

**PAYING THE PRICE**  
**FOR INADEQUATE ROADS**  
**IN MICHIGAN**

THE COST TO MOTORISTS IN REDUCED  
SAFETY, LOST TIME AND INCREASED VEHICLE  
WEAR

MAY 2007

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## Executive Summary

Michigan's extensive network of roads and bridges allows the state's 10.1 million residents to safely and freely travel while enabling businesses to efficiently serve their customers. However, continued growth in Michigan's population and travel is straining the capacity of the state's transportation system and causing further deterioration.

As a result of increased use and a lack of adequate repairs, Michigan's system of roads and highways are deteriorated and urban congestion is worsening. Deteriorated roads and highways, a lack of some desirable roadway safety features and increasing traffic congestion are costing Michigan motorists in the form of accident costs, travel delays, wasted fuel and vehicle operating costs.

In addition, as Michigan's manufacturing, industrial and retail businesses become less dependent upon stockpiled inventories and more dependent on "just-in-time" delivery of goods and services, increasing levels of traffic congestion could impede economic development in the state.

Making needed improvements to Michigan's highway transportation system is key to providing a safer, smoother, more efficient roadway system that will save lives and decrease the amount of time and money wasted by motorists while improving the economic livelihood of the entire state.

This report looks at road and bridge conditions, traffic safety and congestion levels in Michigan, as well as the cost to motorists who drive on inadequate roads.

Sources of information for this study include the U.S. Department of Transportation (DOT), the Federal Highway Administration (FHWA), the U.S. Census Bureau, the National Highway Traffic Safety Administration (NHTSA), and the Texas Transportation Institute (TTI).

### **Key findings of the report include:**

**TRIP estimates that Michigan's roadways that lack desirable safety features, have inadequate capacity to meet travel demands or have poor pavement conditions cost the state's drivers \$7 billion annually in the form of costs related to traffic accident, lost time and wasted fuel as a result of traffic congestion and additional vehicle operating costs as a result of driving on deteriorated roads. TRIP estimates that the average cost of inadequate roadways is \$1,671 annually per driver in the Detroit metro area, \$1,085 annually per driver in the Grand Rapids area, \$866 annually per driver in the Lansing area, and \$785 per urban driver living elsewhere in the state.**

- Traffic crashes and fatalities in which roadway design was an important factor cost Michigan motorists approximately \$2.1 billion annually, including medical costs, lost economic and household productivity, property damage and travel delays. Annual costs of traffic crashes per driver are \$200 in the Detroit metro area, \$261 in the Grand Rapids area and \$321 in the Lansing area. The annual cost for urban Michigan drivers not residing in the three major urban areas is \$302.

- Traffic congestion in Michigan costs licensed drivers \$2.3 billion annually in delays and wasted fuel. Annual traffic congestion costs per driver are \$955 in the Detroit metro area, \$315 in the Grand Rapids area and \$135 in the Lansing area. The annual congestion cost for urban Michigan drivers not residing in the three major urban areas is \$120.
- Driving on roads in need of repair costs Michigan's motorists \$2.6 billion annually in extra vehicle operating costs, including accelerated vehicle depreciation, additional repair costs and increased fuel consumption and tire wear. Additional annual vehicle operating costs as a result of driving on deteriorated roads are estimated to be \$516 in the Detroit metro area, \$509 in the Grand Rapids area, \$410 in the Lansing area, and \$363 in other urban areas in Michigan.

**Steady population growth has resulted in increased vehicle travel on Michigan's transportation system, resulting in growing urban traffic congestion levels and longer commute times.**

- Michigan's population increased by 825,000 residents between 1990 and 2006, from approximately 9.3 million residents to 10.1 million residents.
- Annual vehicle travel in Michigan increased by 28 percent between 1990 and 2005, from 81 billion vehicle miles of travel (VMT) to 104 billion VMT. Vehicle travel in Michigan is projected to increase by another 25 percent by 2020, to 130 billion vehicle miles of travel.
- Thirty-nine percent of Michigan's urban highways were congested in 2006, the latest year for which data is available, carrying traffic volumes that resulted in significant rush hour delays. Urban traffic congestion in Michigan has increased since 2000, when 23 percent of the state's urban highways were considered congested.
- The average rush hour trip in the Detroit area takes approximately 38 percent longer to complete than during non-rush hour; 14 percent longer to complete in the Grand Rapids area than during non-rush hour; and five percent longer to complete in the Lansing area than during non-rush hour.
- By 2030, unless additional roadway capacity is added, rush hour travel in the Detroit area will take approximately 50 percent longer to complete than during non-rush hour – similar to the current traffic congestion levels in the San-Francisco-Oakland and Washington, DC areas.
- By 2030, unless additional roadway capacity is added, rush hour delays will double in both the Grand Rapids and Lansing areas, with rush hour travel taking approximately 28 percent longer to complete than during non-rush hours in the Grand Rapids area and 11 percent longer to complete in the Lansing area than during non-rush hours.

**Improving safety features on Michigan's roads and highways would result in a decrease in fatal traffic crashes.**

- On average, 1,235 people were killed annually in motor vehicle crashes in Michigan from 2001 through 2005.
- In 2005, there were 298 traffic fatalities in the Detroit urban area, 82 traffic fatalities in the Grand Rapids urban area and 54 traffic fatalities in the Lansing urban area.
- There are three key factors associated with fatal vehicle crashes: driver behavior, vehicle design and roadway design. It is estimated that roadway design is an important factor in one-third of fatal traffic crashes.
- Highway improvements such as adding lanes, removing or shielding obstacles, adding or improving medians, widening lanes, widening and paving shoulders, improving intersection design, and better road markings and traffic signals can reduce traffic fatalities and vehicle crashes.
- The Federal Highway Administration has found that every \$100 million spent on needed highway safety improvements will result in 145 fewer traffic fatalities over a 10-year period.

**Pavement conditions on 38 percent of Michigan's major roads are in poor or mediocre condition.**

- Approximately 15 percent of Michigan's major roads were rated in poor condition in 2005, the latest year for which data is available, and are in need of resurfacing or reconstruction. An additional 23 percent of the state's major roads were rated in mediocre condition in 2005.
- Roads rated poor are badly cracked or broken. In some cases, poor roads can be resurfaced, but often are too deteriorated and must be reconstructed.
- The Grand Rapids urban area has the highest share of deteriorated major roads among the state's three largest urban regions, with 34 percent of its major roads rated in poor condition in 2005. In the Detroit urban area, 32 percent of major roads are rated in poor condition and 24 percent of pavements are rated in poor condition in the Lansing urban area.

**The quality of a region's transportation system is an important factor in where many businesses and industries decide to locate, expand or downsize. A modern transportation system is of critical importance if the state is to capitalize on economic development opportunities.**

- Businesses have responded to improved communications and greater competition by moving from a push-style distribution system, which relies on low-cost movement of bulk commodities and large-scale warehousing, to a pull-style distribution system, which relies on smaller, more strategic and time-sensitive movement of goods.

- Every year, \$389 billion in goods are shipped annually from sites in Michigan and another \$407 billion in goods are shipped annually to sites in Michigan, mostly by truck.
- Seventy-eight percent of the goods shipped annually from sites in Michigan are carried by trucks and another seven percent are carried by courier services, which use trucks for part of the deliveries. Similarly, 83 percent of the goods shipped to sites in Michigan are carried by trucks and another nine percent are carried by courier services, which use trucks for part of their deliveries.
- Commercial trucking is projected to increase by 52 percent in Michigan by 2020.

## **Introduction**

Michigan's extensive network of roads and bridges allows the state's 10.1 million residents to safely and freely travel, while enabling businesses to efficiently serve their customers. However, Michigan's roads and highways are significantly deteriorated, do not include all desirable safety features, and are becoming increasingly congested.

Making needed improvements to Michigan's highway transportation system is critical to providing a safer, more efficient transportation network that will save lives and decrease the amount of time and money wasted by motorists, while improving the economic livelihood of the entire state. Significant road and bridge improvements throughout the state could serve to enhance economic development, ease congestion and foster a better quality of life for Michigan's residents and visitors. An increase in transportation funding would help Michigan undertake many critical road, bridge and public transportation projects.

This report looks at road and bridge conditions, traffic safety and congestion levels in Michigan, as well as the cost to motorists who drive on inadequate roads.

Sources of data for this study include the U.S. Department of Transportation (US DOT), the Federal Highway Administration (FHWA), the Texas Transportation Institute (TTI), the U.S. Census Bureau and the National Highway Traffic Safety Administration (NHTSA).

## **Population Growth, Travel Trends and Traffic Congestion**

Michigan residents enjoy modern lifestyles that rely on a high level of personal and commercial mobility. Population growth has resulted in increased traffic on the state's roads and

highways. Michigan's population is estimated at 10.1 million in 2006, up from 9.3 million in 1990 – an increase of approximately 800,000 residents.<sup>1</sup>

In addition to population growth, annual vehicle travel in Michigan increased by 28 percent from 1990 to 2005, from 81 billion vehicle miles of travel (VMT) to 104 billion vehicle miles of travel.<sup>2</sup> Based on population and other lifestyle trends, TRIP estimates that travel on Michigan's roads and highways will increase by another 25 percent by 2020, to 130 billion vehicle miles of travel.

Traffic congestion is a growing burden in Michigan's key urban areas and threatens to impede the state's economic development. Congestion on Michigan's urban highways is worsening as a result of steady increases in vehicle travel. In 2005, the latest year for which data is available, 39 percent of Michigan's urban highways (Interstates and other freeways) were congested, carrying traffic volumes that result in significant rush hour delays.<sup>3</sup> Urban traffic congestion has increased over the past several years. In 2000, 23 percent of Michigan's urban highways were considered congested.<sup>4</sup>

The average rush hour trip in the Detroit area takes approximately 38 percent longer to complete than during non-rush hour.<sup>5</sup> According to a recent report by the Reason Foundation, unless additional highway capacity is added, rush hour trips taken in the Detroit area in 2030 will take 50 percent longer to complete than during non-rush hour, similar to the current level of traffic congestion in the San-Francisco and Washington, DC, urban areas.<sup>6</sup>

In the Grand Rapids urban area, the average rush hour trip takes approximately 14 percent longer to complete than during non-rush hour. But, by 2030, unless additional highway capacity is added, travel delays in the area are projected to double, with the average rush hour trip taking 28 percent longer to complete than during non-rush hour. In the Lansing area, rush

hour trips currently take approximately five percent longer to complete than during non-rush hours. By 2030, unless additional highway capacity is added in the area, the average rush hour trip in the Lansing area is expected to take approximately 11 percent longer to complete during than during non-rush hours.<sup>7</sup>

## **Economic Impact of Michigan's Transportation System**

The efficiency of Michigan's transportation system, particularly its highways, is critical to the health of the state's economy. The advent of modern national and global communications and the impact of free trade in North America and elsewhere have resulted in a significant increase in freight movement, and consequently, the quality of a region's transportation system has become a key component in a business' ability to compete locally, nationally and internationally.

This tremendous increase in freight delivery is being fueled by improved communications and the need for greater competitiveness. Improved communications provided by the Internet are integrating producers, wholesalers, retailers and consumers. Businesses have responded to improved communications and the greater necessity to cut costs with a variety of innovations including just-in-time delivery, increased small package delivery, demand-side inventory management and by accepting customer orders through the Internet.

The result of these changes has been a significant improvement in logistics efficiency as firms move away from a push-style distribution system, which relies on large-scale warehousing of materials, to a pull-style distribution system, which relies on smaller, more strategic movement of goods. While the nation's economy has depended on low-cost movement of bulk

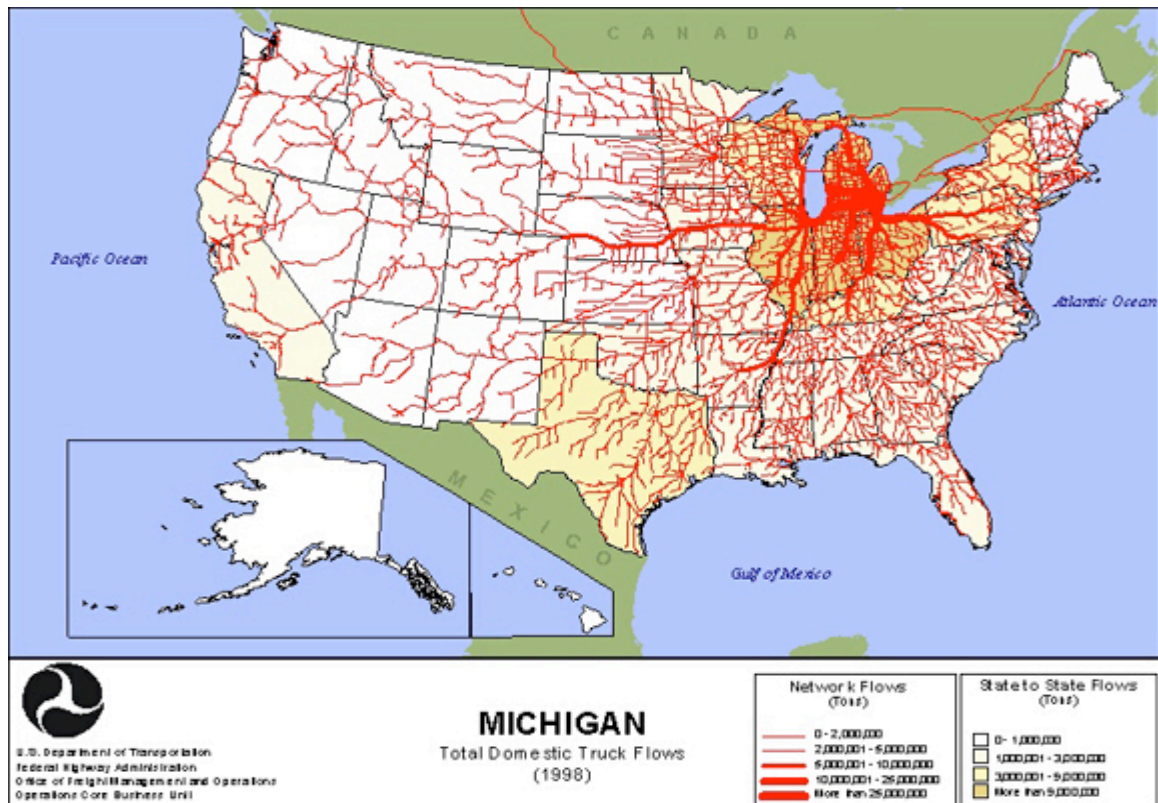
commodities, it increasingly requires the movement of high cost goods with a high level of reliability, and fast movement of smaller, more specialized goods.<sup>8</sup> The recent improvements in the nation's logistics systems have made mobile inventories the norm, resulting in the nation's trucks literally becoming rolling warehouses.

Trucking is a crucial part of Michigan's economy, as commercial trucks move goods from sites across the state to markets inside and outside the state. Because of this, commercial truck travel in Michigan will continue to increase. The Federal Highway Administration estimates that commercial trucking will increase by 52 percent in Michigan by the year 2020.<sup>9</sup>

Every year, \$389 billion in goods are shipped from sites in Michigan and another \$407 billion in goods are shipped to sites in Michigan, mostly by truck.<sup>10</sup> Seventy-eight percent of the goods shipped annually from sites in Michigan are carried by trucks and another seven percent are carried by courier services, which use trucks for part of their deliveries. Similarly, 83 percent of the goods shipped to sites in Michigan are carried by trucks and another nine percent are carried by courier services, which use trucks for part of their deliveries.<sup>11</sup>

The following map illustrates the truck freight traffic flows for products traveling to and from sites in Michigan, showing the volume levels along specific highways (indicated by the width of the route). The chart includes truck freight traffic flows for international and domestic freight movement, both imports and exports.

**Chart 1. Truck freight flow to and from Michigan.**



**Source: Office of Freight Management and Operations, Federal Highway Administration**

Because of the importance of transportation to the efficiency and success of many businesses, the level of access and the quality of a region's transportation system is critical to where businesses choose to locate and expand. Numerous firms cite reliable access to the Interstate highway system and other major routes as a major criterion in deciding where to locate and expand their operations.

A comprehensive 2002 Transportation Research Board report on the adequacy of U.S. freight movement capabilities found that a region's ability or failure to provide a transportation system that minimizes traffic congestion and provides reliable freight movement has a significant impact on whether jobs are created locally or are shifted elsewhere. The report found that "workplaces and residences will move away from congestion within metropolitan areas and from

more congested to less congested regions within the United States. Some production will move from the United States to other countries if congestion costs cause the United States to lose comparative advantage in some industries.”<sup>12</sup>

## **Condition of Michigan’s Roads**

The lifecycle of Michigan’s roads is greatly affected by the state's ability to perform timely maintenance to ensure that structures last as long as possible. The pavement condition of the state's major roads are evaluated and classified as being in poor, mediocre, fair or good condition. In 2005, the latest year for which data is available, 15 percent of Michigan’s major roads were rated in poor condition and 23 percent of the state’s major roads were rated in mediocre condition.<sup>13</sup> Roads rated poor are badly cracked or broken. In some cases, poor roads can be resurfaced, but often are too deteriorated and must be reconstructed. Major roads include all arterial roads, which are Interstate highways, freeways, and major routes connecting urban areas and major routes within cities.

The Grand Rapids urban area has the highest share of deteriorated major roads among the state’s three largest urban regions, with 34 percent rated in poor condition in 2005. In the Detroit urban area, 32 percent of major roads are rated in poor condition and 24 percent of pavements in the Lansing urban area are rated in poor condition.

**Chart 2. Pavement Condition of Major Roads in Michigan Urban Areas, 2005 (may not add up to 100 because of rounding)**

	<b>Detroit</b>	<b>Grand Rapids</b>	<b>Lansing</b>	<b>Michigan</b>
<b>Poor</b>	<b>32%</b>	<b>34%</b>	<b>24%</b>	<b>15%</b>
<b>Mediocre</b>	<b>37%</b>	<b>28%</b>	<b>26%</b>	<b>23%</b>
<b>Fair</b>	<b>6%</b>	<b>9%</b>	<b>19%</b>	<b>16%</b>
<b>Good</b>	<b>24%</b>	<b>29%</b>	<b>32%</b>	<b>46%</b>

**Source: TRIP analysis of Federal Highway Administration data**

Pavement failure is caused by a combination of traffic, moisture and climate. Moisture often works its way into road surfaces and the materials that form the road’s foundation. Road surfaces at intersections are even more prone to deterioration because the slow-moving or standing loads occurring at these sites subject the pavement to higher levels of stress. It is critical that roads are fixed before they require major repairs because reconstructing roads costs approximately four times more than resurfacing them.<sup>14</sup>

A desirable goal for state and local organizations that are responsible for road maintenance is to keep 75 percent of major roads in good condition.<sup>15</sup> In Michigan, 46 percent of the state’s major roads and highways are in good condition.<sup>16</sup>

### **Traffic Safety in Michigan**

There are three key factors associated with fatal vehicle crashes: driver behavior, vehicle design and roadway design. It is estimated that roadway design is an important factor in approximately one-third of fatal traffic crashes. In Michigan, 6,176 people were killed in motor

vehicle crashes from 2001 through 2005 – an average 1,235 traffic fatalities a year -- according to the National Highway Transportation Safety Administration.<sup>17</sup>

In 2005, there were 298 traffic fatalities in the Detroit urban area, 82 traffic fatalities in the Grand Rapids urban area and 54 traffic fatalities in the Lansing urban area.<sup>18</sup>

Improving safety on Michigan's roads and highway system can be achieved through further improvements in vehicle safety; improvements in driver, pedestrian, and bicyclist behavior; and a variety of improvements in roadway safety features. Roadway improvements such as adding lanes, removing or shielding obstacles, adding or improving medians, widening lanes, widening and paving shoulders, improving intersection design, and upgrading road markings and traffic signals can reduce traffic fatalities and vehicle crashes. The Federal Highway Administration has found that every \$100 million spent on needed highway safety improvements will result in 145 fewer traffic fatalities over a 10-year period.<sup>19</sup>

Roads that lack sufficient lanes, have sharp curves, or have inadequately designed intersections or interchanges pose greater risks to motorists, pedestrians and bicyclists. Nationwide, 76 percent of all fatal crashes occur on two-lane roads while only 14 percent of fatal crashes occur on roads with four or more lanes. In Michigan, 89 percent of major roads, excluding the Interstate, have two lanes.<sup>20</sup>

The following chart shows the correlation between specific needed road improvements and the reduction of fatal accident rates nationally.

**Chart 3. Reduction in fatal accident rates after needed roadway improvements<sup>21</sup>**

Type of Improvement	Reduction in Fatal Accident Rates after Improvements
New Traffic Signals	53%
Turning Lanes and Traffic Signalization	47%
Widen or Modify Bridge	49%
Construct Median for Traffic Separation	73%
Realign Roadway	66%
Remove Roadside Obstacles	66%
Widen or Improve Shoulder	22%

**Source: TRIP analysis of U.S. Department of Transportation data**

Because Michigan’s Interstate Highway System was built to meet higher roadway safety standards than other roads and highways in the state, it is significantly safer than other Michigan routes. The traffic fatality rate per 100 million vehicle miles of travel on Michigan’s interstate system in 2005 was 0.53. The fatality rate per 100 million vehicle miles of travel for non-interstate travel in Michigan in 2005 was 1.23.<sup>22</sup> The fatality rate per 100 million vehicle miles of travel on all roads in Michigan in 2005 was 1.09.

Many of the safety features that are included on most Interstates make them the safest network of routes in the state. Some of these features include access limited to interchanges, the separation of traffic from oncoming vehicles, gentler curves, paved shoulders and rumble strips.

While it may not be appropriate to build most state routes to interstate standards, applying some of the safety features of Interstate roads to non-interstate roads, when practical, would likely result in a reduction in the number of serious crashes and of traffic fatalities.

## **THE COST OF MICHIGAN'S INADEQUATE ROADS**

Many of Michigan's roads lack critical safety features, have significant deterioration or lack adequate capacity to accommodate travel demand. As motorists drive on substandard roads and highways, they incur increased costs in the form of reduced safety, increased vehicle wear and required vehicle maintenance, as well as wasted time and fuel.

### **The Cost to Motorists of Roads Lacking Optimum Safety Features**

Traffic crashes take a tremendous economic toll on a community, in addition to the suffering and grief that they cause to those injured or killed and their loved ones. In 2002 the U.S. Department of Transportation's National Highway Traffic Safety Administration (NHTSA) developed a methodology to estimate the costs of motor vehicle crashes, including medical costs, lost economic and household productivity, property damage and travel delays.<sup>23</sup>

TRIP estimates that roadway design is an important factor in one-third of traffic fatalities, based on an analysis of federal highway safety data. Using the methodology developed by NHTSA, TRIP estimates that the cost of traffic crashes in crashes where roadway design was a significant factor in Michigan is approximately \$2.1 billion per year in medical costs, lost economic and household productivity, property damage and travel delays. Annual costs of traffic crashes per driver are \$200 in the Detroit metro area, \$261 in the Grand Rapids area and \$321 in the Lansing area. The annual cost for urban Michigan drivers not residing in the three major urban areas is \$302.

## **The Cost to Motorists of Roads in Inadequate Condition**

TRIP has calculated the additional cost to motorists of driving on roads in poor or unacceptable condition. When roads are in poor condition, which may include potholes, rutting or rough surfaces, the cost to operate and maintain a vehicle increases. These additional vehicle operating costs include accelerated vehicle depreciation, increased vehicle repair costs, additional fuel consumption and more rapid tire wear.

TRIP estimates that driving on substandard roads costs Michigan a total of \$2.6 billion statewide. In the Detroit metro area, motorists pay an additional \$516 per year in extra vehicle operating costs because of deficient roads. Grand Rapids drivers pay an additional \$509 per year, while drivers in the Lansing area pay \$410 per year. In other areas, motorists pay \$363 per year in extra vehicle operating costs.

Additional vehicle operating costs have been calculated in the Highway Development and Management Model (HDM), which is recognized by the U.S. Department of Transportation and more than 100 other countries as the definitive analysis of the impact of road conditions on vehicle operating costs. The HDM report is based on numerous studies that have measured the impact of various factors, including road conditions, on vehicle operating costs.<sup>24</sup>

The HDM study found that road deterioration increases ownership, repair, fuel and tire costs. The report found that deteriorated roads accelerate the pace of depreciation of vehicles and the need for repairs because the stress on the vehicle increases in proportion to the level of roughness of the pavement surface. Similarly, tire wear and fuel consumption increase as roads deteriorate since there is less efficient transfer of power to the drive train and additional friction between the road and the tires.

TRIP's additional vehicle operating cost estimate is based on taking the average number of miles driven annually by a region's driver, calculating current vehicle operating costs based on AAA's 2006 vehicle operating costs and then using the HDM model to estimate the additional vehicle operating costs being paid by drivers as a result of substandard roads.<sup>25</sup> Additional research on the impact of road conditions on fuel consumption by the Texas Transportation Institute (TTI) is also factored into the TRIP vehicle operating cost methodology.

### **The Cost to Motorists of Congested Roadways**

Motorists waste time and fuel when roads and highways are congested. Slower traffic, particularly during the morning and evening rush hours, results in workers taking longer to reach work or get home and slows the movement of products and services. Based on travel trends, roadway capacity and population figures, TRIP estimated a per-motorist cost of congestion – which includes the cost of lost time and wasted fuel -- for the state of Michigan as well as the three major urban areas based on travel trends, roadway capacity and population figures.

TRIP divided the total regional traffic congestion cost by the number of licensed drivers in each region to determine congestion costs per licensed driver. TRIP estimates that congestion costs each Detroit area motorist an average of \$955 each year, while each driver in Grand Rapids pays an additional \$315. In the Lansing area, motorists lose \$135 per year in congestion related costs.<sup>26</sup> The average cost of traffic congestion in lost time and wasted fuel for Michigan drivers in other urban areas is estimated at \$120 per driver.<sup>27</sup> The traffic congestion cost to drivers in other urban areas of the state was determined by comparing urban freeway traffic levels in the state's largest urban areas with urban areas outside these regions. The total urban congestion cost for Michigan motorists is \$2.3 billion annually.

Michigan’s urban congestion cost estimates are based on data from the Texas Transportation Institute’s 2005 Urban Mobility report, which estimated congestion costs for the nation’s largest 75 urban areas. In order to estimate congestion costs, TRIP obtained FHWA traffic count data per lane mile and estimated traffic congestion based on TTI findings correlating traffic counts per lane mile with congestion costs to motorists.

### **Total Cost of Michigan’s Inadequate Roads**

Inadequate highways and roads cost Michigan’s motorists approximately \$7 billion every year because of additional traffic crashes, lost time, wasted fuel and increased wear and tear on their vehicles. The following is a breakdown of the annual total costs associated with driving on a roadway system that lacks optimal safety features and adequate capacity, and is in substandard condition.

**Chart 4. Total Annual Costs Due to Driving on Michigan’s Inadequate Roads**

<b>Safety</b>	<b>\$2.1 billion</b>
<b>Congestion</b>	<b>\$2.3 billion</b>
<b>Vehicle Operating Cost</b>	<b>\$2.6 billion</b>
<b>TOTAL</b>	<b>\$7.0 billion</b>

**Source: TRIP analysis of Federal Highway Administration data, National Highway Traffic Safety Administration data and Texas Transportation Institute data**

The following is a breakdown by urban areas of the annual costs per driver associated with driving on a roadway system that lacks optimal safety features and adequate capacity, and is in substandard condition.

**Chart 5. Annual Costs per Driver Due to Driving on Michigan’s Inadequate Roads**

<b>Costs per driver</b>	<b>Detroit</b>	<b>Grand Rapids</b>	<b>Lansing</b>	<b>Other Michigan Urban Areas</b>
<b>Safety</b>	<b>\$200</b>	<b>\$261</b>	<b>\$321</b>	<b>\$302</b>
<b>Congestion</b>	<b>\$955</b>	<b>\$315</b>	<b>\$135</b>	<b>\$120</b>
<b>VOC</b>	<b>\$516</b>	<b>\$509</b>	<b>\$410</b>	<b>\$363</b>
<b>Total</b>	<b>\$1,671</b>	<b>\$1,085</b>	<b>\$866</b>	<b>\$785</b>

**Source: TRIP analysis of Federal Highway Administration data, National Highway Traffic Safety Administration data and Texas Transportation Institute data.**

### **Conclusion**

An inadequate highway transportation system cost Michigan motorists billions of dollars every year in wasted time and fuel, injuries and fatalities caused by traffic crashes, and wear and tear on their vehicles. Making needed improvements to Michigan’s roadways is key to providing a safer, more efficient transportation system that could save lives and decrease the amount of time and money wasted by motorists, while improving the economic livelihood of the entire state.

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- <sup>1</sup> U.S. Census Bureau.
- <sup>2</sup> U.S. Department of Transportation, Federal Highway Administration, Highway Statistics 2005: [www.fhwa.dot.gov](http://www.fhwa.dot.gov)
- <sup>3</sup> TRIP analysis of Federal Highway Administration data. Highway Statistics 2005.
- <sup>4</sup> Ibid.
- <sup>5</sup> Texas Transportation Institute. 2005 Urban Mobility Report.
- <sup>6</sup> *Building Roads to Reduce Traffic Congestion in America's Cities: How Much and at What Cost?* Detailed State-by-State Analysis of Future Congestion and Capacity Needs. The Reason Foundation, 2006.
- <sup>7</sup> Ibid.
- <sup>8</sup> The Georgia Department of Transportation's Statewide Transportation Report: Final Report. Cambridge Systematics, Inc. 2002. P. 5-2.
- <sup>9</sup> U.S. Department of Transportation: Office of Freight Management and Operations.
- <sup>10</sup> Bureau of Transportation Statistics, U.S. Department of Transportation. 2002 Commodity Flow Survey, State Summaries.
- <sup>11</sup> Ibid.
- <sup>12</sup> Transportation Research Board. Special Report 271. Freight Capacity for the 21<sup>st</sup> Century. 2002. P. ES-3
- <sup>13</sup> U.S. Department of Transportation, Federal Highway Administration, Highway Statistics 2005: [www.fhwa.dot.gov](http://www.fhwa.dot.gov)
- <sup>14</sup> Selecting a Preventative Maintenance Treatment for Flexible Pavements. R. Hicks, J. Moulthrop. Transportation Research Board. 1999. Figure 1.
- <sup>15</sup> Why We Must Preserve our Pavements, D. Jackson, J. Mahoney, G. Hicks, 1996 International Symposium on Asphalt Emulsion Technology.
- <sup>16</sup> U.S. Department of Transportation, Federal Highway Administration, Highway Statistics 2005: [www.fhwa.dot.gov](http://www.fhwa.dot.gov)
- <sup>17</sup> U.S. Department of Transportation - Federal Highway Administration: Highway Statistics 2001-2005 and National Highway Traffic Safety Administration Fatalities Analysis Reporting System (FARS) – 2002 data. [www.fhwa.dot.gov](http://www.fhwa.dot.gov) and [www-fars.nhtsa.dot.gov](http://www-fars.nhtsa.dot.gov).
- <sup>18</sup> TRIP analysis of NHTSA data. The Detroit urban area is defined as Macomb, Oakland and Wayne County; the Grand Rapids urban area is defined as Ottawa and Kent County and the Lansing urban area is defined as Clinton, Ingham and Eaton Counties.
- <sup>19</sup> Highway Safety Evaluation System, 1996 Annual Report on Highway Safety Improvement Programs, U.S. Department of Transportation.
- <sup>20</sup> U.S. Department of Transportation - Federal Highway Administration: Highway Statistics 2005. [www.fhwa.dot.gov](http://www.fhwa.dot.gov)
- <sup>21</sup> Highway Safety Evaluation System; 1996 Annual Report on Highway Safety Improvement Programs; U.S. Department of Transportation.
- <sup>22</sup> U.S. Department of Transportation - Federal Highway Administration: Highway Statistics 2005. [www.fhwa.dot.gov](http://www.fhwa.dot.gov)

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<sup>23</sup> U.S. Department of Transportation: National Highway Traffic Safety Administration. The Economic Impact of Motor Vehicle Crashes, 2000. [www.nhtsa.dot.gov](http://www.nhtsa.dot.gov)

<sup>24</sup> Highway Development and Management: Volume Seven. Modeling Road User and Environmental Effects in HDM-4. Bennett, C. and Greenwood, I. 2000.

<sup>25</sup> Your Driving Costs. American Automobile Association. 2006.

<sup>26</sup> TRIP estimated based on 2005 Urban Mobility Report by the Texas Transportation Institute. Licensed drivers in each urban area was based on 70 percent of Michigan residents being a licensed driver (see Highway Statistics 2005, Federal Highway Administration).

<sup>27</sup> TRIP estimate made by comparing urban freeway traffic levels in the Detroit, Grand Rapids, and Lansing areas, and the rest of Michigan.