THE UNIVERSITY OF ALABAMA®
Research & Economic Development
Alabama Transportation Policy Research Center

Addressing Alabama's Transportation Infrastructure: Roads and Bridges

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ALABAMA TRANSPORTATION INSTITUTE

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Contents

Figures

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Addressing Alabama's Transportation Infrastructure: Roads and Bridges

Executive Summary

In the year 2040, Alabamians will take stock of their transportation network and how it provides for economic growth and quality of life. They will look back on decisions made in 2019 by Alabama's citizens, business community and Legislature.

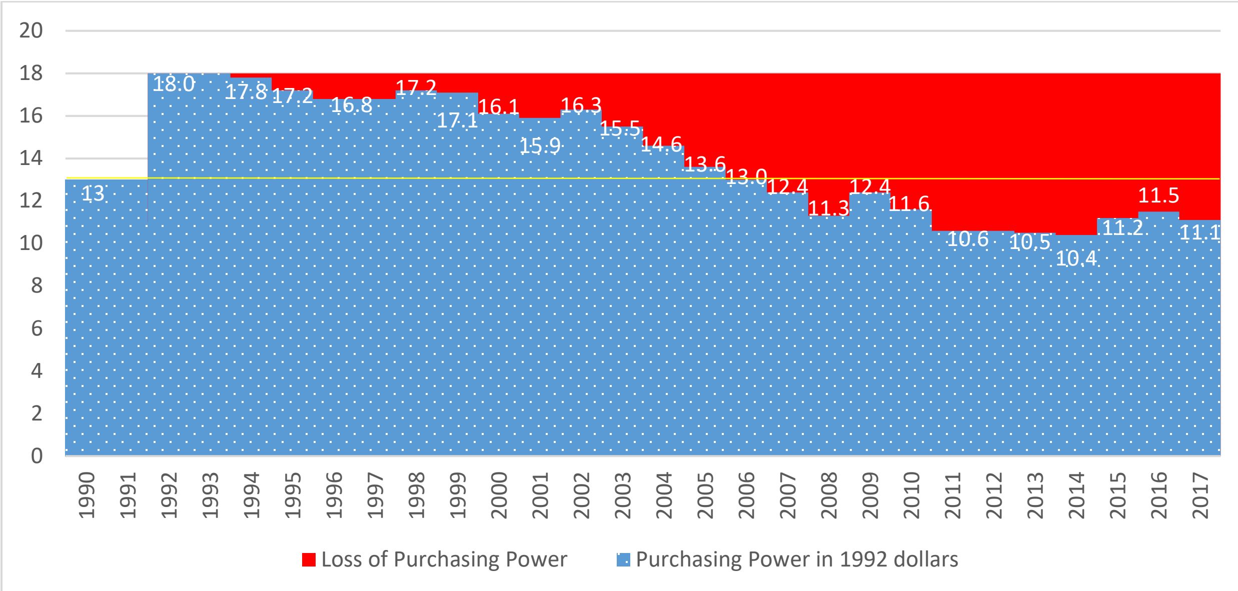
Exotic and disruptive innovations such as automated and autonomous vehicles, networked ridesharing, and cars and trucks communicating electronically with each other and the roadside are moving through research and development phases into real-world testing and eventual deployment. However, infrastructure demand for the next 20 years is expected to focus on well-constructed and maintained roads and bridges with sufficient capacity and consideration for safety to enable efficient freight and passenger movement across the state.

Alabama's methods of paying for transportation infrastructure have lost and continue to lose purchasing power due to inflation, increasing fuel efficiency, and fleet changes, erasing the effects of the 1992 gas tax increase (Exhibit A). Population, the number of registered vehicles, and vehicle miles traveled are increasing at a more rapid rate than the system has been adding capacity to accommodate them. From 1990 to 2015 the number of lane-miles increased 14 percent while Alabama's population increased 20 percent; registered vehicles increased 46 percent; and vehicle miles travelled increased 57 percent.

Working groups and researchers developed a range of cost and outcome scenarios. The first five scenarios result in similar target outcomes for Alabama's urban regions; the final two achieve results that vary according to city size and expected return on investments.

1. Maintain 2016 urban congestion levels
2. Congestion would be less than in similar size southeastern cities
3. Congestion would be in the middle of similar southeastern cities
4. Continue the current spending trend (business as usual)
5. Invest in maintenance rather than new road capacity
6. Create the best achievable congestion conditions
7. Create congestion levels that ensure Alabama cities are economically competitive

Exhibit A: Alabama Gas Tax Purchasing Power (Cents per Gallon)



Improved mobility can have a positive impact on the economy. If all state transportation funds are spent on maintenance after currently committed projects are completed (the Invest in Maintenance scenario), Exhibit B summarizes the estimated total economic benefits associated with investing in additional capacity under each scenario over the next 20 years.

Exhibit B: Scenario Economic Impact and Marginal Capacity Cost over the Next 20 Years

Scenario	Total Cost over the next 20 years		ROI (Economic Impact divided by Marginal Cost)
	Statewide Economic Impact ($ Millions)	Marginal Capacity Cost ($ Millions)	
Maintain 2016 Congestion Level	$33,305	$13,867	2.4
Best Among Southeastern States	$34,727	$14,000	2.5
Middle of Southeastern States	$19,127	$6,933	2.8
Current Trend - Business as Usual	$6,317	$3,733	1.7
Optimum Conditions Alternative	$37,755	$13,467	2.8
Minimum Cost Competitive Alternative (least that can be invested in new capacity and still allow the state to be economically competitive)	$28,145	$9,467	**3.0**

To address the need for additional funding, working groups have focused on options related to the motor fuels tax. Indexing the tax is a way to reduce the impact of inflation. For Alabama, indexing gas and diesel taxes would have raised between $1.3 billion and $5.3 billion above the amounts derived from the existing 18 cents per gallon gas and 19 cents per gallon diesel taxes between 1992 and 2016, depending on the selected index.

Addressing Alabama's Transportation Infrastructure: Roads and Bridges

1 Introduction

In the year 2040, Alabamians will take stock of their transportation network and how it provides for economic growth and quality of life. They will look back on decisions made in 2019 by Alabama's citizens, business community, and elected leadership.

At the time of writing this report (2018), exotic and disruptive innovations such as self-driving vehicles, networked ridesharing, cars and trucks communicating electronically with each other and the roadside, and unmanned aerial, marine, and terrestrial vehicles are moving through research and development phases into real-world testing and eventual deployment. Regardless of their future promise or impact, infrastructure demand for the next 20 years is expected to be overwhelmingly focused on well-constructed and maintained roads and bridges with sufficient capacity and consideration for safety to enable efficient freight and passenger movement across the state.

This report examines the extent, condition, and use of the Alabama road network. The authors received input from a wide range of stakeholders, including legislators, residents, the business community, shippers, truck and auto drivers, passengers, and others involved in the development and use of the network.

Why Transportation Matters

An adequate transportation system serves a wide variety of customers. For employers, it provides access to raw materials, markets for finished products, a labor force and education for that labor force. For families, the transportation system provides a path to jobs, healthcare, education, community, tourism, and a number of other services. To those who live elsewhere, it provides the means for enjoying what Alabama has to offer for education, work, commerce, tourism, sports, or other pursuits. In survey after survey, the adequacy of a state's transportation system consistently ranks as one of the top three items companies assess when making business relocation or expansion decisions. Our economy relies on a functioning, efficient transportation system to prosper and grow.

About This Report

Alabama's legislative leaders sought assistance to establish a baseline body of knowledge, a capacity for analysis, and an understanding of implications of various paths forward. This report's primary purpose is to summarize the extent, condition, and use of the state's road system. This information is compared to other states so that Alabama's ranking among its neighbors and economic competitors may be used as a benchmark. The authors seek to anticipate how demographic and economic growth, as well as technological and other changes, will affect demand for transportation and assess the funding mechanisms that maintain the current system and provide for additional capacity. This report also offers policy options to address road funding. This report does not address county or municipal level information, commercial or general aviation, public transit, passenger rail, cyber considerations, or bicycle or pedestrian travel. These are expected to be addressed in subsequent products. Further, discussions on ports and waterways are not extensive.

Where possible, the authors have used sources that are recent, reliable, and readily available to the public, allowing the reader to verify the data and findings as may be desired. The authors relied heavily on data originating at ALDOT and reported to the USDOT Federal Highway Administration as this information is usually available on the Internet and covers multiple years in a format that allows comparison among states.

Organization of This Report

The authors first describe the physical nature of Alabama's highway infrastructure, including extent and condition. The report then describes the nature of challenges facing the highway system with particular focus on freight. A discussion of possible strategies for addressing the needs follows, along with possible scenarios for each urban area. The report concludes by tying together the funding issues with the scenarios and possible outcomes.

2 Alabama's Infrastructure

Transportation infrastructure is composed of aviation, waterways and ports, highways and bridges, railroads, and pipelines. These elements combine to provide mobility for two different "commodities" -- people and freight.

Air, water, rail, and pipeline modes are primarily owned by private sector entities with regulation by the public sector but minimal public funding. Highways (a term used in this report to also include city streets, bridges, signals, and related structures and systems unless otherwise specified) are primarily publicly funded and support a mix of public and private uses including transit, passenger vehicles, and freight. Local (county and municipal) roads also support non-motorized vehicles and pedestrian activity.

Alabamians have invested their hard-earned money to construct and maintain our State's roadway system. Today's replacement cost of all the road and bridge assets is about $390 billion or about $210,000 per Alabama household. The replacement cost will be $630 billion over ten years or $1.0 trillion over 20 years.

This report focuses on the highway network – its extent, condition, and use; and the outlook and options for maintaining a system that serves the economic, health, and social needs of Alabamians.

Figure 1: Map of Alabama

Source: alabamamaps.ua.edu

To the extent practical, this report uses data that is recent, reliable, and readily available to the public so the reader may verify and replicate the results as desired. The reader is also provided with relevant reports and Internet links for more detailed information.

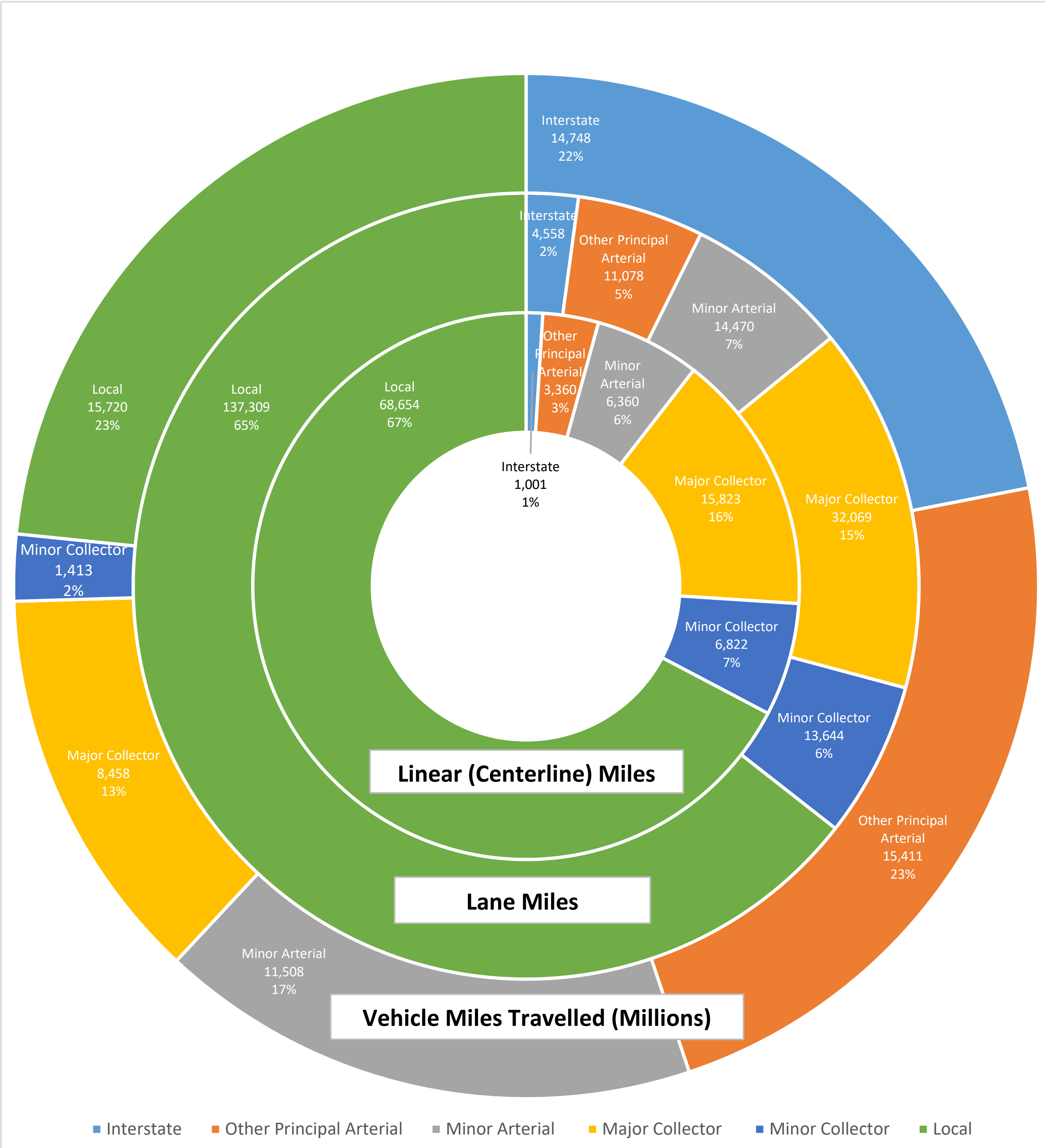
2.1 Extent and Physical Characteristics

There are two distinct ways to measure road length: lane-miles and linear (centerline) miles. A road one mile long but four lanes wide is four lane-miles but one centerline mile. Lane-miles are good measures of capacity or maintenance need; centerline miles are good measures for distance covered. The Alabama transportation road network, from city streets up to Interstate highways, has just over 102,000 centerline miles and 213,000 total lane-miles.

Roads are grouped into categories known as functional classifications. Generally, these are Principal Arterials which provide mobility and long-distance travel and typically includes Interstates, Freeways and Expressways; Minor Arterials for trips of moderate length; and Collectors which connect traffic from Local Roads to the arterials. For more information, see Highway Functional Classification Concepts, Criteria and Procedures.

Interstate highways comprise 2 percent of Alabama lane miles but carry 22 percent of the traffic. The extent and use of the Alabama road network are illustrated in Figure 2: Alabama Road Miles by Use and Functional Classification.

Figure 2: Alabama Road Miles by Use and Functional Classification



Source: US DOT Bureau of Transportation Statistics 2016, Functional System Lane-Length (PDF file), Public Road Length (PDF file), Functional System Travel – 2015 (Excel file)

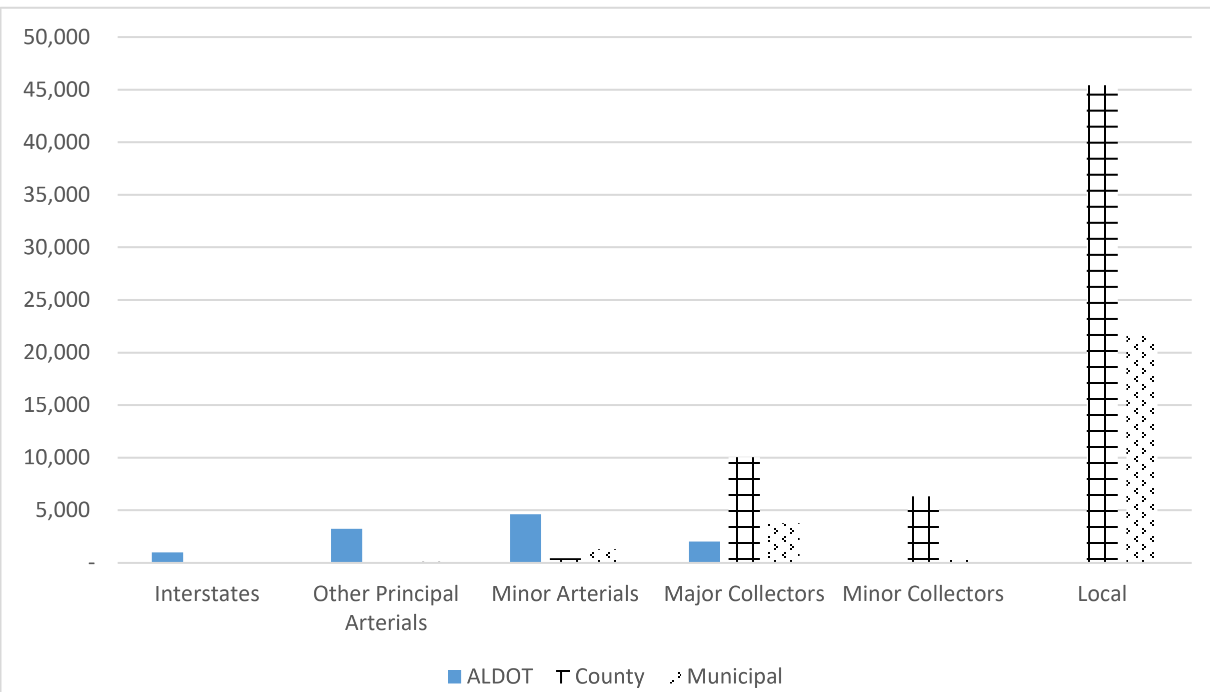
The functional classification accounting for the most centerline miles of road is Local, with 64 percent of the system. Almost ¾ of local roads are found in rural areas. Urban and rural counts for the functional classification system are found in Figure 3. Figure 4 illustrates which level of government is responsible for roads, by functional classification, in centerline miles.

Figure 3: Urban/Rural Functional System (lane-miles)

Classification	Urban			Rural			Total Lane-Miles	
	Lane-miles	% of Class	% of Miles	Lane-miles	% of Class	% of Miles	Lane-miles	% of Miles
Interstates	2,157	47%	4%	2,401	53%	2%	4,558	2%
Other Freeways & Expressways	127	100%	0%		0%	0%	127	0%
Other Principal Arterials	4,886	45%	8%	6,065	55%	4%	10,951	5%
Minor Arterials	5,988	41%	10%	8,482	59%	5%	14,470	7%
Major Collectors	7,545	24%	13%	24,524	76%	16%	32,069	15%
Minor Collectors	372	3%	1%	13,272	97%	9%	13,645	6%
Local	36,648	27%	63%	100,661	73%	65%	137,309	64%
TOTAL	57,722		100%	155,405		100%	213,128	100%

Source: US DOT Bureau of Transportation Statistics 2016, Functional System Lane-Length (Excel file)

Figure 4: Alabama Roads by Ownership and Functional Classification (Centerline Miles)



Source: US DOT Bureau of Transportation Statistics 2016, Functional System Length

2.2 Condition - Pavement

The Alabama Department of Transportation (ALDOT) maintains approximately 10,874 centerline miles of road, and approaching three times that in lane-miles -- 29,384. Pavement performance is measured using pavement condition ratings (PCR). The following factors are considered in developing PCR: roughness (percent which is usually the most obvious quality to the public), structure, or cracking of the surface, and rutting, which presents safety issues, and age of the surface. Concrete-paved roads, bridges, and tunnels (CBT) use different measures. About 60 percent of ALDOT roads are rated new or good or are CBT. Pavement condition ratings are shown in Figure 5.

Figure 5: Pavement Condition – All ALDOT Maintained Roads

Condition	Total			
	Centerline Miles	Percent	Lane-Miles	Percent
New	1,290	12%	3,508	12%
Good	5,246	48%	14,364	49%
Fair	1,799	17%	4,850	17%
Marginal	2,352	22%	5,805	20%
Concrete—paved Roads, Bridges, and Tunnels	176	2%	814	3%
Incomplete	11	0%	43	0%
TOTAL	10,874	100%	29,384	100%

Source: ALDOT Bureau of Materials and Tests, December 2015

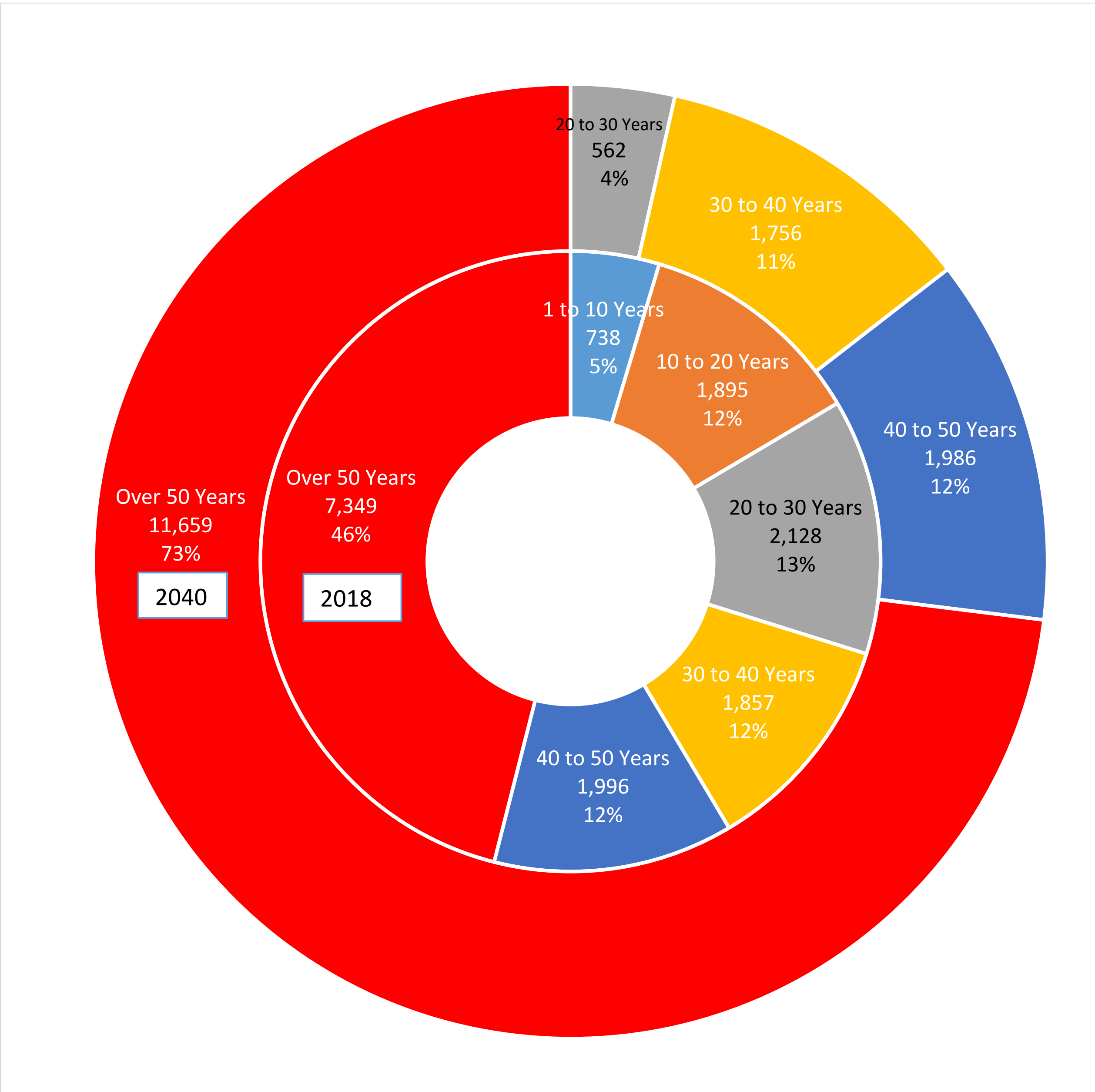
2.3 Condition – Bridges

ALDOT owns 36 percent of Alabama's over 16,000 bridges but 74 percent of the bridge deck surface area. As a measure, deck area for bridges is similar to lane-miles for roads – it illustrates the length and width of the bridges. The longer, wider bridges tend to carry the most traffic and freight, while the shorter, narrower ones may provide a critical local link for the public including critically important school buses or emergency vehicles. Some 8 percent of bridges in the state – 3 percent if measured by bridge deck area -- are structurally deficient (a component is rated in Poor or Worse condition) (Figure 6). Almost half of Alabama's bridges are over 50 years old. By 2040, almost three-fourths of existing bridges will be over 50 years old (Figure 7). Bridges are typically designed to last 50 to 75 years.

Figure 6: Alabama Bridge Ownership and Condition

Owner	Number of Bridges	Percent of Total	Bridge Deck Area (square yards)	% of Total	Number of Structurally Deficient Bridges	Percent of Owner's Bridges	Percent of Total Deficient Bridges	Structurally Deficient Bridge Deck Area (square yards)	Percent of Owner's Bridge Deck Area	Percent of Total
ALDOT	5,752	36%	8,149,011	74%	98	2%	8%	172,816	2%	45%
County	8,609	53%	2,217,995	20%	962	11%	78%	161,754	7%	42%
City/Town	1,502	9%	539,505	5%	145	10%	12%	42,516	8%	11%
State Park	31	<1%	7,652	<1%	5	16%	<1%	621	8%	<1%
Other State Agency	10	<1%	1,934	<1%	2	20%	<1%	104	5%	<1%
Other Local Agency	2	<1%	1,317	<1%	0	0%	0%	0	0%	0%
Private	5	<1%	24,158	<1%	0	0%	0%	0	0%	0%
Railroad	23	<1%	5,591	<1%	15	65%	1%	3,523	63%	1%
State Toll	0	0%	0	0%	0	0%	0%	0	0%	0%
Local Toll		<1%		<1%	0	0%	0%	0	0%	0%
Federal	164	1%	101,443	1%	2	1%	<1%	500	0%	<1%
TOTAL	16,098	100%	11,048,605	100%	1,229	8%	100%	381,834	3%	100%

Figure 7: Age of Existing Alabama Bridges



Source: US DOT Bureau of Transportation Statistics 2016 (text file)

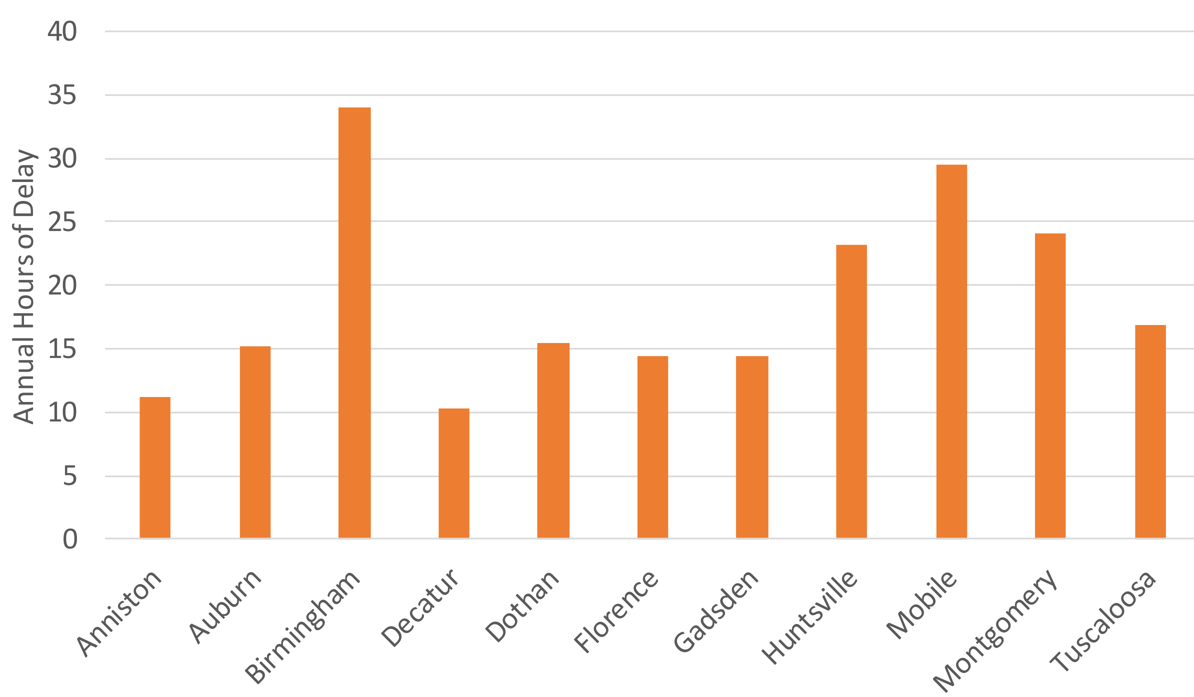
2.4 Usage

The number of licensed drivers in Alabama increased 8 percent from 2003 (3.6 million) to 2016 (3.9 million). During that time, Alabama motor vehicle registrations increased 25 percent from 4.4 million to 5.5 million. Vehicle-miles traveled (VMT) increased 17 percent from 59 billion to 69 billion, including a brief decrease in 2008.

Traffic congestion is a widespread challenge that causes delays for motorists and freight, wasting time and fuel. The Urban Mobility Scorecard, produced by the Texas A&M Transportation Institute (TTI), uses speed and traffic volume data to quantify traffic congestion in 471 major urban areas across the United States, including eleven in Alabama.

Measuring delay is a way to describe congestion, capturing the added travel time taken by commuters when compared to the travel time in uncongested conditions. Figure 8 summarizes the annual hours of delay experienced per commuter, ranging from 10 hours in Anniston and Decatur to nearly 35 in Birmingham. Commuters in Montgomery, Mobile, and Birmingham spend the equivalent of a day or more per year in traffic congestion. The average is nineteen hours of delay – more than two days' worth of time.

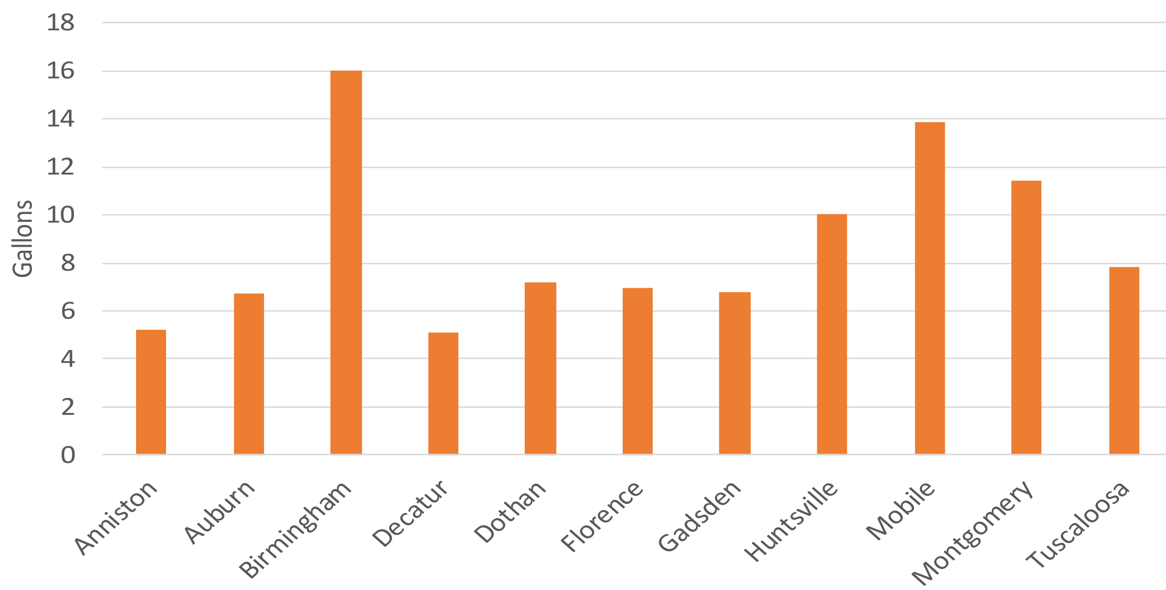
Figure 8: Annual Hours of Delay per Commuter 2014



Source: TTI Urban Mobility Scorecard 2014

Congestion also has an environmental impact, as increased travel times necessitate more fuel and create more emissions. Figure 9 summarizes the excess fuel consumed per commuter during 2014, ranging from 5 gallons in Anniston and Decatur up to 16 in Birmingham. Each gallon of gasoline produces 17.6 pounds of carbon dioxide when burned (US Energy Administration, Frequently Asked Questions).

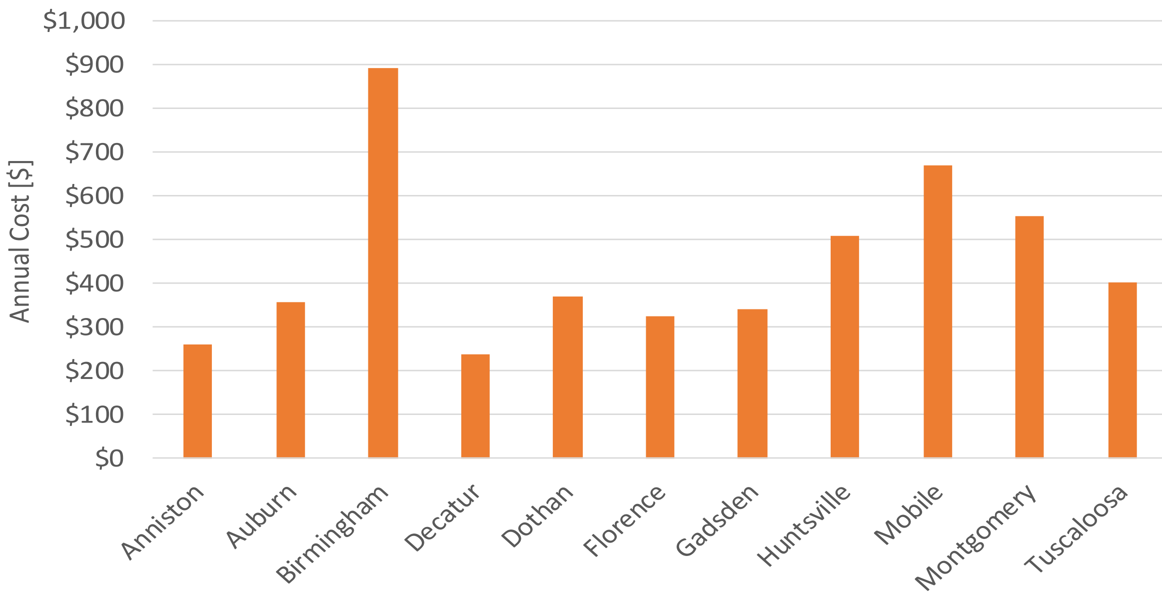
Figure 9: Annual Excess Fuel Consumed per Commuter 2014



Source: TTI Urban Mobility Scorecard 2014

The cost of delay can be measured by combining the extra time and fuel costs. Using an average value of travel time and statewide fuel cost information, Figure 10 summarizes this cost. The values range from $240 per commuter in 2014 to $890 with an average of $450. The annual cost of delay to Alabama consumers is $1.4 billion, with an economic impact of $2.3 billion.

Figure 10: Annual Cost of Delay per Commuter 2014

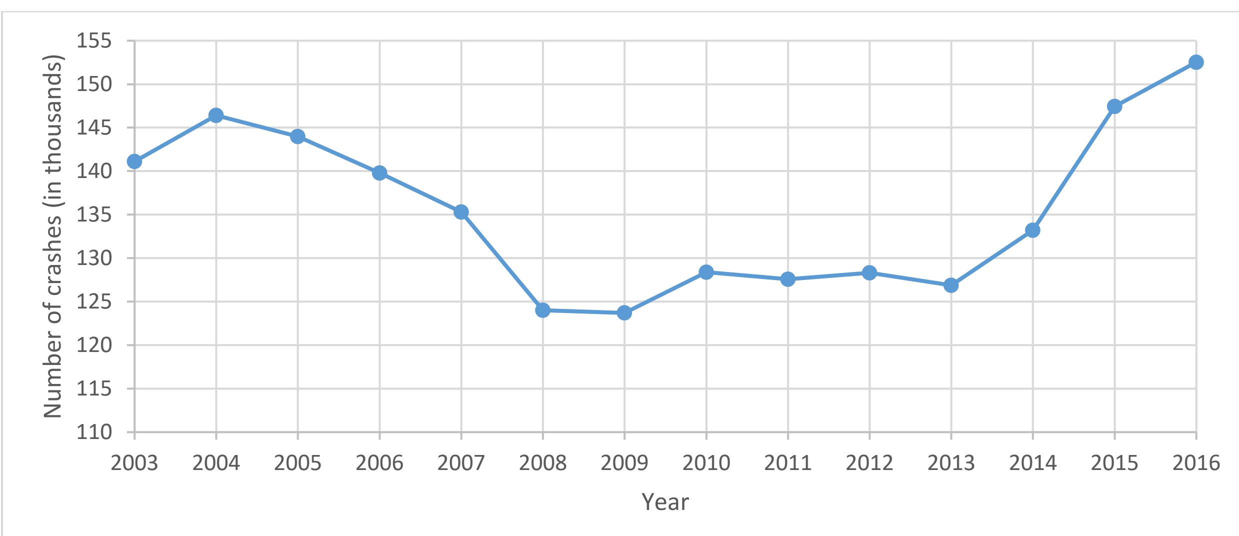


Source: TTI Urban Mobility Scorecard 2014

2.5 Safety

Between 2003 and 2016 Alabama experienced nearly 2 million motor vehicle crashes, resulting in 13,624 deaths and about 570,000 injuries. Crashes declined starting in 2004, leveling off in 2008, and increasing significantly since 2013 (Figure 11).

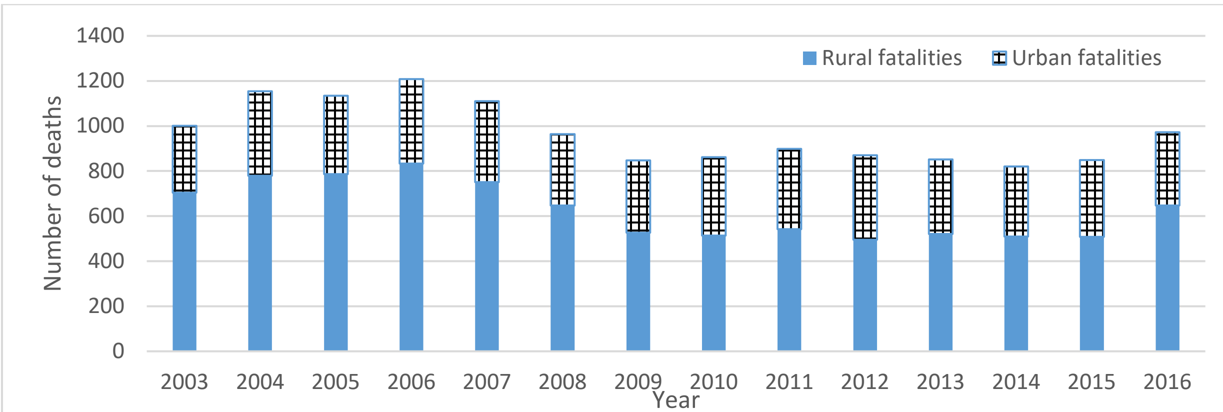
Figure 11: Number of crashes recorded between 2003 and 2016 (in thousands)



Source: Alabama Crash Facts Book, various editions 2003-2016

More fatalities occur on Alabama's rural roads than in urban areas. The variation in the number of urban road fatalities has been small compared to that of rural fatalities. The number of rural road fatalities increased from 2003 to 2006 by 18.3 percent and then decreased steadily until 2009. Between 2009 and 2015 the number of road crash deaths in rural areas remained fairly constant. However, 2016 recorded a 27.4 percent increase in the number of rural road fatalities from the previous year (Figure 12).

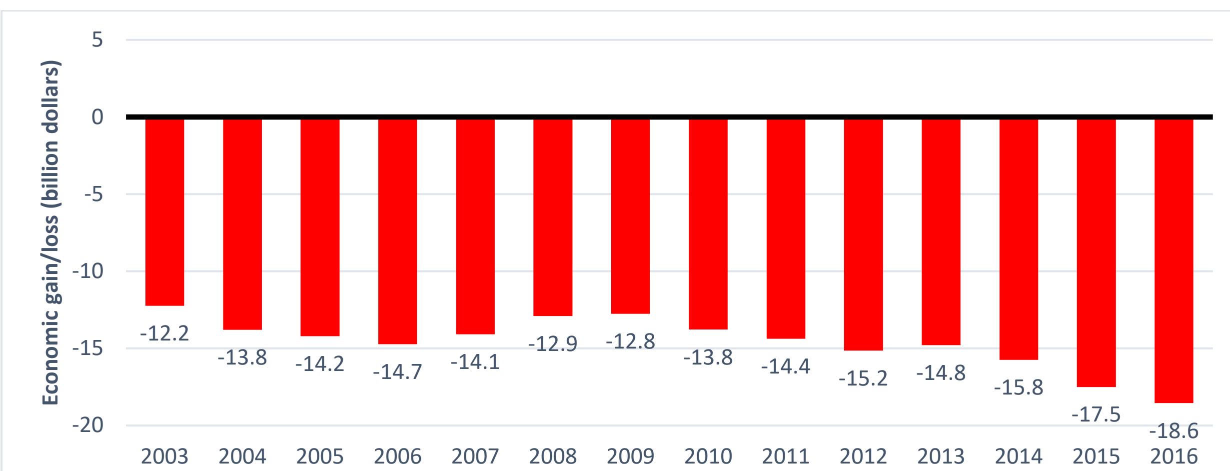
Figure 12: Fatalities by location of crash between 2003 and 2016



Source: Alabama Crash Facts Book, various editions 2003-2016

The economic loss to Alabama due to road traffic crashes in 2016 has exceeded $15 billion every year since 2014 and continues to increase (Figure 13).

Figure 13: Economic impact of Alabama crashes between 2003 and 2016 (losses in billions of dollars)

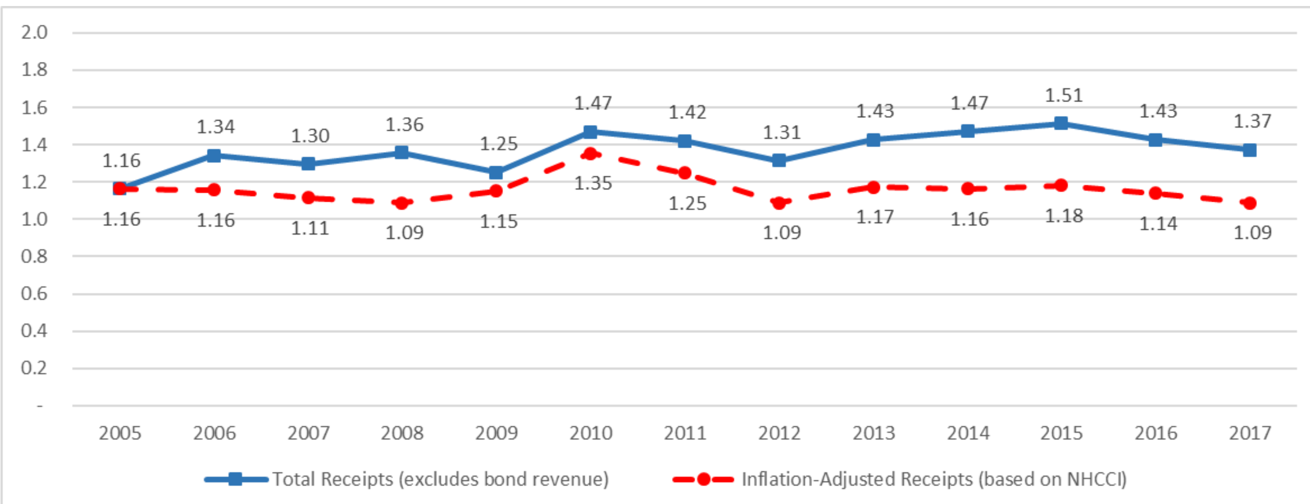


Source: Alabama Crash Facts Book, various editions 2003-2016

2.6 Finance

ALDOT's annual receipts steadily increased from $1.16 billion to $1.37 billion between 2005 and 2017 ($1.23 billion to $1.69 billion when bond proceeds are included). The increase is considerably less significant when adjusted against the increasing cost of highway construction (Figure 14) as measured by the National Highway Construction Cost Index (NHCCI; for further information see National Highway Construction Cost Index, FHWA.

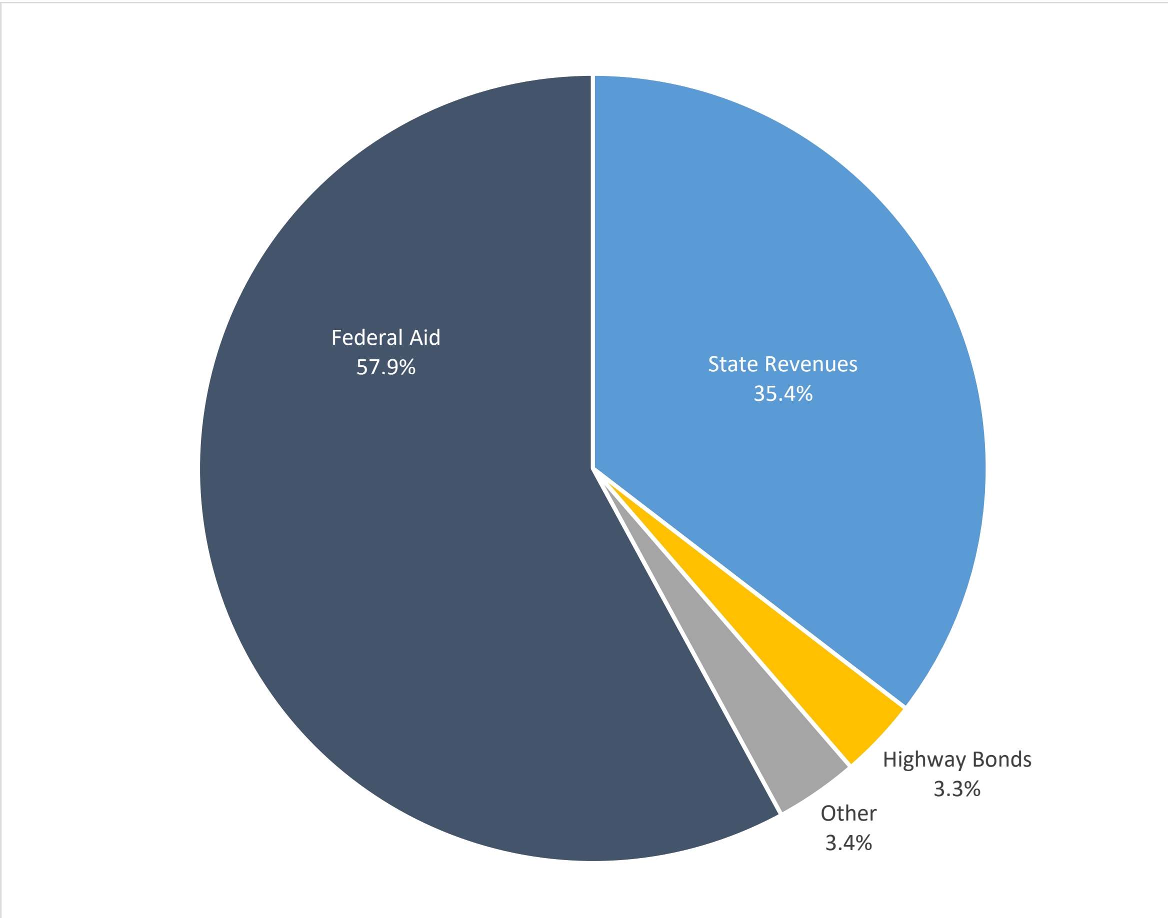
Figure 14: ALDOT Actual and Inflation Adjusted Receipts 2005-2015(in billions of dollars)(excludes bond revenue)



ALDOT Revenue

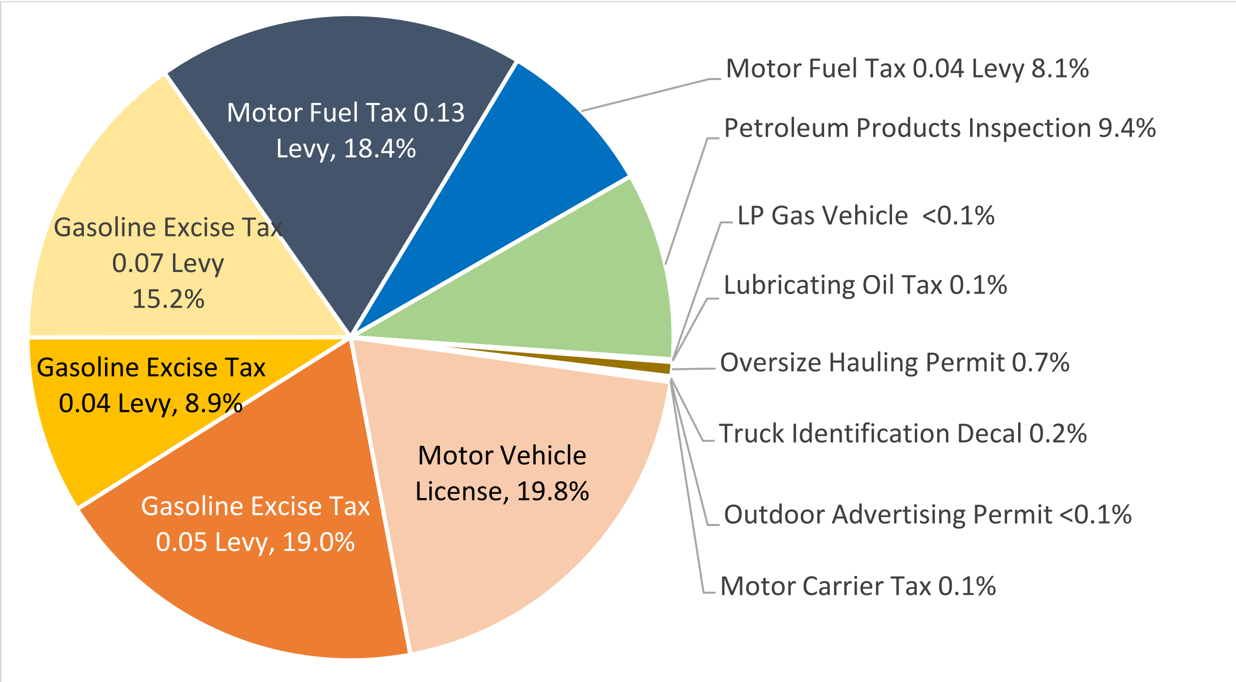
Historically, federal aid (primarily a return of federal fuel taxes collected from the sale of gasoline and diesel) contributed about 58 percent of ALDOT transportation revenue. About 35 percent of ALDOT revenues are state generated. Other non-revenue receipts account for 7 percent of total receipts (Figure 15).

Figure 15: Sources of ALDOT Funds (Average 2005-2015)



The state revenues consist of various taxes and fees collected from different sources. Taxes such as motor fuel, gasoline excise tax, Liquefied Petroleum Gas (LPG), lubricating oil, and motor carrier tax contribute about 70 percent. The remaining 30 percent of state revenues are generated from fees such as licenses, oversize hauling permits, decals, inspection and advertising (Figure 16).

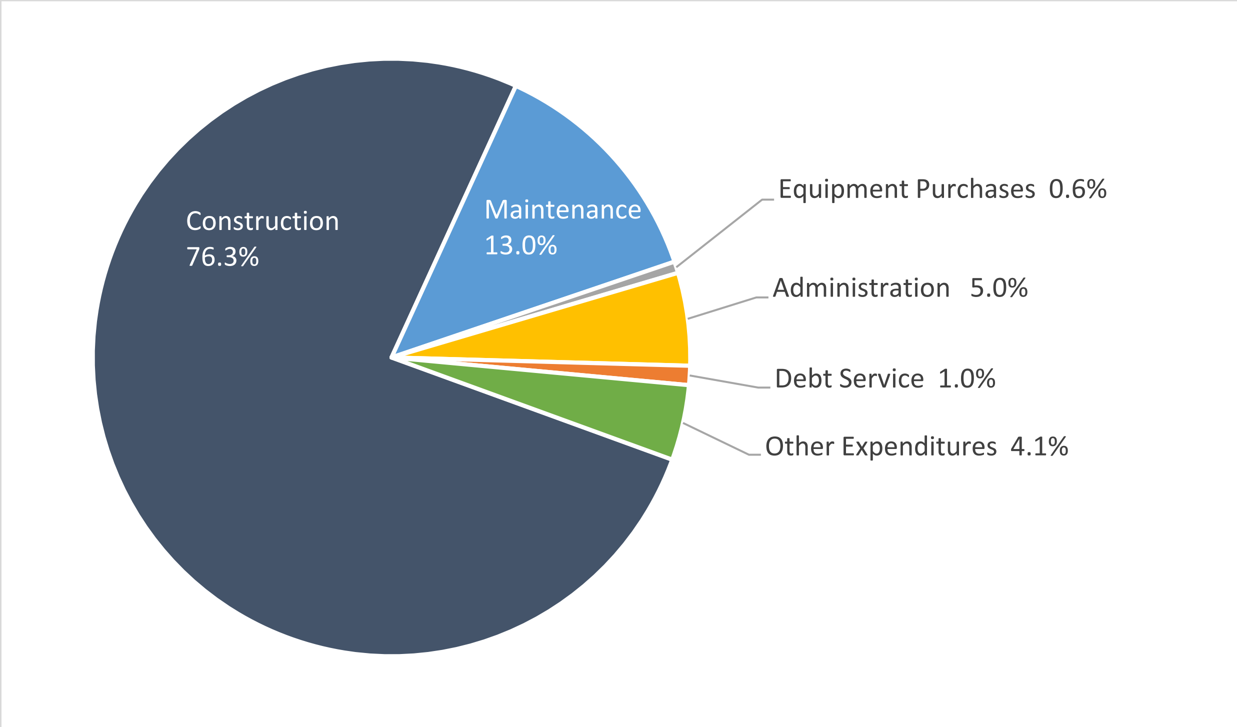
Figure 16: ALDOT Revenue Sources (Average 2005-2015)



ALDOT Expenditures

Figure 17 summarizes the distribution of ALDOT's expenditures. Construction and maintenance expenditures account for about 90 percent of total state expenditures. The remaining 10 percent of expenditures are spent on equipment purchases, administration, and debt and other services.

Figure 17: ALDOT Expenditures (Average 2005-2015)



There is a considerable amount of detailed information regarding ALDOT's revenues and operations available online. For further information, see:

- 2017 ALDOT Final Annual Report (PDF file)
- 2017 Alabama Statewide Freight Plan (PDF file)
- Alabama 2040 Statewide Transportation Plan - Interim Report #1 (PDF file)
- Alabama 2040 Statewide Transportation Plan - Interim Report #2 (PDF file)
- Alabama 2040 Statewide Transportation Plan - Supplement #2 (PDF file)

For comparisons among Alabama and other states, see:

- How Alabama Roads Compare (PARCA 2017, PDF file)
- 2018 Comparative Data Report on State Transportation Programs (SLC/CSG July 2018, PDF file)

3 The Challenge

At the heart of the transportation network is the physical infrastructure. Under ideal conditions, the physical infrastructure supports safe and efficient travel and evolves over time to accommodate changes in demand (for example, heavier or more frequent truckloads; new regional distribution centers) and advances in resiliency, security, and technology.

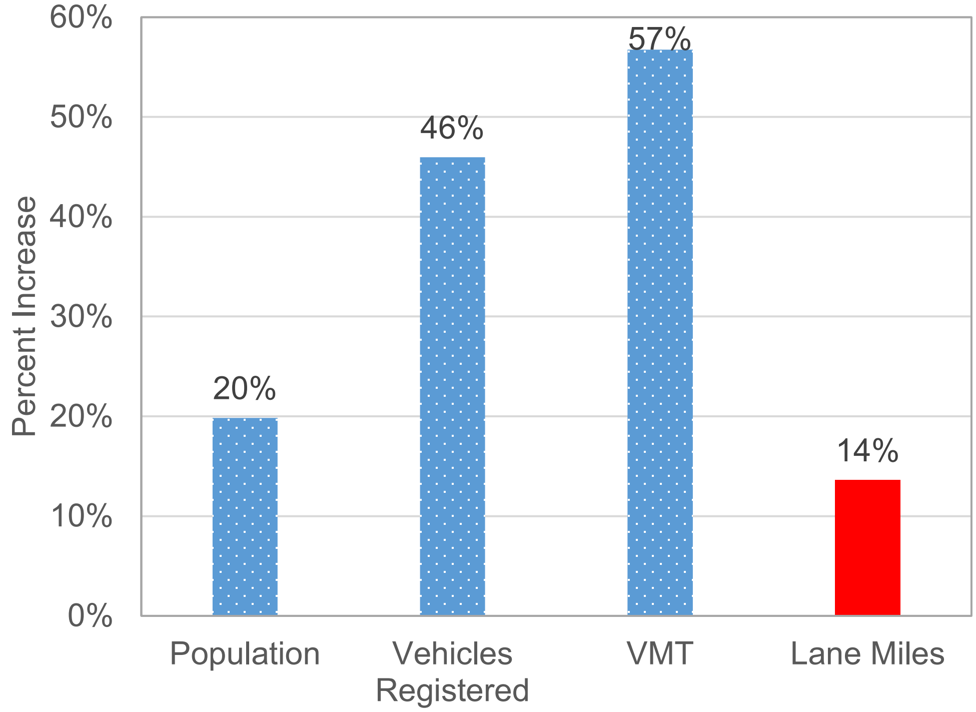
- *Resiliency* implies that the structure is better able to withstand severe weather, natural disasters, and associated conditions that impair its functionality and can include status detection and early warning devices, erosion management, use of advanced materials and technologies, and redundancies for key economic routes.
- *Security* needs include protection for cyber systems such as traffic signals, designing key structures such as bridges in a way to impede unauthorized access, and including components such as bollards, berms, and other features to address the use of highways for terrorism, human trafficking, and similar exploits.
- Examples of *technology advances* might be intelligent or electricity generating pavement, innovative approaches involved in the development of automated and autonomous vehicles that rely on constant and highly visible lane markings, and potential for electronic interaction among vehicles and roadside structures to improve traffic flow by decreasing the space needed between vehicles and allowing traffic signals to synchronize and adjust in real time.

In financially constrained times, these improvements compete for funding with maintenance of the existing system and the addition of new capacity. Changes in demography, workforce, and system use increase the demand for capacity, creating a dilemma for policy makers. Changes affecting Alabama today include traffic congestion, population growth, and the erosion of traditional funding mechanisms.

3.1 Traffic Congestion

Traffic congestion occurs when demand for physical infrastructure exceeds capacity. In Alabama, congestion is a sign that the supply of transportation has not kept up with the growth in demand (Figure 18).

Figure 18: Percent Increase 1990 to 2015 in Population, Registered Vehicles, Vehicle Miles Traveled and Lane-miles of Roadway



The causes of congestion fall generally into five categories:

- Population Growth
- Demographic Change
- Economy/Workforce/Unemployment
- System Use
- Erosion of Traditional Funding Mechanisms

3.2 Population Growth and Demographic Change

The 2010 census showed that the 12 metropolitan areas in Alabama accounted for about 75 percent of the state's 4.8 million population. The University of Alabama's Center for Business and Economic Research (CBER) projects an additional half million people in Alabama by 2040. CBER projects the largest increase will be in the Huntsville Metropolitan Planning Organization (MPO) area, while the largest percent increase will be a 65.1 percent increase in the population of the Eastern Shore followed by Auburn-Opelika with 51.5 percent. Rural Alabama will see a 4.8 percent decline in population (Figure 19). (MPOs are responsible for transportation planning in metropolitan areas over 50,000 population. For more information see USDOT/FHWA, Metropolitan Planning).

Figure 19: Population Change between 2010 and 2040 for Metropolitan Planning Organizations in Alabama

MPO	2010 Census	2040 Projection	Change 2010-2040 Population	Change 2010-2040 Percent
Auburn-Opelika	140,247	212,431	72,184	51%
Birmingham	1,128,047	1,246,782	118,735	11%
Calhoun Area	118,572	107,875	-10,697	-9%
Decatur	153,829	150,951	-2,878	-2%
Eastern Shore	182,265	300,899	118,634	65%
Gadsden-Etowah	104,430	99,980	-4,450	-4%
Huntsville	417,593	584,385	166,792	40%
Mobile	412,992	431,909	18,917	5%
Montgomery	374,536	395,590	21,054	6%
Shoals	147,137	146,011	-1,126	-1%
Southeast Wiregrass Area	145,639	166,785	21,146	15%
Tuscaloosa	230,162	279,742	49,580	22%
Urban	3,555,449	4,123,340	567,891	16%
Rural	1,224,287	1,165,243	-59,044	-5%
TOTAL	4,779,736	5,288,583	508,847	11%

Source: University of Alabama Center for Business and Economic Research

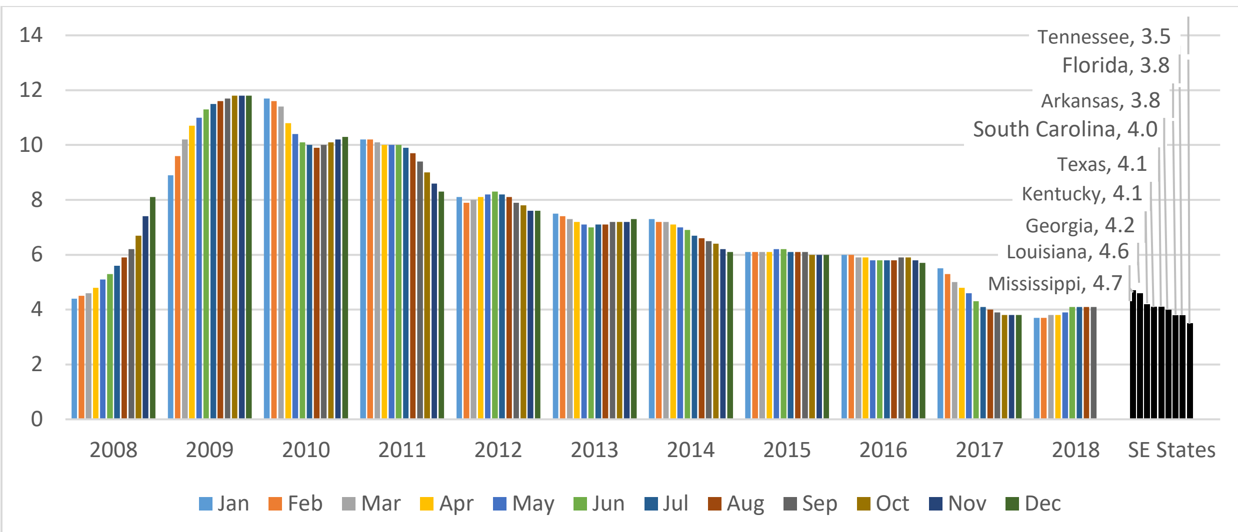
In 2010, over 650,000 Alabamians were aged 65 years and above. By 2040, this demographic will increase by 74 percent. Mobile, Baldwin, Jefferson, Shelby, and Madison counties will experience the largest increase in this population. Shelby County is projected to have an over 200 percent increase in the elderly population. An aging population impacts traffic safety, transit needs, and access to health and other activities. For more information see Unique Issues Related to Older Adults and Transportation, National Aging and Disability Transportation Center.

3.3 Economy/Workforce/Unemployment

Employers consider efficient and well-maintained transportation infrastructure to be critical to enabling economic development, expansion, and additional employment. Alabama employment is forecast to increase .07 percent per year -- from 2.07 million in 2014 to 2.23 million by 2024 (Employment Projections, Alabama Department of Labor). If we assume that growth rate is maintained, employment in Alabama will reach 2.5 million by 2040 – an increase of almost 440,000 daily commuters on the roadways.

Transportation infrastructure and its uses also play a key role in addressing unemployment, which in turn affects demand on the transportation system. Alabama has enjoyed a general trend of continually decreasing unemployment rate since 2009, leveling off at 4.1 percent in 2018. Alabama's unemployment rate falls in the middle when compared to nearby southeastern states (Figure 20).

Figure 20: Unemployment Rate – Alabama and Southeastern States

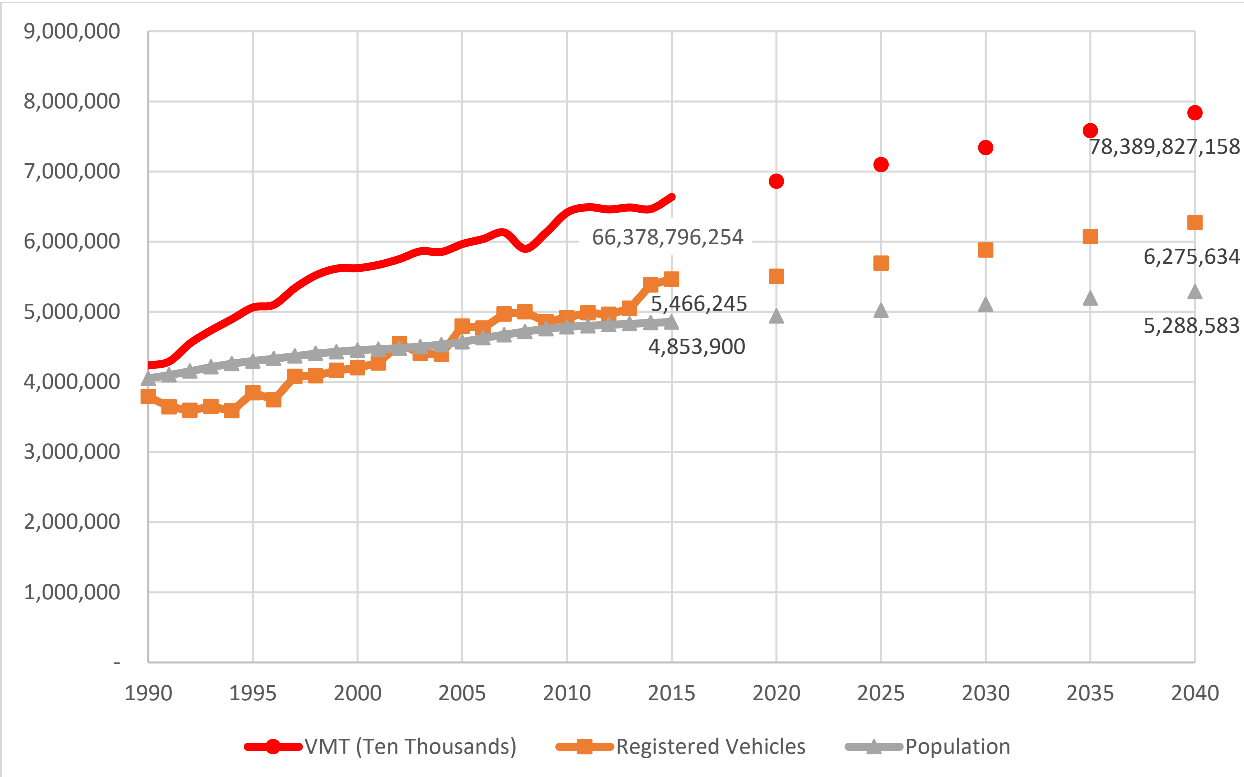


Source: US Department of Labor, Bureau of Labor Statistics

3.4 System Use

In 2015, 5.5 million vehicles were registered in Alabama. Registrations are projected to grow to 6.3 million in 2040, a 24 percent increase. Vehicle registrations are projected to increase at a faster rate than the growth in the population. Vehicle miles travelled (VMT) is a measure commonly used to quantify the demand on the system. In 2010, Alabama experienced 64 billion vehicle miles travelled. By 2040, it is projected to be 78 billion, a 22 percent increase since 2010 (Figure 21). (In order to show VMT on the same chart as population and vehicle registration, VMT is shown in ten thousands. The actual number is shown in the chart labels).

Figure 21: Historical and Projected Alabama Population, Vehicle Registration, and VMT



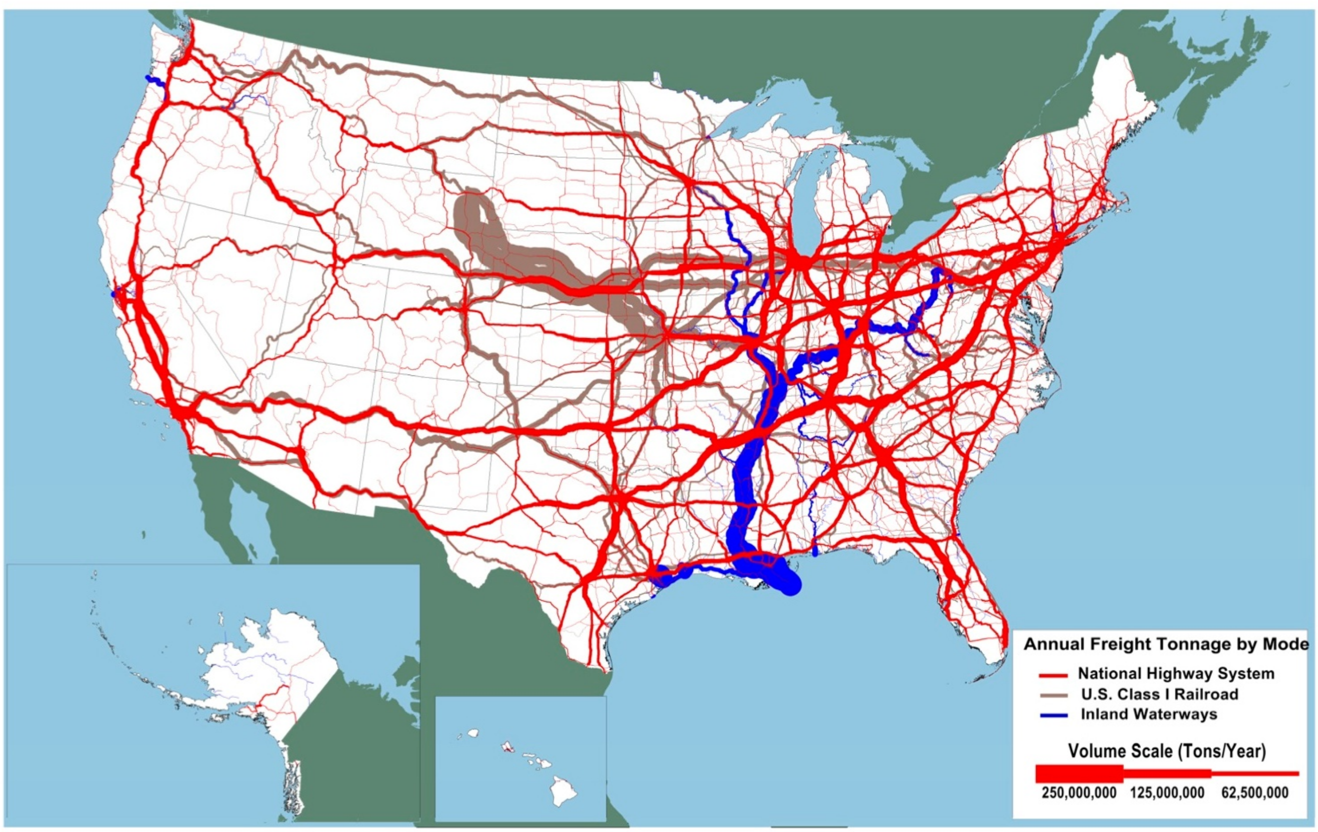
3.5 Freight

As the Alabama economy grows, freight traffic is expected to increase at twice the rate of passenger vehicle traffic. The efficient movement of freight not only helps keep consumer prices down, it is also a key component in retaining existing businesses and attracting new employment opportunities. If raw materials and finished products do not move efficiently in Alabama, the state will lose jobs to areas where they do.

Infrastructure usage by freight is expected to increase, heavily affecting highways. This report therefore includes key information about water and rail infrastructure as they are significant indicators of freight expansion.

Alabama is central to several nationally key highway freight corridors (Figure 22).

Figure 22: Tonnage on Highways, Railroads, and Inland Waterways



Sources: Highways: U.S. Department of Transportation, Federal Highway Administration, Freight Analysis Framework, Version 3.4, 2012. Rail: Based on Surface Transportation Board, Annual Carload Waybill Sample and rail freight flow assignments done by Oak Ridge National Laboratory. Inland Waterways: U.S. Army Corps of Engineers (USACE), Annual Vessel Operating Activity and Lock Performance Monitoring System data, as processed for USACE by the Tennessee Valley Authority; and USACE, Institute for Water Resources, Waterborne Foreign Trade Data, Water flow asssignments done by Oak Ridge National Laboratory.

Source: US Department of Transportation (JPG file)

Truck traffic through the year 2040 is expected to increase by about 40 percent for shipments originating in Alabama and 46 percent for truck shipments destined for the state. This increase amounts to 194 million tons. Figures 23-27 provide details on projected freight growth.

Figure 23: Freight by Mode and Origin/Destination – 2012 vs. 2040

Origins in Alabama			Destinations in Alabama		
2012			2012		
Mode	Kilotons	Percent	Mode	Kilotons	Percent
Trucks	229,945	69.10%	Trucks	224,274	63.12%
Pipeline	67,951	20.42%	Pipeline	78,470	22.08%
Rail	25,499	7.66%	Rail	39,090	11.00%
Multiple modes & mail	7,751	2.33%	Multiple modes & mail	5,368	1.51%
Water	1,494	0.45%	Water	8,055	2.27%
Other and unknown	65	0.02%	Other and unknown	68	0.02%
Air (including truck-air)	44	0.01%	Air (including truck-air)	5	0.00%
TOTAL	332,749		TOTAL	355,330	
2040			2040		
Mode	Kilotons	Percent	Mode	Kilotons	Percent
Trucks	321,053	68.82%	Trucks	327,307	64.56%
Pipeline	97,540	20.91%	Pipeline	110,243	21.74%
Rail	30,284	6.49%	Rail	48,237	9.51%
Multiple modes & mail	13,935	2.99%	Multiple modes & mail	9,285	1.83%
Water	3,327	0.71%	Water	11,734	2.31%
Other and unknown	228	0.05%	Other and unknown	190	0.04%
Air (including truck-air)	131	0.03%	Air (including truck-air)	16	0.00%
TOTAL	466,498		TOTAL	507,012	
Projected Change	(2040 vs 2012)		Projected Change	(2040 vs 2012)	
Mode	+/-	Percent	Mode	+/-	Percent
Trucks	91,108	39.62%	Trucks	103,033	45.94%
Pipeline	29,589	43.54%	Pipeline	31,773	40.49%
Rail	4,784	18.76%	Rail	9,147	23.40%
Multiple modes & mail	6,184	79.79%	Multiple modes & mail	3,917	72.98%
Water	1,834	122.78%	Water	3,680	45.68%
Other and unknown	163	249.77%	Other and unknown	12	252.93%
Air (including truck-air)	87	196.27%	Air (including truck-air)	122	179.66%
TOTAL	133,749	40.20%	TOTAL	151,684	42.69%

Source: ATI using Freight Analysis Framework Data Tabulation Tool Version 4

Notes:

- Multiple Modes and Mail: Includes shipments by multiple modes and by parcel delivery services, U.S. Postal Service, or couriers (capped at 150 pounds). This category is not limited to containerized or trailer-on-flatcar shipments.

- Air including Truck-Air: Includes shipments move by air or a combination of truck and air in commercial or private aircraft. Includes air freight and air express. In the case of imports and exports by air, domestic moves by ground to and from the port of entry or exit are categorized with *Truck*.

- Other and Unknown: Includes movements not elsewhere classified such as *flyaway* aircraft, conveyor belts and shipments for which the mode cannot be determined.

Figure 24: Annual Truck Cargo Originating From Alabama Shipped by Commodity (in Kilotons) – 2012 vs. 2040

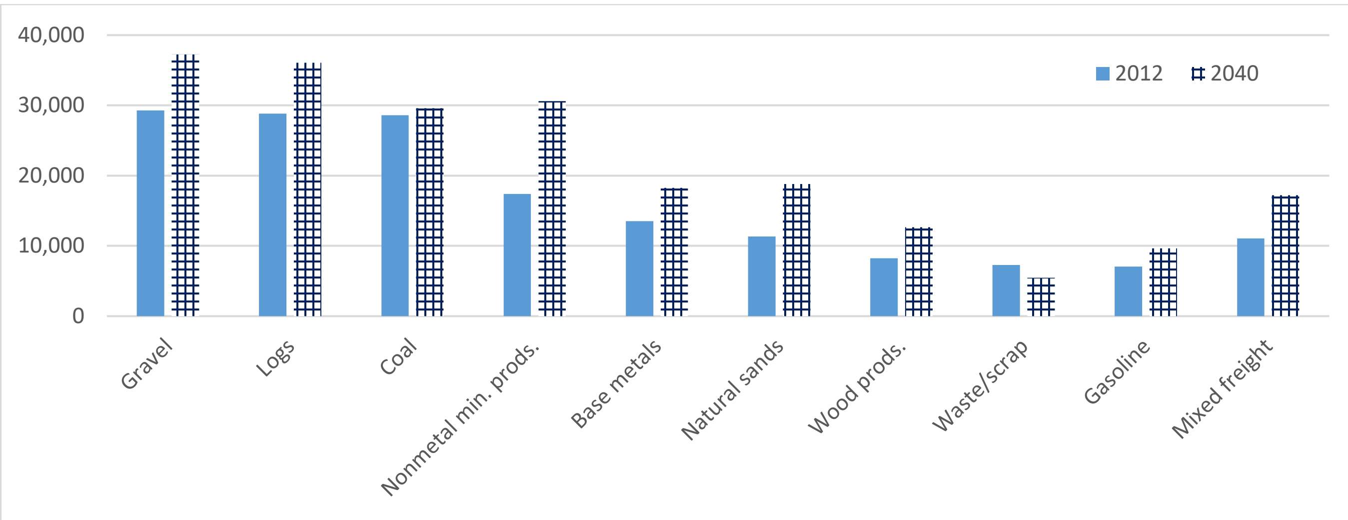


Figure 25: Annual Truck Cargo Destinations in Alabama Shipped by Commodity (in Kilotons) – 2012 vs. 2040

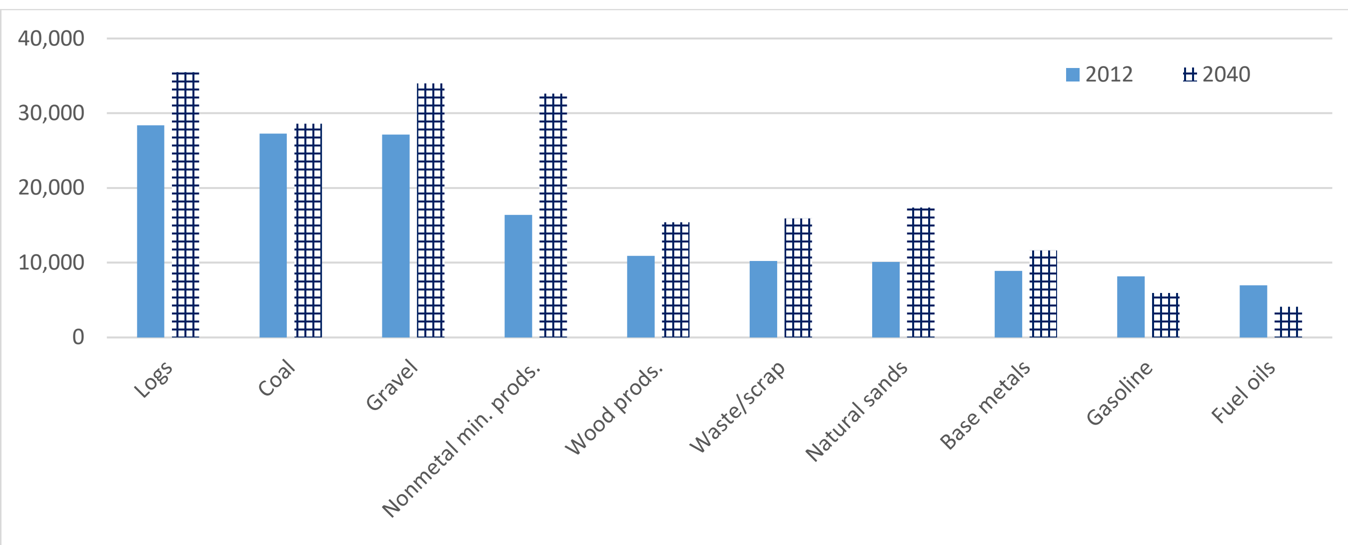


Figure 26: Annual Inland Waterway Cargo Originating in Alabama Shipped by Commodity (in Kilotons) – 2012 vs. 2040

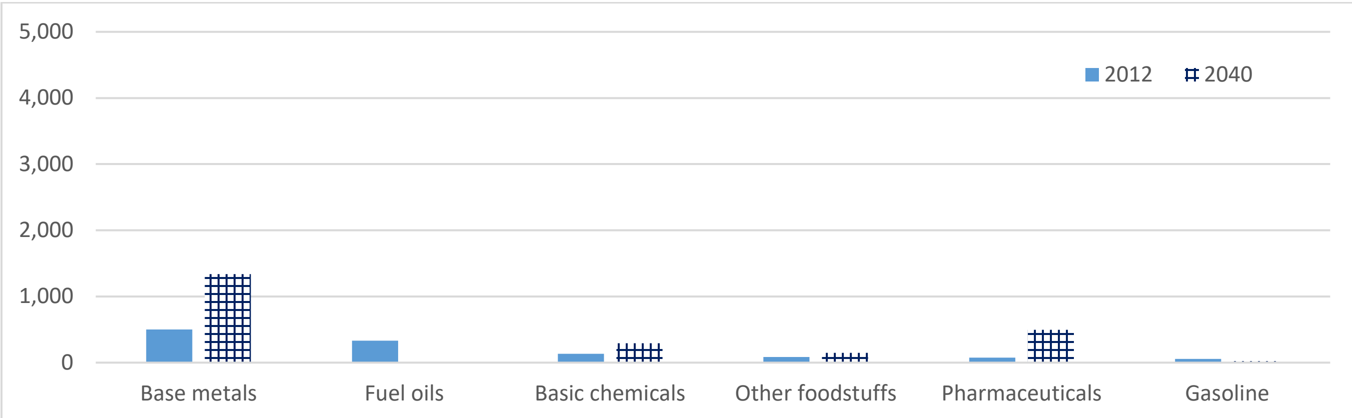
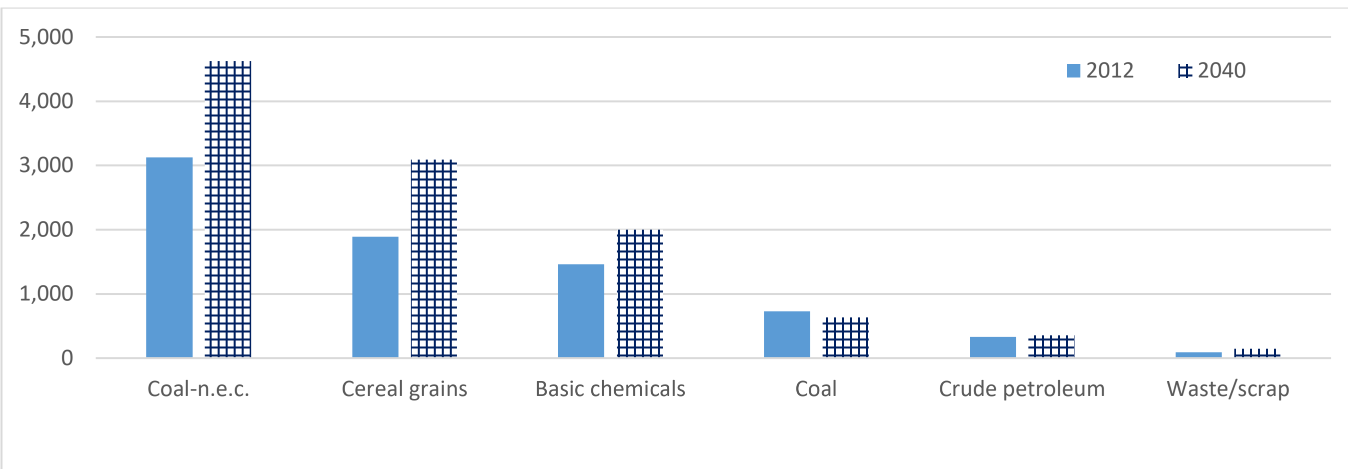


Figure 27: Annual Inland Waterway Cargo Destinations in Alabama Shipped by Commodity (in Kilotons) – 2012 vs. 2040



Source: ATI using Freight Analysis Framework Data Tabulation Tool Version 4

3.6 Ports and Waterways

Alabama also has an extensive network of navigable inland waterways, which includes the Tennessee, Tennessee-Tombigbee, Warrior-Tombigbee, Alabama-Coosa, Chattahoochee-Apalachicola, and Gulf Intracoastal waterways. There are 18 river ports across the state, most are small. The Alabama State Port Authority operates 11 of these ports: Bridgeport, Claiborne, Columbia, Cordova, Demopolis, Axis, Eufaula, Montgomery, Phenix City, Selma, and Tuscaloosa-Northport (Figure 28).

Figure 28: Port Facilities in Alabama

Port Name	Port Authority	City
Bevill-Hook Port	Aliceville Industrial Development Board	Aliceville, AL
Crossroads of America Port	Greene County Economic and Industrial Board	Boligee, AL
Port of Bridgeport	Alabama State Port Authority	Bridgeport, AL
Barry Electric Generating Plant	AL Power	Bucks, AL
Port of Claiborne	Alabama State Port Authority	Claiborne, AL
Port of Columbia	Alabama State Port Authority	Columbia, AL
Port of Cordova	Alabama State Port Authority	Cordova, AL
Port of Decatur	Decatur Transit, Inc.	Decatur, AL
Port of Demopolis	Alabama State Port Authority	Demopolis, AL
Port of Epes	Industrial Board of Sumter County	Epes, AL
Port of Eufaula	Alabama State Port Authority	Eufaula, AL
Port of Florence	Florence – Lauderdale County Port Authority	Florence, AL
Port of Guntersville	American Commercial Barge Line	Guntersville, AL
Port of Mobile	Alabama State Port Authority	Mobile, AL
Port of Montgomery	Alabama State Port Authority	Montgomery, AL
Port of Phenix City	Alabama State Port Authority	Phenix City, AL
Pickens County Port	Pickens County Port Authority	Pickensville, AL
Port of Selma	Alabama State Port Authority	Selma, AL
Port of Tuscaloosa	Alabama State Port Authority	Tuscaloosa, AL

Source: World Port Source

The Port of Mobile is ranked in the top 10 US ports in 2014 based on tonnage with 64.3 million total tons handled. Owned and operated by the Alabama State Port Authority, the Port of Mobile is Alabama's only deep-water port but provides access to two interstates, five Class I railroads, and approximately 15,000 miles of inland waterway connections. The 4,000-acre complex offers 41 berths and handles bulk and general cargo, with coal its biggest commodity.

Most inland waterway freight is transported along the Tombigbee and Tennessee rivers. Two of the ten locks along the Tennessee-Tombigbee waterway are located in Alabama: Tom Bevill in Carrollton and Howell Heflin in Gainesville. Ports along the Tennessee-Tombigbee in Alabama include Pickens County Port (Pickensville), Aliceville River Terminal and Bevill-Hook Port (Aliceville), Crossroads of America Port (Boligee), and Port of Epes (Epes). Tennessee River ports include Port of Florence, Mallard-Fox Creek River Port (Decatur), Guntersville, and Alabama State Docks Department (Bridgeport).

ATI obtained information from the Alabama State Ports Authority on future expansion activities through 2040. Their overall mission is to facilitate international trade for the benefit of

Alabama and regional shippers and receivers. While it is somewhat problematic to forecast overall Port needs through 2040, the following information was provided:

- The planned phases for expansion of the overall container terminal at the Port of Mobile ramp up to a capacity of 1.5 million 20-foot shipping containers per year by 2040. This growth is anticipated to increase the amount of truck traffic through the Port significantly through 2040. Future phases of the container terminal are estimated to cost approximately $125 million.
- The Vehicle/Roll On-Roll Off Terminal will be completed and operational by 2019, at an estimated cost of $60 million to complete. This is anticipated to generate as much as 170,000 autos per year plus associated roll-on/roll-off cargo. Port staff estimates it will generate an additional 20,000 truck trips per year from the Port.
- The Port is in the process of developing value-added sites adjacent to the container terminal for Port-related businesses. It is estimated that developing these properties will generate roughly 30,000 truck trips and $50 to 60 million economic impact per year.

Statewide Freight Plan

The Alabama Statewide Freight Plan addresses existing and projected commodity flows, the primary freight network, and freight improvements of statewide significance. Notable findings include:

- Overall increases in rail and truck traffic are projected through 2040, with trucks remaining as the most utilized mode for Alabama freight movement.
- Much of the commodity flow volume to and from the Port of Mobile occurs by rail.
- Nearly all existing bottlenecks across the state are along the Interstate system, and the Birmingham area has the most facilities with current and projected bottlenecks.
- Future demand for coal is uncertain. If current projections prove optimistic, the effects will be apparent at the Port of Mobile and on rail traffic while the effects on roads will be minimal.

3.7 Erosion of Traditional Funding Mechanisms

Motor Fuels Taxes

Motor fuels taxes have historically been the preferred method for raising funding for highways. Unlike vehicle registration fees and sales taxes, motor fuels taxes have a relationship to vehicle usage and road consumption, allowing a "pay as you go" system. The infrastructure for charging, collecting, and distributing motor fuels taxes is largely in place, unlike toll systems, which require additional infrastructure for billing and collection. Approaches designed to replace motor fuels taxes, such as mileage-based user fees, are in pilot project status but have not yet experienced widespread consumer acceptance.

The motor fuel tax in Alabama is an excise tax, not a sales tax. An excise tax is typically levied on the consumption of a specific good and is a flat rate, whereas a sales tax is a percent of the price of the product or goods.

There are different types of motor fuels taxes and rates in Alabama. The Alabama state tax on gasoline is 18 cents per gallon, 18 cents per gallon on gasohol, and 19 cents per gallon on diesel. The gasoline, gasohol, and diesel rates include a 2 cents per gallon inspection fee. Alabama-registered LPG vehicles pay an annual fee based on vehicle type in lieu of the volume tax. For more information, see Alabama Department of Revenue – Motor Fuels.

Gas tax rates in other states range from 8 cents per gallon (Alaska) to 50.3 cents per gallon (Pennsylvania). Thirty nine states and the District of Columbia have higher gas tax rates than Alabama (USDOT/FHWA Tax Rates on Motor Fuel) (Figure 29).

Figure 29: Gas Taxes and Diesel Taxes

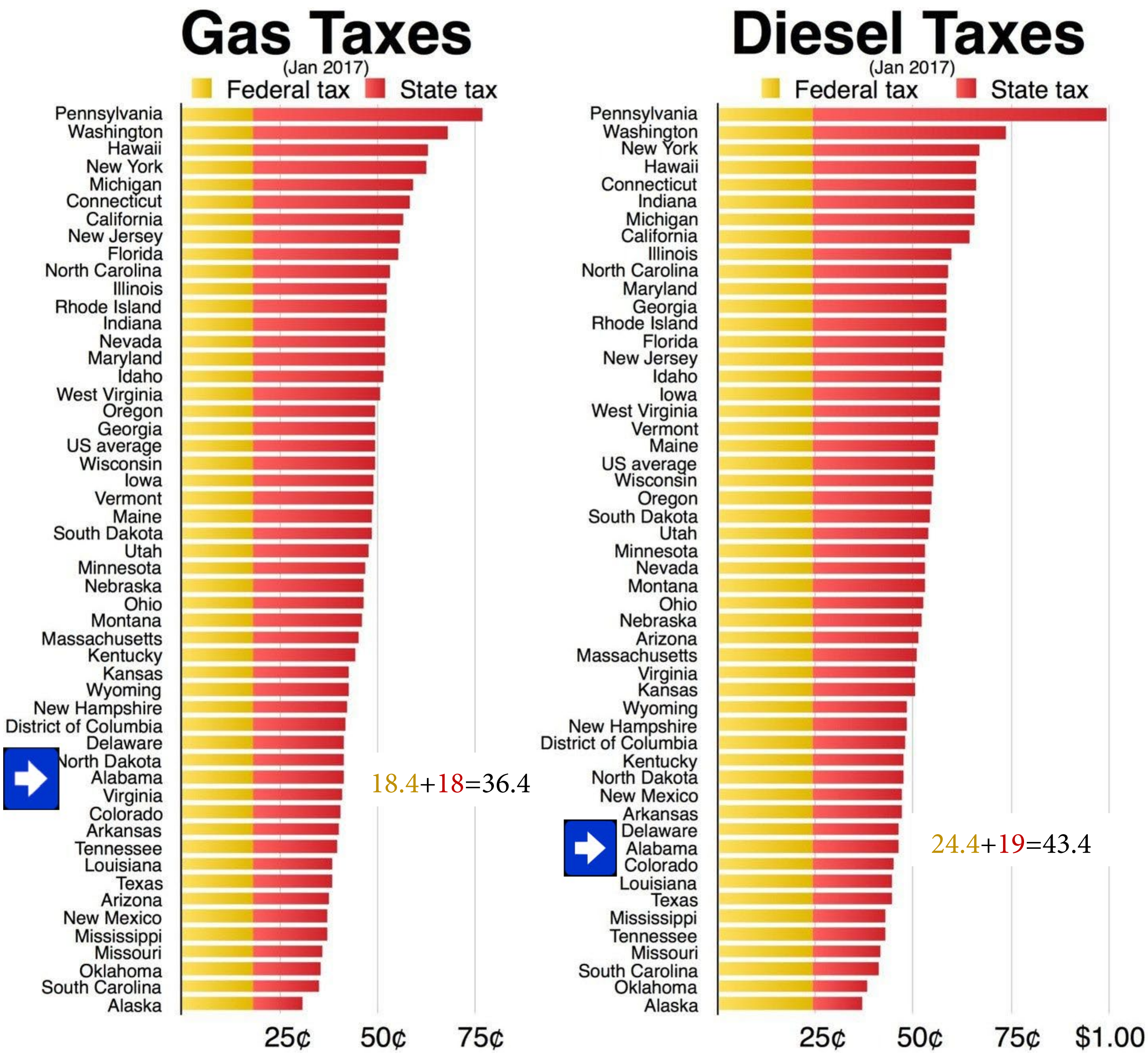


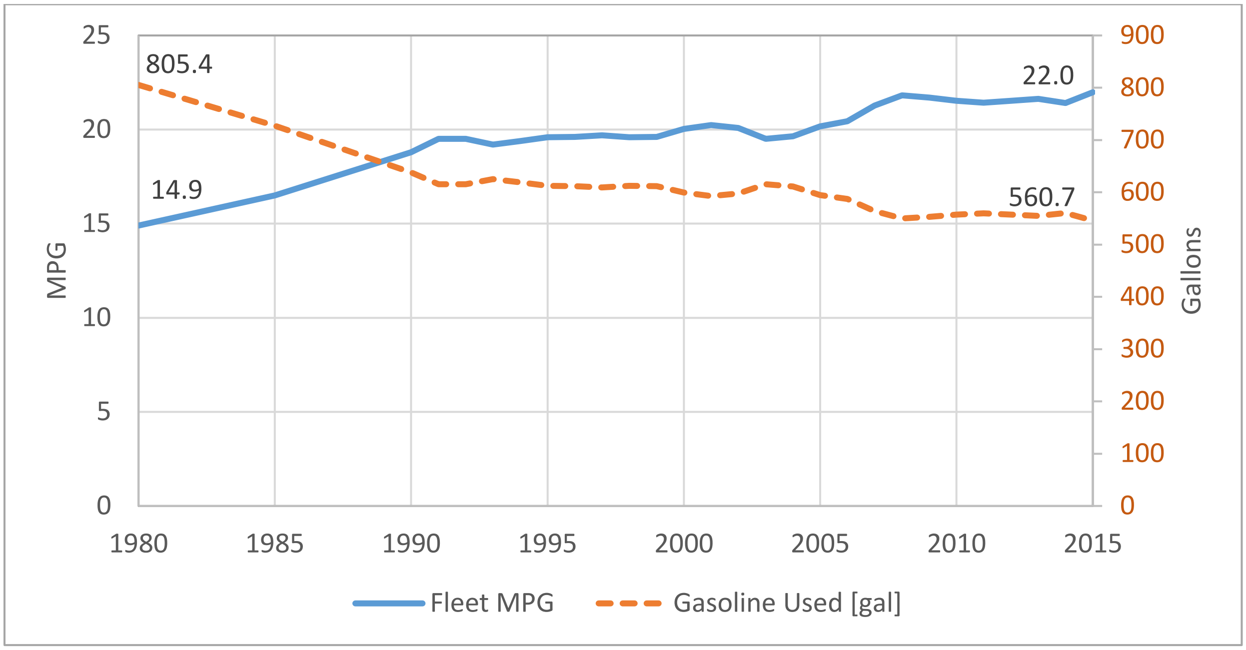
Image Sources:Wikimedia (PDF file graphic), Twitter, Chris McKenna (arrows))

Loss of Purchasing Power

Transportation funding is constantly losing purchasing power due to increasing vehicle fuel efficiency combined with the effects of inflation on the cost of construction.

Vehicles continue to become more fuel efficient, resulting in a reduction in gasoline used per vehicle in the course of a year (Figure 30).

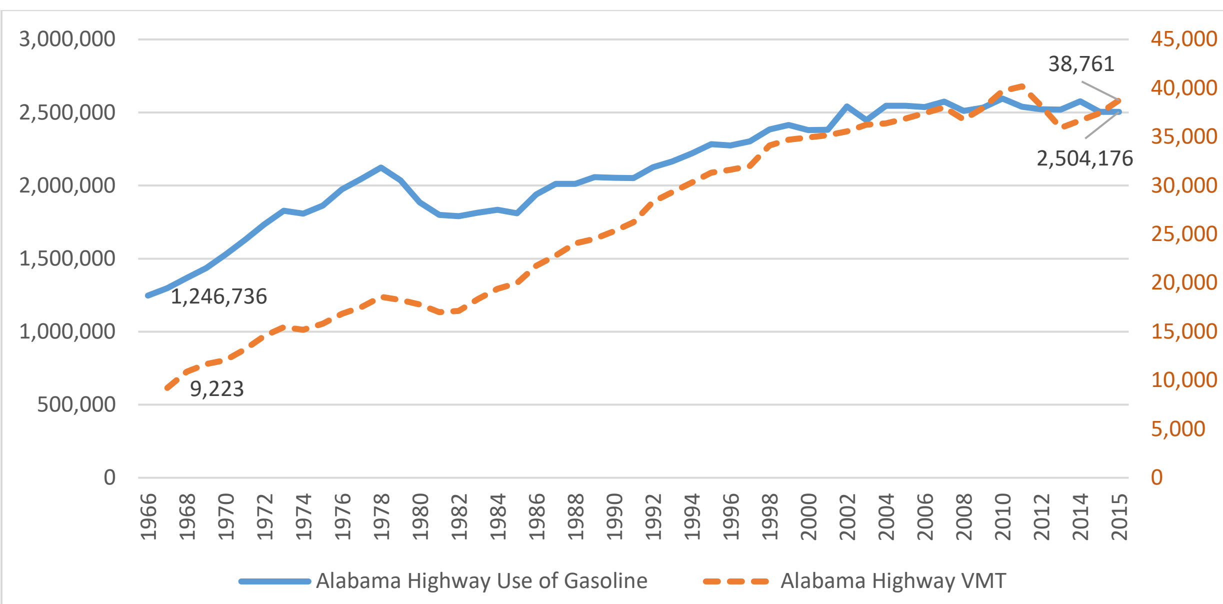
Figure 30: Miles per Gallon Compared To Gasoline Consumed Per Vehicle



Source: National Household Travel Survey, median miles per year for most used car in a household

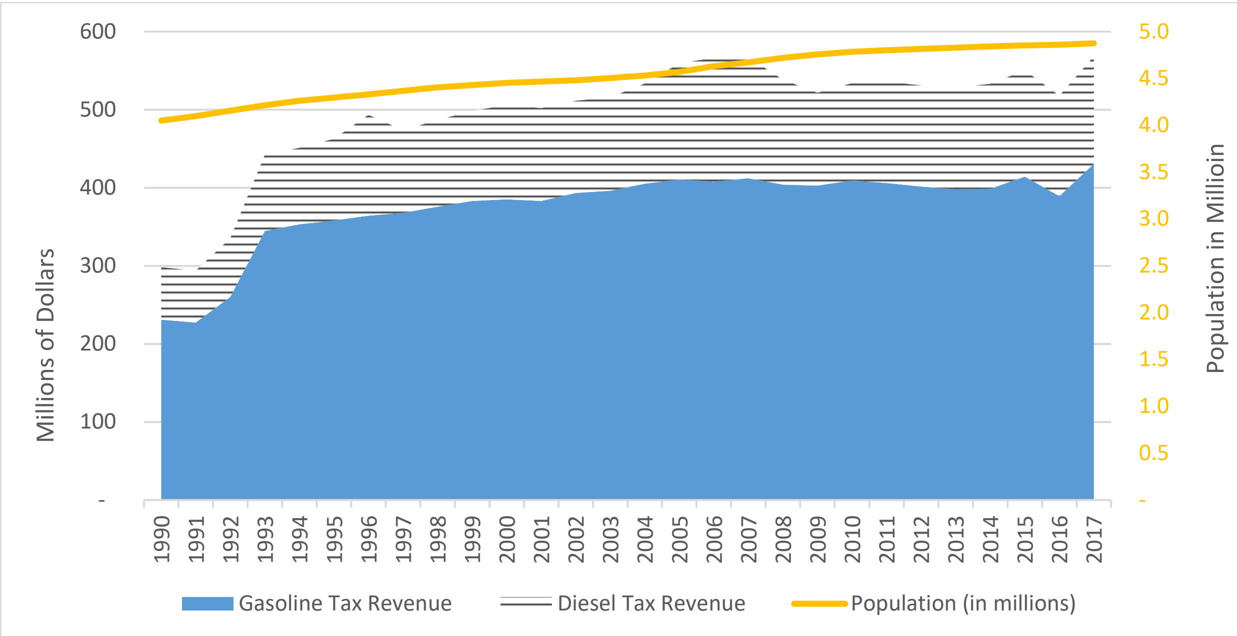
Increasing fuel efficiency is reducing gasoline consumption and the resulting revenue even as vehicle miles of travel (Figure 31) and population (Figure 32) increase.

Figure 31: Alabama Highway VMT (in millions) compared to Highway Use of Gasoline (thousands of gallons)



Sources: Highway Use of Gasoline by State (Alabama, thousands of gallons) US DOT/FHWA, Alabama Highway Vehicle Miles Travelled (in millions) – US DOT/FHWA (PDF file)

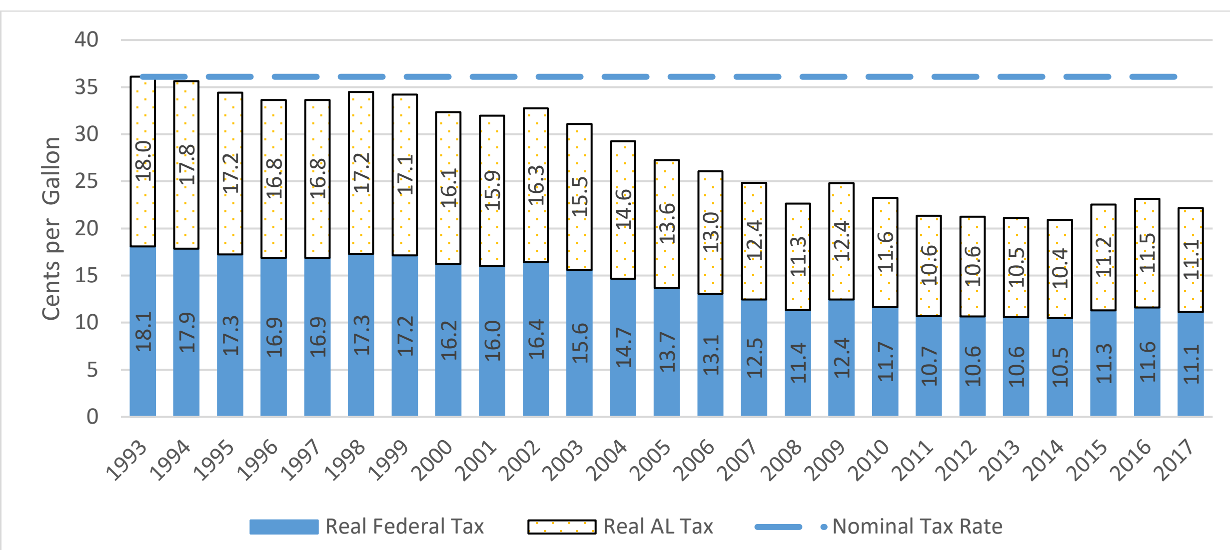
Figure 32: Alabama Motor Fuels Tax Revenue Compared to Population



Source: Alabama Department of Revenue annual reports, various years

Purchasing power is further reduced by inflation. Federal and state gas taxes on gasoline combined have been 36.6 cents since 1993. Inflation's effects have reduced the purchasing power to a little over 22 cents when comparing the real (adjusted for inflation) tax rates to the nominal (unadjusted) tax rates (Figure 33).

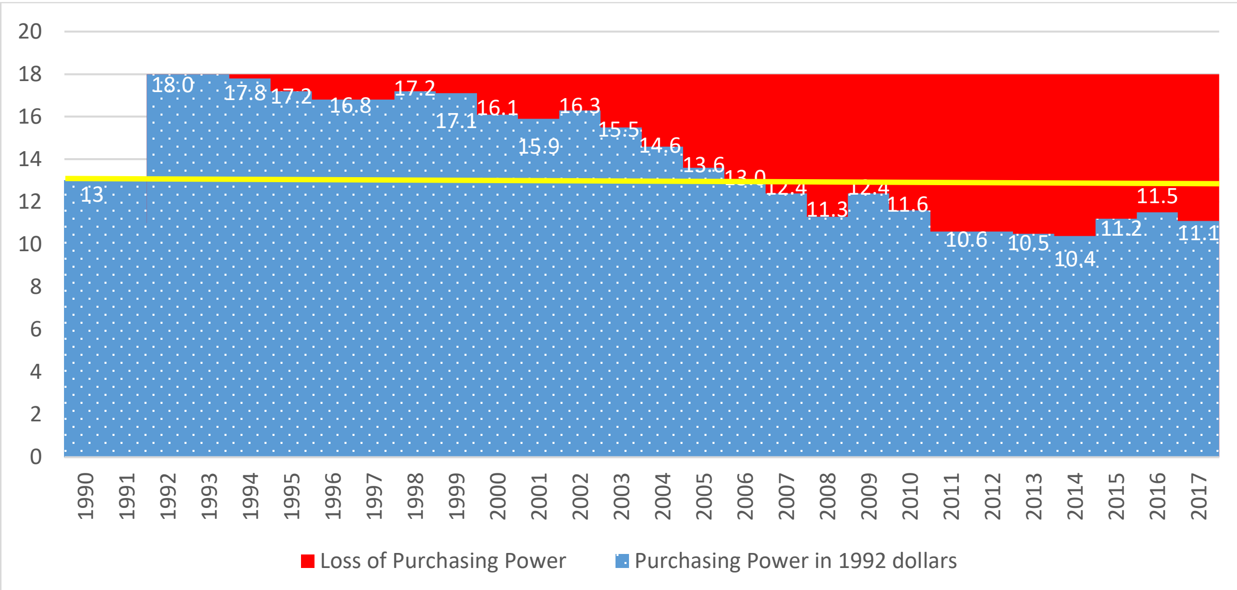
Figure 33: Purchasing Power of the Federal and State Motor Fuel Tax Rate



Source: ATI

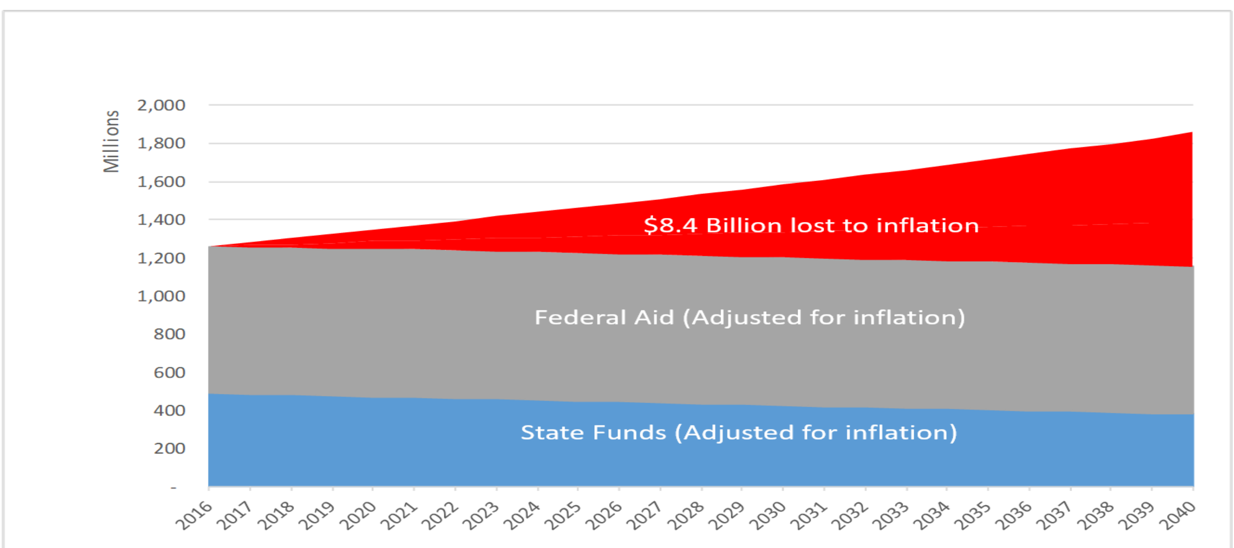
Alabama's fuel excise tax increased by 5 cents in 1992 (from 11 cents to 16 cents, on top of an inspection fee of 2 cents per gallon added in 1984). Inflation has eroded the state gas tax purchasing power to the point where it has negated the last gasoline tax increase (Figure 34).

Figure 34: Alabama Gas Tax Purchasing Power (Cents per Gallon)



When the revenue-reducing effect of inflation is taken into account, Alabama's purchasing power could be reduced by $8.4 billion through 2040 (Figure 35).

Figure 35: Projected Revenues, in millions of dollars, based on 2 percent annual inflation



Source: ATI

4 Options and Strategies for Addressing Transportation

Population, employment, and economic growth all contribute to increased demand for transportation. ALDOT estimates a budget of $105 million for new capacity in 2019. Today there are a number of ways to address increased demand for transportation infrastructure, including strategies to maximize the efficiency of the existing system, such as Transportation System Management and Operations (TSMO) and Travel Demand Management (TDM).

4.1 Transportation System Management and Operations (TSMO)

According to the Institute of Transportation Engineers, TSMO is "an integrated program to optimize the performance of existing infrastructure through the implementation of systems, services, and projects designed to preserve capacity and improve security, safety, and reliability. The term includes improvements to the transportation system such as:

- • Traffic detection and surveillance,
- • Arterial management,
- • Freeway management,
- • Demand management,
- • Work zone management,
- • Emergency management,
- • Electronic toll collection,
- • Automated enforcement,
- • Traffic incident management,
- • Roadway weather management,
- • Traveler information services,
- • Commercial vehicle operations,
- • Traffic control,
- • Freight management, and
- • Coordination of highway, rail, transit, bicycle, and pedestrian operations."

Source: Transportation System Management and Operations, Institute of Transportation Engineers (PDF file)

An example of TSMO is ALGO Traffic which provides information on current traffic conditions. Additional examples include five Regional Traffic Management Centers, located in each of ALDOT's five regions.

4.2 Travel Demand Management (TDM)

TDM strategies involve alternatives, incentives, and penalties intended to influence travel behavior, such as reducing the number of single occupancy vehicle trips, shifting travel times or modes, and educating people about transportation options. Examples include ridesharing, telecommuting, and parking management. Determining an appropriate TDM solution typically depends on the types of trips addressed and participation by the private sector (Figure 36).

Figure 36: Travel Demand Management Approaches

TRIP PURPOSE	Site	Subarea/Corridor	Regional
Work	Carpools Vanpools Public/Private Transit Bicycling/Walking Alternative work hours Site telecommuting Parking policies	Subarea rideshare Corridor HOV Parking policies Transit subsidies Subarea telecommute	Area-wide rideshare Transit service HOV lanes Area-wide pricing Area-wide telecommute Trip reduction ordinances Area-wide traveler information system
Shop	Shuttles Transit subsidies Pedestrian access Bicycle access Urban design Tele-shopping	Shuttles Park-and-ride Transit services	Tele-shopping Transit subsidies Area-wide transit services Area-wide traveler information system
Tourist	Shuttles Parking policies Transit services	Park-and-ride lots Parking management Shuttles Transit services Bicycle/pedestrian amenities	Regional transit services Marketing Park-and-ride lots Area-wide traveler information system
	Example Delivery Mechanisms for TDM Programs		
	Employer transportation coordinators Personnel department Part time transportation manager Voluntary participation Negotiated traffic mitigation Site design	Transportation management associations Chambers of commerce Transportation management districts City or MPO coordinator	Trip reduction ordinances Adequate public facilities ordinances Growth management State, MPO, or transit agency coordination

Source: Meyer, Siwek and Berman 1994

TDM serves to stretch infrastructure resources and improve the efficiency of existing networks but does not replace the physical infrastructure of highways. For more information on TDM, see Integrating Demand Management into the Transportation Planning Process: A Desk Reference.

4.3 Revenue Enhancement Options

There are other possible funding mechanisms in addition to motor fuel taxes and related sources. These include mileage based user (VMT) fees, cordon pricing, ramp fees, empty seat taxes, parking fees and management, use of curb access, GPS and data fees, mobile business taxes, electricity fees, charging stations, advertisement/tax in vehicles, and special districts. For more information on current Alabama transportation revenue sources and options see Revenue Enhancement Alternatives for the Alabama Department of Transportation. For examples of innovative revenue sources see Autonomous Vehicle Revenue Implications for Portland, Tigard and Tualatin. For a comprehensive map of other states' legislative activity, see State Transportation Funding Bills Enacted Into Law 2008-2018, Texas A&M Transportation Institute.

Other states have also successfully used public-private partnerships to stretch their transportation dollars. The current federal Administration has proposed increasing the private sector's involvement in infrastructure finance. As of this writing, Congress has not passed legislation implementing such a program or specifying how states like Alabama could access any additional federal dollars that might become available. For more information on states and public-private partnerships, see Public-Private Partnerships for Transportation, National Conference of State Legislatures (PDF file). For more information on the Administration's proposal, see Legislative Outline for Rebuilding Infrastructure in America (PDF file).

Electric vehicles do not use gasoline and therefore do not pay motor fuels taxes. The Alabama Transportation Institute projects that by 2040 electric vehicles will comprise 3 percent of registered vehicles in Alabama. Assuming by the year 2040 electric vehicles account for 3 percent of all vehicles, fee of $200 per vehicle would raise about $42 million in 2040.

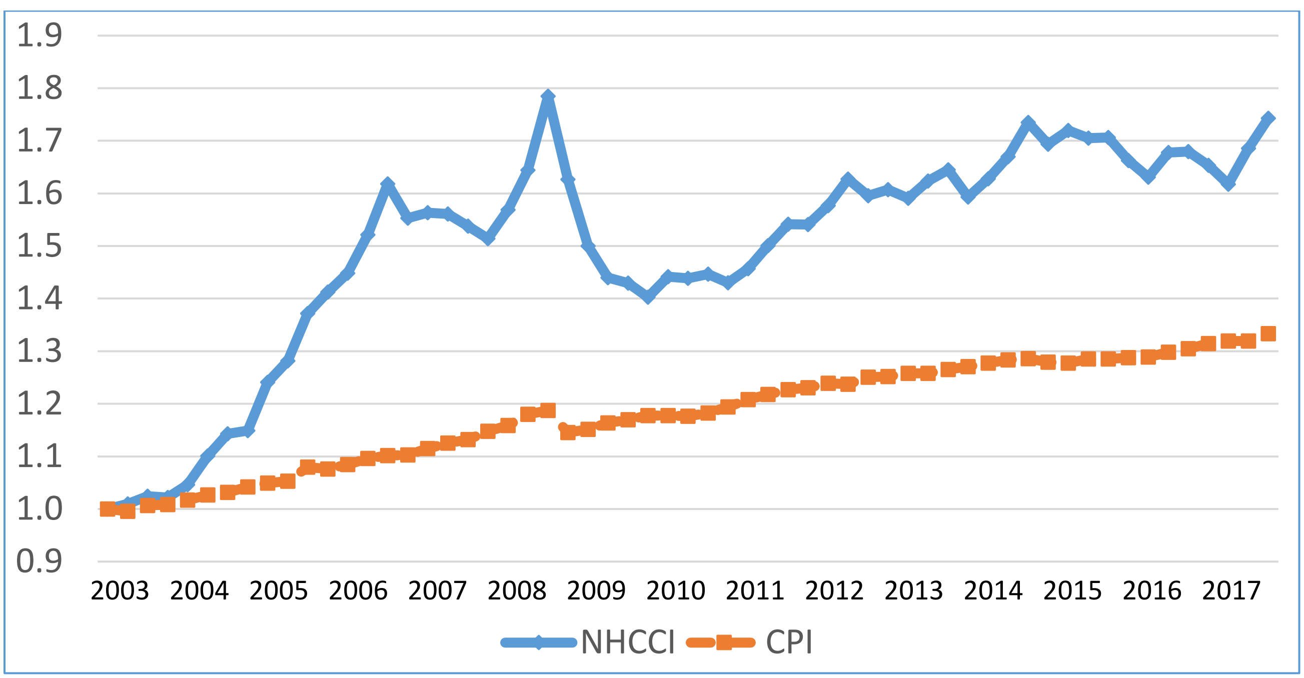
4.4 Variable Rate Gas Taxes

One alternative approach is a variable rate gas tax, where all or part of the fuel is taxed using a measure that changes based on selected forces. Twenty states and the District of Columbia, accounting for a majority of the nation's population, use a form of variable gas tax that adjusts to changing prices without legislative action. For more information see Variable Rate Gas Taxes (NCSL). According to the American Road and Transportation Builders Association, "Five of those states—Connecticut, New York, Utah, Vermont and West Virginia—have a flat excise tax on motor fuel and an additional percentage-based tax on the wholesale price of gasoline. Three states—Kentucky, Pennsylvania, and Virginia—determine their gasoline prices solely by a percentage of the wholesale price of gas. Five states—California (beginning Jan. 2019), Florida, Indiana (ending 2024), Michigan (beginning Jan. 2022), and Rhode Island—determine gas prices by consulting the CPI for economic changes. Four states— Georgia, Maryland, Nebraska, and North Carolina— use multiple factors to calculate their gas tax." For more detailed information see Variable-Rate State Gas Taxes (Transportation Information Advocacy Center, PDF file).

Eight states index all or part of their gas tax so that the amount can vary in response to inflation, as opposed to Alabama's current constant tax rate regardless of the product cost.

There are several indices used to measure inflation; most commonly the Consumer Price Index (CPI). Another is the Corporate Average Fuel Economy (CAFE) standard, a federally imposed requirement that each automaker's fleet must obtain a certain average miles per gallon. The more appropriate measure for infrastructure may be the National Highway Construction Cost Index (NHCCI) which involves a market basket of materials regularly used in highway construction, including steel, asphalt, cement, fuel, and aggregates. However, the NHCCI is more volatile than the CPI and is subject to large swings in demand (Figure 37).

Figure 37: CPI vs NHCCI (March 2003 Index – 1.0)



Source: ATI

For Alabama, indexing gas and diesel taxes would have raised between $1.3 billion and $5.3 billion above the amounts generated by the 18 cents per gallon gas and 19 cents per gallon diesel taxes between 1992 and 2016, depending on the selected index (Figure 38):

- Indexing to CAFE standards would have raised $1.3 billion;
- Indexing to a combined CPI/NHCCI would have raised $2.4 billion;
- Indexing to the NHCCI would have raised $3.9 billion;
- Indexing to the CPI would have raised $5.3 billion.

Figure 38: Outcomes if Alabama Gas Tax had been Indexed

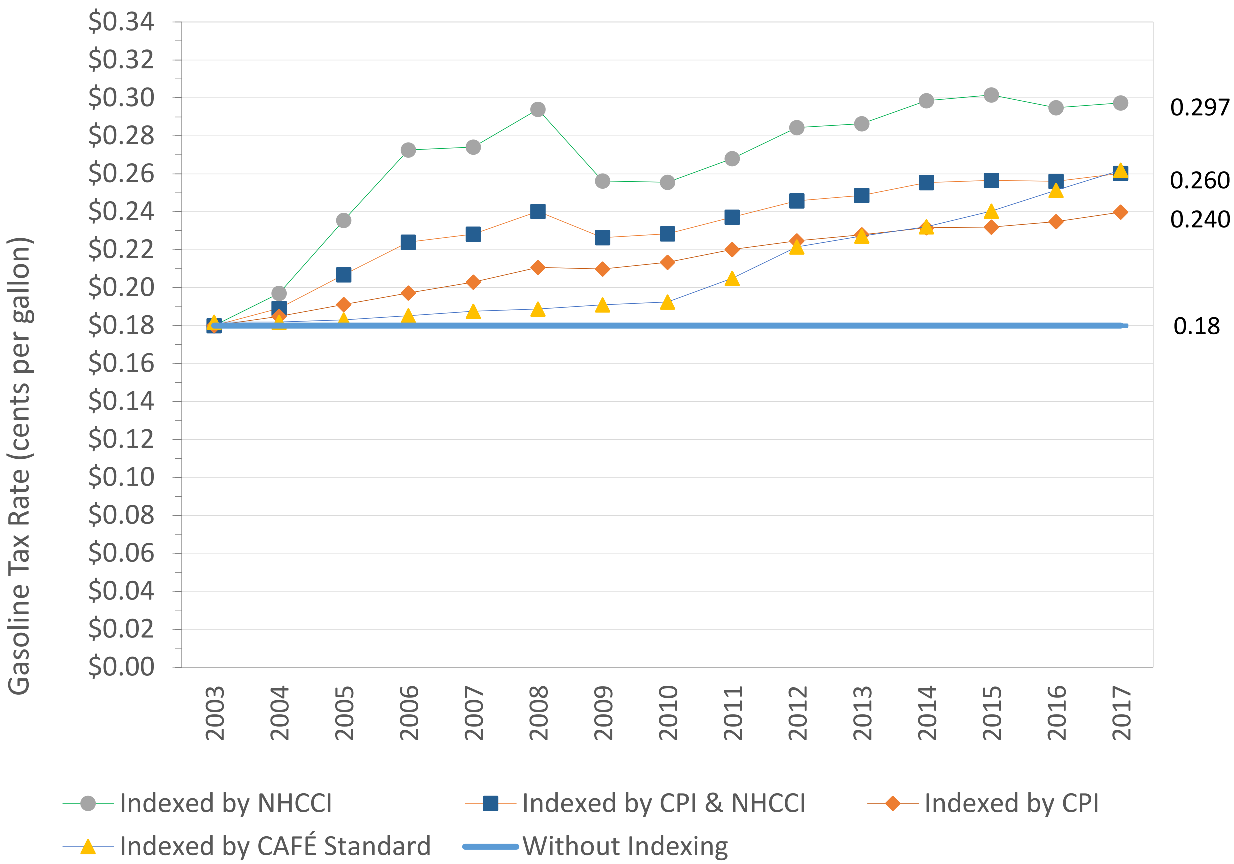
Index Method	2016 Tax Rate if index had been implemented beginning in 1992 (cents / gallon)		Additional revenues above base if index had been implemented 1992-2016 ($, million)	Additional revenues above base if index had been implemented 2003-2016 ($, million)*
	Gasoline	Diesel		
Current rate – no index	18	19	$0	
CPI	31	33	$5,285	$1,449
NHCCI	29	31	N/A	$3,914*
CPI & NHCCI average	26	27	N/A	$2,410*
CAFE Standards	25	27	$1,266	

Source: ATI

*Note: The NHCCI was started in 2003. Revenues that would have been raised by indexing to NHCCI and CPI/NHCCI is for the period 2003-2016, whereas the revenues raised by indexing to CPI and CAFE is for the period 1992-2016.

If indexed in 1992 by the CPI, gas taxes would have risen slowly and steadily. The NCCHI was not established until 2003; its rise has been more volatile but the rate using its index today would be less than the CPI (Figure 39).

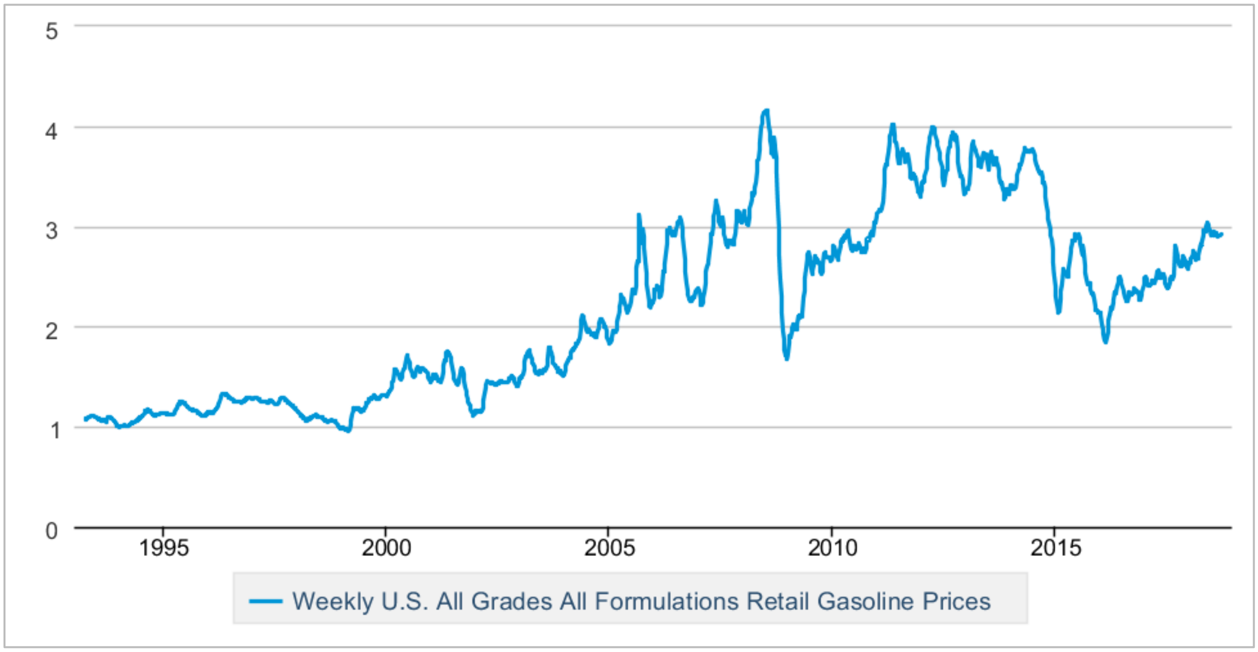
Figure 39: Comparison of Fuel Indexing Scenarios (Changes in Gas Tax Rate)



Source: ATI

Seven states have a ceiling on how much the tax can vary and 10 have a floor. A gas tax index implementation may include upper/lower bounds provisions to insulate the consumer from price volatility (Figure 40).

Figure 40: Weekly US All Grades All Formulations Retail Gasoline Prices (Dollars per Gallon)



Source: US Energy Information Administration

4.5 Working Group Discussions

Legislative leadership established working groups of stakeholders to address a wide range of issues and identify possible paths forward. 165 participants representing 78 entities joined Legislators and staff from four universities in discussing possibilities. Meetings continue as of this writing, but the groups and their discussion points focus on these items:

Physical Infrastructure, Safety, and Intermodal Facilities

1. Ensuring state, county, and municipal agencies' stewardship of taxpayer money in terms of roadway cost, performance, and life
2. Improving safety – reducing crashes and their outcomes
    a. Fatalities, injuries, property damage
    b. Economic and societal losses
3. Building a system that reflects our aspirations
4. Providing adequate revenues for transportation
5. Improving rural accessibility and mobility, including access to opportunities

Ports and Inland Waterways

1. The Legislature should consider establishing a grant program for the State's waterway ports, both public and private to fund the development and improvement of port and waterway facilities
    a. Minimum of $10 million annually
    b. Eligible projects must have a benefit-to-cost ratio greater than one, and generate a rate of return to the State of at least 2 percent
    c. Grant recipient is responsible for funding, as a minimum, 10 percent of project cost
    d. Program administered by the Alabama State Port Authority
    e. An Advisory Board should be appointed that has a majority of its representation made up of primarily representatives of the ports to provide recommendations to the grant administrator

Technology Considerations

1. Automation
    a. Vehicle operations
    b. Infrastructure operations
    c. Infotainment
2. Efficiency
    a. Individual
    b. Societal (system level)
3. Concerns
    a. Distraction
    b. Complacency
    c. System vulnerability
    d. Disruptive technologies
    e. Hybrid and electric vehicles – implement an annual registration fee
    f. Ownership
4. Safety and security
5. Transition from current legacy environment to connected/automated vehicles
6. Demand and supply considerations (public agencies, businesses, individuals)

Transportation Revenues, Standardization and Resource Allocation

1. City/County split of fuel tax (no consensus currently exists)
2. Collection standardization
3. Initial increase in the excise tax for both gasoline and diesel.
4. A perpetual index with a combination of Consumer Price Index (CPI) and the National Highway Construction Cost Index (NHCCI) initially, moving to CPI after a number of years.
5. A floor and ceiling, either at the initial excise increase or after a set time period, depending on how the index is calculated and expected to increase/decrease.
6. A set amount (~$10m) dedicated to port funding from the diesel excise in order for the Alabama Port Authority to draw down significant federal investment for the widening of the Mobile Port.
7. Reforming the Joint Transportation Committee to include, but not limited to, mandatory affirmation of ALDOT's 5 year plans, continuous oversight of permitting regulations, construction policy and costs, and guidance on future projects.
8. Create an advisory council made up of industry and business members to provide expertise to the members of the Joint Transportation Committee
9. Create a scheme of fees for hybrid and electric vehicles
10. Work throughout the Session and Quadrennium to find avenues to move road and bridge fund monies out of the General Fund

Transportation Policy

- Accountability, Sustainability, Fairness in Distribution
- There is a cost if we do nothing
- Greater transparency and accountability

5 Possible Future Scenarios

One of the key questions this report seeks to answer is, "How much does Alabama need to be spending on surface transportation?" The answer is, "It depends. What kind of system performance and condition do we want?" In other words, how much extra travel time are we willing to tolerate? How many potholes can we handle? How many school bus trips and travel miles to avoid low-load capacity bridges are too many? The level of spending is driven by the answers to these kind of fundamental travel concerns. Note: This section covers the period 2010 to 2040. Unless otherwise noted, estimates of cost and revenue are for the entire 30 year period.

5.1 Mobility Scenarios

Instead of providing one answer to the "what should we spend?" question, this report outlines investment options that provide a range of service levels and their attendant costs and benefits. Taxpayers and decision-makers should consider how they wish to pay for transportation costs. The taxes and fees represent one cost, but the extra travel time, wasted fuel in stop-and-go-conditions, added vehicle maintenance and operating costs, and missed meeting and family gathering time also have some cost implication.

ATI developed cost estimates built around a framework of five scenarios provided by legislative leadership. ATI later added two scenarios to refine the options, as no single scenario outcome best meets the needs. The initial five mobility scenarios are outlined below:

Maintain 2016 Congestion Level: The state will invest sufficient capital to maintain the urban and rural congestion levels that were experienced in 2016. Your morning and evening commute would take about as long as it does now; it will not get better – but it will stop getting worse.

Best Among Southeastern States: This scenario assumes the state desires to have a surface transportation system that is *equal to or better than* all states in the southeast. This also requires new capacity investment sufficient to achieve congestion levels equal or better than similarly sized metro areas in Arkansas, Florida, Georgia, Louisiana, Mississippi, South Carolina, Tennessee, and Texas.

Middle of Southeastern States: This scenario assumes a level of new capacity investment sufficient to achieve congestion levels equal to the *average* of states and similarly sized metro areas in Arkansas, Florida, Georgia, Louisiana, Mississippi, South Carolina, Tennessee, and Texas.

Current Trend – Business as Usual: The current level of annual investment by the state in new capacity is assumed to continue into the future. The amount of new annual capacity is the same during the analysis period; spending levels are adjusted to accommodate highway cost inflation.

Invest in Maintenance Only: Maintaining the existing system preserves the investment in highways and bridges; these expenses are less than the cost of rebuilding the network elements after they have failed. Once the existing system expansion projects are finished and the committed construction projects are completed, no new added capacity projects would be undertaken. All other expenditures for roadway transportation would be dedicated to maintenance.

Figures 41-52 show the scenario results for each of the 12 Alabama metro areas. The bottom (green) part of each column represents the cost of new capacity for the period 2010 to 2040. The top (red) part of each column represents the congestion cost over the 2010 to 2040 period associated with the scenario. The number above each column reflects the annual hours of delay associated with each scenario in 2040 – in other words, the hours of extra travel time that each commuter will experience over the course of a year.

In Figures 41-52 the relationship between the performance of transportation system and the amount of money invested in the system becomes readily apparent.

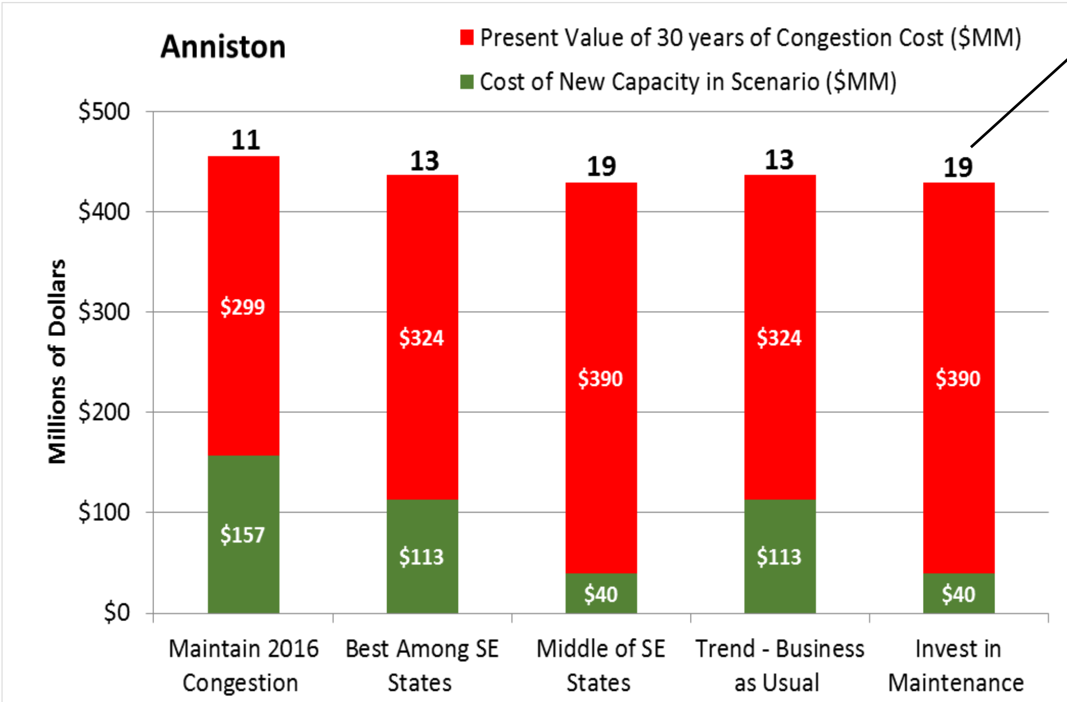
For example, in Anniston, under the "Middle of SE States" scenario, the total cost of improvements over the period from 2010 to 2040 is estimated to be $40 million, while the congestion cost paid by commuters in the area is estimated to be $390 million. Consequently, the total scenario cost "paid" by all commuters in the area is $430 million over the 30-year period ($40M + $390M). Further, under this scenario, a commuter can expect to spend an estimated 19 hours of extra travel time in 2040 compared to 11 hours in 2016.

Personal delay is the extra travel time to make a trip in congested conditions. The cost of personal delay represents the median wage rate of the area multiplied by average vehicle occupancy plus the cost of reduced fuel efficiency due to stop and go traffic.

Commercial delay is the extra travel time for freight vehicles in congested conditions. The cost of commercial travel time includes the cost of the driver's wages and benefits multiplied by average vehicle occupancy, fuel, insurance and other vehicle operating costs.

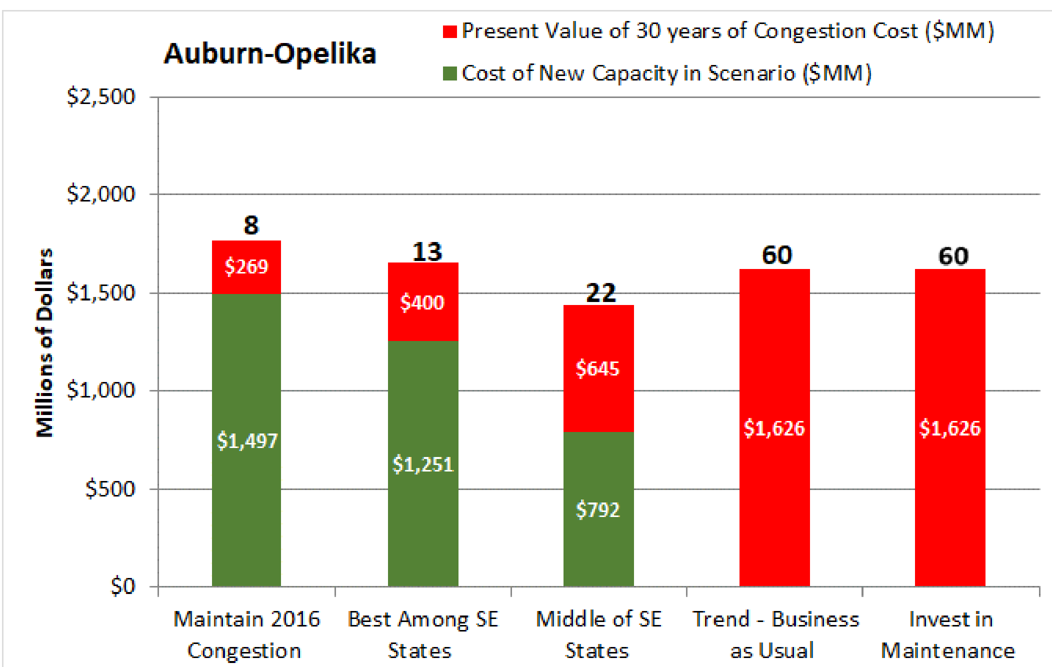
It should be noted that the Invest in Maintenance scenario also adds $40 million in new capacity. The resulting delay value (19 hours) is better than needed to meet the Middle of SE States goal. This also occurred in a few scenarios in other metro regions.

Figure 41: Present Value of Congestion and Cost of New Capacity - Anniston



The number above each column reflects the annual hours of delay associated with each scenario in 2040 – in other words, the hours of extra travel time that each commuter will experience over the course of a year.

Figure 42: Present Value of Congestion and Cost of New Capacity - Auburn-Opelika



Note: No new capacity projects are currently programmed and, as a result, none are included in the "Current Trend – Business as Usual" and "Invest in Maintenance Only" scenarios.

Figure 43: Present Value of Congestion and Cost of New Capacity - Birmingham

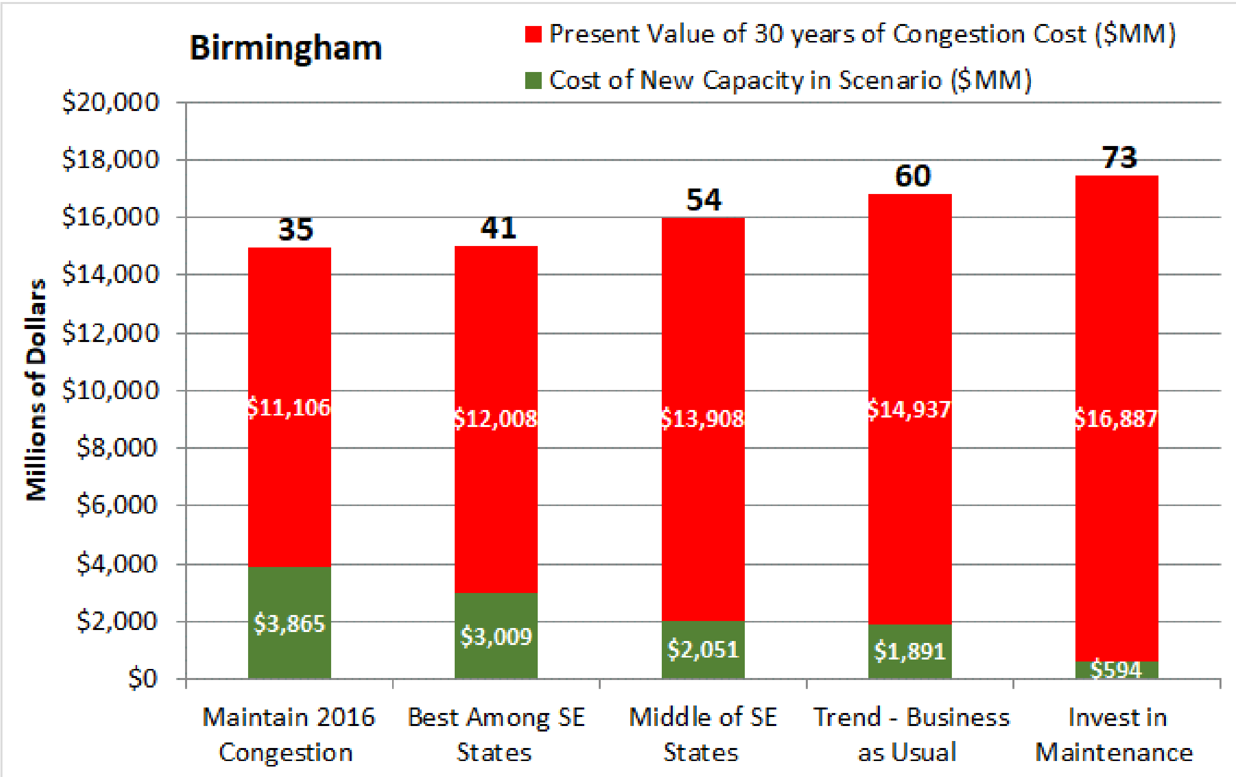


Figure 44: Present Value of Congestion and Cost of New Capacity - Decatur

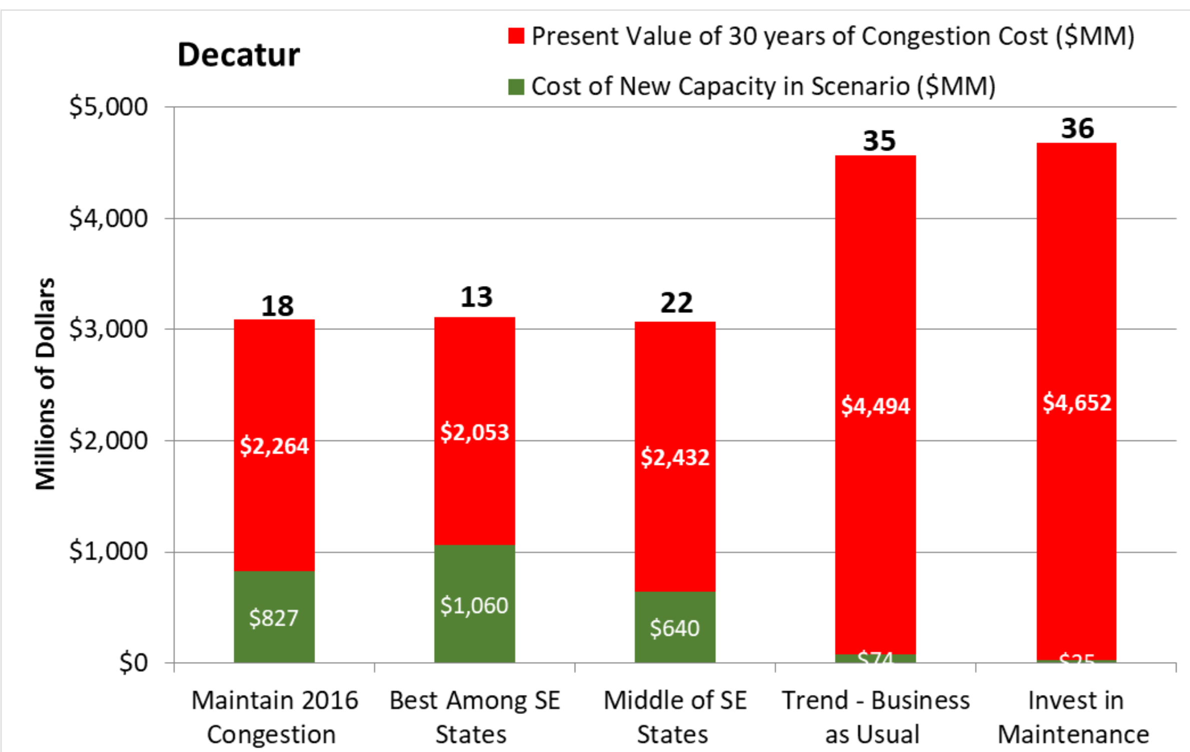
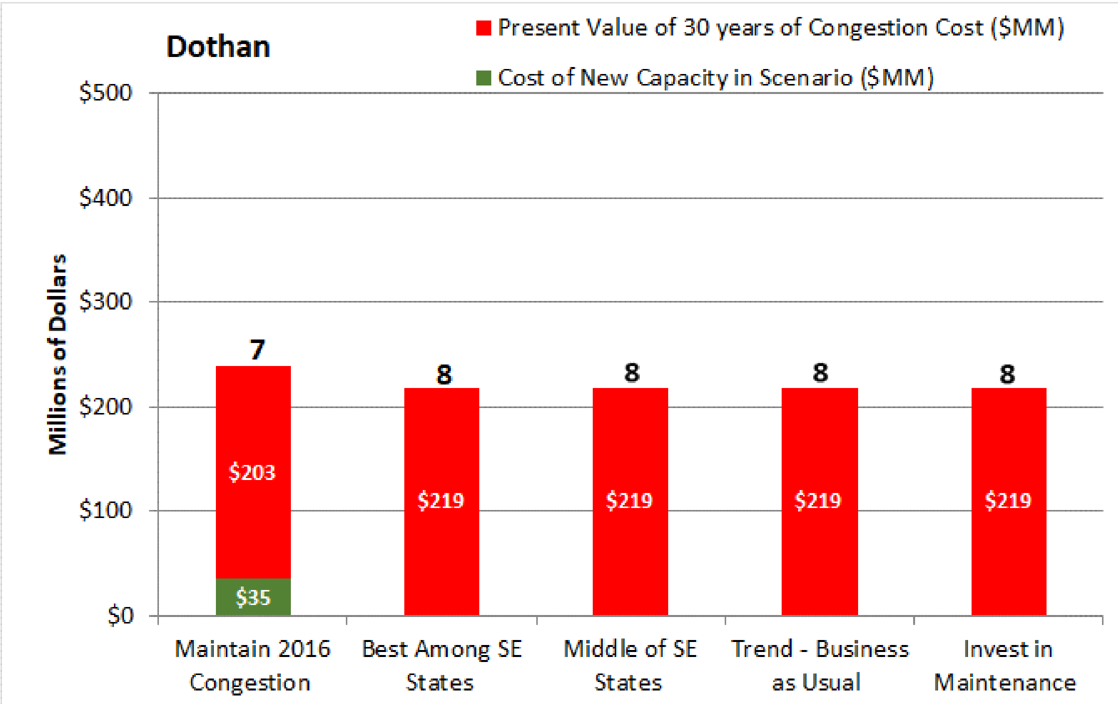


Figure 45: Present Value of Congestion and Cost of New Capacity - Dothan



Note: No new capacity projects are currently programmed and none is required except under the "Maintain 2016 Congestion Level" scenario.

Figure 46: Present Value of Congestion and Cost of New Capacity - Eastern Shore

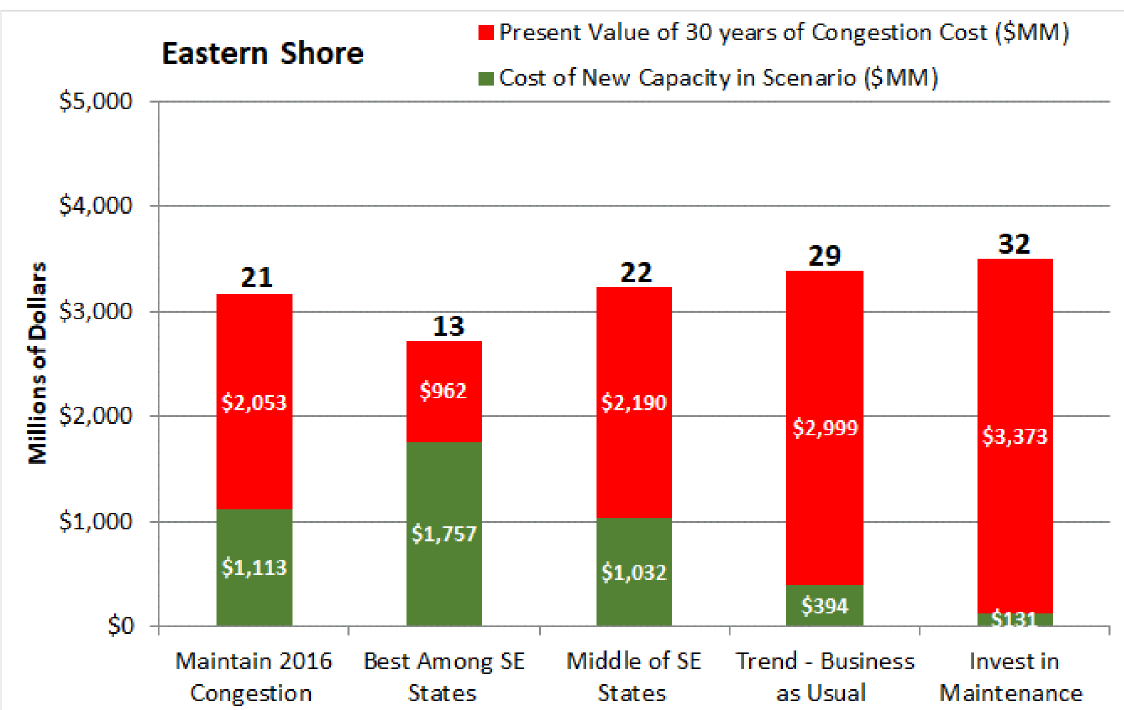


Figure 47: Present Value of Congestion and Cost of New Capacity - Gadsden

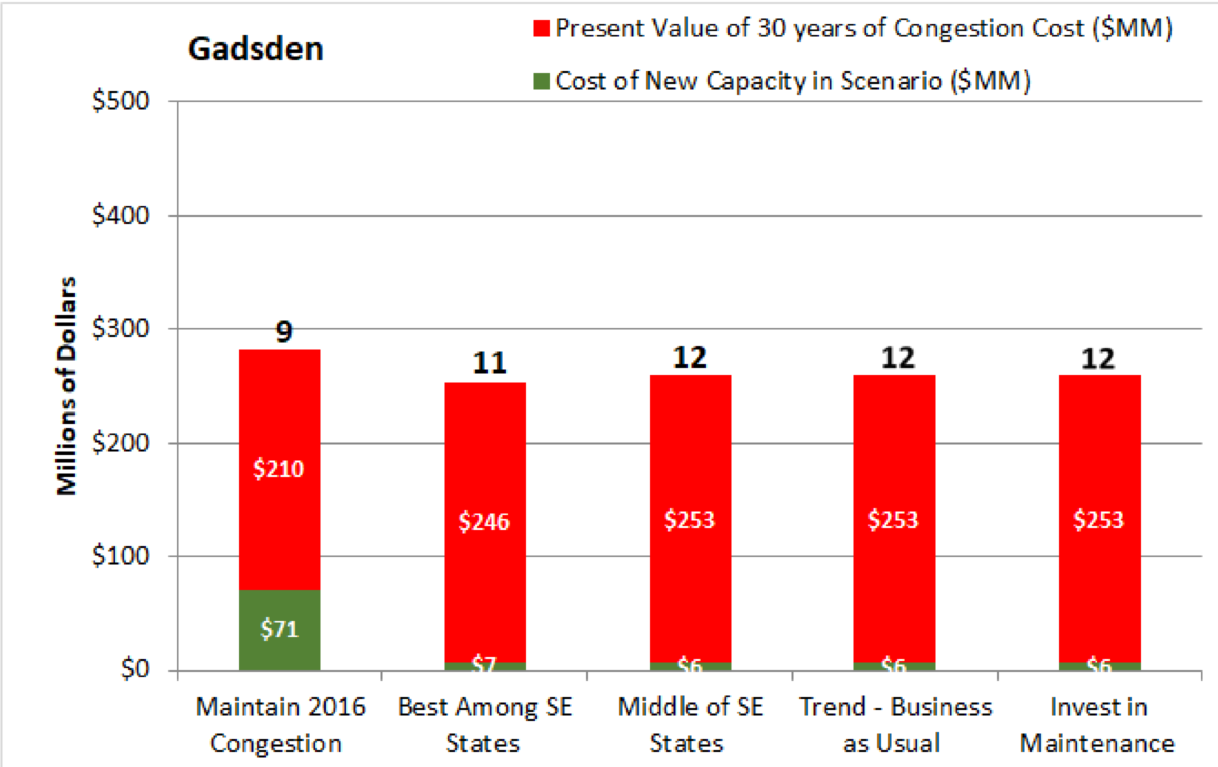


Figure 48: Present Value of Congestion and Cost of New Capacity - Huntsville

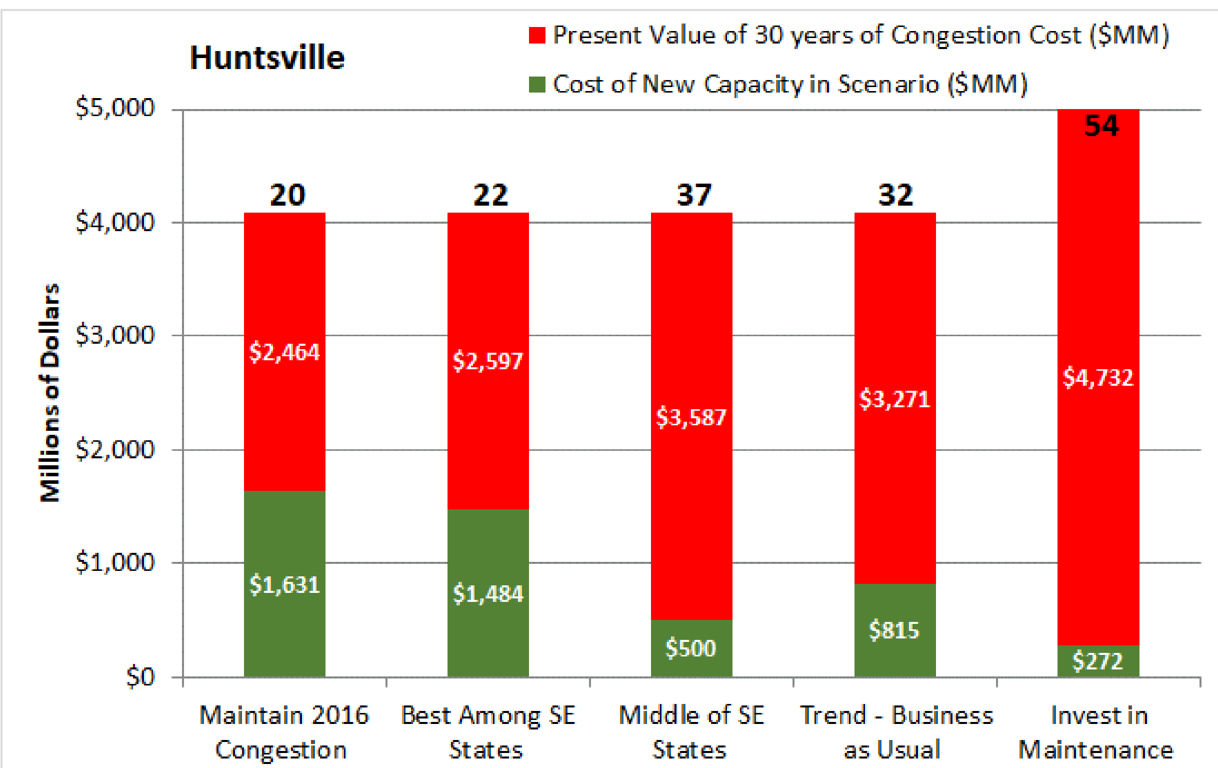


Figure 49: Present Value of Congestion and Cost of New Capacity - Mobile

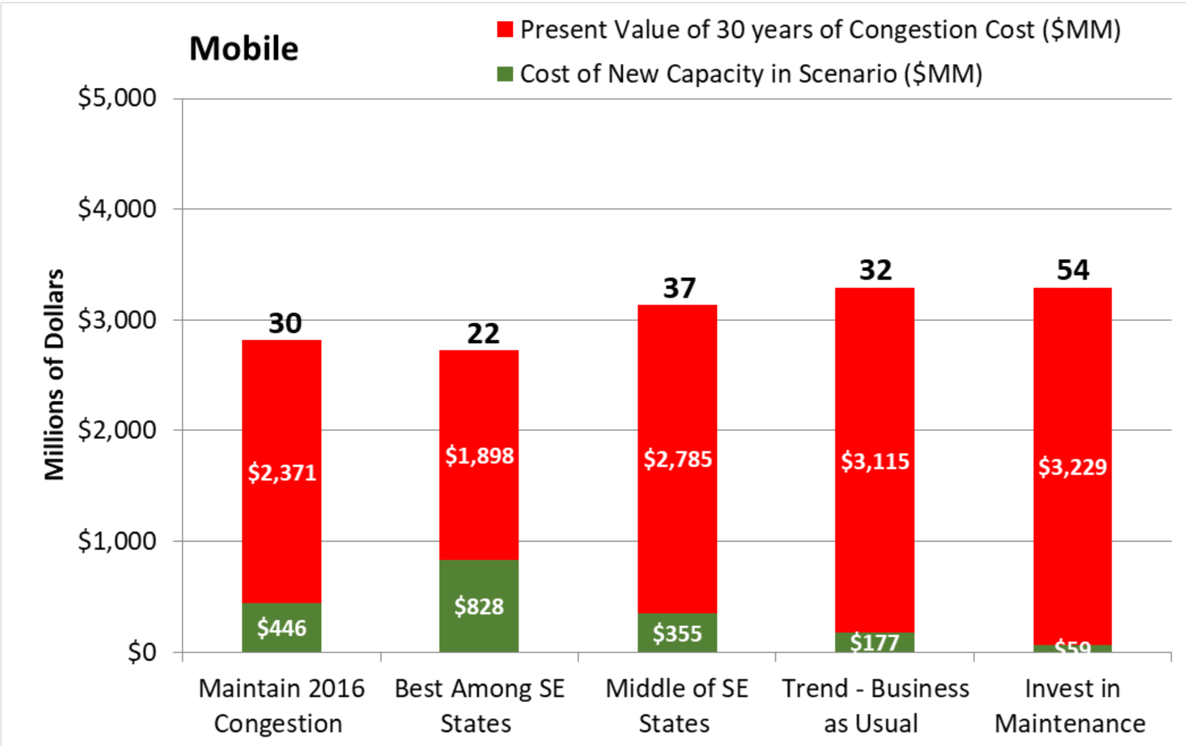


Figure 50: Present Value of Congestion and Cost of New Capacity - Montgomery

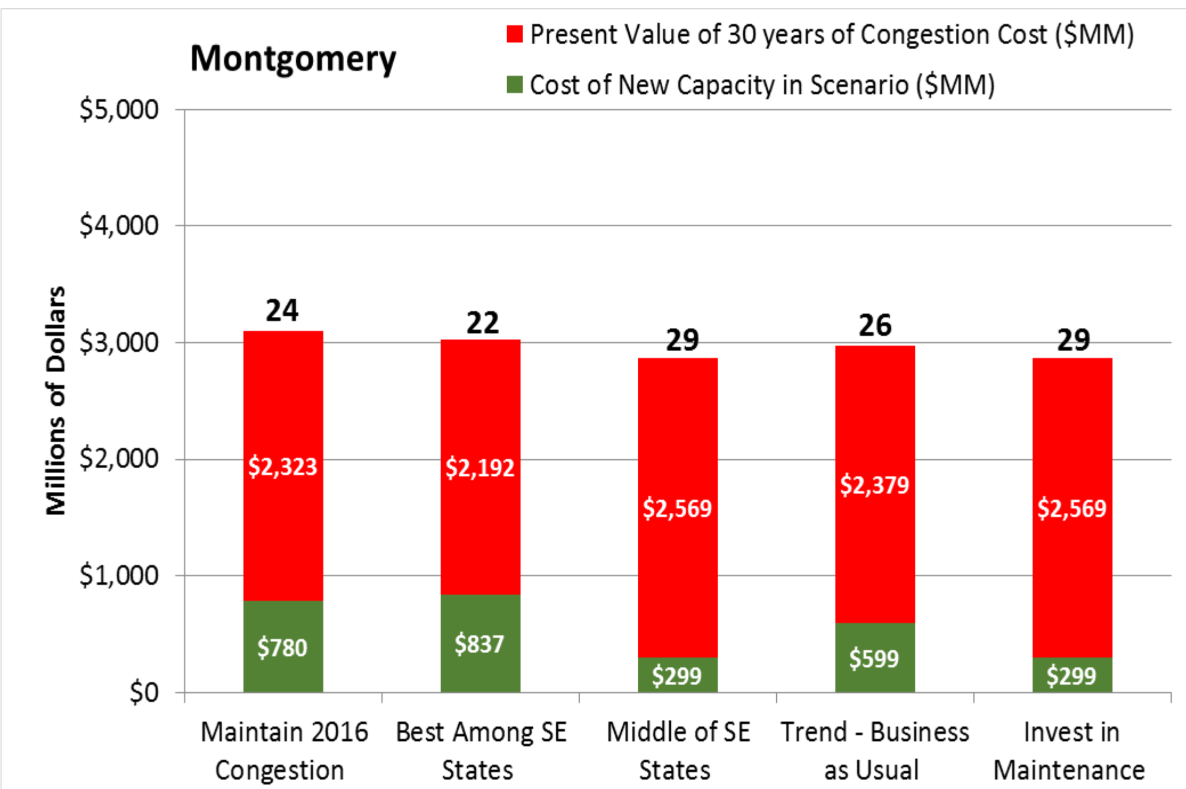


Figure 51: Present Value of Congestion and Cost of New Capacity - Shoals

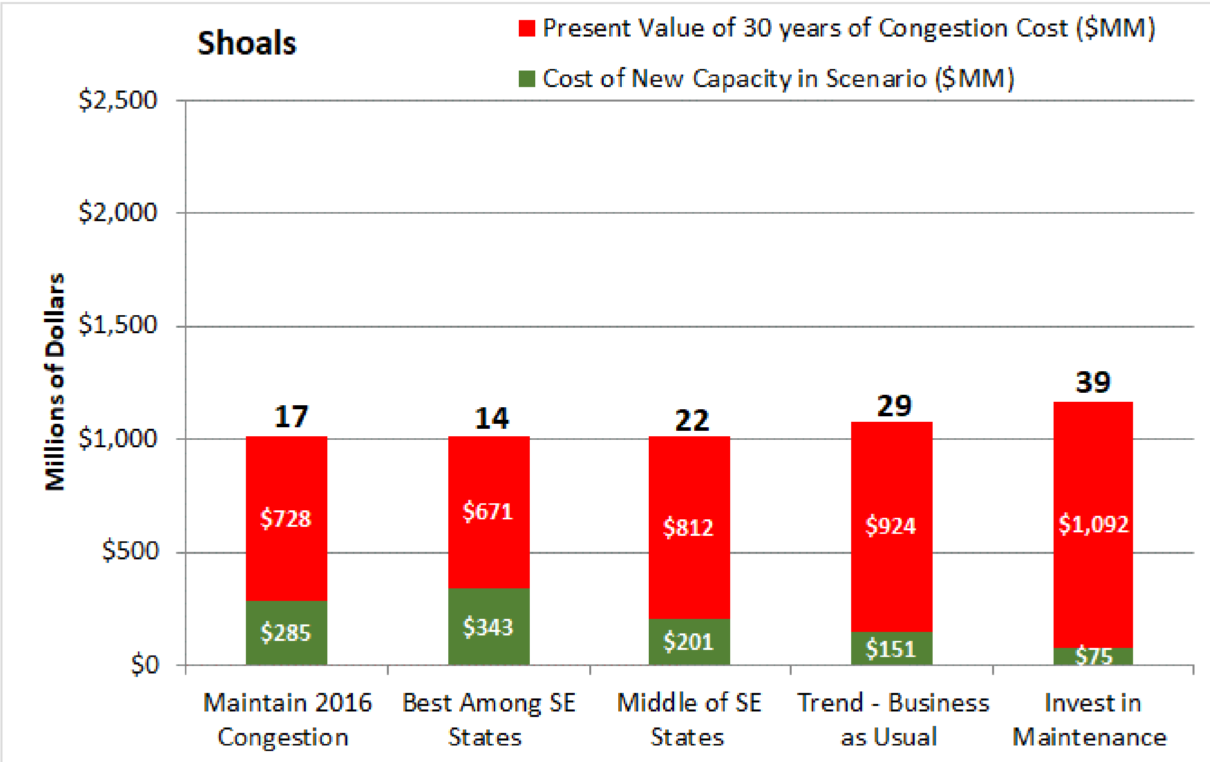
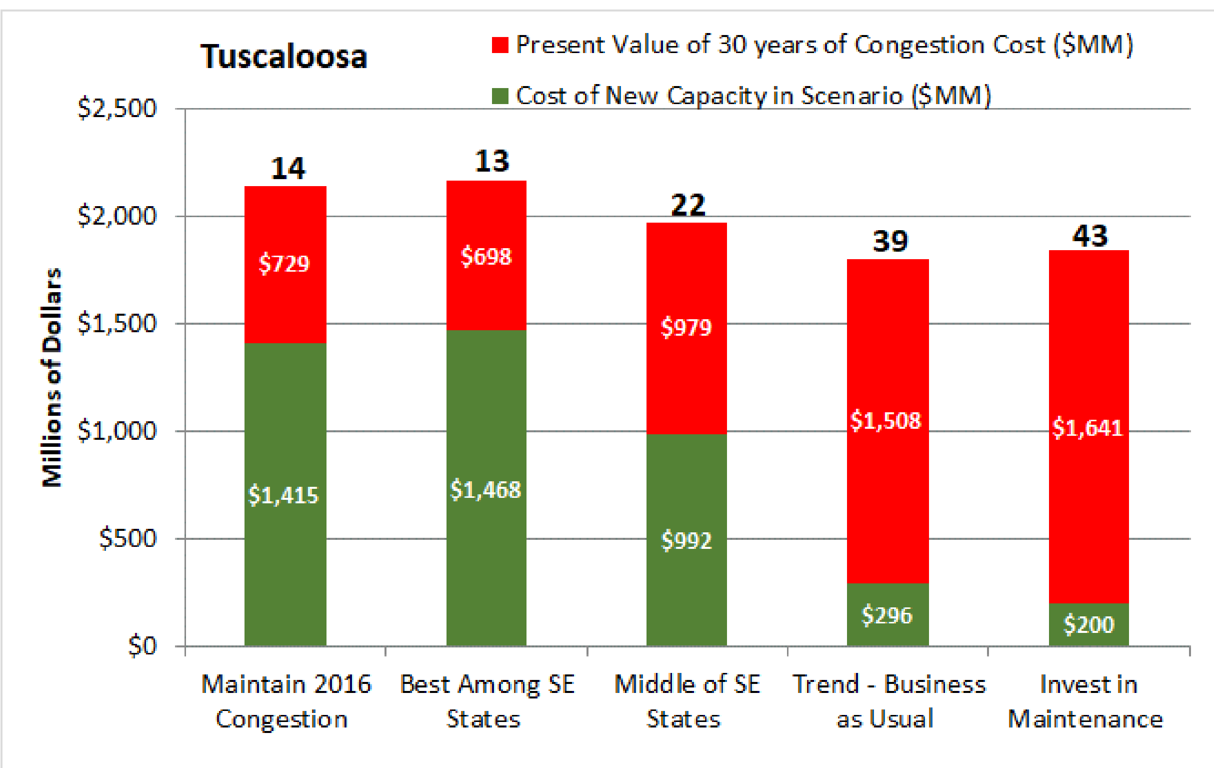


Figure 52: Present Value of Congestion and Cost of New Capacity - Tuscaloosa



Two additional alternatives were added to the initial scenarios to improve the choice set – these recognize there is no one "best" answer for all Alabama metro regions. A variety of combinations are possible; the following scenarios represent different balance points between **investing in solving** the problem and the **cost of living with** the problem.

Optimum Conditions Alternative: For each metro region, the option with the best congestion conditions was chosen unless the cost to obtain that congestion level exceeded the benefits. In most regions, this was the Maintain 2016 Congestion Level scenario.

Minimum Cost Competitive Alternative: Based on qualitative and quantitative analyses, this alternative answers the question, "What is the least amount of money that can be invested in new capacity and still allow the state to be economically competitive?" The investment option that appear to provide the greatest return in terms of improved mobility relative to the cost to achieve that improvement was selected from the five options in each region. The results are split equally between the "best of" and "middle of" scenarios, with two regions using the "business as usual" trend scenario (Figure 53). The scenarios appearing in Figure 53 are Best Among SE States, Maintain 2016 Congestion, Trend - Business as Usual, and Middle Among SE States.

Figure 53: Metro Area Scenario Comparisons

Metro Area	Optimum Alternative	Hours of Delay	Baseline Delay	Reduction in Hours of Delay	New Capacity Cost (millions)	Congestion Cost (millions)	Total Cost (millions)
Anniston	Best Among SE	13	19	6	$113	$324	$437
Auburn	Maintain 2016	8	60	52	$1,497	$269	$1,766
Birmingham	Maintain 2016	35	73	38	$3,865	$11,106	$14,971
Decatur	Best Among SE	13	36	23	$1,060	$2,053	$3,113
Dothan	Maintain 2016	6	8	2	$35	$203	$239
Eastern Shore	Best Among SE	13	32	19	$1,757	$962	$2,720
Gadsden	Maintain 2016	9	12	3	$71	$210	$281
Huntsville	Maintain 2016	20	54	34	$1,631	$2,464	$4,096
Mobile	Best Among SE	22	45	23	$828	$1,898	$2,726
Montgomery	Best Among SE	22	29	7	$837	$2,192	$3,029
Shoals	Best Among SE	14	39	25	$343	$671	$1,014
Tuscaloosa	Best Among SE	13	43	30	$1,468	$698	$2,166
All		15.7	37.5	21.8	$13,505	$23,051	$36,556
Metro Area	**Minimum Competitive**	**Hours of Delay**	**Baseline Delay**	**Reduction in Hours**	**New Capacity**	**Congestion Cost**	**Total Cost**
Anniston	Best Among SE	13	19	6	$113	$324	$437
Auburn	Middle Among	22	60	38	$792	$645	$1,437
Birmingham	Best Among SE	41	73	32	$3,009	$12,008	$15,017
Decatur	Middle Among	22	36	14	$640	$2,432	$3,072
Dothan	Best Among SE	8	8	0	$0	$219	$219
Eastern Shore	Best Among SE	13	32	19	$1,757	$962	$2,719
Gadsden	Best Among SE	11	12	1	$7	$210	$217
Huntsville	Trend - Business	32	54	22	$815	$3,271	$4,086
Mobile	Trend - Business	43	45	2	$177	$3,115	$3,292
Montgomery	Middle Among	29	29	0	$299	$2,569	$2,868
Shoals	Middle Among	22	39	17	$201	$812	$1,013
Tuscaloosa	Middle Among	22	43	21	$992	$979	$1,971
All		23.2	37.5	14.3	$8,802	$27,546	$36,348

Source: ATI

Notes: Hours of Delay are per commuter per year by 2040. Baseline Delay reflects what the delay would be if no action is taken (Do Nothing scenario). New Capacity Cost is the present value cost to the state for construction of additional lanes over 30 years. Congestion Cost is the present value cost to the consumer of delay.

Note that the aforementioned estimates only take into account Alabama's 12 MPOs. The MPOs account for about 75 percent of the state's population. In order to account for the entire population of the state, the new capacity costs were estimated based on commensurate investments on a per capita basis across the state. These are reflected in the rest of this report.

5.2 What Does it Cost and What are the Benefits?

The scenarios provide a range of comparisons between congestion and new capacity costs for each metro region. The goal is to achieve the best performance from a system at a price that Alabamians are willing to pay. "Payment" comes in two forms: 1) taxes, fees, tolls, etc. and 2) expenses related to the inconvenience from slow speeds, travel time unreliability and wasted fuel due to slow speeds. Combined costs (cost to the transportation agencies and cost to the consumer) ranges from $38.83 billion (Optimum Conditions scenario) to $42.97 billion (Maintenance Only scenario) (Figure 54).

Figure 54: Capacity and Congestion Costs

Scenario	TOTAL COST OVER 20 YEARS ($ Billions)		
	New Capacity Cost	Congestion Cost	Total Cost
Maintain 2016 Congestion Level	$16.13	$25.00	$41.13
Best Among Southeastern States	$16.27	$24.30	$40.57
Middle of Southeastern States	$9.20	$30.80	$40.00
Current Trend - Business as Usual	$6.00	$36.00	$42.00
Invest in Maintenance Only	$2.27	$40.70	$42.97
Optimum Conditions Alternative	$15.73	$23.10	$38.83
Minimum Cost Competitive Alternative	$11.73	$27.50	$39.23

The US Bureau of the Census estimated that Alabama had about 1.86 million households (2013 to 2017). These data were used to determine the annual and monthly cost of *new capacity* improvements to the average Alabama household under each of the investment scenarios described above. These are summarized in Figure 55.

Figure 55: Cost of Improvements per Household

Scenario	Average Annual Additional Household Cost	Average Monthly Additional Household Cost
Maintain 2016 Congestion Level	$434	$36
Best Among Southeastern States	$438	$37
Middle of Southeastern States	$248	$21
Current Trend - Business as Usual	$162	$13
Invest in Maintenance Only	$61	$5
Optimum Conditions Alternative	$424	$35
Minimum Cost Competitive Alternative	$316	$26

What is the Cost of Doing Nothing?

Often, when faced with a problem that will take money to solve, we assume the cost of not addressing the problem is zero. Most often, that is not the case. For example, we might need a new roof on our house. For a while, we can postpone the spending. But, ultimately, if we do nothing, the solution will involve more than a new roof (e.g., replacing furniture, appliances, clothes, etc.) and at considerably greater cost. So it is with roadways. If investments in maintenance are not made on a timely basis, the required repairs become more extensive (and expensive). But that's only one part of the story.

An inadequate roadway system that results in excessive delay ultimately becomes a problem not only for commuters, but also for businesses. If transportation costs increase because of traffic congestion, if the system is unreliable, the results are increased costs from several sources:

- Commuters pay more for fuel due to inefficient operations in stop-and-go conditions.
- Travelers have longer journey times and must allow more time for trips due to unreliable conditions.
- Businesses must spend more to serve the same area – larger vehicle fleets and more staff – and pay more to employees to get them to suffer the congested conditions.

These effects and others can place an entire region at a competitive disadvantage relative to other areas resulting in the loss of jobs, income and tax revenue.

The presence of a good transportation system is consistently one of the top three requirements businesses look for in a city. If that type of system is not present, the area will not be competitive for acquiring new jobs. In deciding to select Ridgeville, South Carolina for their first U.S. manufacturing facility, Volvo placed a priority on transportation infrastructure, highlighting the Interstate road network and proximity to the Port of Charleston.

Every other scenario was measured against the "Invest in Maintenance Only" as a way to measure the economic impact of improved mobility. Further, the cost of delay and increased operating costs for trucks associated with commercial trucks was assumed to be costs either passed on to consumers in the form of higher prices or absorbed by company as a loss of income. Next, the effect of the reduced income was calculated using a series of input-output models tailored to each specific metropolitan area and the Alabama economy as a whole.

> Output is the value of all sales of goods and services. As sales increase, so do income and increased job opportunities.

When compared to the "Invest in Maintenance Only" scenario, spending the required funds to have a system that maintains 2016 congestion levels would help support an estimated 59,558 jobs, with a combined income of $2.98 billion, and contributing $9.77 billion to the economy. The two combination alternatives provide two more points along the decision line with the optimum conditions alternative creating the most jobs and output and the minimum competitive alternative just below the Maintain 2016 Congestion Level option (Figure 56).

Mobility, Employment, and Income: Improved mobility creates jobs. The old saying, "time is money" is true. Reducing travel time through improved mobility helps reduce transportation cost for business. When a business' cost are reduced, profit increases. As businesses become more profitable they expand, creating more employment opportunities. As more income is paid to more employees, other job opportunities

Figure 56: Scenario Impact on Employment, Labor Income, and Output

Scenario	Employment	Labor Income (millions of $)	Output (millions of $)
Maintain 2016 Congestion Level	59,588	$2,980	$9,767
Best Among Southeastern States	64,175	$3,093	$10,184
Middle of Southeastern States	33,980	$1,604	$5,609
Current Trend - Business as Usual	12,973	$620	$1,853
Optimum Conditions Alternative	69,696	$3,400	$11,072
Minimum Cost Competitive Alternative	52,262	$2,539	$8,254

Finally, as noted earlier, increased congestion negatively affects business productivity as well as on a personal level in terms of reduced access to jobs, education and healthcare among other things. Conversely, improved mobility can have a positive impact on the economy. Assuming the status quo of completing the projects currently committed and then spending all state transportation funds on maintenance (the Invest in Maintenance Only scenario), Figure 57 shows the estimated total economic benefits associated with investing in additional capacity under each of the scenarios. The marginal cost for each scenario is the difference between the new capacity cost for the scenario and the new capacity cost for the Invest in Maintenance Only scenario. The Minimum Cost Competitive scenario provides the best ratio of economic impact to added capacity cost at 3.0. Both the Middle of Southeastern States and Optimum

Statewide economic impact is the increase in value-added as a result of increased economic output plus the multiplier effects associated with the income and spending of all the jobs created.

Conditions Alternative have ratios of 2.8. However, the latter alternative has double the marginal cost and double the economic impact. The Maintain 2016 Congestion Level and Best Among have ratios of 2.5 and 2.4 respectively.

Figure 57: Scenario Economic Impact and Marginal Capacity Cost

Scenario	TOTAL COST ($ Millions)		ROI (Economic Impact divided by Marginal Cost)
	Statewide Economic Impact	Marginal Capacity Cost	
Maintain 2016 Congestion Level	$33,305	$13,867	2.4
Best Among Southeastern States	$34,727	$14,000	2.5
Middle of Southeastern States	$19,127	$6,933	2.8
Current Trend - Business as Usual	$6,317	$3,733	1.7
Optimum Conditions Alternative	$37,755	$13,467	2.8
Minimum Cost Competitive Alternative	$28,145	$9,467	**3.0**

About Economic Impact

The cost of delay is often thought of as time and fuel cost – the value of the extra time it takes to get somewhere and the cost of the extra fuel that is used because a vehicle is operating in stop-and-go traffic instead of free-flow conditions. But, it's more than that. Those same extra time and fuel costs are incurred by delivery trucks, for example. When that happens, the delivery cost of the items on those trucks goes up, so consumers pay more money for them, leaving less money to be spent elsewhere, affecting demand for other items, so fewer of those items are produced, requiring fewer employees to make them – all of whom no longer earn a salary with which to buy things. That same process happens throughout the economy and the seemingly small, incremental cost of traffic congestion ends up having a huge impact. Nothing exists in a vacuum. Eventually, we all pay for traffic congestion.

Almost every item we purchase goes through various stages from raw material to finished product requiring people to perform tasks for which they are paid. Economic models (really, a series of inter-related equations) are used to measure the combined impact of changes in employment, income or production throughout the economy as a result of changes in demand. For example, a new cell phone becomes popular. Raw materials, machines and people are required to manufacture and distribute the new cell phones. All of these activities cause changes in employment, income and production across different sectors of the economy. Models help estimate the combined effect of these changes throughout the economy.

What About Our Rural Areas?

This section has spoken to mobility in Alabama's metropolitan areas, but the state's rural areas need transportation investment too. Unlike our metro areas where the primary issue is mobility, our rural areas face significant issues in terms of the quality of the roads and bridges as well as providing efficient access to the state's job centers. An adequate transportation system in rural areas is critical to accessing markets, for both the in- and out-flow of goods, as well as jobs, education, healthcare, and a host of other services. As noted elsewhere in this report, collision and fatality rates on our state's rural roads are of critical concern as well. Alabama's rural highways should provide a high-quality network between cities and towns, points of entry, tourism areas, ports and other vital destinations for people and freight. Rural road improvements should focus on projects that support the economic goals of the communities and the state. These improvements may include upgrades of state roadway standards to match Interstate roadway standards to gain the additional economic development benefits of being adjacent to a designated Interstate route.

Bridges have many of the same problems as pavements, but both consequences of the problem and the remedies are different. Unlike pavements, if a bridge fails its inspection, it is either closed or restricted to lighter-weight vehicles. These actions mean that heavy vehicles, such as cargo-carrying trucks or school buses, must be rerouted to roads and bridges that can handle their loads. As a result, these vehicles (with weights that are legal on other roads) travel longer distances to deliver goods and services, thereby increasing travel time and costs.

6 Conclusions

Over the past 25 years, the travel demand on the roads and bridges across Alabama has increased significantly, while there has only been a nominal increase in the extent (capacity) of the roads and bridges. Over the same period, the user experience (congestion, delays, detours, adverse safety outcomes) has deteriorated and the roads and bridges have aged significantly. The sources of revenues available to maintain, operate, and enhance these roads and bridges have remained largely unchanged during this period. Current transportation infrastructure revenue methods and streams are degraded due to inflation, increasing fuel efficiency, and fleet changes that reduce the number of vehicles paying into the system, erasing the additional purchasing power realized from the last gas tax increase (1992).

Participants in several working groups worked over the past year to develop consensus on a variety of approaches and related issues to best position Alabama for the next twenty years. This report summarizes the results of a few key scenarios for consideration by decision makers and stakeholders. Additional funding needed to address new capacity between now and 2040 ranges from $12 billion (minimum competitive scenario) to $16 billion (optimum scenario) and beyond. Put annually, these translate to an additional $600 million for the minimum competitive scenario or $800 million for the optimum scenario.

7 Acknowledgements

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