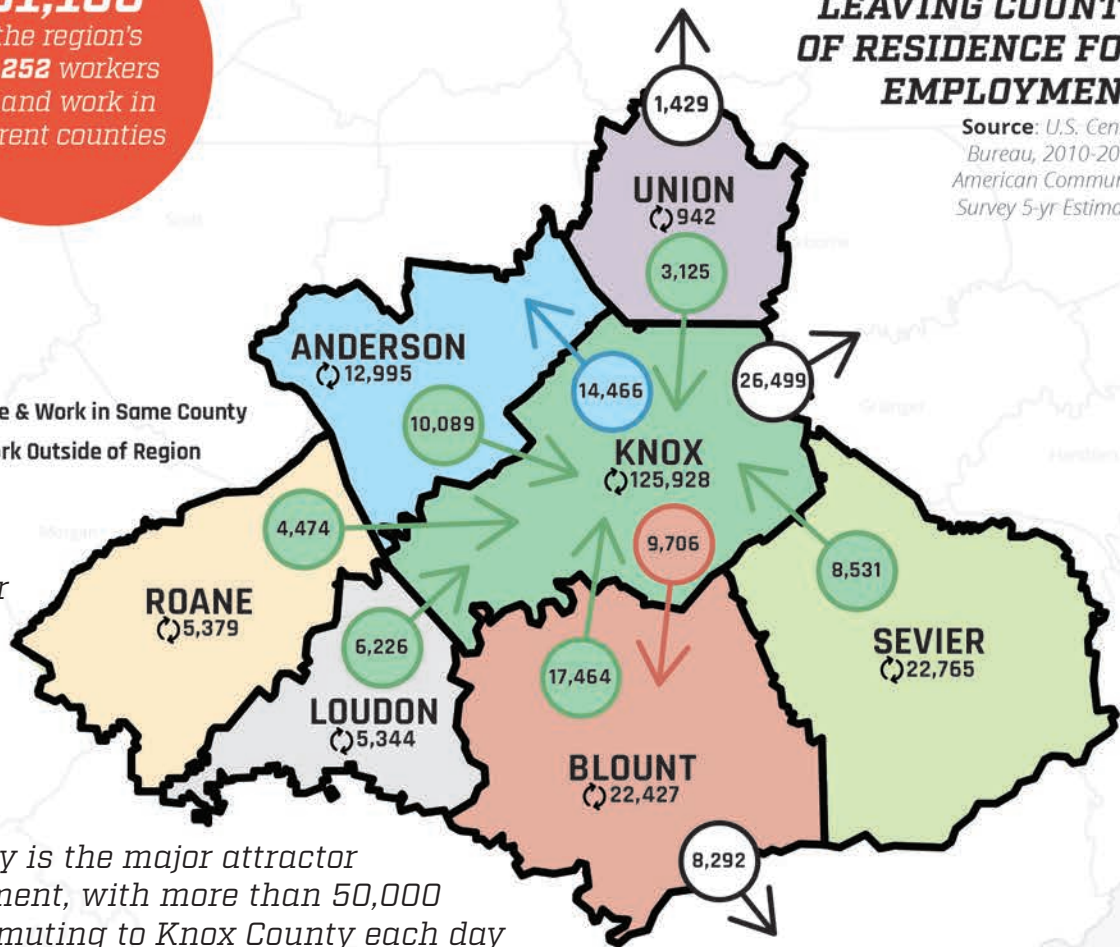
2011
47%

2014
48%

WORKERS LEAVING COUNTY OF RESIDENCE FOR EMPLOYMENT

Source: U.S. Census Bureau, 2010-2014; American Community Survey 5-yr Estimates

- Live & Work in Same County
- Work Outside of Region



The number of people commuting to another county for work is increasing.

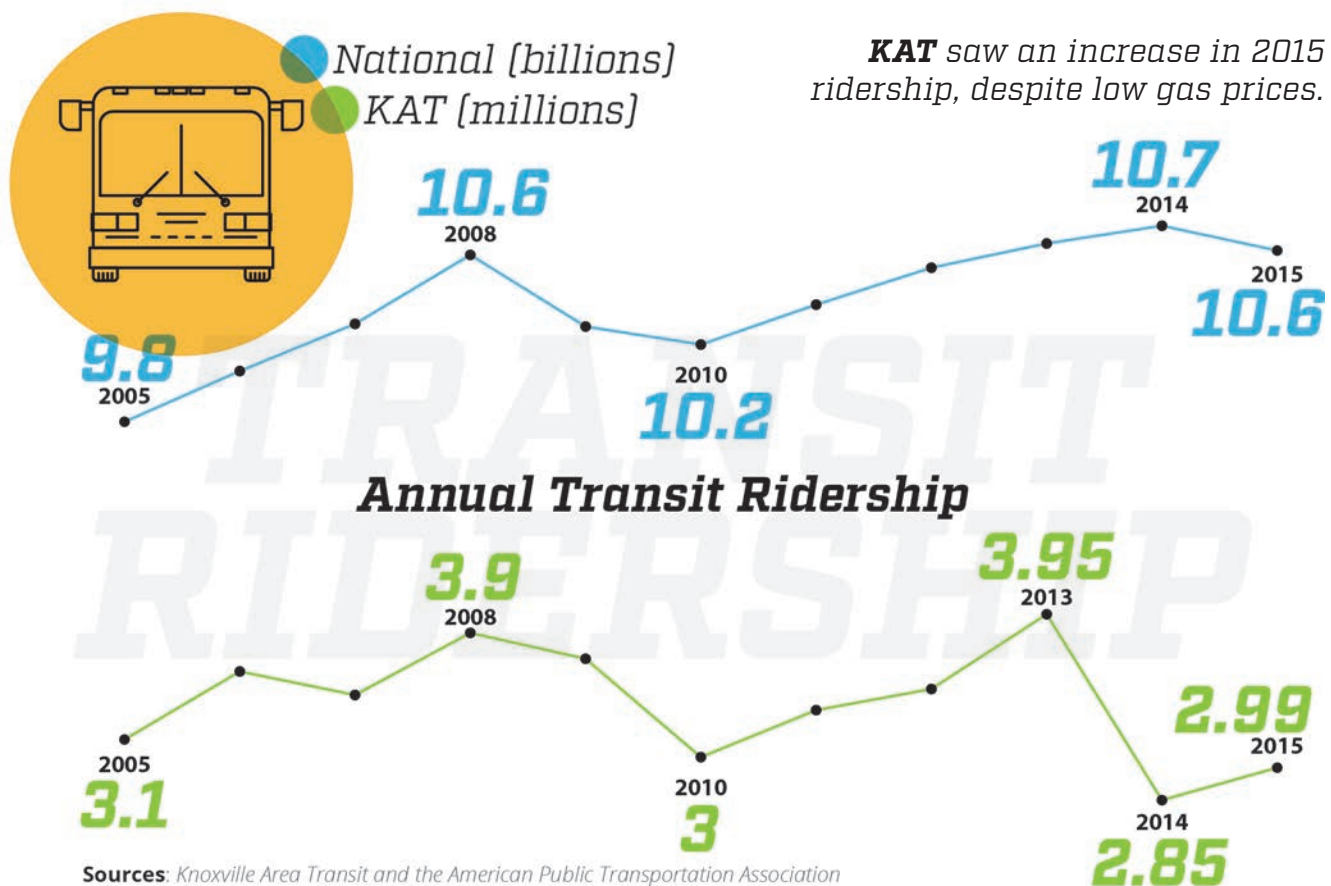
Knox County is the major attractor for employment, with more than 50,000 people commuting to Knox County each day from other counties in the region. Anderson County, with ORNL and Y-12, is also a major attractor, with more than 14,000 people commuting there from Knox County alone. Fewer than 14% of the workers who live in Union County work there - nearly half of them work in Knox County.

While commute trips get a lot of attention (because commute data are readily available from the U.S. Census Bureau), work-related and commute trips make up only about 15% of all trips. Most trips, 42%, are errands or shopping, and 27% are social or recreational. Miles traveled are more evenly distributed among purposes: 25% of miles traveled are work-related or commute, 30% are shopping or errands, and 30% are social or recreational.²

Public Transit

Public transportation enhances quality of life and the economic competitiveness of the region. Residents want transportation choices including public transit for work, community services and amenities, recreation, and shopping. In urban areas, public transit increases the ability to access jobs and daily services. For many in rural areas, public transit serves as an important life-line that connects residents to health care and necessary services.

Americans took 10.6 billion trips on public transportation in 2015, the third highest annual ridership in 10 years, according to the American Public Transportation Association (APTA). In 2015 the average price of a gallon of gasoline was \$2.52, which was 26.7% lower than in 2014. Research conducted by APTA shows that on average, every 10% decrease in gas prices leads to a 1.8% decrease in transit ridership.





Public transportation in the region is provided by Knoxville Area Transit (KAT), Knox County Community Action Committee (CAC) Transit, Blount County Community Action Agency (CAA), East Tennessee Human Resource Agency (ETHRA), Oak Ridge Transit, and the University of Tennessee Transit System.

- KAT provides fixed-route service in the City of Knoxville. KAT has 26 routes and 2,000 stops. In Fiscal Year (FY) 2016, KAT provided approximately 3 million passenger trips.
- CAC Transit provides more than 189,000 trips per year.
- ETHRA provides 299,460 trips a year. In FY 2015, 68% of ETHRA's trips were to medical appointments.
- Gatlinburg Trolley services seven routes covering 50 miles in and around Gatlinburg and surrounding areas. Ridership in 2015 was nearly 900,000, an increase over 2013's ridership of 835,236.
- Pigeon Forge's Fun Time Trolley serves the City of Pigeon Forge and a portion of Sevierville with six routes. 2015 ridership was more than 2.2 million. This was a huge increase over 2013's ridership of 808,076, in part because of two new developments: The Island in Pigeon Forge and the LeConte Events Center. The trolleys also have seen increased ridership to Dollywood and Dollywood's Splash Country as parking costs for those destinations have increased.

Detailed info on each provider can be found on page F1 in the appendix.

Regional Bicycle and Pedestrian Infrastructure

Walking and bicycling are essential parts of the regional transportation system and have numerous benefits at the local, regional, and national levels. Walking and bicycling allow people to make trips while reducing roadway congestion and air pollution. These choices can be combined with transit which incorporates exercise into daily routines. On a household level, they reduce the cost of transportation and improve health, and at a national level, they reduce our dependence on non-renewable energy sources.

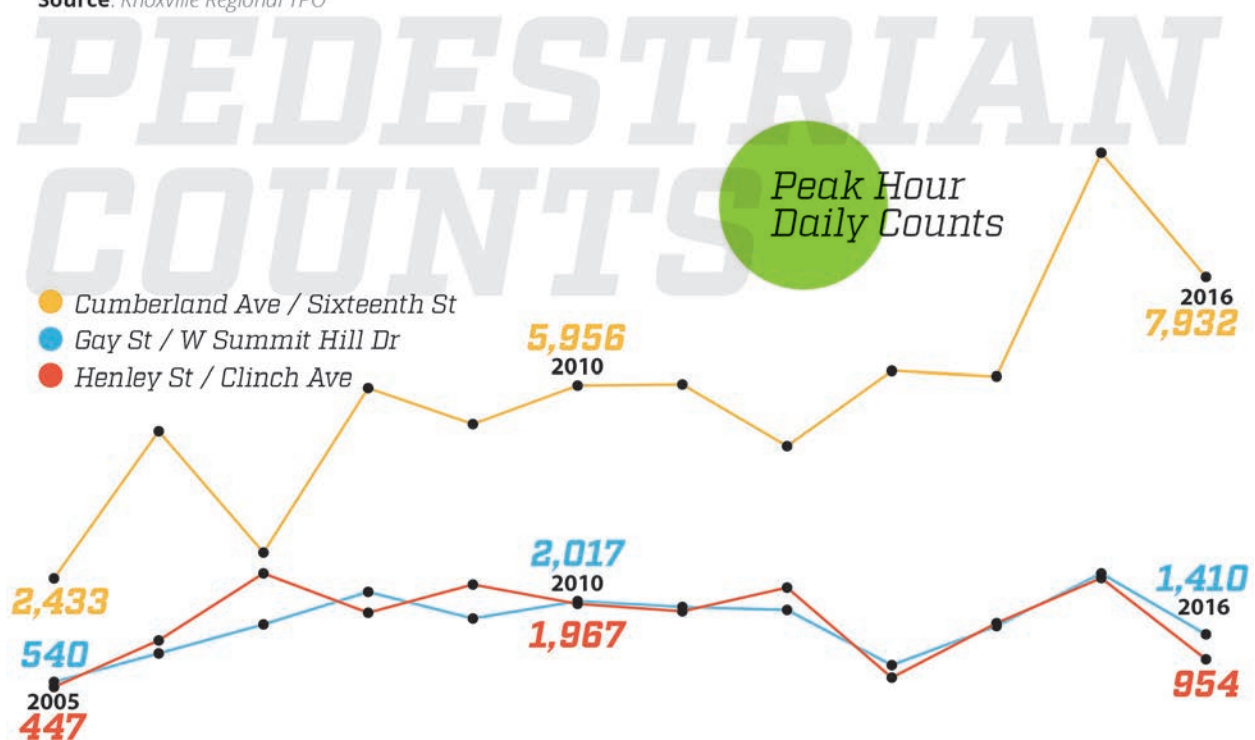
Walking and bicycling trips tend to be relatively short in this region, averaging about ¼ to ½ mile for walking and several miles for bicycling. Because of these short trip lengths, local governments lead development of the bicycle and pedestrian networks. The TPO helps facilitate planning for regional bicycle and pedestrian systems that connect between jurisdictions and travel modes, and seeks to find solutions to regional barriers to bicycling and walking.

Pedestrian Infrastructure

Pedestrian infrastructure – sidewalks, trails, and other amenities such as trees, lighting, and benches accessible to people of all ages and abilities – is key to making places feel easily reached, inviting, and safe. For people who do not drive, walking or traveling by wheelchair can be essential to meeting daily needs, and walking can be an important part of active living. Many opportunities for walking, such as going to the grocery store or to the bus stop, are made unsafe or impossible by lack of sidewalks or busy intersections.

Actions that communities can take to better accommodate pedestrians include: planning for Complete Streets to ensure accessibility and safety for all travelers, implementing accessible design standards, and coordinating projects with broad input from businesses, residents, and adjacent communities.

Source: Knoxville Regional TPO



3 Counts are conducted during peak hours that vary slightly by location. Gay/Summit Hill and Clinch/Henley: 7 - 9 a.m., 11 a.m. - 1 p.m., 4 - 6 p.m. Cumberland/16th: 7-10 a.m., 3 - 6 p.m.

The TPO has conducted regular pedestrian counts in selected locations within the City of Knoxville for several years. The TPO also partners with local governments to collect data on greenway trail usage. The TPO subsidizes trail counters for local governments, and owns some counters of its own, which it deploys for short-term counts. Each jurisdiction collects data from its counters and shares via a common online platform.

Several local jurisdictions have ordinances or regulations that require sidewalks with development and/or redevelopment:

- **Alcoa:** Sidewalks are primarily in Alcoa's downtown and older neighborhoods. A city ordinance requires sidewalks to be constructed with all single-lot development and redevelopment projects whenever site plan review is conducted by the Planning Commission. Alcoa's subdivision regulations require sidewalk construction with all new road construction by developers. In some instances, the City asks developers to pay a fee in lieu of sidewalk construction, and the fees go into Alcoa's general sidewalk fund.
- **Farragut:** The Town of Farragut, as part of the subdivision process, requires sidewalks to be constructed on the internal spine street of a subdivision, for walking trails to be constructed to all adjacent vacant properties, and for walking trails to be constructed on all adjacent, existing streets. As part of the site plan approval process (non-single-family residential), Farragut requires walking trails/sidewalks to be constructed on all adjacent, existing streets and construction of a pedestrian connection from the internal parking lot to the adjacent pedestrian facility and to adjacent properties.
- **Maryville:** Sidewalks are located mainly in Maryville's downtown and older neighborhoods. Since 1995, Maryville's subdivision regulations have required that sidewalks be constructed along both sides of all new streets.

See Appendix F for a detailed discussion of the pedestrian network in the region.





Greenways

Greenways are shared-use paths designed for use by pedestrians and bicyclists. They serve both recreational and transportation purposes. As greenway links and loops are connected, they are able to serve more uses to get people where they want to go. Greenways complement the on-street pedestrian and bicycle network provided by sidewalks and bicycle lanes and provide important connections to transit routes and other destinations.

The region has nearly 120 miles of paved greenways (see page F5 for a complete list). Knoxville has the most trail miles - nearly 50 - of any municipality, followed by Alcoa and Maryville's interconnected 16 miles. Knox County as a whole boasts a total of 72 paved trail miles, followed by Blount County's 25.

Over seven miles of greenways have been added in the region since 2013.

Bicycle Network

Bicycle facilities are an integral component of the regional transportation system. The region currently has approximately 24 miles of bike lanes. Great strides have been made in bicycle facilities in the City of Knoxville since the last Mobility Plan was developed in 2013. The extent of bike lanes increased from less than four miles in the City of Knoxville to 16 miles as of September 2016. See map on page 32.

The City of Alcoa has increased from 2.5 miles to 4.7 miles over that same time frame.

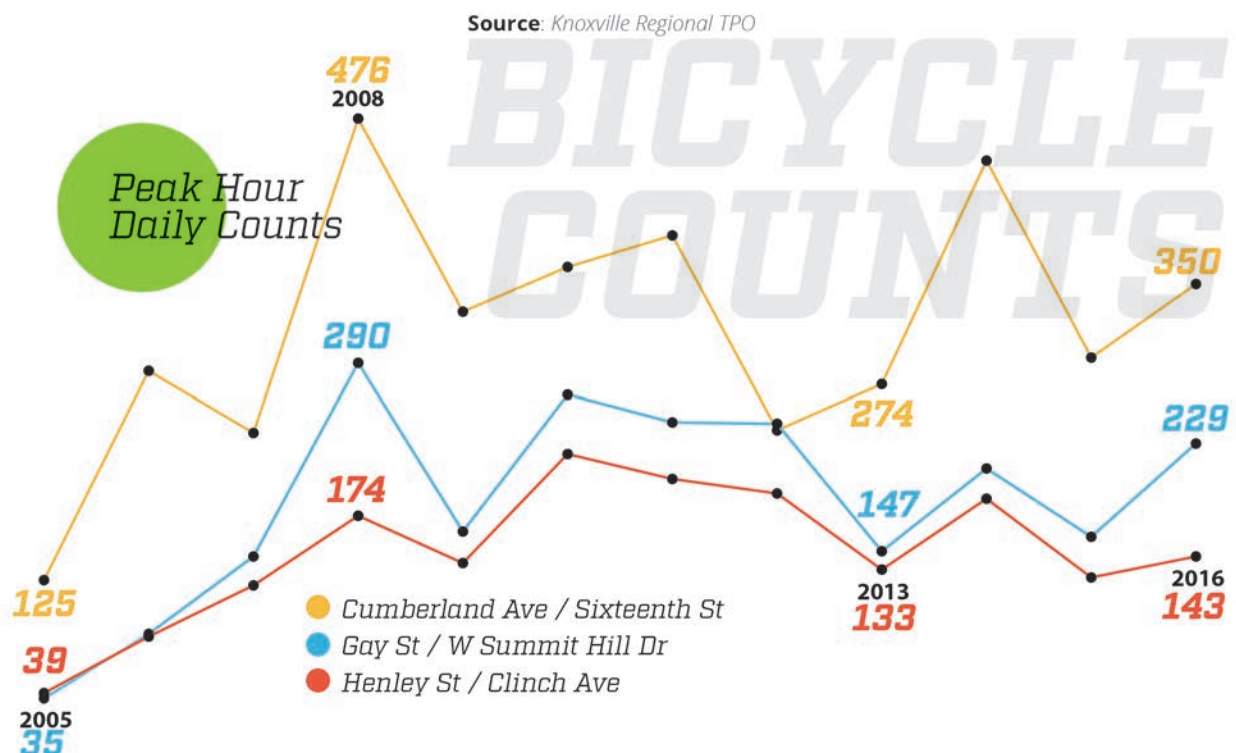
The City of Knoxville also has added shared use lane markings over four miles of streets, two sections of green bike lanes at key intersections, and four signed bike routes covering nearly 30 miles of streets.



The TPO has conducted regular bicycle counts at select locations for several years. These counts show that the number of people bicycling has generally increased since counts began in 2005.⁴

The TPO also utilizes a mobile app in partnership with Civil and Environmental Engineering researchers at the University of Tennessee – Knoxville. People are asked to use the app to record their bicycles trips in the region. The project aims to improve bicycling safety by using the data gathered to understand how improvements to area roadways can best meet the needs of bicyclists. This information is being shared with local jurisdictions, and a map is available online for the general public. www.ibikeknx.com/cycleknox

The TPO encourages and offers resources for member jurisdictions to develop prioritized lists of projects in order to be able to make effective funding decisions. Grant applications are more successful if based on an adopted plan or project list. The City of Knoxville leveraged TPO planning funds in order to develop a Bicycle Facilities Plan in 2015.



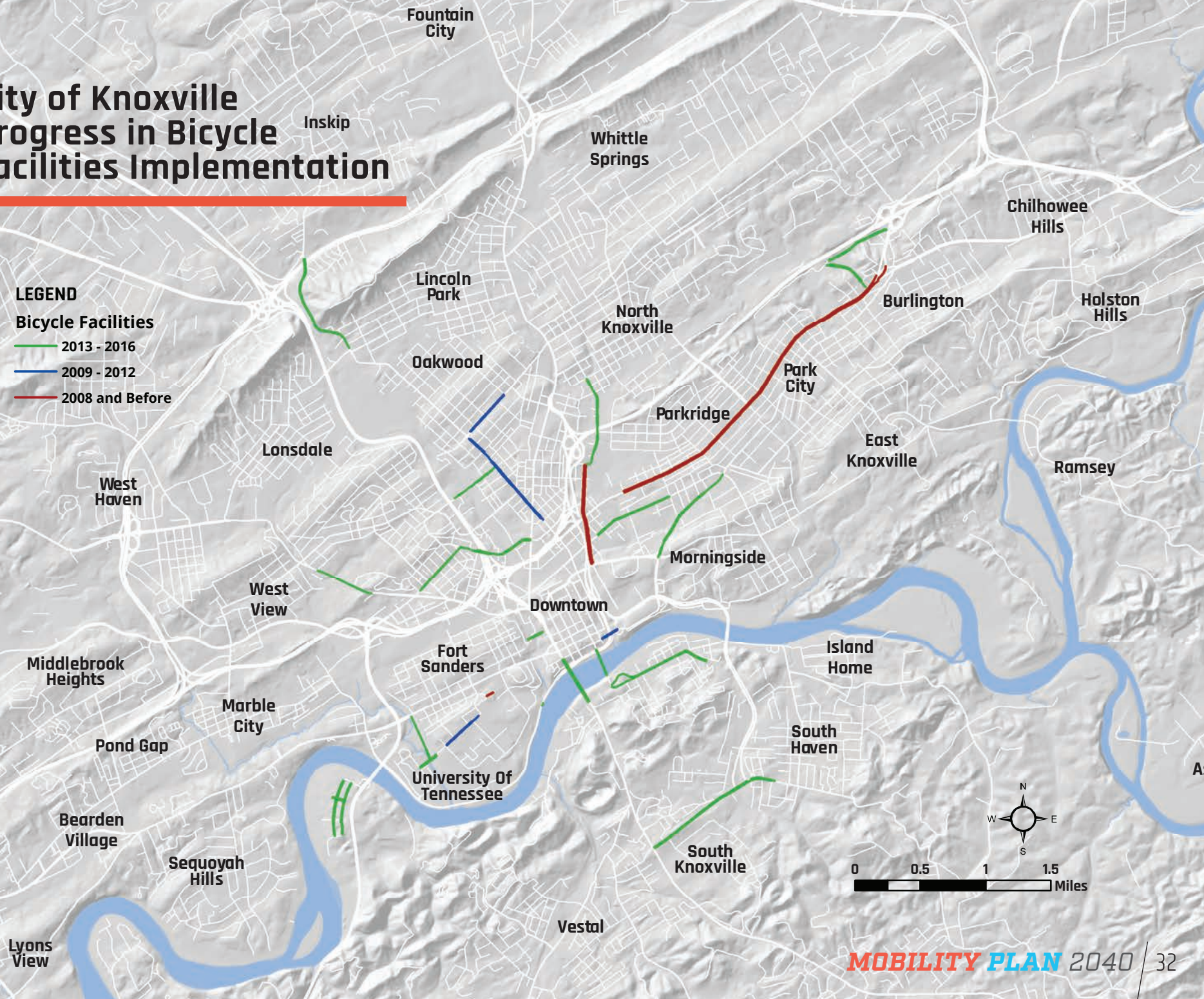
⁴ These counts are available on the TPO website: <http://www.knoxtrans.org>. They are conducted during peak hours that vary slightly by location. Gay/Summit Hill and Clinch/Henley: 7 - 9 a.m., 11a.m. - 1 p.m., 4 - 6 p.m. Cumberland/16th: 7-10 a.m., 3 - 6 p.m.

City of Knoxville Progress in Bicycle Facilities Implementation

LEGEND

Bicycle Facilities

- 2013 - 2016
- 2009 - 2012
- 2008 and Before



Regional Freight System

Eighty-three percent of all intercity freight in the U.S. is moved by trucks on highways. The remaining 17% is moved by air, water, and rail. Most freight infrastructure is owned by the private sector. Public sector freight-related infrastructure includes highways, navigable rivers, river port terminals, and airports.

Trucking

The trucking industry is responsible for handling 65 - 70% of the 17 billion tons of freight moved across the nation's transportation system each year. Trucks also handle an additional 18% of freight at some point during its shipment. This includes rail, air, or barge freight that is moved to a truck for a portion of its trip. Truck activity has increased in recent years and will continue to place great demands on the transportation system, particularly the interstate highways. The U.S. Department of Transportation estimates freight volumes in the United States will increase 40% in the next 30 years.

A large volume of truck traffic uses the interstate system in Knoxville to transport freight to or from various parts of the country. Almost 150 million tons of freight move across highways in the Knoxville Region each year, resulting in nearly 28 million truck trips.

Rail

Nearly 100 million tons of freight move by railroad throughout our region each year. Only 7 million tons have an origin or destination in the region, meaning 93% is passing through. There are approximately 310 miles of railroad in our region operated by two major Class I railroads, Norfolk Southern and CSX, and one short line railroad, the Knoxville & Holston River Railroad.

The American Association of Railroads reported that in 2013, railroads moved a ton of freight an average of 473 miles on a single gallon of diesel fuel. Rail is widely considered to be three to four times more fuel efficient than trucks, and

especially vital for moving bulk cargo—two-thirds of U.S. coal shipments move by rail, for instance. The U.S. Department of Transportation estimates an 88% increase in rail freight demand by 2035. Trains are increasingly used for shipments as short as 500 miles, formerly only the domain of trucks. However, expanding the capacity of the 140,000-mile U.S. rail network and its maintenance will require significant investment, estimated by the Federal Railroad Administration to reach \$149 billion over the next 20 years.

Air

The region is served by one major airport, McGhee Tyson Airport (TYS), and one small airport, Downtown Island Airport (DKX). The Metropolitan Knoxville Airport Authority is an independent, non-profit agency that owns and operates TYS and DKX.

McGhee Tyson Airport experienced its third busiest year in history in 2015. More than 1.7 million passengers traveled through TYS. The two busiest years were 2005 (with 1,845,491 travelers) and 2007 (with 1,821,604 travelers).

Annually, about 4,000 arrivals and departures at the Airport are freight trips. Nearly 40,000 tons of air freight are handled, with only 0.1% of that mail. Three other air traffic facilities operate in the Knoxville Region. The Knoxville Downtown Island Home Airport handles approximately 18,000 aircraft operations each year, none of which are air cargo. Very little freight is handled at Morristown Municipal Airport. Sky Ranch Airport in South Knoxville near Alcoa Highway handles less than 5,000 aircraft operations each year.

LEGEND

Daily Truck Volume

- < 11,999
- 12,000 - 23,999
- > 24,000

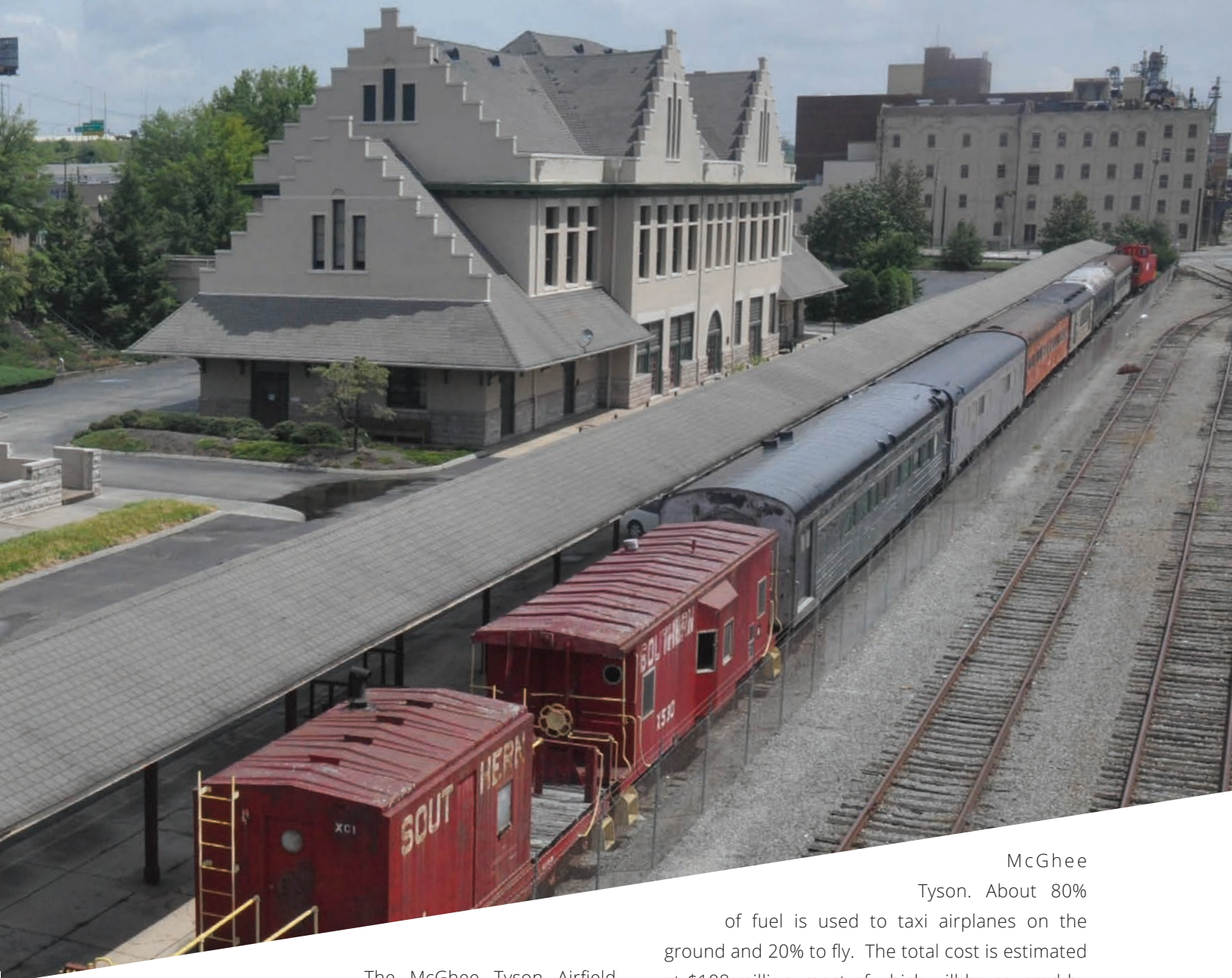
2012



2040



Source: Tennessee Transearch Database, 2012



The McGhee Tyson Airfield Modernization Program, which began in 2014, is a six-year, \$108 million runway construction project involving the reconstruction of both of the airport's runways. With the airfield redesign, the taxiways are being reconfigured according to the latest FAA standards. With rebuilt runways, including one that will be a thousand feet longer than the existing runways, the airport will be able to accommodate nearly all of the aircraft currently operated by major passenger and cargo airlines. This also will result in substantial fuel savings for airlines serving

McGhee Tyson. About 80% of fuel is used to taxi airplanes on the ground and 20% to fly. The total cost is estimated at \$108 million, most of which will be covered by federal and state aviation grants.

McGhee Tyson and Downtown Island airports generate more than \$616 million a year for the regional economy and support more than 4,600 jobs in the immediate area, according to a study by the University of Tennessee's Center for Transportation Research. "From an economic standpoint, aviation access is also an integral part of the region's fabric. Regional commerce simply depends on it. Knoxville's airports provide

LEGEND

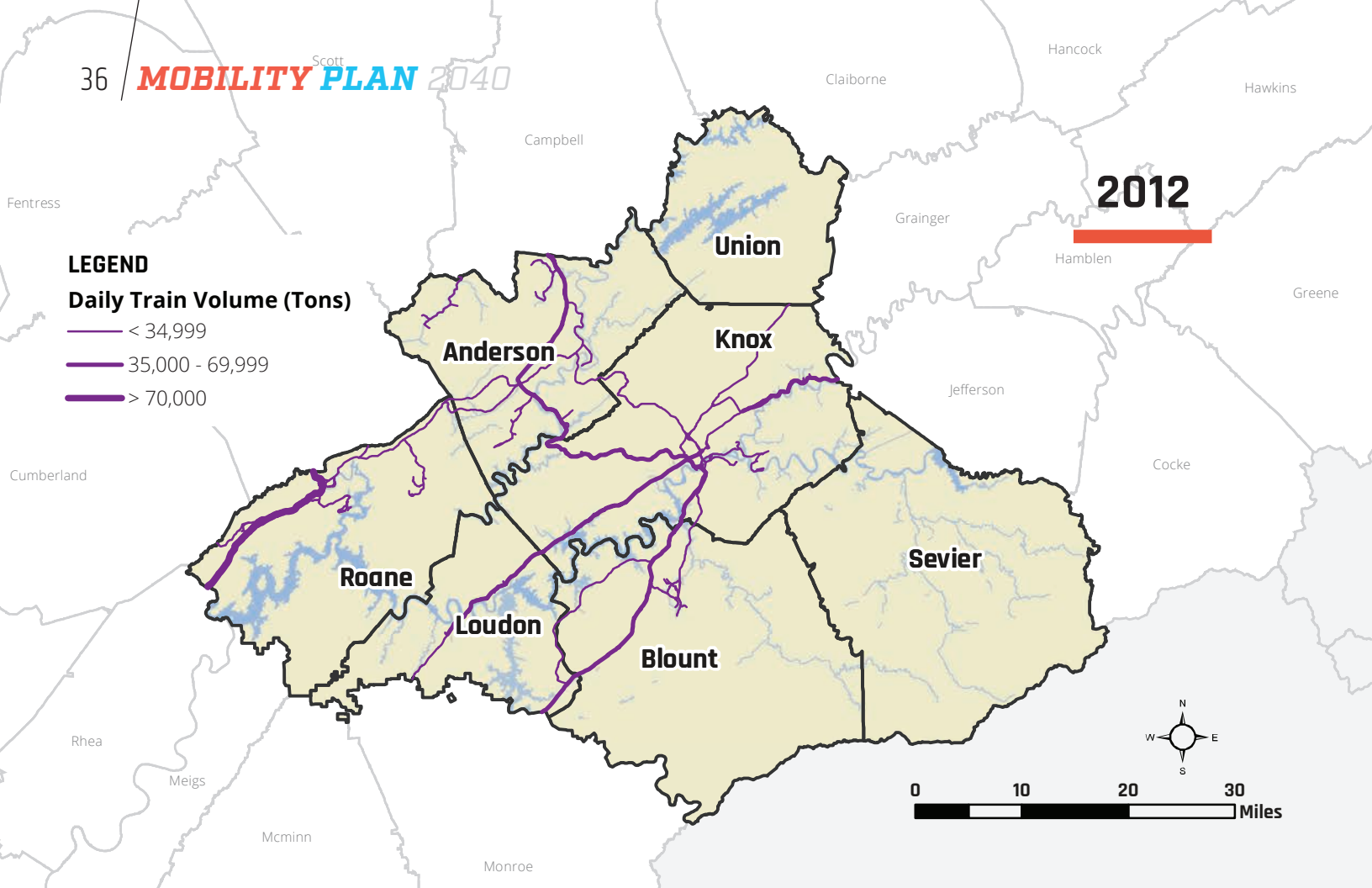
Daily Train Volume (Tons)

< 34,999

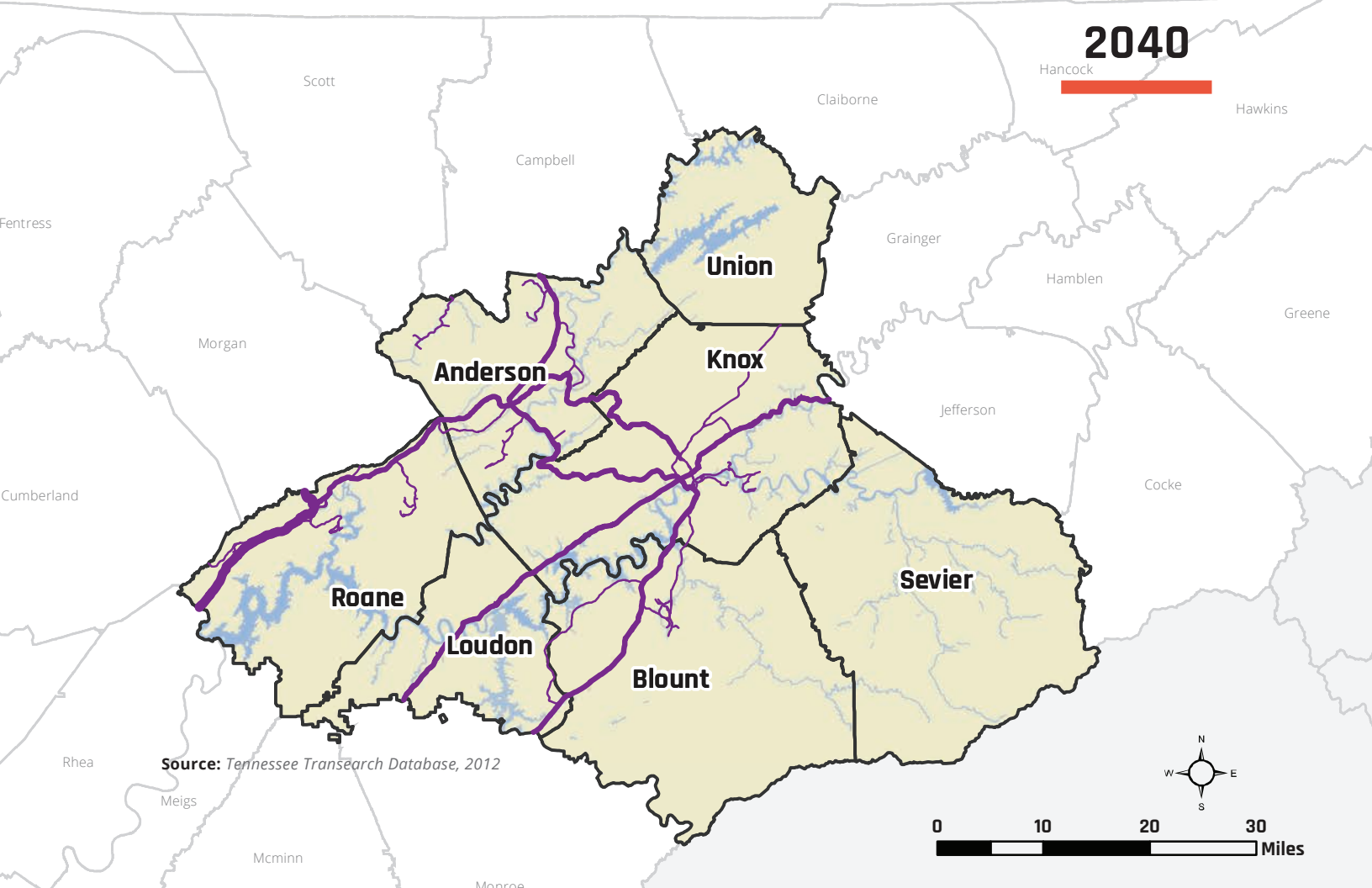
35,000 - 69,999

> 70,000

2012



2040



Source: Tennessee Transearch Database, 2012

the connectivity that is increasingly essential in a world of global markets and the rewards for this connectivity are measurable,” the report states.⁵

Pipeline

Two major pipelines operated by Colonial Pipeline and Plantation Pipeline transport petroleum products from refineries along the Gulf Coast directly to terminals located on Middlebrook Pike between Amherst Road and Ed Shouse Drive in Knoxville. The tanks at the 23-acre Middlebrook Tank Farm are capable of storing more than 100,000 barrels of petroleum. The Tank Farm is a major generator of truck activity for tanker trucks that deliver fuel to retail fuel stations throughout the region.

Barging

The Tennessee River enters our region at the Roane, Rhea, Meigs County junction, joins the Clinch River at Tennessee River Mile 568, transits Fort Loudoun Lock, and continues to the head of navigation in Knoxville. A private terminal there is a multimodal facility with access for rail, highway and a low water wharf for heavy haul loads. More than 577,000 tons of freight are transported by barge upstream of the Ft Loudoun lock.

The Clinch River passes the TVA Kingston Steam Plant at Clinch River Mile 4, passes Oak Ridge, transits the Melton Hill Lock, and reaches the TVA Bull Run Steam Plant. While neither Kingston nor Bull Run currently receive coal by barge, both TVA facilities are capable of doing so.

The US inland waterways lock and dam system continues to age and accumulate more deferred maintenance. This is causing an increased concern for its future effectiveness. One specific concern to stakeholders is the Chickamauga Lock on the Tennessee River, seven miles northeast of Chattanooga. If conditions of the Chickamauga Lock deteriorate to the point where it is closed, it would eliminate 318 miles of commercial navigation waterways, including access for Knoxville and Knox County. An increase in truck movements on I-75 between Chattanooga and Knoxville would be expected if the Chickamauga Lock closes. The new Chickamauga Lock expansion project is expected to be completed in 2021, but is dependent on sufficient funding.

⁵ Assessing the Value of Aviation Access to the Metro-Knoxville Economy, UT Center for Transportation Research, 2011.

Barging on the French Broad River



Tomorrow

To project future conditions of the roadway system, the TPO uses a computer-modeling tool known as a travel demand forecasting model. The model mimics existing traffic patterns in the Knoxville region to forecast future traffic volumes and routes. Information on transportation activity and socio-economic characteristics was gathered from surveys conducted between 2000 and 2008. Approximately 3,000 households in the Knoxville region were asked to record information about all of their trips in a one-day period including purpose, origin and destination, mode of transportation, and time of day.

The model shows that congestion increases considerably if no improvements are made. The travel model is only one tool that helps identify needed improvements. Its results must be carefully scrutinized to determine whether a particular roadway is indeed an area of concern. One drawback of the model is that it can only measure effects of major projects like widenings or new roads. Smaller projects such as intersection improvements, additional turn lanes, transit, and other congestion management projects do not typically show much effect in the model.

During the PlanET process, scenarios were evaluated to gauge potential population and job growth impacts on roadway system performance and congestion, assuming that no improvements are made. This essentially enables us to see what might happen in terms of the level of congestion on the roadway network if all expected future population and employment growth out to year 2040 suddenly appeared tomorrow.

Freight and Technology Trends:

- Increased oversight regulations, such as electronic logging devices, designed to enhance efficiency and workflow, which will improve safety and reduce the potential negative impacts from incidents or accidents.
- Fracturing of supply chains and an expanding number of nodes aimed at reducing delivery time to customers from days to hours.
- Rising recognition among shippers that transportation and logistics can provide significant competitive advantage for them; shipping has become a strategic consideration based on customer expectations, sales volume, and product mix.
- Expanded presence of shippers selling valuable, sensitive products that require exceptional handling, security, reliability, and tracking procedures from their transportation companies.
- Increasingly frequent disruptive events — higher peaks in demand, “100-year” storms and other natural disasters, labor strikes, and geopolitical uncertainties — that are causing shippers to reevaluate their procurement tactics and the effectiveness of their logistics networks.
- High growth of e-commerce with complex shipments and increased tracking requirements.

Another future scenario is for “Existing plus Committed” transportation projects. This second analysis helps determine which roadways are currently congested, or are likely to become congested in the future, if no other improvements are made beyond those that have already been committed.

Future Trends

Over the past decade, smart phones and other technological advances have changed transportation with Global Positioning System (GPS) directions, live traffic updates, and sophisticated mapping. As access to real-time data becomes even more common, people will be able to make more efficient travel decisions. This may improve traffic congestion and safety. Improved access to data could also result in solutions like pop-up bus services and on-demand carpooling. Continued advancements in technology may change how freight travels in the future. GPS-assisted navigation has already made the freight industry more efficient.

The popularity of social media, streaming technology, online banking, telecommuting, and online shopping may translate into less travel in the long-term future. Technology has enabled car-, bike-, and ride-sharing, which can increase transportation options for people.

Ridesharing

is a synonym for carpooling. Traditional ridesharing means people riding together from a common origin, such as a residence or park-and-ride lot, to a common destination, such as an employer or business park. The driver is simply another commuter whose goal is getting to the same destination and home again, not to make money as a commercial driver.

Ride-hailing

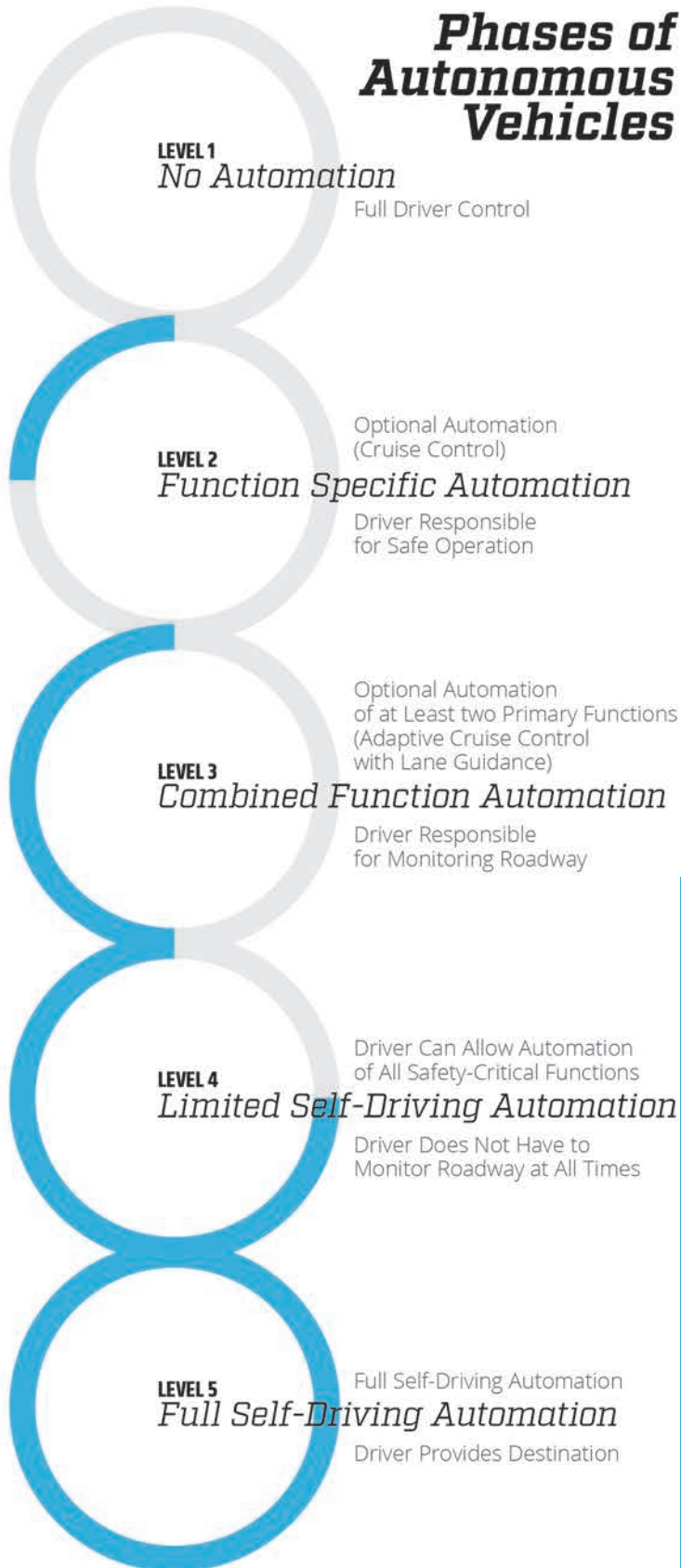
encompasses a range of companies and services, including traditional taxis and new car services like Uber and Lyft. The idea of ride-hailing is that a customer hires a driver to take them exactly where they need to go, something accomplished by signaling a taxi from the street, calling for service via phone, or using a mobile app.

Carsharing

is a service that provides members with access to a fleet of vehicles on an hourly basis. Members reserve a car online or by phone, walk to the nearest parking space, open the doors with an electronic key card, and drive off. They are billed at the end of the month for time and/or mileage. At home, carsharing can substitute for car ownership. At the workplace, it provides access to a vehicle for business use and personal errands during the day, allowing employees to avoid driving to work. Research shows that each shared vehicle in the U.S. reduces the need for between nine and thirteen personal vehicles. More than 1.1 million people are using carsharing services in the U.S.⁶ The carsharing vendor Zipcar as of January 2017 has six vehicles at three locations in Knoxville.

⁶ Susan Shaheen, Transportation Sustainability Research Center at UC Berkeley <http://innovativemobility.org/?project=innovative-mobility-carsharing-outlook-summer-2015>

Phases of Autonomous Vehicles



Source: National Highway Traffic Safety Administration

Autonomous Vehicles

Autonomous vehicles have the potential to revolutionize transportation and land use as automobiles did in the early 20th century. An autonomous vehicle (AV) is a vehicle that utilizes a combination of technologies and sensors to operate with limited or no driver input. Levels 1, 2, and 3 AVs (see sidebar) are on the road today and have some automated features (e.g., parking assist, adaptive cruise control, blind spot warning) but require a driver to monitor the features.

Tennessee is one of eight states in addition to Washington, DC that have passed legislation related to AVs. Self-driving cars could be tested on Tennessee roads as early as January 2017, but it is unlikely they will be in our region. During testing there must be a human driver on board.

Liability and ethical issues surround autonomous vehicles. Complex systems inherently have errors and bugs. Who will be assigned fault when an autonomous vehicle crashes? How should the vehicle be programmed to act in the event of an unavoidable crash? Should it minimize the loss of life, even if it means sacrificing the occupants, or should it protect the occupants at all costs? The answers to these questions are important because they could have a big impact on the way self-driving cars are accepted in society.

If AV implementation follows the patterns of other vehicle technologies, it will take one to three decades to dominate vehicle sales. Technical and ethical challenges may be more difficult to solve than expected, so fully self-driving vehicles may not be commercially available until the 2030s or 2040s. It will be even later before they make up a significant portion of vehicles operating on the road.

Senate Bill 1561 made Tennessee the first state in the U.S. to codify the definition of autonomy, expanding the definition of a driver to include that a human is not required to control a vehicle.⁹ The legislation established a certification program for AV manufacturers to go through before they can sell, test, or operate in the state. In 2015, the state legislature passed a bill prohibiting local governments from banning vehicles equipped with autonomous technology.

When AVs become a major share of total vehicle travel they may significantly reduce traffic risk, traffic congestion, and parking problems, and they may provide energy savings and emission reductions.⁷ They may open up new opportunities for young, elderly, and disabled citizens to travel with greater ease and make it safer for people walking and bicycling on our streets.

Demographic trends, changing consumer preferences, price changes, increased transportation options, and other planning innovations will also influence how people drive. These will have greater planning impacts than self-driving cars, at least during the timeframe of this plan.

The TPO will continue to stay up to date on studies and best practices for the deployment of these new technologies. Coordination with

local, state, and federal partners will continue to synchronize transportation investments needed to support AVs in the future (e.g., appropriate infrastructure, communication devices, and management of real time data).⁸

⁷ Victoria Transport Policy Institute; Autonomous Vehicle Implementation Predictions, Nov. 2016.

⁸ WSP/Parsons Brinckerhoff; Driving Towards Driverless: A guide for Government Agencies; 2016.

⁹ <http://www.brentwoodhomepage.com/senate-passes-legislation-regulating-autonomous-vehicle-use-tax-structure-cms-26105#.V5n8smgrLRY>

TRANSPORTATION GOALS, OBJECTIVES, AND PERFORMANCE MEASURES

To guide decision-making and comply with current federal transportation legislation, Mobility Plan 2040 is built on the following performance framework.

The framework shows how the Mobility Plan's goals align with federal and regional goals. It also establishes project selection criteria and system-level performance measures.

- System-level performance measures will be tracked by the TPO. By tracking these measures over time, we will be able to ensure that investments in the transportation system are moving the region toward achieving its goals.
- Project selection criteria were used to score and prioritize the transportation projects included in Mobility Plan 2040 for funding.

The Mobility 2040 goals are based on federal FAST Act and Map-21 planning factors, USDOT Planning Emphasis areas, goals from the previous Mobility Plan, and from extensive public input during the Plan East Tennessee process.

The following pages include Fact Sheets for each of the eight Mobility Plan 2040 goals. Those sheets include:

- An explanation and discussion of the goal.
- Strategies to guide future decision-making and move us toward the goal.
- System-level performance measures.

TPO staff developed the performance measures as a starting point to help us evaluate progress towards meeting our goals. The performance measures will be updated as additional guidance is received from TDOT and FHWA.

Table 2-1: Planning Factors, Goals, and Performance Measure

FAST Act Planning Factors	Regional Goals	Mobility Plan 2040 Goals		Performance Measures
Economic Vitality	Regional prosperity; Local food production	Economy and freight (8)	Improve intermodal connections to help move freight to and through the region, reduce delay on major freight corridors	Annual truck movement of goods moved via freight through our region - average delay on major freight corridors - % of the Interstate System Mileage providing for Reliable Truck Travel Times - % of the Interstate System Mileage Uncongested - Avg Truck Speed
Travel and Tourism			Support business attraction and retention	Economic impact of tourism - # of new or expanding businesses in the region - # of small-scale, unique businesses in region - unemployment rate
Safety	Healthy people	Safety and security (3)	Reduce rates of crashes with serious injuries and fatalities. Reduce the region's vulnerability to incidents and threats	Number and rate of serious injuries due to traffic crashes - number and rate of fatalities due to traffic crashes - number of crashes involving pedestrians and bicyclists
Security				
Accessibility and Mobility	Transportation choices; Housing choices	More options (2)	Improve access to services and employment with bicycle and pedestrian facilities, and transit services	Mode split -VMT per capita - % of short trips made by bicycling and walking (per FHWA strategic agenda) - Mileage of sidewalks-bicycle facilities and greenways - transit ridership
Environment, Conservation, and Land Use	Clean air and water; Healthy people; Local food production; Efficient infrastructure	Health and environment (4)	Minimize negative impacts on the environment and people's health, and increase access to active transportation/physical activity for all ages	Stormwater BMPs in place - air quality data - pounds of emissions reduced by CMAQ projects in our region - physical inactivity rates - obesity rates
Resiliency and Reliability	Clean air and water; Great places	Preservation of Places (7)	Preserve natural and cultural areas and places that make our region unique (e.g. mountains, open space, farmland, viewsheds, small communities)	% of TPO-funded projects located in existing centers - % of TPO-funded projects located within or along existing, major transportation corridors
Connectivity	Transportation choices	Equitable access (5)	Connect communities to opportunities and services throughout the region, particularly areas with high proportions of low income, senior, and minority populations	% of TPO funded projects in very high and high priority areas
				% of total TPO transportation funds spent in very high or high priority areas
				Number of households in very high and high priority population areas with access to transit or a greenway
System Preservation	Transportation choices; Efficient infrastructure	Maintenance and efficiency (1)	Preserve and maintain our existing infrastructure through repaving projects, bridge replacements, access management, sidewalk repairs, and intersection improvements	% of bridges in good condition and in poor condition - % of roads rated in good condition and in poor condition (interstate and non-interstate NHS) - % of transit fleet older than federal guidelines - % of TIP programmed for maintenance and efficiency projects
System Efficiency		Congestion reduction (6)	Use our system more efficiently through technology like traffic signal coordination, real-time traffic info, and emergency response vehicles	2- and 4-year Total Emission Reductions for each applicable criteria pollutant and precursor - Annual Hours of Excessive Delay Per Capita - % of the NHS providing for Reliable Travel Times (Interstate and non-Interstate) - % of the non-Interstate NHS where Peak Hour Travel Times meet expectations - VMT reduced by CMP

1. Maintenance and Efficiency

Preserve and maintain our existing infrastructure through repaving projects and bridge replacements.

One of the major challenges our region, and the nation, faces is keeping the transportation system in good repair. The emphasis on building new roads has limited the resources available for maintaining and repairing our aging infrastructure. Deficient bridges and deteriorating pavement can negatively affect economic growth as well as the safety and comfort of residents.

Although transportation infrastructure in our region is in relatively good condition compared to much of the U.S., the transportation funding shortfall emphasizes the need to prioritize the preservation of existing infrastructure to avoid much larger expenses in the future.

The status of maintenance is difficult to track for each jurisdiction due to the differing methodologies used. We will continue to work closely with local partners to ensure we are adequately maintaining our system.

Strategies

- Ensure investments in preservation are adequate to continuously improve pavement, bridge, sidewalk, and greenway conditions.
- Ensure investments in transit are adequate to keep the current fleet in a state of good repair and to maintain operations.
- Maximize the efficiency of existing transportation assets by prioritizing limited resources on rehabilitating and replacing aging infrastructure over system expansion.
- Employ life-cycle analyses with any capacity expansion projects and demonstrate resources for future operations and maintenance.

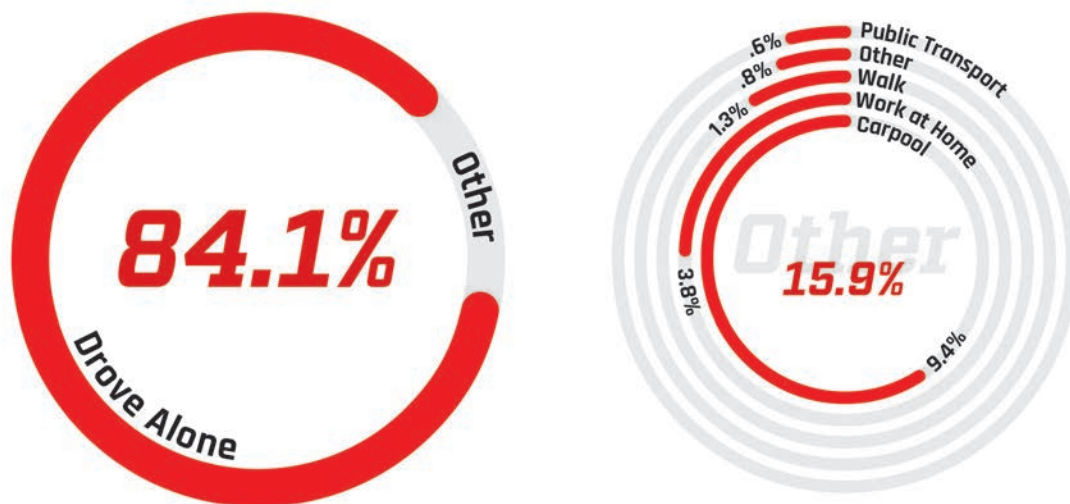
System-level Performance Measures

Bridges	Percentage of the bridge structures in our region rated structurally deficient
Pavement	Percentage of pavement rated “not acceptable”
Transit Fleet	Percentage of the transit fleet older than federal guidelines
Existing Transportation System	Percentage of TIP programmed for maintenance and efficiency projects

2. More Options

Improve access to services and employment with transit, bicycle, and pedestrian projects.

Currently, a relatively small portion of residents get around by walking, bicycling, taking public transportation, or carpooling. The automobile is the most common form of transportation within the region, with 84% of workers driving alone to work. This is higher than the U.S., average of 76.4% of workers.

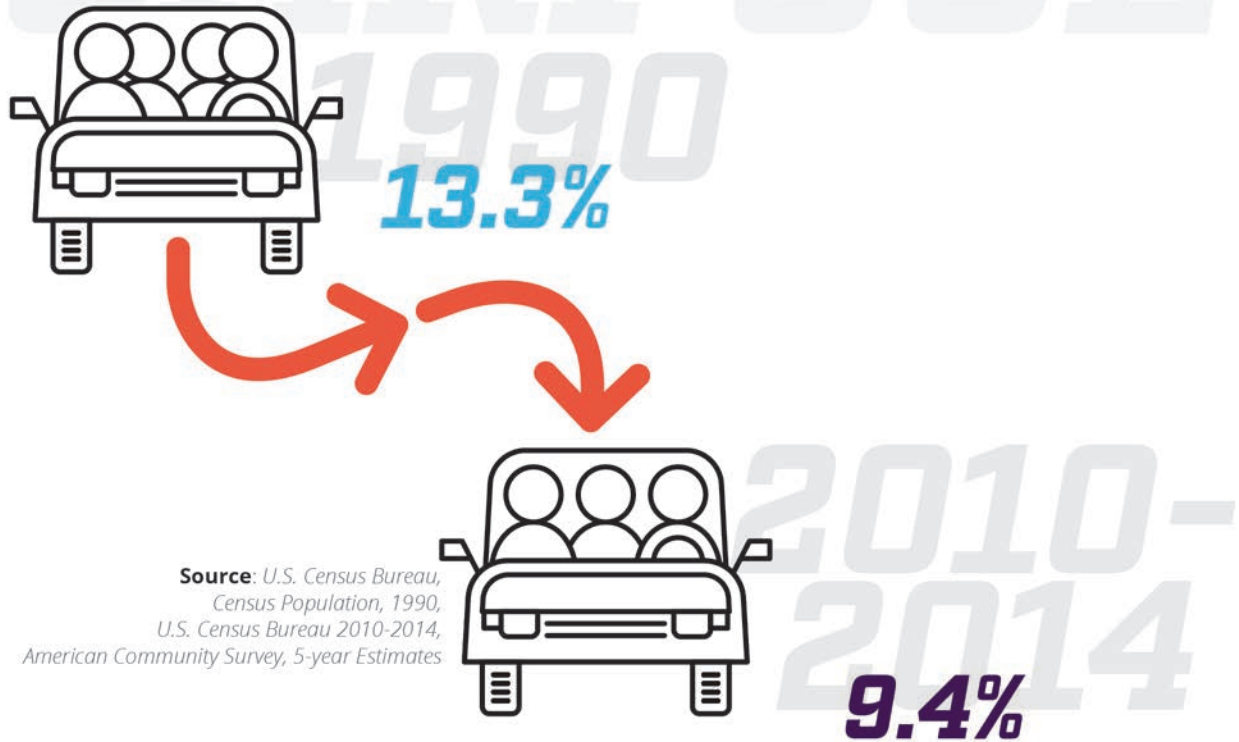


How We Get to Work

Source: 2010-2014 American Community Survey

Though percentages are small, it is important to remember those numbers are people. In the U.S., nearly 5 million people, or around 4.3% of the working population, primarily walk or bicycle to work, and millions of others regularly walk or bicycle to nearby restaurants or parks. Americans walked as means of transportation for nearly 41 billion trips—more than 10% of all trips—over the course of a year.¹⁰

¹⁰ 2009 National Household Travel Survey



The demand for safe bicycling and walking facilities and more transit is increasing. To use limited resources most efficiently, the recommended approach is to target communities and types of trips with greater potential for change.

The U.S. Department of Transportation (USDOT) has recently set a goal targeting short trips¹¹

- Increase the percentage of short trips represented by bicycling and walking to 30% by 2025 – this would be a 50% increase over the 2009 rate of 20.1%.
- Short trips are defined as trips five miles or less for bicyclists and one mile or less for pedestrians.

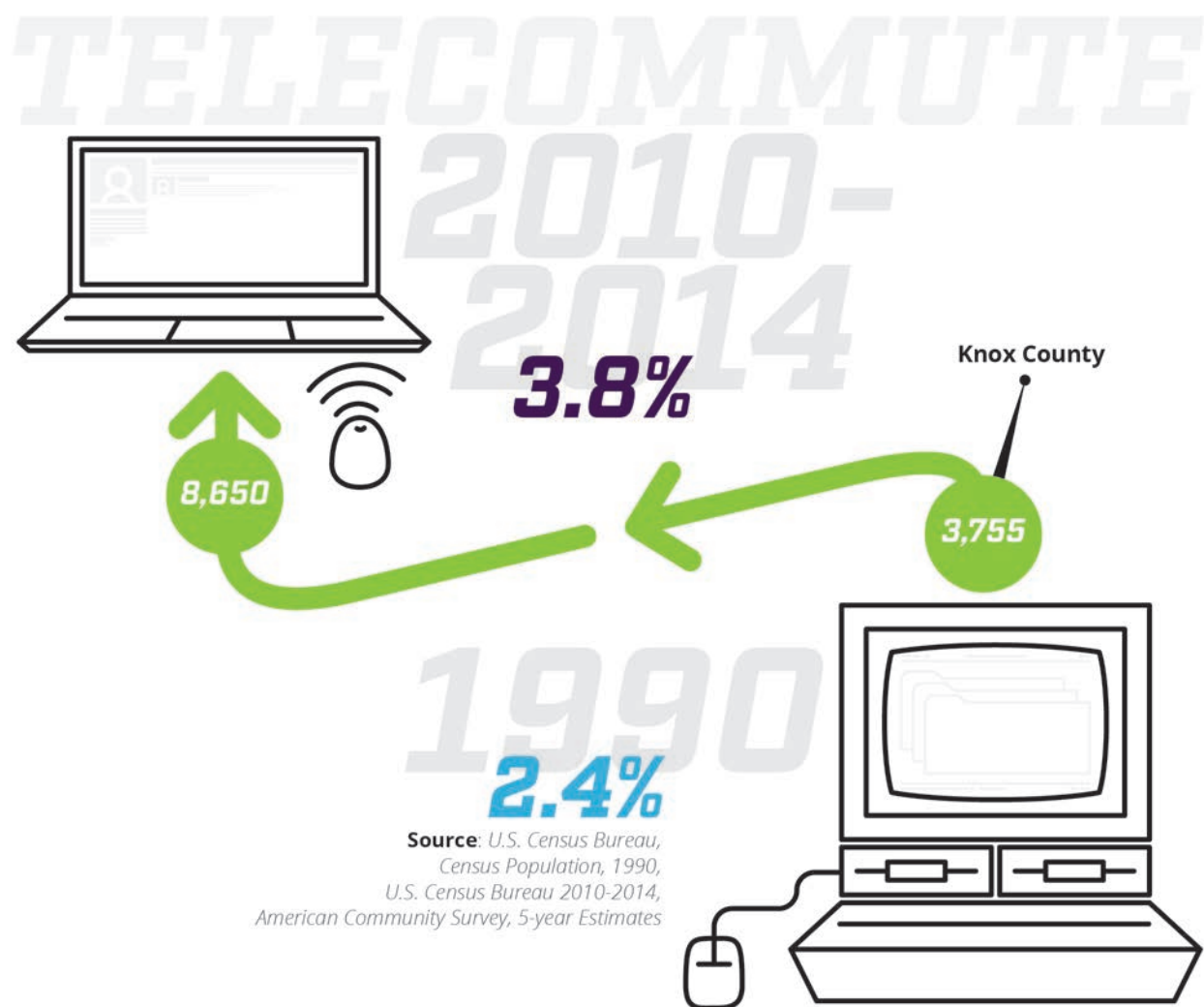
Twenty-eight percent of all trips are less than one mile, and 40 percent of trips are less than two miles. These are comfortable distances for bicycling and walking if safe facilities are provided.¹³

In a 2016 Survey 46% of respondents reported there were not enough greenways in their community. 52% of respondents living in areas with the lowest population density reported that there were too few greenways in comparison to 36% of those living in large cities. 50% believe there are not enough on-street bike lanes currently in their community.¹²

¹¹ http://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/strategic_agenda/page04.cfm

¹² Survey of Tennessee's Registered Voters for Bike Walk Tennessee and Rails to Trails Conservancy, conducted by the University of Tennessee's College of Social Work Office of Research and Public Service. The survey was completed by 762 registered voters between Oct. 5 and Oct. 21, 2016.

¹³ <http://www.advocacyadvance.org/docs/nhts09.pdf>



School trips are another target. Walking and bicycling to school dropped from 48% of all school trips in 1969 to 13% in 2009.¹⁴ Increasing walking and biking to school is generally a good starting point for increasing physical activity in children. It can lead to more bicycling and walking to other destinations. Current efforts fall into two categories: school siting changes (e.g. locating schools near where students live), and improving safety around schools for people walking and bicycling.

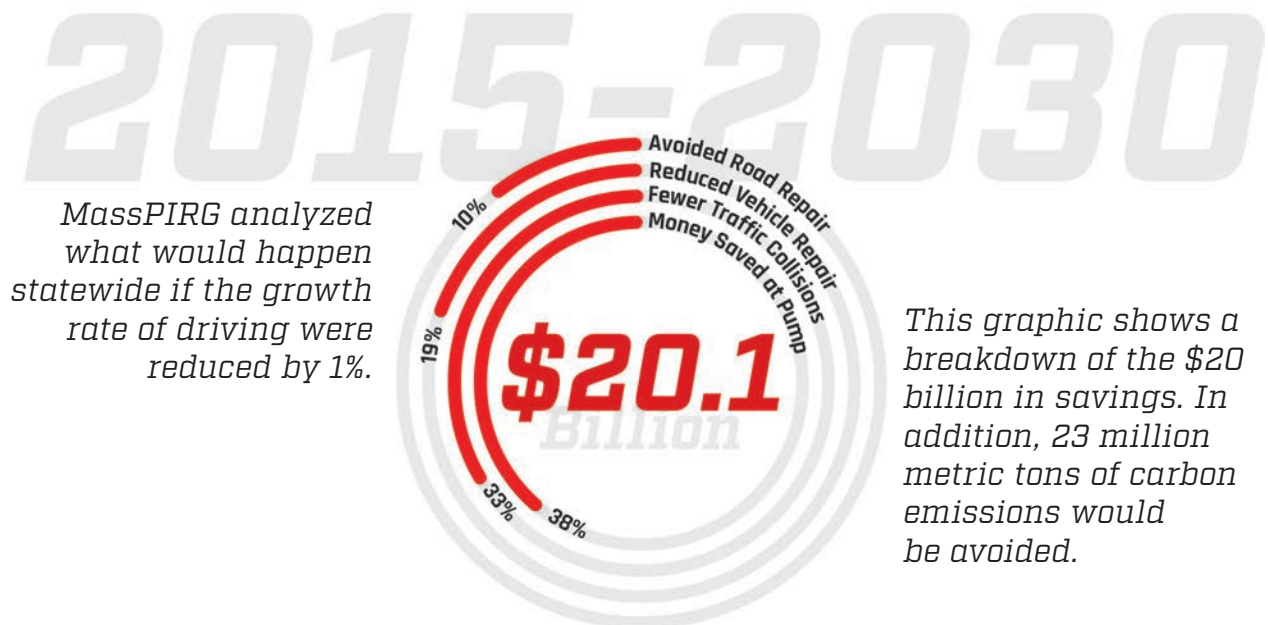
Millennials are the nation's largest population cohort, making their transportation needs particularly important. Several indicators – including continued decreases in per-capita driving across the whole U.S. population, continued shift away from the use of cars by Millennials, and consistency of Millennials' stated preferences for living in urban areas – suggest that the trend toward less driving among Millennials will continue.

¹⁴ <http://saferoutespartnership.org/healthy-communities/101/facts>

42% of the U.S. population is under 18 or over 65.

A significant issue facing our region, and the nation, is the transportation needs of the growing elderly and disabled populations who may not be able to operate a car on their own. In our region, it is projected that one in four residents will be a senior by 2040. Investing in alternative transportation options such as transit and pedestrian facilities will give older adults more choice over where they live and how they travel.

Children and older adults who do not drive, as well as low-income populations, have difficulty accessing daily needs. Bicycle, pedestrian, and transit projects make it easier for people of all ages and abilities to get around and can provide seamless access to schools, parks, and recreation and community facilities.



*Economic Savings from a **1% Decrease** in Driving Growth Rate*

Source: <http://usa.streetsblog.org/2015/11/23/planning-for-less-driving-not-more-would-lead-to-big-savings>

ADA Accessibility

As part of our Mobility Plan 2017 Project application and evaluation, we take into consideration Americans with Disabilities Act (ADA) through our equitable access criteria. Persons with disabilities are considered as part of our vulnerable population criteria and included in the equitable access component of our project evaluation.

As a result of the project application prioritizing equitable access, many of the Mobility Plan projects incorporate ADA accessible pedestrian improvements into the project scope making the transportation investment equitable for all users. Other funding priorities in the Mobility Plan include ADA paratransit services across the Region.

Every four years the TPO certifies that the transportation planning process addresses the major issues in the metropolitan planning area and is conducted in accordance with all federal laws including ADA. TPO staff have engaged member jurisdictions about their respective ADA Transition Plans to ensure on-going ADA compliance progress.

Strategies

- Promote projects that improve multi-modal connections between existing transit and surrounding communities.
- Coordinate with implementing agencies to provide connected, safe, comfortable environments for walking and bicycling.
- Enhance connections between activity centers through access to transit, pedestrian, and bicycle facilities.
- Increase mobility and access to opportunities by coordinating land use and transportation planning.
- Promote the development of bicycle and pedestrian facilities that use best practices guidance from Federal Highway Administration (FHWA) and National Association of City Transportation Officials (NACTO).
- Assist in developing and implementing municipal bicycle and pedestrian plans.
- Coordinate with partners to collect, maintain, and publicize bicycle and pedestrian facility and user data.
- Assist local jurisdictions as they develop their self-evaluation and ADA transition plans.

System-level Performance Measures

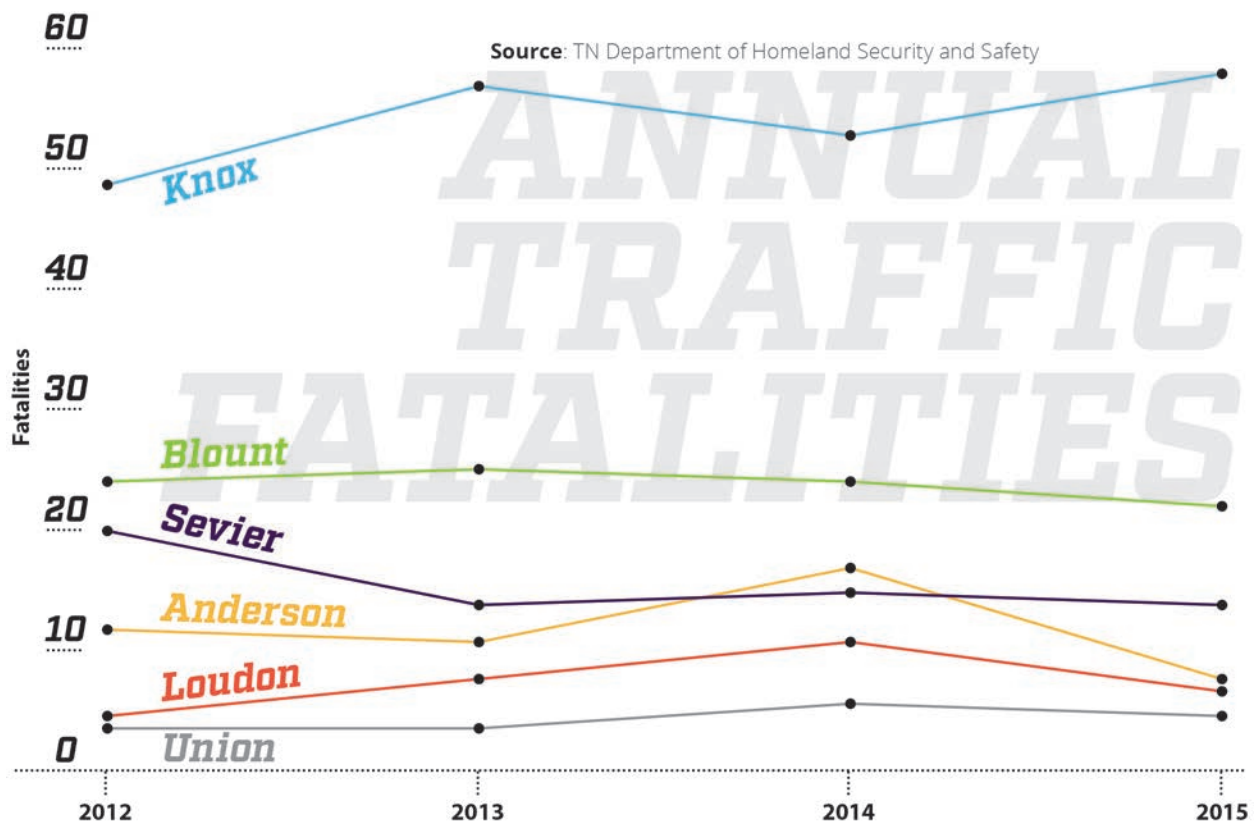
Mode Split	Percentage of commuters walking, biking, taking transit, or ridesharing
	Percentage of short trips by biking or walking (per FHWA Strategic Agenda)
VMT	Vehicle miles traveled per capita per day
Transit	Transit ridership per year
Increased Options	Percentage of TPO dollars programmed by project type
	Percentage change in miles of bicycle lanes, sidewalks, and greenways
	Percentage of jurisdiction with a self-evaluation and ADA transition plan

3. Safety and Security

Reduce rates of crashes with serious injuries and fatalities. Reduce the region's vulnerability to incidents and threats.

Safety

Safety for all users should be a top priority in transportation planning. Motor vehicle crashes are a significant cause of preventable deaths and serious injuries. They also result in economic losses and traffic delays. Communication and collaboration among many agencies and the public is a vital part of safety planning.



Until recent years, traffic fatalities were on a decades-long decline. But 2015 saw the greatest percentage rise in U.S. traffic fatalities in 50 years, and the first six months of 2016 have seen a nine percent increase even over 2015 numbers. Tennessee, on the other hand, has fared better. Since 2011, Tennessee has reported five of the six lowest annual traffic fatality rates since 1963, averaging 971 deaths over the five-year period.¹⁵

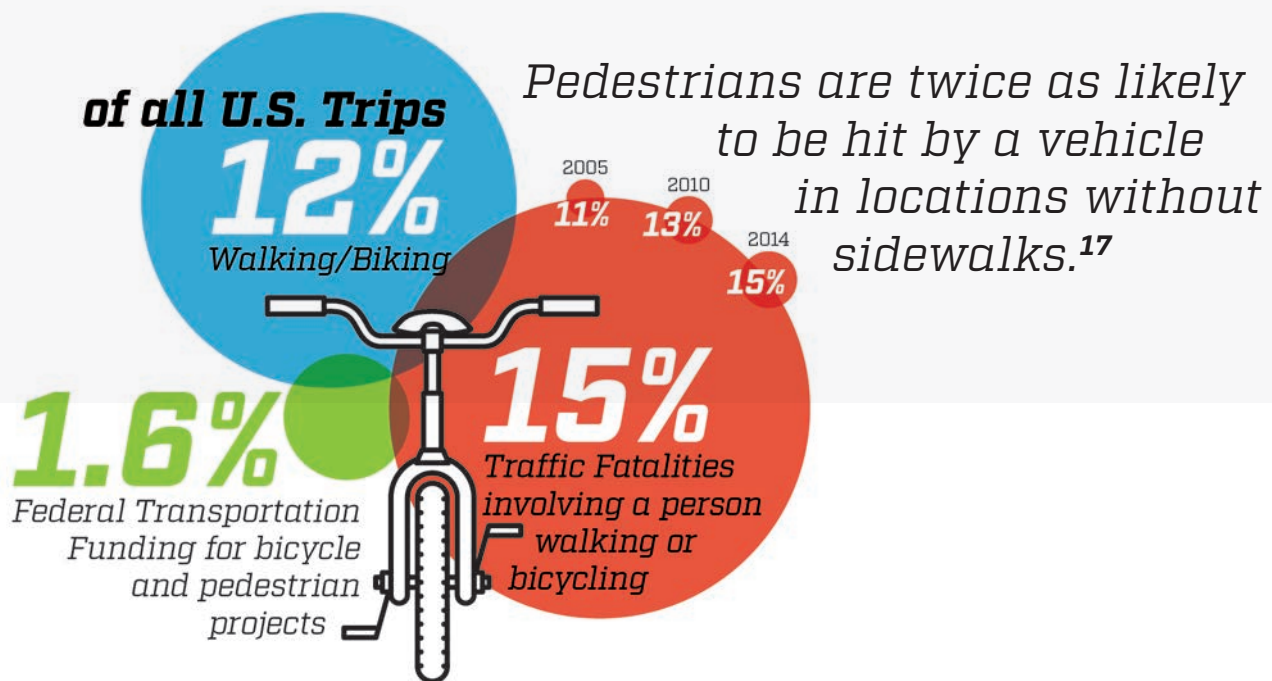
¹⁵ Tennessee Department of Safety and Homeland Security

The rates of fatalities for people walking has also increased. Pedestrian fatalities in 2015 have increased 10% over 2014 numbers. The majority of pedestrian fatalities in 2014 (74%) occurred at non-intersection locations. About half happened between 6 pm and midnight, with 72% after dark. Alcohol involvement for the driver and/or pedestrian was reported in about half of the crashes that resulted in pedestrian fatalities in 2013. ¹⁶

Crash analysis conducted by CDM Smith for the 2014 Knox County Strategic Transportation Plan shows that out of more than 8,000 crashes in Knox County over two years, 26 resulted in a fatality. Seventeen of those crashes did not involve other vehicles (e.g., run off the road, hitting wildlife).

The TPO is beginning to collect and analyze crash data for crashes resulting in fatalities or serious (incapacitating) injuries. Preliminary analysis has been done for pedestrian and bicycle crashes between 2007 and 2015. Detail of the analysis to-date is available in Appendix J.

TDOT is responsible for programming federal Highway Safety Improvement Program Funding.



¹⁶ 2015 estimates are based on based on analysis of preliminary data for the first half of 2015 http://www.ghsa.org/files/pubs/spotlights/spotlight_ped2015.pdf

¹⁷ R. Knoblauch, B. Tustin, S. Smith, and M. Pietrucha. "Investigation of Exposure-Based Pedestrian Accident Areas: Crosswalks, Sidewalks, Local Streets, and Major Arterials." Washington DC: US Dept. of Transportation; 1987.

Table 2-2: TDOT Highway Safety Improvement Program projects in Knoxville Region

County	State Route	Termini	Cost Est	Project Description
Anderson	Clinton Highway (SR-9)	Clinton Highway @ Edgemoor Road intersection	\$675,000	Geometric improvements and signal modifications
Blount	Alcoa Highway (SR-115)	Alcoa Highway @ Louisville Road	\$203,000	Installation of right turn lanes
Blount	Old Knoxville Highway (SR-33)	Old Knoxville Highway @ Defoe Circle	\$275,000	Geometric improvements and signal modifications
Blount	Alcoa Highway (SR-115)	Alcoa Highway @ Lamar Alexander Pkwy	\$731,500	Install dual left-turn lanes on WB Lamar Alexander Pkwy and NB Alcoa Hwy; extend EB Lamar Alexander Pkwy left-turn lane and WB Lamar Alexander Pkwy right-turn lane
Blount	W. Broadway Avenue (SR-33)	W. Broadway Avenue @ Foothills Mall Drive and Montgomery Lane	\$830,385	Install dual left-turn lanes on Foothills Mall and Montgomery; install left-turn lane and additional lane on Montgomery Ln
Blount	N. Hall Road (SR-35)	N. Hall Road @ Lincoln Road	\$113,500	Geometric improvements and signal upgrades
Blount	Topside Road (SR-333)	Topside Road from Wrights Ferry Road to bridge	\$550,000	Geometric improvements
Blount/ Monroe/ Loudon	SR-33	From McMinn/ Monroe Co. line to Blount/ Knox Co. line	\$1,327,300	Low cost safety improvements, including pavement markings, signage, guardrail, and signal head reflective stripes
Knox	Chapman Highway (SR-71)	From south of Simpson Road to Hendron Chapel Road	\$1,545,800	Widen existing roadway from 4 lanes to 5 lanes with center turn lane
Knox	I-75	I-75/I-275 @ I-640 SB Loop Ramp	\$465,000	Sign upgrades, geometric improvements, and high friction surface treatment on the loop ramp
Knox	Oak Ridge Highway (SR-62)	J-Turn Improvements @ Oak Ridge Highway & George Light Road	\$615,000	Create two J-turn movements on Oak Ridge Hwy/Pellissippi Pkwy, and remove a connection from George Light Road.
Knox	Tazewell Pike (SR-131)	Tazewell Pike @ Gibbs High School	\$264,400	Geometric improvements at the school entrance
Knox	Cedar Bluff Road	Cedar Bluff Road @ Executive Park Drive and @ N. Peters Road	\$550,000	Geometric improvements, restriping, and signal modifications
Knox	E. Emory Road (SR-131)	E. Emory Road @ Fairview Road and E. Thompson School Road	\$770,000	Install left turn lanes, signalization, relocate utility poles; align and add left turn lanes to Fairview and Thompson School Rds
Knox	Clinton Highway (SR-9)	Clinton Highway @ W. Emory Road	\$440,000	Geometric improvements and signal modifications
Knox	Middlebrook Pike (SR-169)	Middlebrook Pike @ Weisgarber Road	\$475,000	Minor widening of Weisgarber Rd; expand turn lanes on Middlebrook Pk; add ADA ramps and pedestrian signal heads; signal upgrades

Security

Transportation networks play an integral role in responding to natural (e.g., severe weather) and human-caused (e.g., hazardous materials spills) disasters. The TPO works with federal, state, and local partners to improve security of the transportation system for all users.

The TPO strives to incorporate security and emergency management into existing activities, including:

- Regional Intelligent Transportation Systems (ITS) architecture maintenance.
- Travel demand modeling.
- Transit coordination.
- Geographic Information Systems (GIS) data management.
- Inventory of transportation services for special needs populations.

Resilience

Our transportation infrastructure is confronted with significant vulnerabilities. The systems we use to move people and goods are particularly vulnerable to rising temperatures, more intense storms, and extreme drought.¹⁸

Resilience

is the capacity of individuals, communities, institutions, businesses, and systems within a city to survive, adapt, and grow no matter what kinds of chronic stresses and acute shocks they experience.

Planning for resiliency is essential in the programming and investment of public tax dollars spent on infrastructure. These planning measures require a coordinated process of assessing risks, formulating adaptation and mitigation strategies, and managing implementation.

¹⁸ Transportation Resilience, Extreme Weather and Climate Change. US DOT Volpe. The National Transportation Systems Center. 2014.



Photos above: The reconstruction of about 1,600 feet of Prosser Rd between Knoxville Zoo Drive and East Magnolia Ave was necessary to reduce flooding, which for many years had regularly shut down the road. The reconstruction not only raised the road, but also added bicycle lanes. Photos courtesy of (left) City of Knoxville and (right) Knoxville News Sentinel.

Significant Transportation Stresses Facing our Region:

- Population Growth. The region is expected to increase from 700,000 residents in 2010 to 1 million in 2040, with 240,000 more jobs.
- Commuting. Nearly half of our residents travel across county lines for work, and 84% drive alone.
- Resources. State and federal fuel taxes are not expected to be sufficient to support existing infrastructure or meet long-term transportation demands.

In the coming decades, our region is expected to see increasing temperatures, more heat and moisture in the atmosphere, and more extreme weather events.¹⁹

Warmer and Wetter Summers

- Heat-related health and infrastructure impacts
- Increased extreme weather events (floods, tornadoes, etc.)
- Reduced labor productivity
- Increased energy use and utility costs
- Increased allergens and pollutants (including ozone)
- Increased and new pest populations
- Unwanted spread of non-native species
- Reduced agricultural productivity

Warmer and Wetter Winters

- Increased extreme weather events (ice, floods, etc.)
- Decreased energy use and utility costs
- Increased allergens and pollutants (including ozone)
- Increased and new pest populations
- Unwanted spread of non-native species

¹⁹ From a presentation to the TPO on 8 November 2016 by Erin Gill (Director of the Knoxville Office of Sustainability) and Jack Fellows (Director of the Climate Change Science Institute of Oak Ridge National Lab). The presentation was based on a project entitled "Building a Foundation for Effective Local Climate Communications in Knoxville, Tennessee" that was funded by DOE's Climate Action Champion Program.

These changes are due to continued increases of greenhouse gases like carbon dioxide and methane being introduced into the atmosphere. For example, the number of days with a temperature above 95 degrees Fahrenheit will increase from 5-6 days today to an average of 80-85 degrees by the end of the century. These longer-term, persistent higher temperatures and associated humidity can impact the regions ability to stay below air quality standards and impact the performance of transportation infrastructure and materials (e.g., rail expansion, pavement instability, etc.).

So, how do we plan for a more resilient transportation system?

Our region has some natural buffers to potential risks such as an abundance of water and electricity. However, we can be impacted by conditions in other regions. This could result in more people moving to our region to escape drought in the Western U.S. and disruptions to food and fuel supplies that come from other regions.²⁰

Though it is difficult to predict future conditions, the trends are telling us that our climate is changing. We should prepare for these changes through proactive planning to ensure that our systems continue to work well under the stress of extreme weather. The TPO will continue to work with our communities to identify key and common vulnerabilities and solutions to ensure our transportation system remains resilient and meets future needs.

TDOT completed a statewide assessment of the transportation system in 2015 to gauge the vulnerability of the network to extreme weather and to identify critical transportation assets.

The most significant hazards to our region are temperature extremes, wind, and rock slides.

Over the past 30 years, Tennessee has experienced more than 15 weather disasters that each resulted in over \$1 billion in impacts.²¹ Planning for resiliency is essential to responsibly invest public tax dollars on infrastructure. These planning measures require assessing risks and developing mitigation strategies.

Regional Climate Leaders on the National Stage

By serving on the President's State, Local and Tribal Leaders Task Force for Climate Preparedness and Resilience, Knoxville Mayor Madeline Rogero has championed efforts to make Knoxville a more sustainable and resilient community. These include:

- Increasing the energy efficiency of low-income and affordable housing
- Conserving open space and wildlife habitat
- Expanding infrastructure for bicyclists, pedestrians, and transit users

²⁰ From a presentation to the TPO on 8 November 2016 by Erin Gill (Director of the Knoxville Office of Sustainability) and Jack Fellows (Director of the Climate Change Science Institute of Oak Ridge National Lab). The presentation was based on a project entitled "Building a Foundation for Effective Local Climate Communications in Knoxville, Tennessee" that was funded by DOE's Climate Action Champion Program.

²¹ https://www.tn.gov/assets/entities/tdot/attachments/Safety_022316.pdf

Strategies

- Work with partners to develop strategic transportation safety plans for the region.
- Incorporate safety issues identified in roadway/highway safety plans into the planning process.
- Support projects and programs that focus on safety of vulnerable road users in the region, including current presentations to high school drivers’ education classes.
- Work with partners to integrate complete streets planning that focuses on engineering, education, enforcement, and emergency response.
- Strengthen regional security initiatives supporting a regional communications system supporting emergency response.
- Analyze potential impacts of extreme weather and other climate-related stressors on transportation system and the economy.

System-level Performance Measures

Crashes	Number and rate of traffic crashes
Injuries	Number and rate of serious injuries due to traffic crashes
Fatalities	Number and rate of fatalities due to traffic crashes
Vulnerable Road Users	Number of crashes involving pedestrians
	Number of crashes involving bicycles

4. Health and Environment

Minimize negative impacts on the environment and people's health, and increase access to active transportation/physical activity for all ages.

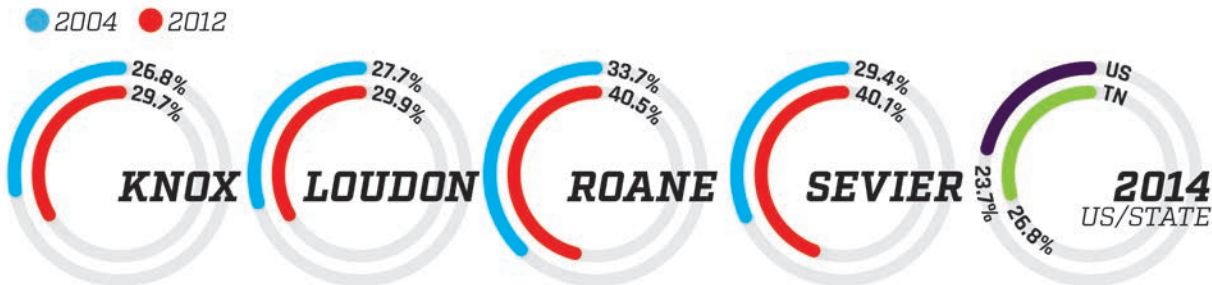
Transportation has an impact on our personal health. Lack of physical activity is a primary cause of most chronic disease (e.g., heart disease, stroke, cancer, type 2 diabetes). Tennessee adults rank second in the nation for rate of diabetes, ninth in physical inactivity, and fourteenth in obesity. Sixty-two percent of people in Tennessee do not get enough physical activity.

In 2013, 64% of adults in Knox County reported engaging in leisure time exercise, compared to 63% statewide and 75% nationwide. Since 2005, the share of adults who exercise fell almost 10 percentage points in Knox County, compared to less significant declines of four points and two points respectively at the state and national level.

*The costs of obesity account for **9%** of total U.S. health care spending, and add an estimated **\$395** per person per year to health care expenses. If current trends continue, total U.S. costs resulting from obesity are expected to be as high as **\$957** billion by 2030. By comparison, the annual U.S. Department of Transportation budget is **\$95** billion.²²*

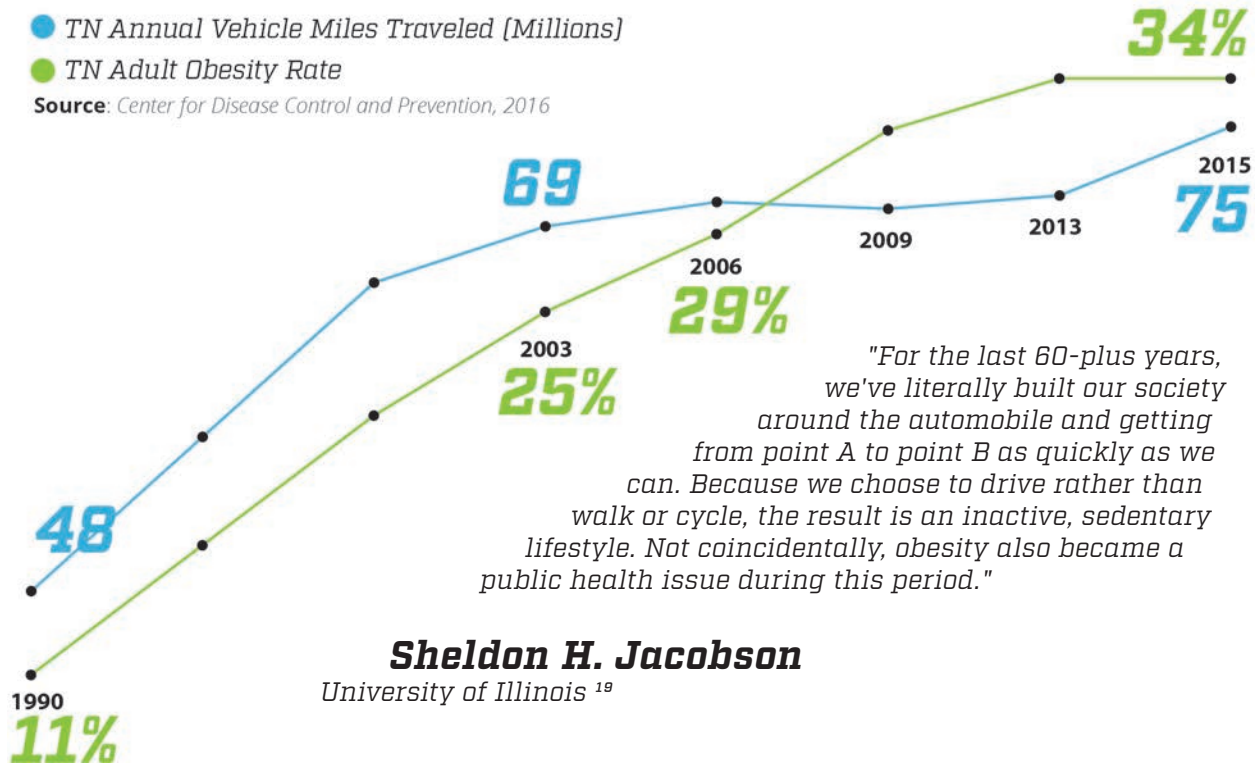
²² Finkelstein, EA, Fiebelkorn, IC, Wang, G. 2003 National Medical Spending Attributable to Overweight and Obesity: How much, and who's paying? Health Affairs W3:219-226. Sutm R. 2002 The Effects of Obesity, Smoking, and Drinking on Medical Problems, and Costs. Health Affairs, March/April: 245-253.

Percentage of Residents who are **Physically Active**



Source: Center for Disease Control and Prevention, 2016

The percentage of residents who are physically active decreased between 2004 and 2012 in Blount, Roane, and Sevier counties. All counties in the region saw increased obesity rates between 2004 and 2012, with a range of 29% in Loudon County to 34% in Blount County.²³



Sources: Centers for Disease Control – National Health and Nutrition Examination Survey/U.S. DOT – Federal Highway Administration, Annual Vehicle Distance Traveled in Miles and Related Data

Regular physical activity promotes important health benefits and reduces risk for obesity, but many communities and neighborhoods lack sidewalks, trails, bicycle facilities, and other infrastructure that

23 "A Note on the Relationship Between Density and Driving"
Transportation Policy; Vol 18, Issue 5, Sept. 2011;
Sheldon Jacobson

support walking and bicycling. There is a growing desire for more opportunities to walk and bicycle in our communities: a national survey found that 55% of adults wanted to bicycle more than they currently do, and 68% wanted to walk more.²⁴

Transportation also has a significant impact on our region's air quality. Mobile sources, primarily motor vehicles, are the largest source of air pollutants, including greenhouse gases, ozone precursors (volatile organic compounds and nitrogen oxides), and particulate matter. Most of our region has been, or is currently, in non-attainment for two criteria pollutants - ground-level ozone and fine particulate matter - under federal air quality standards. These federal standards are based on scientific evidence and intended to protect human health. Air quality non-attainment status can hinder economic development due to imposed requirements for emission control equipment.

Stormwater Runoff

Stormwater runoff is rainfall that flows over the ground or impervious surfaces, such as buildings, roads, and parking lots, into drainage systems and waterways. Stormwater is a leading cause of water pollution because runoff collects pollutants such as oil, pesticides, and other chemicals from roads and parking lots, and then deposits the pollutants into our waterways.

Polluted stormwater runoff is commonly transported through special sewer systems (municipal separate storm sewer systems or MS4s), and then often discharged, untreated, into local water bodies. MS4s are operated by cities or other public entities, designed to collect stormwater, and are not part of a sewage treatment plant. To prevent harmful pollutants from entering waterways, most cities must develop a stormwater management plan.

State transportation agencies are responsible for a large number of roadways; therefore they also must have a stormwater management plan. TDOT's Statewide Storm Water Management Plan outlines the steps TDOT will take to implement erosion prevention and sediment control materials and practices for TDOT construction projects.

Communities can be proactive about stormwater runoff through better planning and coordination. Regulations under the National Pollutant Discharge Elimination System (NPDES) stormwater program offer a structure for considering the water quality benefits associated with smart growth techniques. Given the water benefits of smart growth at the site, neighborhood, and watershed levels, many smart growth techniques and policies are emerging as best management practices (BMPs). Joint land use, transportation, and water planning can improve water quality protection and satisfy regulatory commitments. Examples of some of these techniques include:

- Watershed planning - coordinating across jurisdictional boundaries to prevent and control water quality and quantity impairments.
- Infill development - taking advantage of built out areas that are already served by a variety of transportation options.

²⁴ "National Survey of Bicyclist and Pedestrian Attitudes and Behavior," USDOT National Highway Traffic Safety Administration, 20013,

- Redevelopment policies – supporting construction on sites that have previous uses and are typically already covered by impervious surface.
- Special development districts (e.g., transit oriented development, business improvement districts, and brownfields redevelopment) – creating districts to help address complex challenges in areas that need coordinated zoning, transportation, and planning assistance.
- Tree and canopy programs – incorporating a tree and canopy program to reduce the heat island effect and improve the walking experience.
- Reduced parking requirements – retrofitting existing parking lots and reducing the footprint of new lots to reduce the amount of impervious surface.
- "Fix It First" infrastructure policies – prioritizing repair of existing infrastructure over building new.
- Smart growth street designs.

The reduction or mitigation of stormwater impacts of transportation is a new planning factor required under the FAST Act. FHWA has not yet issued guidance on how transportation planning agencies are required to address this issue, however, the TPO wanted to be proactive by including it in the Mobility Plan. Many of our current goals and strategies align with techniques described above.

Environmentally Sensitive Areas

There are numerous environmentally sensitive areas found throughout the Knoxville Region. Many areas are too small or too numerous to map at a regional level and can only be clearly identified through a project level analysis. Some areas are yet to be identified and will only become known once a project level analysis is completed, such as caves, sinkholes, and wetlands. When a project is ready to move from the Mobility Plan 2040 into implementation phases, a complete analysis should be conducted to determine the type and location of environmentally sensitive areas within the project study area. The following environmentally sensitive areas/sites should be included in that analysis:

- Lakes/rivers/streams;
- Flood plains and floodways;
- Wetlands;
- Steep slopes;
- Preserved forest/game lands;
- National/state/local parks;
- Historic sites/ neighborhoods; and
- Scenic highways/parkways.

The TPO will work with TDOT and local jurisdictions to assist in providing the data listed above for project level analysis.

Environmental Consultation

Since the transportation planning activities of the TPO are regional in scope, this environmental mitigation discussion does not focus on each individual project within Mobility Plan 2040 but offers a summary of the environmentally sensitive areas to be aware of regionwide, the projects that most likely will have an impact on these environmentally sensitive areas, and mitigation strategies that should be considered to reduce the impact of projects. The resources needed to evaluate environmentally sensitive areas and the development of mitigation strategies will continue to be

part of an ongoing dialogue between the TPO and appropriate resource agencies and partners. The TPO provided the following resource agencies with the opportunity to review the Mobility Plan 2040 between December 16, 2016 and January 16, 2017. No comments were received.

- US Army Corps of Engineers
- Tennessee Valley Authority
- US EPA Region 4
- Great Smoky Mountains National Park
- USDA Forest Service Southern Research Station
- TN Dept. of Environment and Conservation
- TN Department of Health
- TN Historical Commission
- TN State Parks, Bureau of Parks and Conservation
- TN Wildlife Resources Agency
- US Housing and Urban Development Office

Environmental Mitigation

While some sort of mitigation effort should be included in every project that has an impact on an environmentally sensitive area, it is recognized that not every project will have the same level of impact and thus different levels and types of mitigation should be utilized. Some projects involve major construction with considerable earth disturbance, such as new roadways and roadway widening projects. Other projects involve minor construction and minimal, if any, earth disturbance, such as traffic signals, street lighting, and resurfacing projects. The mitigation efforts used for a project depends on how severe the impact on environmentally sensitive areas is expected to be. In determining which mitigation strategies to use, each project identified as having an impact on an environmentally sensitive area should follow the three-step mitigation planning process prior to construction:

1. Identify all environmentally sensitive areas throughout the project study area;
2. Determine how and to what extent the project will affect these environmentally sensitive areas; and
3. Develop appropriate mitigation strategies to lessen the impact these projects have on the environmentally sensitive areas.

All projects shall minimize off-site disturbance in sensitive areas and develop strategies to preserve air and water quality, limit tree removal, minimize grading and other earth disturbance, provide erosion and sediment control, and limit noise and vibration. Where feasible, alternative designs or alignments should be developed that would lessen the project's impact on environmentally sensitive areas. The three-step mitigation planning process should solicit public input and offer alternative designs or alignments and mitigation strategies for comment by the TPO, resource agencies and local government.

For major construction projects, such as new roadways, or for projects that may have a regionwide environmental impact, a context sensitive solutions process should be used in which considerable public participation and alternative design solutions are used to lessen the impact of the project.

The following table provides potential mitigation strategies that should be considered during the project development stage for each project programmed in the Mobility Plan.

Resource	Potential Mitigation Strategy
Agricultural Areas	<ul style="list-style-type: none"> • Avoidance and minimization • Conservation easements • Environmental compliance monitoring
Air Quality	<ul style="list-style-type: none"> • Avoidance and minimization • Control loose, exposed soils with watering or canvas sheets • Minimize idling of heavy construction vehicles and tractor trailer trucks • Promote car and van pooling • Promote usage of transit, bicycles, and walking for trip making
Cultural Resources	<ul style="list-style-type: none"> • Avoidance or minimization • Landscaping for historic properties • Preservation in place or excavation for archaeological sites • Memoranda of agreement with the Department of Historic Resources
Forested and Other Natural Areas	<ul style="list-style-type: none"> • Avoidance and minimization • Use selective cutting and clearing • Replace or restore forested areas • Preserve existing vegetation • Avoid development on steep hillside slopes • Avoid karst topographic areas such as sinkholes • Avoidance and minimization
Neighborhoods, Communities, Homes, and Businesses	<ul style="list-style-type: none"> • Avoidance and minimization • Minimize noise impact with sound barriers • Prevent the spread of hazardous materials with soil testing and treatment • Context sensitive solutions for communities (appropriate functional and/or aesthetic design features)
Parks and Recreational Areas	<ul style="list-style-type: none"> • Avoidance, minimization or mitigation
Protected and Endangered Species	<ul style="list-style-type: none"> • Avoidance and minimization • Coordination with the Tennessee Department of Environment and Conservation (TDEC) and/or U.S. Fish and Wildlife Service (USFWS)
Wetlands and Water Resources	<ul style="list-style-type: none"> • Avoidance and minimization • Replace or restore wetlands • Improve stormwater management and utilize best management practices • Utilization of wetland banks

Strategies

- Support projects and programs that reduce energy use and greenhouse gas production.
- Coordinate air quality and transportation planning activities in the region through partnerships.
- Share data and collaborate with partners to minimize the impact of projects on environmentally sensitive areas.

System-level Performance Measures

Stormwater	Stormwater BMPs in place
Air Quality	Criteria pollutant emission reductions
	Daily pounds of air pollutants (VOC, Nox, PM2.5, GHG) reduced by CMAQ projects in our region
	2 and 4 year total emission reductions for each criteria pollutant
Health	Physical inactivity rates
	Obesity rates
Environmental Mitigation	Minimize impacts on environmentally sensitive areas

Note: FHWA is proposing GHG emissions performance measures because mobile sources account for over 80% of U.S. transportation sector GHGs (closer to 50% in our region). FHWA believes that GHG emissions would be best measured as the total annual tons of CO2 from all on-road mobile sources, but final measures have not yet been released.

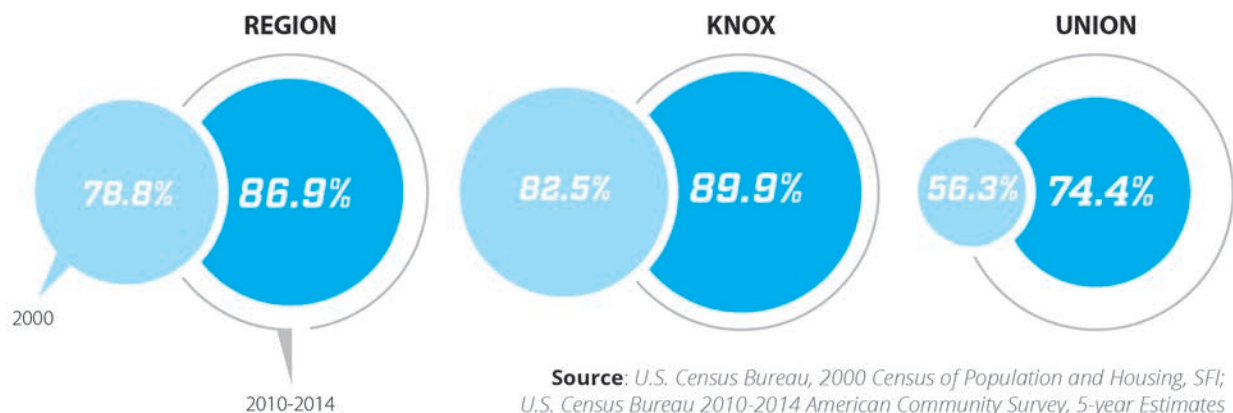
5. Equitable Access

Connect communities to opportunities and services throughout the region, particularly areas with high proportions of low income, senior, and/or minority populations.

While transportation planning has historically focused on the concept of “mobility” (moving people from place to place), recently the focus has begun shifting to “access” -- ensuring that people can safely reach jobs, education, and other daily needs. Transportation planning decisions can help improve residents’ health by promoting bicycling and walking, focusing on access to food shopping and other daily needs (especially for vulnerable populations such as low-income, elderly, and disabled), and conceiving of neighborhoods as destinations rather than funnels for cars and other vehicles.

Most of the counties in the region have between 25% and 30% of their households making less than \$25,000 annually. One-third of Union County households make less than \$25,000. Loudon County had the highest median household income, at more than \$50,000.

Most people in our region who live below the poverty level are in Knox County – more than 65,000 people between 2010 and 2014. This has increased from 46,500 in 2000.



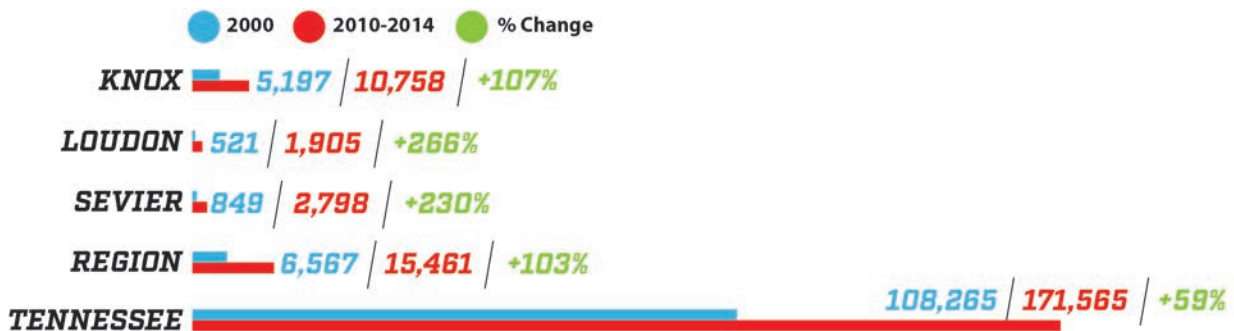
Educational Attainment

Educational attainment in Union County is also lower than the rest of the region, with only 74.4% of residents having at least a high school degree. This is a significant increase from 2000, though, when just 56.3% had a high school degree. Knox County has the highest educational attainment rates, with nearly 90% of residents having at least a high school degree.

The percentage of residents with limited English proficiency has increased significantly in the region, especially Loudon and Sevier counties. Actual counts, however, remain low in Loudon and Sevier Counties.

LIMITED ENGLISH PROFICIENCY

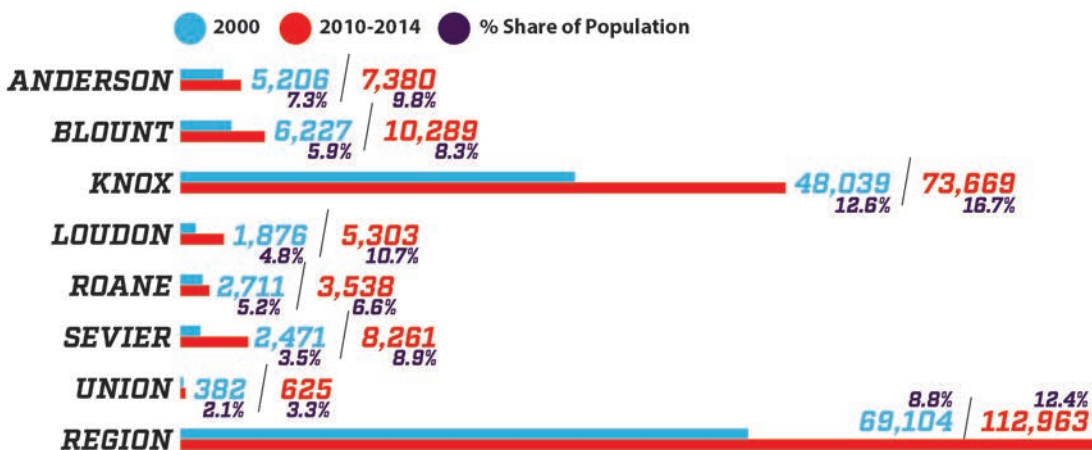
Source: U.S. Census Bureau, 2000 Census of Population and Housing, SFI; U.S. Census Bureau 2010-2014 American Community Survey, 5-year Estimates

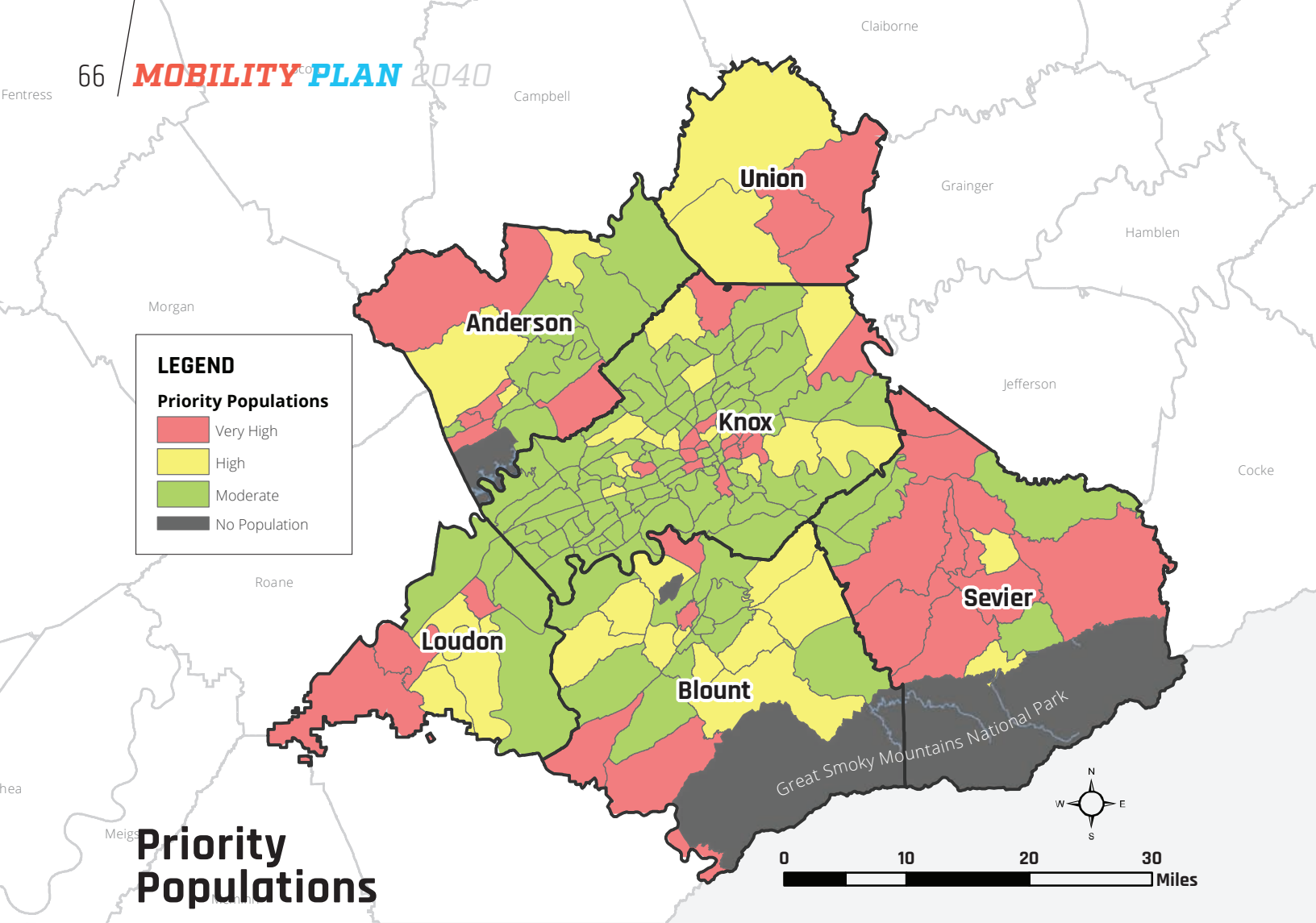


This is also reflected in the increase in number of non-white residents in the region, especially Loudon and Sevier Counties.

NON-WHITE POPULATION

Source: U.S. Census Bureau, 2000 Census of Population and Housing, SFI; U.S. Census Bureau 2010-2014 American Community Survey, 5-year Estimates



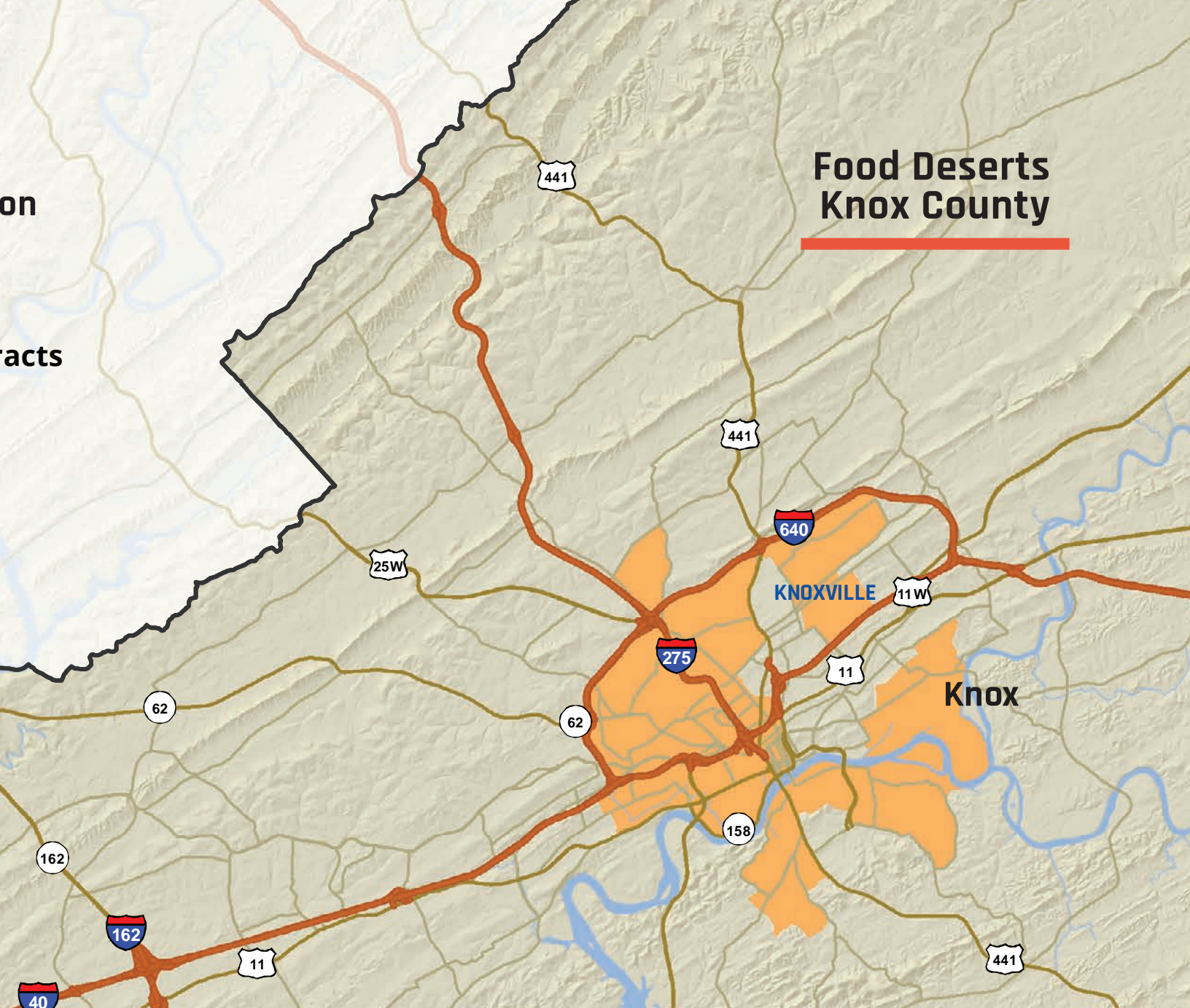


For the first time, project selection criteria for the Mobility Plan includes equity and access to opportunity. In conjunction with the U.S. Department of Transportation's Ladders of Opportunity initiative, the TPO seeks to fund transportation projects that connect communities to centers of employment, education, and services. These projects can also stimulate long term job growth, especially in economically distressed and historically disenfranchised areas.

The TPO developed a methodology to measure the location and extent of challenges to accessible quality food, physical activity centers, and chronic disease to provide a more detailed picture of need in our region. Priority populations are characterized by those living in areas (represented by census tracts) with less opportunity, less accessibility to safe places for being active, and greater vulnerability than the region to leading a healthy and economically sustainable life.

Twenty-two socioeconomic measures, or indicators, were chosen to represent components of Priority Populations. Data for each indicator were assembled at census tract geography to represent neighborhoods and small communities throughout the region. The 22 indicators were organized into three themes: Opportunity, Accessibility, and Vulnerability.

Data sources, calculations, and scoring (where appropriate) of indicators are described in Appendix O.



"Food deserts" are areas where people cannot reach affordable, healthy food due to the lack of grocery stores, farmers' markets, and healthy food providers. Food deserts are most commonly found in communities of color and low-income areas (where many people do not have cars). Transportation planning can play a role in eliminating local food deserts. Two transportation-related recommendations came out of a 2013 Knoxville-Knox County Food Policy report. City and County should adopt complete street policies and standards that include sidewalks, greenways, and transit amenities; and assure that public transportation routes maximize accessibility to grocery stores and other healthy food sources.²⁵

25 Knoxville-Knox County Food Policy Council, 2013 Community Research Findings and Recommendations <http://knoxfood.org/wp-content/uploads/documents/2013KKCFPCReportfinal.pdf>

Strategies

- Ensure adequate funding for regional paratransit providers that serve disabled and elderly populations.
- Research and support initiatives and policies that stimulate job training and quality job creation in low-income and minority communities.
- Ensure that low-income, minority, and aging populations have equal access to the metropolitan planning and decision making process through proactive outreach.
- Prioritize projects that include multi-modal access to community resources, especially for priority populations with high and very high vulnerability.
- Work with the disabled community and local agencies to ensure that all planning and implementation processes meet or exceed ADA requirements.

System-level Performance Measures

Connectivity	Number of households in very high and high priority population areas within a 1/4 mile of fixed route transit, bicycle, or pedestrian facility
Funding	Percentage of TPO funded transportation projects in very high and high priority population areas
	Percentage of total TPO transportation dollars spent in very high and high priority population areas

6. Congestion Reduction

Use our system more efficiently through technology like traffic signal coordination, real-time traffic information, and emergency response vehicles.

Severe traffic congestion detracts from a region's ability to grow and prosper. Congestion can also result in poor air quality and quality of life. However, the TPO recognizes that different levels of congestion can be considered acceptable based on context. For example, in dense urban areas, congestion can be expected and is a sign of a thriving district. Also, in such areas, accommodation of motor vehicles must be balanced with other modes of travel such as walking, biking, and public transportation. Eliminating congestion may not be desired if it comes at the expense of economic vitality, community livability, or bicycle/pedestrian access.

The traditional solution to congestion is to add capacity, or lanes, to the road network. These lanes are typically used by people driving alone, and are expensive. The TPO is responsible for conducting a Congestion Management Process (CMP). The CMP monitors roadways for congestion problems and seeks to implement projects, plans, and programs to reduce congestion. The CMP places higher priority on projects that provide operational management strategies and increase the efficiency of existing roadways before resorting to the construction of additional roadway capacity.

The Congestion Management Process (see sidebar) is made up of eight steps. See Appendix H in the appendix for more information about the CMP process.

Here are some of the strategies currently used in our region:

- **Intelligent Transportation Systems**
Intelligent transportation systems (ITSs) are technologies which aim to manage traffic and enable road users to be better informed and make more efficient use of the transportation network.
- **Traffic signal coordination**
There are more than 260,000 traffic signals in the United States. It is estimated that over 75% of these could be improved by updating equipment or by simply adjusting and updating the timing plans. It is further estimated that poor traffic signal timing accounts for 5 to 10% of all traffic delay, or 295 million vehicle-



Source:
*The Congestion
Management Process:
A Guidebook, FHWA*

hours of delay on major roadways alone. Traffic signal retiming is one of the most cost effective ways to help traffic move and is one of the most basic strategies to help mitigate congestion. Optimizing traffic signals can produce cost-benefit ratios as high as 40 to 1.

- Incident management and traffic operations
Traffic incidents cause approximately 25% of traffic congestion. Traffic Incident Management is an important tool in lessening the impact of non-recurring congestion as well as increasing safety. TDOT's SmartWay Program strives to reduce congestion and incidents by providing real-time traffic information to the public and by responding to minor incidents on the interstates. The program uses traffic cameras, dynamic message signs, roadway detection systems, HELP patrols, and a website to accomplish their goals.
 - HELP trucks operate daily along 77 miles of interstates in the Knoxville region: I-40, I-75, I-140, I-275, and I-640. HELP trucks are equipped to respond to crashes and other incidents along these roadways or adjoining ramps to restore normal traffic flow as quickly as possible. Since the HELP program began in 1999, their trucks have responded to 410,392 incidents in the Knoxville region. More details on the SmartWay program are in the appendix.
- Commuter choice/travel options
Smart Trips is a commuter choice program that aims to reduce the number of people driving alone. Smart Trips provides information and help on all of the options for commuters, including carpooling, bicycling, transit, telecommuting, compressed work weeks, and more. Smart Trips offers a free ridematching database and rewards for participating commuters. The program also encourages businesses to promote participation and provide incentives such as free bus passes to their employees.
 - As of April 2016, Smart Trips has more than 700 active participants and continues to add more. Participation has waned recently due to significant decreases in gas prices, which is in line with national trends. Program coordinators have implemented changes in 2017 to make all types of trips, not just commute trips, eligible for logging. This is consistent with recent US DOT goals to increase bicycling and walking for short trips. It also is a response to commute trips being a small percentage of total travel. Smart Trips produces a quarterly progress report that describes participation, events, and performance metrics. These reports are available at www.knoxsmarttrips.org.

Strategies

- Employ the Congestion Management Process to identify projects and transportation system management strategies that reduce travel delays.
- Promote efforts that encourage transportation alternatives to single-occupancy vehicle travel.
- Continue to invest in regional ITS.
- Ensure proper consideration of appropriate congestion mitigation strategies in the project development and implementation process.
- Work with partners to facilitate coordination of transportation system operations.

System-level Performance Measures

Efficiency	Annual hours of excessive delay per capita
	Percentage National Highway System (NHS) providing reliable travel times
	Percentage of non-interstate NHS where peak hour travel times meet expectations
CMP	VMT reduced by CMP strategies

7. Preservation of Places

Preserve the natural and cultural areas that make our region unique.

Our goal is to preserve our natural assets and strengthen the identity of our unique communities, small towns, and cities, and enhance their character to make them great centers of activity. When we talk about East Tennessee as a region, we focus on what we have in common, but each of the region's communities possesses a unique identity. Celebrating and building upon these identities can shape and improve each community and the entire East Tennessee region, attracting visitors, tourists, and new businesses.

Sense of place is important to both retiring Baby Boomers and Millennials entering the workforce and choosing unique communities in which to live. Communities across the U.S. have increasingly become similar to one another because of standard building practices, as well as streets and public spaces designed for efficiency and not character. Communities should be encouraging development or redevelopment that reflects their unique identity.

Strategies

- Invest in facilities and programs unique to our region.
- Coordinate transportation investments with open space preservation.
- Preserve and re-invest in existing transportation and utility corridors.
- Support new community centers along transit lines and major transportation corridors.

System-level Performance Measures:

Resiliency & Conservation	Percentage of TPO-funded projects located in existing centers.
	Percentage of TPO-funded projects located within or along existing major transportation corridors

8. Economy and Freight

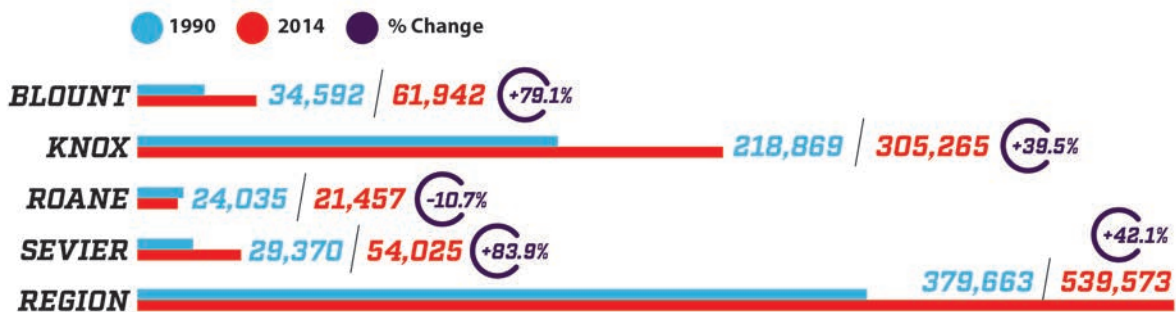
Improve intermodal connections to help move freight to and through the region, reduce delay on major freight corridors, and support business attraction and retention.

The transportation needs of the regional economy are as varied as the economy itself. One area might require the movement of heavy goods; another might rely on public transportation for access to labor; and another might need good airline connections to major cities. A comprehensive transportation system that provides good mobility is necessary to sustain and grow our economy.

Currently, our region, when compared to peer regions around the country, does not experience serious congestion. Our goal is to work toward providing a reliable system that can manage any delays that do occur, given that freight volumes are expected to increase by 60% over the next 25 years in the United States. Recent and planned investments in Intelligent Transportation Systems, including traffic signal coordination, continue to improve the travel experience for both personal travel and freight.

Regional **Employment Growth**

Source: U.S. Department of Commerce, Bureau of Economic Analysis. Woods and Poole Economics.



Throughout the region, major shifts in employment by industry have occurred. Manufacturing and farming experienced the sharpest declines between 1990 and 2014, (37.4% and 31.7%, respectively). The largest growth took place in the education and management sectors (165% and 159%). However, those sectors remain a small percentage of the workforce. Retail, government, health care, and hotel/food services are responsible for 44% of employment.

In Memphis, TN, bicycle lanes are part of the city's Broad Avenue Arts District initiative which has revitalized a struggling commercial and residential area.

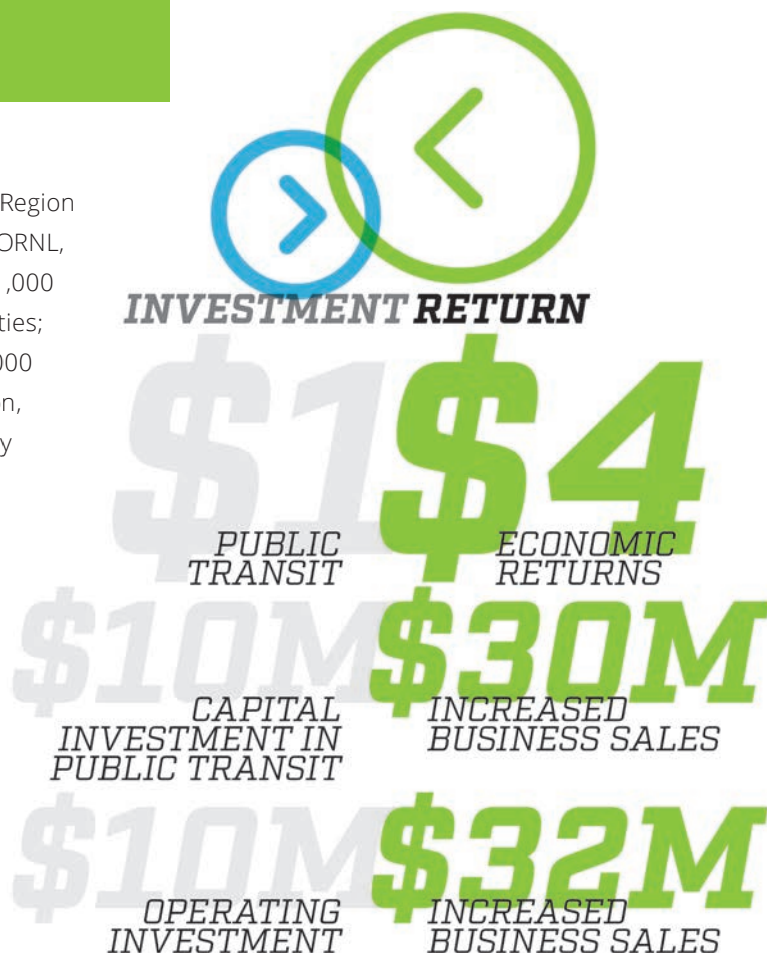
Since the beginning of the project, the district has seen 16 new businesses, 29 property renovations (17 at blighted locations), and 40,000 visitors to the Arts Walk. Restaurants have reported a growth in business from people on bicycles.²⁶

Cost benefit analysis shows that up to \$11.80 in benefits can be gained for every \$1 invested in bicycling and walking.²⁷

The largest employers in the Knoxville Region include the U.S. Department of Energy (ORNL, Y-12, ORAU, etc.) with more than 11,000 employees in Anderson and Roane counties; Covenant Health with more than 10,000 employees in Anderson, Knox, Loudon, Roane, and Sevier counties; University of Tennessee with 6,660 employees in Knox County; Denso Manufacturing with 3,500 employees in Blount County; and Dollywood Corporation with 2,500 employees in Sevier County.

A significant component to future economic growth in the region will be the quality of access of goods to markets and of people to employment.

Similarly, attracting and retaining young talent is a concern among business leaders in the region. The "brain drain"



²⁶ Overton Broad Connector Partners, "Broad Avenue Corridor: Fostering a Choice Neighborhood Fueling Economic Development," presentation; Peel, Jeff, "A Better Block on Broad"

²⁷ Bicycling and Walking in the United States: 2012 Benchmarking Report

of skilled, college-educated students leaving the region significantly affects the quality of the regional labor pool. Investing in transportation options could help reverse this trend. An American Planning Association survey found that only 8% of Millennials (those born between 1980 and 2001) would prefer to live in an auto-dependent suburb.

By investing transportation dollars in walkable neighborhoods with bicycle facilities and transit options, we may encourage more college graduates to stay in the region.

Eighty percent of 18 to 34-year-olds want to live in walkable neighborhoods.²⁸ An average of 60% of those over 50 want to live within one mile of daily goods and services.²⁹ A majority of venture capital is going to center cities or walkable suburbs. Many cities are striving to increase walkability after losing bids for new businesses to areas that are more walkable.

In most major U.S. cities, an increase of one point in Walk Score—a proxy for walkability that rates nearness to commercial destinations on a scale of one to 100—translated into higher home prices (ranging from \$700 to \$3,000). Going from an “average” level of walkability to an “above average” level was associated with a \$10,000 to \$30,000 increase in home values.³⁰ Over the past decade, prices for properties located in urban centers have risen 125% while prices for suburban properties that are also considered highly walkable are up 43%. Comparatively, prices are up just 22% for properties in suburban locations that are just somewhat walkable or car-dependent.³¹

From 2006-2011, residential property values performed 42% better on average if they were located near public transportation with high-frequency service.

A 2015 analysis by Smart Growth America found that nearly 500 companies have relocated, expanded, or opened new offices in downtown locations recently. Fifty-two of these companies are on the Fortune 500. Through interviews with executives, Smart Growth America learned that companies chose to leave suburban office parks for central business districts and other walkable centers primarily to retain their competitive advantage.³²

²⁸ [Survey: To recruit and keep millennials, give them walkable places with good transit and other options](#)

²⁹ [2011 Boomer Housing Survey](#)

³⁰ [Walking the Walk: How Walkability Raises Home Values in U.S. Cities](#)

³¹ [RCA Walks Score](#)

³² [Core Values: Why American Companies are Moving Downtown, Smart Growth America, June 2015](#)

Strategies

- Prioritize multi-modal transportation and land-use investments that increase access to quality job clusters, education, and job training in the region.
- Coordinate with local development officials and implementation partners in the private sector to ensure the adequacy of transportation access to sites where quality jobs exist or where new job growth is anticipated.
- Support transit programs that expand reverse commute possibilities and improve access to job centers.
- Coordinate with stakeholders from the freight sector to identify challenges and opportunities.

System-level Performance Measures

Freight	Amount of goods moved via freight through the region
	Average delay on major freight corridors
Travel and Tourism	Economic impact of tourism - revenues from hotel/motel tax
Economy	Number of new or expanding businesses in the region
	Number of small scale, unique businesses (non-chain)
	Unemployment rate

SUMMARY OF PLANNED INVESTMENTS

Overview

The investment plan of Mobility Plan 2040 was developed through technical evaluation as well as public and stakeholder input.

All projects using federal transportation funds must first be identified in Mobility Plan 2040's investment plan. By federal law, both the Mobility Plan's investment plan and the Transportation Improvement Program must be fiscally constrained—this means we cannot spend more than we expect to receive. Applying the financial constraint ensures that the investment plan is more than merely a wish list; it provides a level of certainty concerning the nature and timing of project funding. Projects considered for inclusion in the Plan are labeled as either priority or unfunded—priority projects are those that are affordable within the region's anticipated resources, whereas unfunded projects are beyond the region's financial ability. If additional funding becomes available, however, unfunded projects may advance to the priority list.

Project Selection

Transportation funding must go toward projects that help us realize the vision and goals we have established.

To establish project selection criteria in line with our goals, we conducted a statistically significant phone survey and an online survey of residents in the region, and conducted keypad polling of our Mobility Advisory Committee and Technical Committee. Based on the results of that input, we developed a scoring system as seen on page 81. For the first time, projects that are considered *within community* (i.e. smaller in scale) were scored differently than *community to region* projects (i.e. larger projects).

For instance, survey input showed that people think congestion reduction and economy and freight are not as important for *within community* projects as they are for *community to region* projects. Equitable access, health and environment, and safety and security are considered more important *within community* than for regional projects. Additional details on Mobility Plan 2040 outreach can be found in Appendix D.

Within community projects support local, multimodal connections and access to community resources within a variety of centers, from large urban to rural crossroads. These projects include intersection improvements, streetscaping projects, sidewalks, and short sections of greenways. *Community to region* projects support strategic, multimodal connections between community centers and regional economic centers. *Community to region* projects include major roadway projects, long corridor projects, regional greenways, and regional transit.

Each project was scored using the selection criteria. Quantitative data was used whenever available to eliminate subjectivity. There are some measures that lend themselves to quantification more easily than others. Following are brief descriptions of each scoring criterion and how points were generally assigned.

Congestion Reduction

The Knoxville Regional Travel Demand Model was used to determine the roadway's current volume-to-capacity ratio that would be affected by the project and a portion of the points in this category were assigned based on that relative congestion level. The other portion of points in this category were assigned based on the type of project and whether it specifically targeted congestion reduction, as opposed to having a safety or economic development emphasis. Additionally, maximum points were given to project types that would address congestion through demand management or operations.

Economy & Freight

Points were awarded based on the amount of employment within one mile of project location and relative percentile ranking. The percent of truck traffic was also used to assign points specifically for projects submitted in the *Community to Region* category.

Equitable Access

Points were awarded based on project location relative to the Priority Population status (Moderate, High or Very High).

Health & Environment

The majority of points for this category were based on a clear demonstration of the project promoting active transportation and whether stormwater mitigation was addressed. A small number of points were also given based on a subjective assessment of the project's potential impact on idling reduction to reduce air pollution.

Maintenance & Efficiency

Roughly two-thirds of points were awarded based on whether the project improved the efficiency of an existing roadway rather than new construction, maximum points were awarded for projects that minimized environmental impacts. Therefore, a simple resurfacing project would receive more points than a major roadway widening project. The other one-third of points were based on the roadway functional classification in order to give more weight to projects that are on roadways of more regional significance.

More Options

Points were awarded based on the inclusion of transit accommodation, sidewalks, bike lanes, and/or greenway trails within the project. This was combined with the level of population and employment density calculated with the “Preservation of Places” goal to assess the level of connectivity between major origins and destinations. Projects with additional lanes were given slightly fewer points than a comparable minor reconstruction project because of increases in vehicle speeds and crossing distance which degrade safety for people walking and bicycling..

Preservation of Places

A geographic analysis was performed to determine the existing population and employment density within the immediate area around each project and a relative scale was developed to convert this measure to appropriate points. This measure was used to determine whether the project was located in a more established area rather than spreading out to undeveloped locations.

Safety & Security

The majority of points were awarded based on existing crash rates on a scale developed by a percentile ranking process relative to all projects. If a project was on a new route it was given only the minimum points possible unless it could be specifically tied to a parallel route that was being bypassed and its crash rate. Additional points were awarded if accommodations for alternative modes were provided. Security/emergency response points were based on the functional class of the roadway.

The projects selected through our application and evaluation process will help our region meet the eight goals of the Mobility Plan.

Here are four projects that demonstrate how goals and objectives are met. Not every project has a strong connection to each goal but the overall project list moves us toward achieving our vision.

The full project list can be found in Appendix E.

Advanced Traffic Management System

Several projects to upgrade and coordinate traffic signal systems in Knoxville, Oak Ridge, Loudon, Farragut, and Knox County (Appendix E, Table E-1)

Maintenance and efficiency

These projects increase the efficiency of our existing roadways.

More options

NA

Safety and security

Having coordinated traffic signals can increase safety at intersections.

Health and environment

These projects can reduce idling time of motor vehicles, which decreases emissions.

Equitable Access

These projects are being implemented all over the region, including in areas with priority populations.

Congestion reduction

Signal coordination can reduce congestion by moving vehicles more efficiently.

Preservation of places

Increasing efficiency of traffic reduces the need to widen roads.

Economy and freight

Moving people and goods more efficiently helps commerce.

E Broadway (SR-33) at Brown School Rd

Realign intersection; add turn lanes and new traffic signal (Appendix E, Table E-1)

Maintenance and efficiency

Using a targeted approach rather than widening an entire corridor is a great way to increase the efficiency of our existing network.

More options

NA

Safety and security

The public has expressed support for this project, citing that it has been a safety issue.

Health and environment

These projects can reduce idling time of motor vehicles, which decreases emissions.

Equitable Access

These projects are being implemented all over the region, including in areas with priority populations.

Congestion reduction

This project is expected to reduce congestion at this intersection.

Preservation of places

By focusing on the intersection rather than widening the entire corridor, less land is impacted.

Economy and freight

Moving people and goods more efficiently helps commerce.

Sidewalk projects

Kingston Pike between Old Stage Rd and Virtue Rd; S. Castle St. from Martin Luther King Jr. Ave. to Wilson Ave.; Atlantic Ave from Pershing St to Broadway (Appendix E, Table E-2)

Maintenance and efficiency

Adding a sidewalk to an existing roadway increases the road's capacity.

More options

More people can walk, and walk more safely, when there is a complete sidewalk network.

Safety and security

People walking are twice as likely to be hit where there aren't sidewalks.

Health and environment

Walking is a great way to build physical activity into your daily life, which increases your health.

Equitable Access

These projects are occurring in several areas of the region, including ones with high priority populations.

Congestion reduction

When people are able to choose walking instead of driving, it can reduce congestion.

Preservation of places

NA

Economy and freight

One element of business recruitment is having a walkable community.

KAT Express Transit Service Enhancement - Broadway Transit Signal Priority Implementation

Implementation of enhancements to create Bus Rapid Transit (BRT) along KAT Route 22, the Broadway corridor. Includes transit signal priority technology, new transit stops equipped w/ passenger info systems. (Appendix E, Table E-3)

Maintenance and efficiency

Increases the capacity of a busy roadway, and increases the use of existing transit service.

More options

Makes transit a more attractive/convenient choice.

Safety and security

Taking transit is safer than driving, so more people riding transit is a safety improvement.

Health and environment

Will improve air quality. Transit users also walk more than motorists, so health will improve.

Equitable Access

NA

Congestion reduction

Increased transit use will decrease congestion on this corridor.

Preservation of places

Increasing transit use reduces the need to widen roads.

Economy and freight

One element of business recruitment is transit service.

Table 3-1: Mobility Plan 2040 Selection Criteria & Point System

Selection Criteria	Community to Region	Within Community
Congestion reduction	12	8
Economy and freight	9	4
Equitable access	9	13
Health and environment	10	13
Maintenance & efficiency	19	19
More options	17	18
Preservation	11	9
Safety & security	13	16
Local support and consistency with plans	*	*
* plus or minus 5 points		

The call for projects was open from March 28 to May 3, 2016. One hundred and eighty applications were submitted by TPO member jurisdictions.

A copy of the project application form is provided in Appendix K. The project sponsors were asked to categorize their project into one of three broad types – Roadway, Transit (capital) and Bicycle/ Pedestrian. The following table shows the approximate cost of projects for each of these three categories in terms of year 2016 dollars.

Table 3-2: Cost Summary by Project Category

Project Category	Cost (Year 2016 \$)
Roadway*	\$1,660,192,365
Bike/Ped	\$131,192,360
Transit	\$108,891,408
Total	\$1,900,276,133

*Most roadway projects include pedestrian and bicyclist accommodation as part of the design.

The TPO staff scored each project based on the information provided in the project application against the selection criteria and point system in order to develop a ranked list of projects. The rankings were then used to inform the process of selecting specific projects for funding within one of the Plan's horizon year periods (2022, 2026, 2030, 2034 and 2040) based on available revenues by funding category as estimated through the financial constraint process. Since the total number of projects applied for exceeded the amount of projected revenue some projects were not recommended for funding at this time and instead placed into an unfunded "illustrative" list. The TPO staff reviewed the initial prioritized project list with the Technical Committee and further refined project selections and horizon year placement based on input that was received. The TPO Executive Board endorsed the final project list (see Appendix E) at its November 2016 meeting.

Air Quality Conformity

As an Air Quality Non-attainment Area, the TPO must demonstrate that its transportation plans and programs will meet air quality conformity requirements – a process known as “Transportation Conformity.”

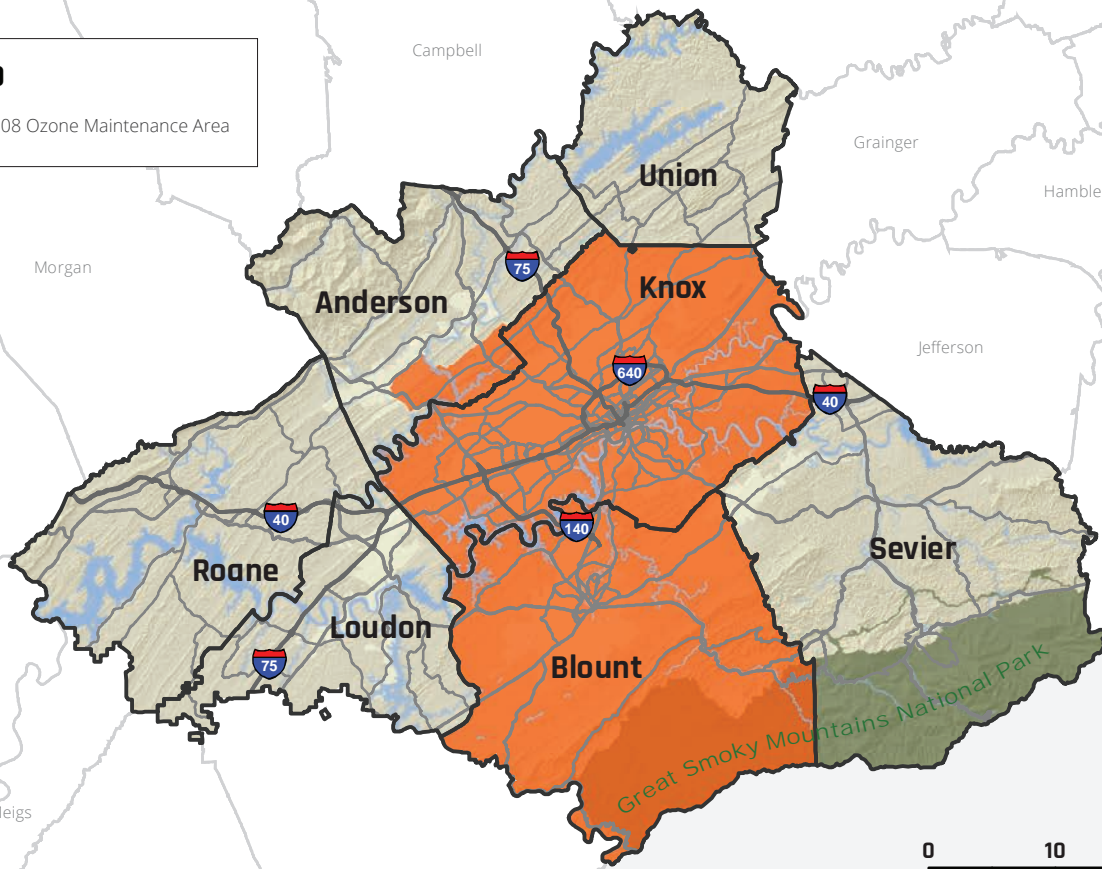
This process ensures that federal funds will not be spent on projects that cause or contribute to new violations of the National Ambient Air Quality Standards (NAAQS), increase the frequency or severity of NAAQS violations, or delay timely attainment of the NAAQS.

Transportation Conformity is demonstrated through a technical process using the TPO Travel Demand Forecasting Model and an EPA mobile source emissions model known as MOVES2014. The Travel Demand Model provides estimates of future vehicle miles of travel (VMT) based on forecasted changes in demographics and implementation of roadway projects, while MOVES2014 computes emission rates for each pollutant based on local characteristics such as meteorology and operating speeds on the roadway system. Total estimated emissions for future analysis years are compared against allowable limits from the applicable State Implementation Plans (SIP).

More detailed information can be found in the full Conformity Determination Report included in Appendix L.

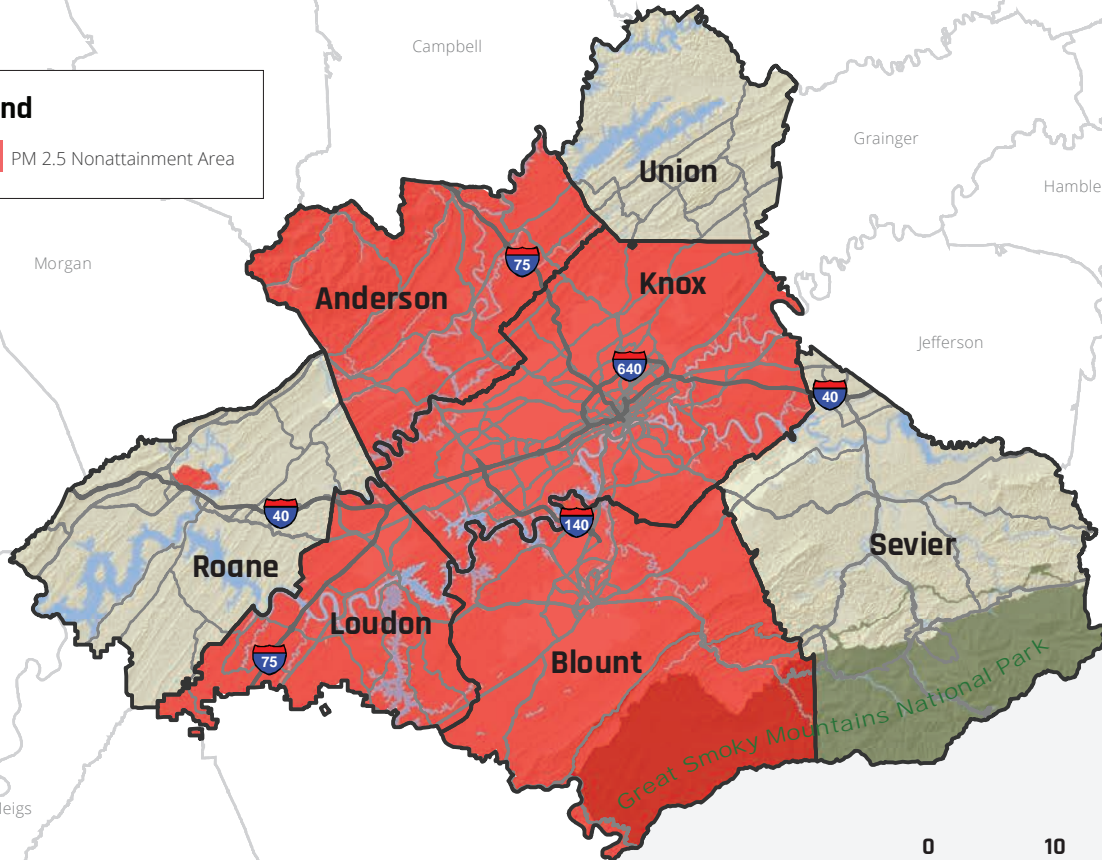
LEGEND

2008 Ozone Maintenance Area



Legend

PM 2.5 Nonattainment Area



IMPLEMENTATION AND MONITORING

The TPO will utilize the ETIndex (ETIndex.org) to help measure our progress towards the implementation of our goals and objectives and the performance measures identified.

ET Index is a community indicators project for East Tennessee. Community indicators tell the story of our area, helping us to clearly see our strengths and challenges, and focus our efforts to improve our community. The 78 indicators on this site track critical aspects of our region's economy and quality of life. These indicators, coupled with data collected for the performance measures identified, will help us more clearly evaluate and convey our progress over time.

In addition to a wide array of community indicators, ET Index interprets the information through dashboards, trend summaries, charts, graphs, and maps. Information is provided on current efforts to advance our region, as well as links to local community resources. These indicators, combined with data collected for the performance measures identified in the Mobility Plan, will help us more clearly evaluate and convey our progress over time.

We will provide periodic updates to the community and the TPO Executive Board on the progress over the next four years.

THE FINANCIAL PLAN

Financial Constraint

Federal legislation requires the Mobility Plan be financially constrained, in other words it only programs what it can expect to receive. Transportation projects are funded through many different sources including federal, state, and local funds. The greatest funding source for transportation projects is from the federal government, which accounts for approximately 80% of the funding granted to the TPO Area. A number of these funding sources have strict guidelines about the types of projects and programs that can be funded. Additional detail about specific funding sources is included in Appendix N. The table below identifies the full names of the federal funding source acronyms.

Local and state funding for transportation over the past several years has been primarily limited to safety, operations and maintenance type projects and providing match for federal funds. New projects have not been regionally significant. We do not see this changing unless there is new revenue added at the state or local level. The Tennessee State Legislature is currently considering an increase in revenues for transportation investments.

Table 5-1: Funding Sources

Funding Source Acronym	Funding Source Full Name
CMAQ	Congestion Mitigation and Air Quality Improvement Program
HSIP	Highway Safety Improvement Program
NHPP	National Highway Performance Program
L-STBG	Local Surface Transportation Block Grant Program
S-STBG	State Surface Transportation Block Grant Program
TAP	Transportation Alternatives Program

Roadway and Active Transportation Projects

The following section details the methodology for financially constraining the 2040 Knoxville Regional Mobility Plan. Specifically, the projected expenditures for all the projects in the Plan are compared to the projected revenues anticipated to be available for each network year through 2040. This section supports the Plan's financial constraint because the costs of the projects do not exceed the projected revenues.

Capital Projects

Projected Revenues

An average annual revenue amount was developed based on revenues received over the past 5 years. They were evaluated based on changes from the FAST Act and Tennessee's estimated apportionment for FY2016-2020. Through 2020, projected TPO revenues were increased by four percent yearly which is the best estimate from the FAST Act. After 2020 there is much less certainty with regard to long-term transportation funding mechanisms at the federal and state levels, therefore a simple two percent inflation rate per year was applied to the 2020 funding levels and carried out for the life of the plan to account for the regular inflationary increase that can be expected over time, but with an otherwise flat federal/state funding stream beyond the FAST Act.

Projected Expenditures

Each roadway project cost was projected from a 2016 cost and inflated to its horizon year, with an inflation rate of two percent a year for the life of the plan. The year of expenditure cost was projected to the midpoint of the horizon year period. It is assumed that half of the projects will be funded before the middle of the horizon year range and half will be funded after. For instance, projects within the 2015 to 2019 horizon year were projected to year 2017, the midpoint for that period.

Financial Constraint

Funding estimates show expected revenues will exceed the expected expenditures for the projects in all categories of funding. Some categories, such as National Highway Performance Program (NHPP) funds, have a significant anticipated balance which is due to the limited number of projects identified for this program as part of this plan development. The Surface Transportation Block Grant (STBG) program carries a small balance over each horizon period and the life of the plan. This is largely due to the fact that S-STBG and NHPP funds may only be used for a narrowly-defined set of roadways. Local STBG funds have broad criteria, thus a much larger list of projects compete for these funds despite the limited budget. Each project has been scored and prioritized based on a list of criteria discussed on page 81.

In general, projects that scored lower based on these criteria moved to later horizon years and some moved to a non-constrained unfunded list. This unfunded list identifies projects that local jurisdictions believe to be beneficial to the Knoxville Region though funding does not exist at this time. Jurisdictions would like to keep these projects available to pursue if other funding becomes available or if other projects are implemented with lower than anticipated costs or expenditures.

Tables 5-2 through 5-7 display all the projected revenues and expenditures by funding source. The tables show that the Plan is financially constrained for construction and rehabilitation of roadways as well as active transportation and operational improvements. Expenditures tie directly to costs shown in the project lists in Appendix E.

Table 5-2: Roadway and Bicycle/Pedestrian Cost vs. Revenue,
Total for all Horizon Years 2017 - 2040

Funding Category	Fed %	State/ Local %	Carry Over	New Revenue	Total Revenue	Expenditures	Balance
CMAQ	80	20	\$8,381,400	\$122,352,480	\$130,733,880	\$43,726,179	\$87,007,701
HSIP	90	10	\$0	\$354,668,614	\$354,668,614	\$42,972,784	\$311,695,830
LOCAL	0	100	\$0	\$63,527,848	\$63,527,848	\$63,527,848	\$0
L-STBG	80	20	\$47,121,376	\$415,698,567	\$462,819,943	\$412,075,390	\$50,744,553
NHPP	80	20	\$0	\$2,409,324,398	\$2,409,324,398	\$1,350,990,651	\$1,058,333,748
S-STBG	80	20	\$0	\$706,735,157	\$706,735,157	\$633,078,554	\$73,656,603
TA	80	20	\$4,222,175	\$31,374,062	\$35,596,237	\$31,985,655	\$3,610,581
Subtotal			\$59,724,951	\$4,103,681,126	\$4,163,406,077	\$2,578,357,061	\$1,585,049,016

Table 5-3: Roadway and Bicycle/Pedestrian Cost vs. Revenue,
Total for all Horizon Years 2017 - 2022

Funding Category	Fed %	State/ Local %	Carry Over	New Revenue	Total Revenue	Expenditures	Balance
CMAQ	80	20	\$27,234,800	\$25,000,931	\$52,235,731	\$43,726,179	\$8,509,552
HSIP	90	10	\$0	\$72,471,319	\$72,471,319	\$34,117,954	\$38,353,365
LOCAL	0	100	\$0	\$63,527,848	\$63,527,848	\$63,527,848	\$0
L-STBG	80	20	\$47,121,376	\$84,941,893	\$132,063,269	\$88,769,394	\$43,293,875
NHPP	80	20	\$0	\$492,310,034	\$492,310,034	\$242,135,197	\$250,174,837
S-STBG	80	20	\$0	\$144,410,943	\$144,410,943	\$0	\$144,410,943
TA	80	20	\$4,222,175	\$6,410,828	\$10,633,003	\$9,792,029	\$840,975
Subtotal			\$78,578,351	\$889,073,797	\$967,652,148	\$482,068,600	\$485,583,548

Table 5-4: Roadway and Bicycle/Pedestrian Cost vs. Revenue,
Total for all Horizon Years 2023 - 2026

Funding Category	Fed %	State/ Local %	Carry Over	New Revenue	Total Revenue	Expenditures	Balance
CMAQ	80	20	\$8,509,552	\$18,738,981	\$27,248,534	\$0	\$27,248,534
HSIP	90	10	\$38,353,365	\$54,319,524	\$92,672,890	\$6,653,010	\$86,019,880
LOCAL	0	100	\$0	\$0	\$0	\$0	\$0
L-STBG	80	20	\$43,293,875	\$63,666,611	\$106,960,486	\$102,850,807	\$4,109,679
NHPP	80	20	\$298,213,601	\$369,001,797	\$667,215,398	\$634,179,801	\$33,035,596
S-STBG	80	20	\$96,372,180	\$108,240,527	\$204,612,707	\$133,569,169	\$71,043,537
TA	80	20	\$840,975	\$4,805,117	\$5,646,092	\$4,057,651	\$1,588,441
Subtotal			\$485,583,548	\$618,772,557	\$1,104,356,105	\$881,310,439	\$223,045,667

Table 5-5: Roadway and Bicycle/Pedestrian Cost vs. Revenue,
Total for all Horizon Years 2027 - 2030

Funding Category	Fed %	State/ Local %	Carry Over	New Revenue	Total Revenue	Expenditures	Balance
CMAQ	80	20	\$27,248,534	\$20,283,676	\$47,532,210	\$0	\$47,532,210
HSIP	90	10	\$86,019,880	\$58,797,200	\$144,817,080	\$2,201,820	\$142,615,260
LOCAL	0	100	\$0	\$0	\$0	\$0	\$0
L-STBG	80	20	\$4,109,679	\$68,914,787	\$73,024,465	\$72,422,440	\$602,025
NHPP	80	20	\$33,035,596	\$399,419,412	\$432,455,008	\$330,200,816	\$102,254,192
S-STBG	80	20	\$71,043,537	\$117,163,028	\$188,206,565	\$120,133,633	\$68,072,931
TA	80	20	\$1,588,441	\$5,201,213	\$6,789,654	\$5,109,366	\$1,680,288
Subtotal			\$223,045,667	\$669,779,316	\$892,824,982	\$530,068,075	\$362,756,907

Table 5-6: Roadway and Bicycle/Pedestrian Cost vs. Revenue,
Total for all Horizon Years 2031 - 2034

Funding Category	Fed %	State/ Local %	Carry Over	New Revenue	Total Revenue	Expenditures	Balance
CMAQ	80	20	\$47,532,210	\$21,955,703	\$69,487,913	\$0	\$69,487,913
HSIP	90	10	\$142,615,260	\$63,643,980	\$206,259,240	\$0	\$206,259,240
LOCAL	0	100	\$0	\$0	\$0	\$0	\$0
L-STBG	80	20	\$602,025	\$74,595,582	\$75,197,607	\$21,999,962	\$53,197,645
NHPP	80	20	\$102,254,192	\$432,344,417	\$534,598,609	\$123,397,442	\$411,201,167
S-STBG	80	20	\$68,072,931	\$126,821,029	\$194,893,960	\$105,977,848	\$88,916,112
TA	80	20	\$1,680,288	\$5,629,960	\$7,310,248	\$5,902,979	\$1,407,270
Subtotal			\$362,756,907	\$724,990,671	\$1,087,747,578	\$257,278,231	\$830,469,347

Table 5-7: Roadway and Bicycle/Pedestrian Cost vs. Revenue,
Total for all Horizon Years 2035 - 2040

Funding Category	Fed %	State/ Local %	Carry Over	New Revenue	Total Revenue	Expenditures	Balance
CMAQ	80	20	\$69,487,913	\$36,373,188	\$105,861,101	\$0	\$105,861,101
HSIP	90	10	\$206,259,240	\$105,436,589	\$311,695,830	\$0	\$311,695,830
LOCAL	0	100	\$0	\$0	\$0	\$0	\$0
L-STBG	80	20	\$53,197,645	\$123,579,695	\$176,777,340	\$126,032,787	\$50,744,553
NHPP	80	20	\$411,201,167	\$716,248,739	\$1,127,449,906	\$69,116,159	\$1,058,333,748
S-STBG	80	20	\$88,916,112	\$210,099,630	\$299,015,742	\$225,359,139	\$73,656,603
TA	80	20	\$1,407,270	\$9,326,943	\$10,734,213	\$7,123,632	\$3,610,581
Subtotal			\$830,469,347	\$1,201,064,785	\$2,031,534,133	\$427,631,716	\$1,603,902,416

Roadway Operation and Maintenance (O&M)

Operations and maintenance are critical elements of the transportation network. Lack of maintenance leads to increased costs for repair or replacement, and decreased system efficiency. Due to budget constraints, agencies are placing greater emphasis on maintaining existing roadways, rather than building new facilities. It's important that jurisdictions budget enough money for maintenance and operations. This section details the street and highway operations and maintenance costs associated with sustaining the existing system and the improvements proposed in this Plan.

Local and State Operations and Maintenance Revenues

Operating budgets for each jurisdiction for fiscal year 2015 were reviewed to determine the current revenues used on street and highway O&M activities. The O&M activities include sidewalk, greenway, street, and signal maintenance, resurfacing, street striping, street lighting, and other expenses related to operating and maintaining the jurisdiction's facilities.

Each jurisdiction identifies O&M activities differently within their individual operating budgets, and some jurisdictions incur significantly higher costs than others, such as those which maintain street lights versus those that do not provide street lighting. Table 5-8 identifies the estimated costs for O&M activities for the major jurisdictions within the TPO Planning Area for which FY 2015 operating budget information was available. This table also identifies the number of major roadway lane miles within the TPO Planning Area for each jurisdiction. A major roadway is defined as one that is included on the Federal-aid functional classification system.

Table 5-8: TPO Planning Area Current Operations and Maintenance Cost, per Lane Mile

Jurisdiction	O&M Costs (FY 2015)	Federal Aid Roadway Mileage (Lane Miles)
Anderson County*	\$1,728,420	49.3
City of Clinton	\$420,000	20.9
City of Oak Ridge	\$874,000	105.8
Blount County*	\$4,429,844	229.2
City of Alcoa	\$232,392	76.0
City of Maryville	\$458,423	67.7
Knox County	\$3,825,000	500.4
Town of Farragut	\$607,954	50.7
City of Knoxville	\$11,300,000	434.0
Loudon County*	\$795,302	106.3
Lenoir City	\$267,125	43.7
City of Loudon	\$166,934	23.8
Sevier County*	\$7,867,084	38.6
TDOT**	\$6,500,000	1,833.0
Total TPO Planning Area	\$39,472,478	3,579.4
* TPO Planning Area does not include entire county - O&M costs are for full county, lane miles represent TPO Planning Area		
** TDOT's O&M costs include only the portion specifically for roadway resurfacing		

Cost per Network Year to Maintain Transportation System

Costs associated with operating and maintaining the transportation system were derived by calculating a cost per lane mile and applying this cost to the number of lane miles built in each network year. It is assumed that the same level of operation and maintenance currently applied to the transportation system will be available in future years.

In order to determine financial constraint for O&M activities, it was assumed that the total revenues and costs would increase by two percent annually.

Financial Constraint

Street and highway operation and maintenance expenses are financially constrained for the life of this Plan as demonstrated in Table 5-9. A review was made of the increase in lane miles of major roadways based on the projects identified in the Plan as a reasonableness check for O&M financial constraint. Table 5-10 shows the increase in lane miles that will need to additionally be maintained due to the implementation of the projects in the KRMP. The overall addition of 205 lane miles represents a growth amount of 6.1% for the entire life of the Plan, which translates to an annual average increase in lane miles of less than 0.3%. We believe that this small percentage increase should be manageable in terms of jurisdictional O&M budgeting.

Table 5-9: O&M Costs vs. Revenues, by Major Horizon Year (Adjusted for Inflation)

Jurisdiction	Horizon Years 2017 - 2030			Horizon Years 2031 - 2040			All Horizon Years (2017 - 2040)		
	Costs	Revenues	Balance	Costs	Revenues	Balance	Costs	Revenues	Balance
Anderson County	\$32,216,513	\$32,216,513	\$0	\$25,980,953	\$25,980,953	\$0	\$58,197,467	\$58,197,467	\$0
City of Clinton	\$7,828,500	\$7,828,500	\$0	\$6,313,281	\$6,313,281	\$0	\$14,141,780	\$14,141,780	\$0
City of Oak Ridge	\$16,290,735	\$16,290,735	\$0	\$13,137,636	\$13,137,636	\$0	\$29,428,372	\$29,428,372	\$0
	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Blount County	\$82,569,126	\$82,569,126	\$0	\$66,587,734	\$66,587,734	\$0	\$149,156,860	\$149,156,860	\$0
City of Alcoa	\$4,331,621	\$4,331,621	\$0	\$3,493,228	\$3,493,228	\$0	\$7,824,849	\$7,824,849	\$0
City of Maryville	\$8,544,677	\$8,544,677	\$0	\$6,890,841	\$6,890,841	\$0	\$15,435,518	\$15,435,518	\$0
	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Knox County	\$71,295,266	\$71,295,266	\$0	\$57,495,948	\$57,495,948	\$0	\$128,791,214	\$128,791,214	\$0
Town of Farragut	\$11,331,828	\$11,331,828	\$0	\$9,138,534	\$9,138,534	\$0	\$20,470,362	\$20,470,362	\$0
City of Knoxville	\$210,623,923	\$210,623,923	\$0	\$169,857,311	\$169,857,311	\$0	\$380,481,235	\$380,481,235	\$0
	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Loudon County	\$14,823,861	\$14,823,861	\$0	\$11,954,678	\$11,954,678	\$0	\$26,778,539	\$26,778,539	\$0
Lenoir City	\$4,979,019	\$4,979,019	\$0	\$4,015,322	\$4,015,322	\$0	\$8,994,341	\$8,994,341	\$0
City of Loudon	\$3,111,530	\$3,111,530	\$0	\$2,509,289	\$2,509,289	\$0	\$5,620,819	\$5,620,819	\$0
	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Sevier County	\$146,636,823	\$146,636,823	\$0	\$118,255,021	\$118,255,021	\$0	\$264,891,844	\$264,891,844	\$0
	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
TDOT	\$121,155,354	\$121,155,354	\$0	\$97,705,533	\$97,705,533	\$0	\$218,860,887	\$218,860,887	\$0
	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total TPO Planning Area	\$735,738,777	\$735,738,777	\$0	\$593,335,308	\$593,335,308	\$0	\$1,329,074,085	\$1,329,074,085	\$0

Table 5-10: Total Lane Miles of Major Roadways by Horizon Year

	2015	2022	2030	2040
TPO Planning Area	3,341	3,380	3,457	3,546

Active Transportation

Active transportation projects, which include bicycle, pedestrian, and greenway improvements, do not have as many funding sources as do roadway projects. The Surface Transportation Block Grant (STBG) program and the Transportation Alternatives Program (TAP) are the biggest source of funding for active transportation projects. Both the TAP and STBG are available for more than just bike and pedestrian projects.

What is Active Transportation?

Active transportation refers to any form of human-powered transportation – walking, cycling, using a wheelchair, skateboarding. There are many ways to engage in active transportation, whether it is walking to the bus stop, or riding a bike to school or work.

Walking and bicycling projects are also an eligible activity for CMAQ and the Highway Safety Improvement Program (HSIP). Bicycling and walking projects are broadly eligible in all the major funding categories and the funding for more targeted programs, such as the STBG. The majority of roadway projects include bicycle and pedestrian accommodations, however, calculating the portion of a project devoted to active modes is virtually impossible.

Transit Financial Constraint Analysis (TFCA)

Within the Knoxville urban area a variety of governments, agencies, and organizations use federal funding to purchase vehicles and provide transit services. The main source of funding is Federal Transit Administration (FTA) grants. The TPO also uses a portion of its Surface Transportation Block Grant Program (STBG) to help fund transit capital projects. TDOT sometimes awards Congestion Mitigation and Air Quality Improvement Program (CMAQ) grants to Knoxville agencies for transit projects. The TFCA examine the fiscal needs and potential revenue sources of the transit providers in the urban area to ensure services can be sustained over the life of the Mobility Plan (2017-2040).

The full TFCA is in Appendix N, page N5. Following is a summary of the results:

Knoxville Area Transit (KAT)

KAT's expenses and revenues were forecasted over the Mobility Plan's time frame. Table 5-11 highlights the Mobility Plan's Horizon Years.

Table 5-11: KAT Projected Expenses & Revenues (Year of Expenditure)

Category	Mobility Plan Horizon Years					
	2017	2022	2026	2030	2034	2040
Total Expenses	\$19,483,955	\$22,587,244	\$25,422,142	\$28,612,844	\$32,204,008	\$38,453,270
Revenues						
City of Knoxville	\$9,290,105	\$10,008,082	\$10,622,213	\$11,274,030	\$11,965,845	\$13,083,972
State of Tennessee	\$3,113,900	\$4,113,900	\$4,113,900	\$4,113,900	\$5,113,900	\$5,113,900
FTA	\$5,290,793	\$6,929,058	\$8,106,018	\$9,482,894	\$11,625,792	\$14,710,336
Fares	\$2,390,211	\$2,770,909	\$3,118,683	\$3,510,105	\$3,950,654	\$4,717,288
Other Funding Sources	\$0	\$0	\$0	\$0	\$0	\$0
Total Revenue	\$20,085,009	\$23,821,949	\$25,960,814	\$28,380,930	\$32,656,191	\$37,625,496
% Difference Expenses/ Revenue	+3.1%	+5.5%	+2.1%	-0.08%	+1.4%	-2.2%

KAT's budget is expected to increase from \$19.5 million in 2017 to \$38.5 million by 2040. The difference in projected expenses and revenues was also calculated. Based on this analysis, KAT should be able to meet its future operating expenses.

The TFCA assumes no new transit service. Several studies have called for expanded transit services, which would require additional funding than what is forecasted.

KAT Vehicle Replacement Needs

Maintaining an up-to-date fleet is a must in providing effective transit service, therefore, planning must take into account vehicle replacement needs. A vehicle replacement plan, including inflation, was created for each vehicle over the life of the Mobility Plan. Table 5-12 reflects the funding needed for these replacements and anticipated revenues.

Table 5-12: KAT Vehicle Replacement Funding Needs (2017-2040) (Year of Expenditure)

Horizon Years	Bus	NS Vehicle	Trolley	Lift Van	Total
2017	\$0	\$0	\$0	\$317,750	\$317,750
2022	\$7,696,538	\$793,270	\$4,950,035	\$858,203	\$14,298,047
2026	\$23,227,592	\$897,512	\$3,642,609	\$1,363,745	\$29,131,458
2030	\$14,833,140	\$966,523	\$0	\$952,965	\$16,752,627
2034	\$13,383,542	\$1,093,532	\$6,657,247	\$628,561	\$21,762,883
2040	\$37,408,105	\$2,509,976	\$4,898,904	\$1,834,085	\$46,651,071
Total Expenses	\$96,548,918	\$6,260,813	\$20,148,795	\$5,955,310	\$128,913,836
Revenues					
Federal	\$77,239,134	\$5,008,651	\$16,119,036	\$4,764,248	\$103,131,069
State	\$9,654,892	\$626,081	\$2,014,880	\$595,531	\$12,891,384
Local	\$9,654,892	\$626,081	\$2,014,880	\$595,531	\$12,891,384
Total Revenues	\$96,548,918	\$6,260,813	\$20,148,795	\$5,955,310	\$128,913,836
% Difference Expenses/Revenue	0.0%	0.0%	0.0%	0.0%	0.0%
Average Per Year	\$4,022,872	\$260,867	\$839,533	\$248,138	\$5,371,410
Note: Vehicle cost inflated 2.5% annually					

Regional Transit Providers

Knox County CAC Transit and ETHRA provide public demand response transit services in the urban area. Knox County CAC Transit also operates the Volunteer Assisted Transportation (VAT) program that provides services for seniors and individuals who are disabled who require additional assistance during their trips.

Large urban areas like Knoxville receive federal funding called Section 5310 "Enhanced Mobility of Seniors & Individuals with Disabilities." Agencies providing transit service within the urban area must apply for funding through the TPO. At least 55% of the funds are for capital projects, and 45% may be used for operations. The TPO administers a project selection process that involves an open call-for-projects from non-profits, governmental agencies, and private operators.

The TPO for FY 2016 was apportioned by FTA \$541,437. Over the TPO's first four years the annual allocation has seen slight growth. In FY 2015, funding was awarded to six different agencies and non-profits for the purchase of 10 vehicles to transport elderly or disabled passengers. It is expected that these types of projects will be continued as long as the Section 5310 program funds come to the urban area.

The FTA funds 80% of the cost of vehicles with a local match requirement of 20%. FTA funds operating projects at 50% with 50% local match required. TDOT has typically provided half of the local match. It is assumed that TDOT will continue to provide half of the match for vehicle purchases. For operations, TDOT funding of local match is determined based on project merit and overall state funding availability.

Vehicle Needs for Regional Transit Providers

Table 5-13 summarizes the funding needs for the vehicle replacement plan for Knox County CAC Transit and ETHRA. This projection is based on maintaining today's service levels and does not take into consideration any future expansion. The combined cost for both agencies is \$23.4 million. This replacement plan is solely for replacing ETHRA vehicles that are used in the Knoxville urbanized area.

Table 5-13: Regional Transit Providers - Vehicle Replacement Funding Needs (2017-2040)
(Year of Expenditure)

Horizon Years	CAC Paratransit Van	VAT Mini-Van	VAT Sedan	ETHRA Paratransit Van	Total
2017	\$508,400	\$0	\$48,000	\$137,100	\$693,500
2022	\$2,739,125	\$100,860	\$311,594	\$792,886	\$3,944,466
2026	\$2,448,274	\$114,114	\$291,096	\$546,079	\$3,399,563
2030	\$2,702,436	\$129,109	\$255,147	\$728,765	\$3,815,458
2034	\$2,982,984	\$146,075	\$349,458	\$870,607	\$4,349,124
2040	\$5,065,031	\$165,271	\$554,944	\$1,440,769	\$7,226,016
Total Expenses	\$16,446,251	\$655,429	\$1,810,240	\$4,516,207	\$23,428,127
Revenues					
Federal	\$13,157,001	\$524,343	\$1,448,192	\$3,612,966	\$18,742,502
State	\$1,644,625	\$65,543	\$181,024	\$451,621	\$2,342,813
Local	\$1,644,625	\$65,543	\$181,024	\$451,621	\$2,342,813
Total Revenue	\$16,446,251	\$655,429	\$1,810,240	\$4,516,207	\$23,428,127
% Difference Expenses/Revenue	0.0%	0.0%	0.0%	0.0%	0.0%
Average Per Year	\$685,260	\$27,310	\$75,427	\$188,175	\$976,172

Note: Vehicle cost inflated 2.5% annually

Future Funding Considerations

Transportation Funding Uncertainty

Historically, investments in transportation infrastructure have primarily been funded through national and state taxes on motor fuels. However, the national gasoline tax has not been raised since 1993 (even to account for inflation). Tennessee's motor fuel tax has not been raised since 1989. This, combined with an increase in the cost of construction materials, a decrease in the overall miles driven by Americans, and the increased use of more fuel efficient, and electric/hybrid vehicles, has significantly lowered the amount of money available to fund transportation at all levels of government.

Even with the passage of the FAST Act, a 5-year federal surface transportation program, there continues to be a lack of a long-term plan to address our nation's transportation infrastructure deficiencies and revenue needs. The Congressional Budget Office anticipates that by 2023 there will be a \$37 billion shortfall in the national transportation budget.³³

33 [Highway Trust Fund, March 2016 estimates](#)

The state of Tennessee will grow by approximately 2 million people in the next 25 years. The current transportation system will not be able to manage such growth. Even now the Tennessee Department of Transportation has identified a transportation infrastructure improvement back log of nearly \$6 billion and an additional need of almost \$5 billion. For the Knoxville region TDOT has identified almost \$1 billion in unmet transportation infrastructure needs. Local transportation improvements, including investment in public transit, could require an additional \$1 billion of infrastructure requirements in the next 20 to 25 years.

Need for New Funding Sources

Funding is Unreliable and not Keeping Up with Rising Costs

While the costs have very recently fluctuated and even dropped in some instances, in general, transportation construction costs have risen quickly in the last 10 years.

The reduced purchasing power of current revenues leads to increased competition for transportation funds. This means less capability to expand, improve, and maintain our infrastructure. Meanwhile, our infrastructure continues to age, requiring more maintenance. Over the next two decades, the gap will grow between the revenues we have and the investments we need just to keep our surface transportation infrastructure and services in their current condition.

How Could We Fund Transportation in the Future?

One of the primary foundations of a strong region is a well-maintained and well-connected transportation system. In order to continue to maintaining our system and create connections within and between our communities, we need to continue to identify the resources necessary to move our region ahead. We need to continue to use our money wisely and look for stable sources of long-term funding.

The FAST Act provided additional funding from general funds to balance the Highway Trust Fund budget, but this is a temporary solution. The costs of projects needed to maintain the system far exceed the revenue generated. There are four avenues to pursue moving forward:

- Revenue sources will need to increase to meet system needs.
- New revenue sources will need to be identified.
- General funds will continue to supplement the Highway Trust Fund.
- Transportation investments will need to be cut drastically.

In a 2016 Survey

35% of respondents from East Tennessee were more likely to support an increase in the gas tax if sidewalks were included. 34% said they would be more likely to support the gas tax increase if greenway funding was included.

58% of all respondents said they would be more likely to support a gas tax increase if funding decisions were made at the local, rather than state, level.³⁴

34 Survey of Tennessee's Registered Voters for Bike Walk Tennessee and Rails to Trails Conservancy, conducted by the University of Tennessee's College of Social Work Office of Research and Public Service. The survey was completed by 762 registered voters between Oct. 5 and Oct. 21, 2016.

Raising revenues, either from increasing existing revenue sources or creating new ones, has been very politically unpopular, however few people are willing to accept the consequences, such as crumbling infrastructure. The solution may very well include two components. First, identify inexpensive solutions to maximize the efficiency of the system. These include travel demand management programs, technology that provide better information to drivers, and more targeted physical improvements, such as improving interchanges rather than widen a highway. This is often referred to “Right-Sizing” projects, which simply means finding a less costly solution that delivers the best return on your investment. The second component may include looking at reasonable ways to generate revenue. This is ultimately a decision that will be made by elected officials at the federal, state, and local levels.