Where Are We Going?

Michigan's Current and Future Pavement and Bridge Conditions, Safety, and Congestion and Reliability Levels and the Impact on Michigan Households, Based on Investment Levels over the Next Decade

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Founded in 1971, TRIP ® of Washington, DC, is a nonprofit organization that researches, evaluates and distributes economic and technical data on surface transportation issues. TRIP is sponsored by insurance companies, equipment manufacturers, distributors and suppliers; businesses involved in highway and transit engineering and construction; labor unions; and organizations concerned with efficient and safe surface transportation.

Executive Summary

Michigan's roads, highways and bridges form vital transportation links for the state's residents, visitors and businesses, providing daily access to homes, jobs, shopping, natural resources and recreation. The growth and development of a state or region hinges on efficient and safe access to employment, customers, commerce, recreation, education and healthcare via multiple transportation modes.

Ensuring Michigan's continued economic recovery and growth will require that the state invests adequately in its transportation system, which is critical to the health of the state's automotive, manufacturing, agriculture, education and healthcare sectors, all of which are vital to the state's economic growth and stability. Michigan's transportation system also contributes to quality of life and helps to make the state a desirable place to live and visit.

But deficiencies in the transportation system remain an economic burden to Michigan households. The level of future investment in roads, highways and bridges will have a significant impact on the quality of life of the state's residents and Michigan's future economic growth and competitiveness.

Making transportation improvements can provide the state with a transportation network that is safer, more reliable and better maintained. Conversely, inadequate investment in the state's transportation system could lead to increased delays and congestion, declining road and bridge conditions, and reduced highway safety.

In this report, "Where Are We Going?" TRIP begins by examining and evaluating the current condition and performance of Michigan's roads, highways and bridges. Based on three possible investment scenarios, TRIP projects the conditions and performance of the state's transportation system over the next decade, the future impact and financial burden on Michigan households, and the state's economic competitiveness and quality of life.

Sources of data include the Michigan Department of Transportation (MDOT), the U.S. Department of Transportation (USDOT), the Federal Highway Administration (FHWA), the U.S. Bureau of Transportation Statistics (BTS), the Bureau of Labor Statistics (BLS), the U.S. Census Bureau, IHS Markit, the American Road and Transportation Builders Association (ARTBA), and the Texas Transportation Institute.

FUTURE FUNDING SCENARIOS AND PREDICTED OUTCOMES

Based largely on data provided by the Michigan Department of Transportation (MDOT), TRIP has analyzed data on the current and projected future condition and performance of Michigan's roads, highways and bridges over the next decade based on three possible funding scenarios. The data provided by MDOT incorporates the impact of additional funds as a result of the passage of the five-year federal Infrastructure Investment and Jobs Act (IIJA), signed into law in November 2021, which will provide Michigan with $9 billion in road, highway and bridge funding from 2022 to 2026, resulting in a 33 percent increase in federal funding in 2022. These funding scenarios range from current levels of funding to a level of funding adequate to make substantial improvements in roadway conditions, bridge conditions, highway safety and traffic congestion levels. Below are the three scenarios for funding from 2021 to 2031 that TRIP uses in this report:

Scenario A assumes *anticipated expenditures based on current funding formulas*, regardless of whether they are adequate to maintain or improve conditions and performance into the future.

Scenario B assumes that adequate funding is made available to *maintain current conditions and performance* into the future.

Scenario C assumes a level of funding is made available that would *provide a significant improvement* in near-term conditions and performance and a significant improvement in future conditions and performance.

HOUSEHOLD COSTS OF TRANSPORTATION INVESTMENT SCENARIOS

Within 10 years, an inadequate level of transportation investment will leave Michigan with road, highway and bridge conditions that have further deteriorated, are less reliable, and have a similar level of traffic fatalities. These conditions will reduce economic competitiveness due to traffic congestion and the resultant increase in household transportation costs. However, increased transportation investment will position Michigan as a state with well-maintained roads, highways and bridges, improved safety and enhanced reliability, which will increase economic competitiveness because of improved transportation reliability, safer roads and reduced household transportation costs.

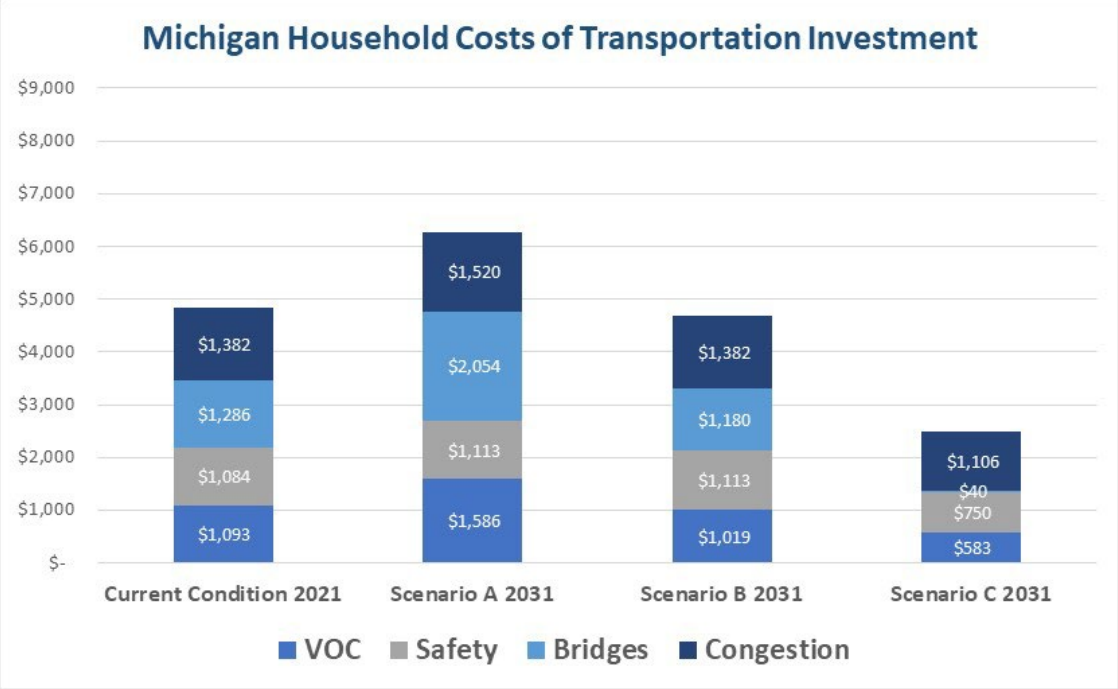
- The level of transportation funding available over the next decade will have a significant bearing on quality of life in Michigan and the economic burden to Michigan households in the form of the cost of traffic crashes, traffic delays, vehicle operating costs and unfunded, needed bridge repairs.

- Currently, inadequate roads, highways and bridges in Michigan cost the average state household $4,845 annually in the form of traffic crashes, delays caused by traffic congestion and unreliability on the state's transportation network, extra vehicle operating costs (VOC) due to driving on roads in poor condition, and in the cost to repair the state's structurally deficient bridges.

- By 2031, if Michigan continues to invest in its roads and bridges under current funding formulas (Scenario A), inadequate roads, highways and bridges will cost the average Michigan household $6,273 annually in the form of traffic crashes, delays caused by traffic congestion, extra vehicle operating costs due to driving on roads in poor condition, and in the cost to repair the state's structurally deficient bridges.

- If the level of funding made available in Michigan allows the state to maintain current levels of conditions and performance (Scenario B), by 2031, the annual cost to the average Michigan household in the form of traffic crashes, delays caused by traffic congestion and unreliability on the state's transportation network, extra vehicle operating costs due to driving on roads in poor condition, and in the cost to repair the state's structurally deficient bridges will be $4,694.

- If Michigan invests in roads and bridges at a level that would achieve a significant improvement in road and bridge conditions and performance (Scenario C), by 2031 the average annual cost to Michigan households of inadequate roads, highways and bridges will decline to $2,479 in the form of traffic crashes, delays caused by traffic congestion, extra vehicle operating costs due to driving on roads in poor condition, and in the cost to repair the state's structurally deficient bridges.



- Currently, the total statewide cost of traffic crashes, delays caused by traffic congestion, extra vehicle operating costs due to driving on roads in poor condition, and in the cost to repair the state's structurally deficient bridges is $19.3 billion. By 2031, the annual cost of transportation deficiencies is anticipated to be $25 billion under funding Scenario A, $18.7 billion under funding Scenario B, and $10 billion under funding Scenario C.

- The current annual Michigan investment per household in maintaining roads, highways and bridges, improving roadway safety, and improving reliability and reducing traffic congestion is $436. The average annual needed investment per Michigan household from 2021-2031 is $436 under funding Scenario A, $746 under funding Scenario B, and $1,309 under funding Scenario C.

- The return on the additional annual household transportation investment in Michigan of $873 (the difference between the investment needs under Scenario C versus Scenario A) will result in a reduction of household costs of $3,794 – a rate of return on the state's transportation investment of approximately 4.3.

ROAD CONDITIONS IN MICHIGAN

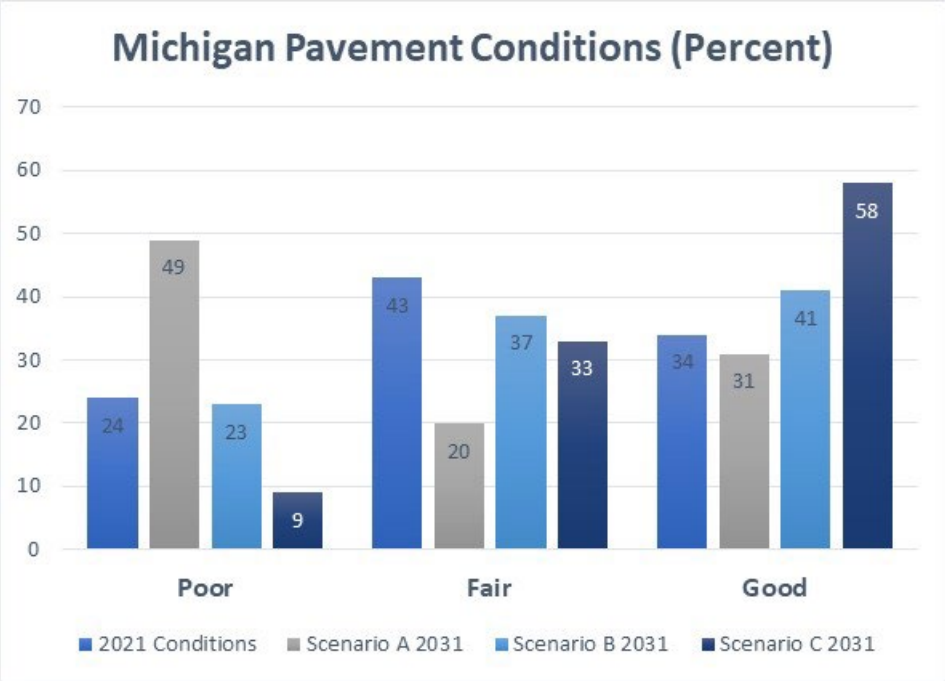
Michigan's major roads and highways have substantial deficiencies, which will worsen significantly by 2031 under current funding formulas. With adequate funding, Michigan's roads could be improved significantly by 2031, including the reconstruction of critical portions of the state's major roadways.

- Currently, approximately one quarter (24 percent) of the pavements on Michigan's major roads and highways are rated in poor condition, 43 percent are rated in fair condition and 34 percent are rated in good condition.

- Under current funding formulas (Scenario A), by 2031 the share of Michigan's major roads and highways in poor condition is forecast to more than double, reaching 49 percent. Roads rated fair will drop from 43 to 20 percent, and the share of roads rated in good condition would drop to 31 percent.

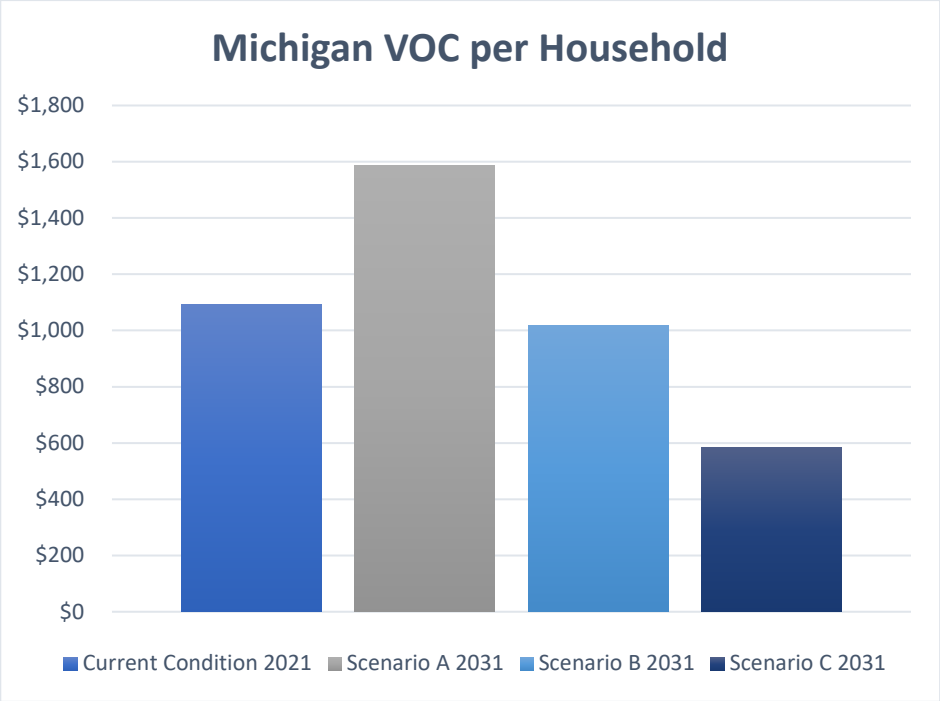
- If a level of funding is made available that allows the state to maintain current conditions and performance (Scenario B), by 2031 the share of Michigan's major roads and highways in poor condition is forecast to decrease slightly to 23 percent. Thirty-seven percent of major roads would be in fair condition, and the share of roads rated in good condition would increase to 41 percent.

- If the state's investment in major roads and highways was adequate to achieve significant improvement in the condition of these roads (Scenario C), by 2031 the share of Michigan's major roads and highways in poor condition is forecast to decrease to nine percent, with 33 percent rated in fair condition and 58 percent rated in good condition.



- When roads are in deteriorated condition – which may include potholes, rutting or rough surfaces – the cost to drivers of operating and maintaining a vehicle increases. These additional vehicle operating costs (VOC) include accelerated vehicle depreciation, additional vehicle repair costs, increased fuel consumption and increased tire wear. Currently, TRIP estimates that additional VOC borne by Michigan motorists as a result of deteriorated road conditions is $4.3 billion annually, an average of $1,093 per household.

- Under current funding formulas (Scenario A), by 2031, TRIP estimates that additional VOC borne by Michigan motorists as a result of deteriorated road conditions would be $6.3 billion annually, an average of $1,586 per household. If a level of funding is made available that allows the state to maintain current conditions and performance (Scenario B), by 2031 additional VOC would be $4.1 billion, an average of $1,019 per household. If the state's investment in major roads and highways was adequate to achieve significant improvements in the condition of the roads (Scenario C), by 2031, additional VOC borne by Michigan motorists would drop to $2.3 billion, an average of $583 per household.



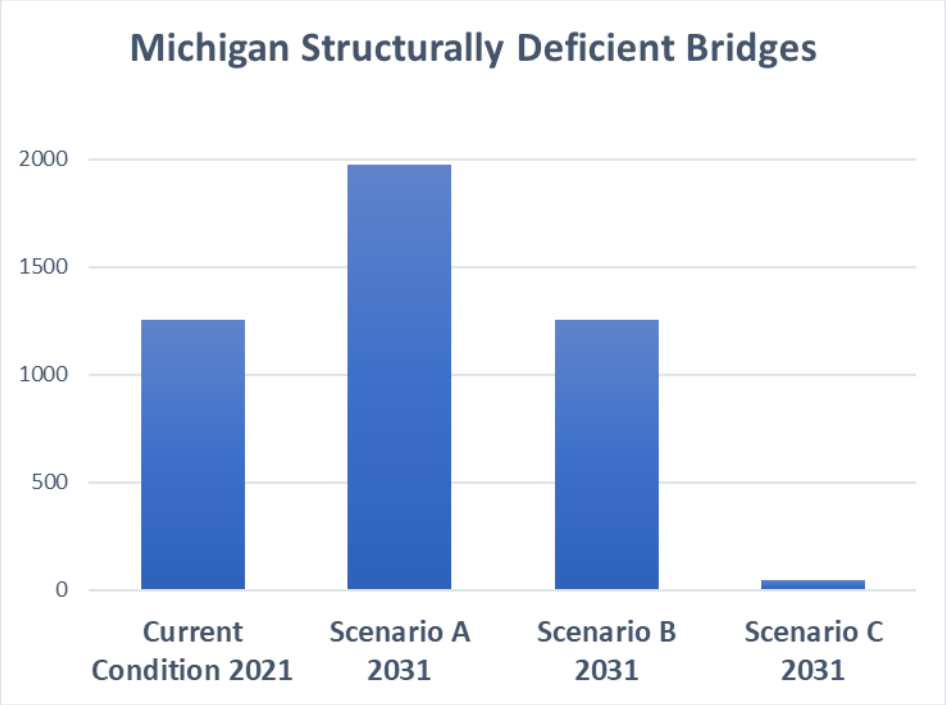
BRIDGE CONDITIONS IN MICHIGAN

Michigan's bridges currently have significant deficiencies, with more than one-in-ten of the state's bridges rated structurally deficient. Over the next decade, bridge conditions will worsen considerably under current funding formulas. With increased funding Michigan's bridges could be improved significantly by 2031.

- Currently, 11 percent (1,252 of 11,195) of Michigan's bridges are rated structurally deficient. Under current funding formulas (Scenario A) 18 percent of the state's bridges will be rated structurally deficient by 2031, a total of 1,976 bridges.

- If a level of funding is made available that allows the state to maintain current bridge conditions (Scenario B), by 2031 the share of Michigan bridges rated structurally deficient would remain at 11 percent (1,251 of 11,181 bridges).

- If Michigan's investment in bridges was adequate to achieve significant improvement in the condition of the state's bridges (Scenario C), the number of Michigan's bridges rated structurally deficient would be reduced from 1,252 currently to 48 by 2031 (less than one percent).



- The current cost to repair all structurally deficient bridges in Michigan is $5.1 billion. By 2031, repair costs would increase to $8.2 billion under funding Scenario A. The 2031 cost to repair all structurally deficient bridges would decrease to $4.7 billion under Scenario B, and $158 million under Scenario C.

TRAFFIC SAFETY IN MICHIGAN

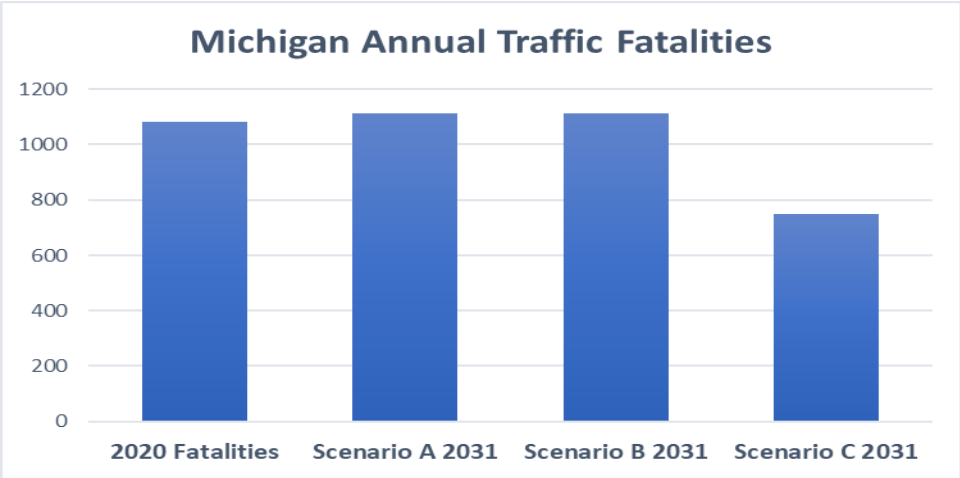
Traffic crashes on Michigan roadways result in a significant number of fatalities and economic loss in Michigan. The extent of needed roadway safety improvements made in the state over the next decade will have a significant impact on the number of people killed in crashes on Michigan's roadways.

- In 2020, 1,083 people were killed in crashes on Michigan's roads and highways.

- Where appropriate, roadway improvements such as providing rumble strips, adding turn lanes, removing or shielding obstacles, adding or improving medians, widening lanes, widening and paving shoulders, improving intersection layout, providing better road markings, and upgrading or installing traffic signals could reduce the severity of serious traffic crashes.

- Under current funding formulas (Scenario A) the number of annual traffic fatalities in Michigan in 2031 is anticipated to increase to 1,112. The same number of annual traffic fatalities is projected in 2031 if the state's level of transportation investment is adequate to sustain the current conditions and performance of the transportation system (Scenario B).

- If Michigan's investment in roadway safety improvements was adequate to achieve significant safety improvements on these routes (Scenario C), it is projected that the number of annual traffic fatalities in Michigan would drop to 750 in 2031, a decrease of 333 fatalities.



- The economic costs of traffic crashes include work and household productivity losses, property damage, medical costs, rehabilitation costs, legal and court costs, congestion costs, and emergency services. Currently, traffic crashes in which a lack of adequate roadway safety features, while not the primary factor, were likely a contributing factor imposed $4.3 billion in economic costs on Michigan households each year - $1,084 per household.

- Under current funding formulas (Scenario A) and the funding level needed to sustain current performance (Scenario B), the annual economic cost of traffic crashes in 2031 would be $4.4 billion annually - $1,113 per household.

- If the state's investment in roadway safety improvements was adequate to achieve significant safety improvements (Scenario C), the annual statewide economic cost of traffic crashes in Michigan would drop to $3 billion in 2031 - $750 per household.

TRAFFIC CONGESTION AND RELIABILITY IN MICHIGAN

Traffic congestion, particularly in Michigan's largest urban areas, reduces travel time reliability and impedes economic competitiveness. Over the next decade, Michigan's level of investment in projects and programs to relieve traffic congestion and improve travel reliability will determine whether congestion levels and reliability improve or get worse.

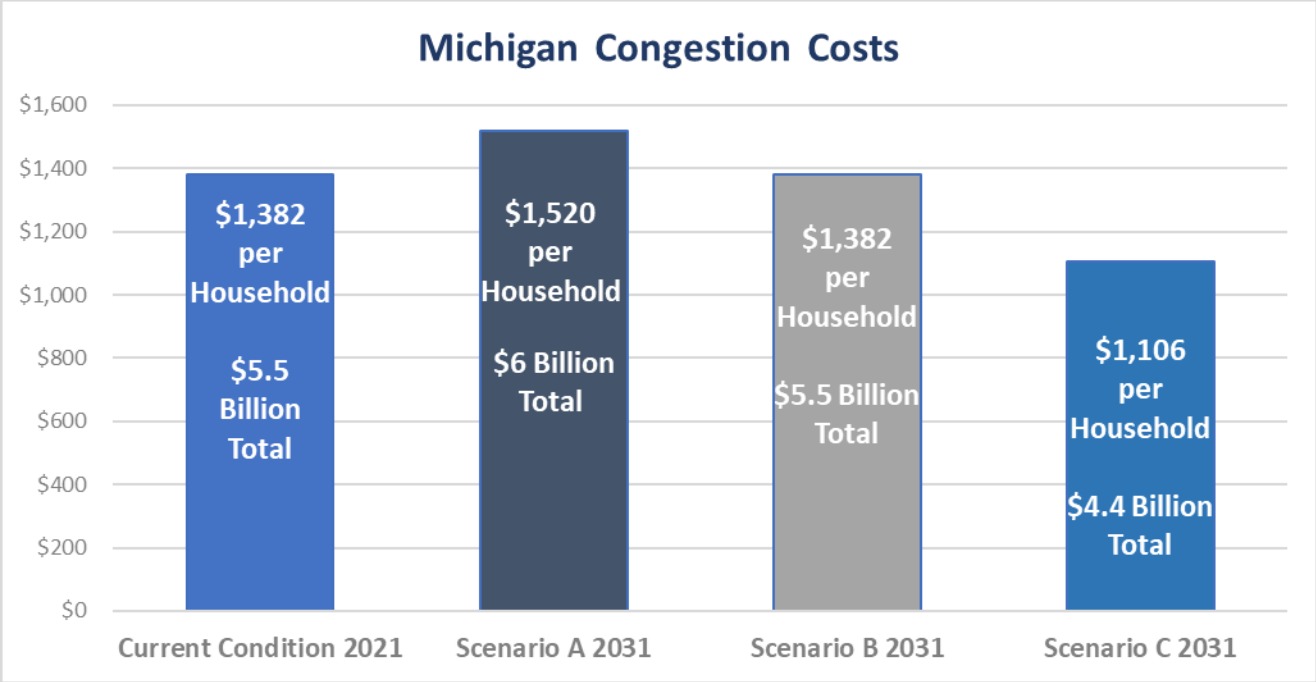
- Due to the Covid-19 pandemic, vehicle travel in Michigan dropped by as much as 54 percent in April 2020 (as compared to vehicle travel during the same month the previous year), but rebounded to five percent above November 2019 levels by November 2021.
- Traffic delays due to congestion in the Detroit area increased by 15 percent from 2000 to 2019 from approximately 139 million hours to 160 million hours and by 69 percent in the Grand Rapids area from approximately 10 million hours to 17 million hours.
- The chart below, based on an MDOT analysis of freeway and congestion reliability, lists the state's highways rated as being the least reliable based on a measure of travel time consistency during the AM and PM peak travel hours. Travel time reliability measures how consistent the travel time is from one point to another, from one day to the next. When travel times are unreliable, travelers are more likely to experience unexpected delays.

Rank	AM or PM	Metro Area	Route	From	To
1	AM	Detroit	I-75 SB	Chrysler Drive / Exit 78	I-75 BL / M-24 / Exit 81
2	AM	Ann Arbor	M-14 WB	US-23	Gotfredson Rd / Exit 15
3	AM	Ann Arbor	I-94 WB	State St / Exit 177	US-12 / Michigan Ave / Exit 181
4	AM	Detroit	I-75 NB	I-696 / Exit 61	14 Mile Road / Exit 65
5	AM	Detroit	I-75 SB	8 Mile Road/Exit 59	14 Mile Road / Exit 65
6	AM	Grand Rapids	I-196 EB	Fuller Ave / Exit 79	I-96 / M-37
7	AM	Ann Arbor	US-23 SB	Plymouth Rd / Exit 41	M-14 / Exit 42
8	AM	Detroit	M-10 SB	Webb St / Elmhurst St.	Wyoming St
9	AM	Detroit	I-96 EB	Milford Rd / Exit 155	Beck Rd / Exit 160
10	AM	Detroit	I-94 EB	30th St. / Exit 212	14th St.
11	AM	Detroit	I-696 WB	Southfield Rd / Exit 12	M-1 / Woodward Ave / Exit 16
12	AM	Grand Rapids	US-131 SB	Ann St / Exit 88	I-96 / M-37/Exit 98 (N)
13	AM	Detroit	I-94 WB	M-35 / Van Dyke / Exit 218	Cadieux Rd / Exit 223
14	AM	Detroit	I-275 NB	M-153 / Ford Rd / Exit 25	I-96 / M-14 / Exit 29
15	AM	Detroit	M-39 SB	Plymouth Rd / Exit 10	I-96 / Exit 11
16	AM	Detroit	I-75 NB	I-96/Ambassador Bridge/Exit 47 & 48	Grand River Ave Exit 50
17	AM	Detroit	I-75 SB	Clay Street / Exit 54	Caniff St. / Exit 55
18	AM	Grand Rapids	I-96 EB	Leonard St / Exit 36	M-21 / Exit 39
19	AM	Detroit	M-53	23 Mile Rd	26 Mile Rd
20	AM	Detroit	I-75 NB	M-59 / Exit 77	Chrysler Dr / Exit 78

Rank	AM or PM	Metro Area	Route	From	To
1	PM	Detroit	I-75 NB	I-75 BL / Exit 75	Joslyn Rd / Exit 83
2	PM	Detroit	I-696 EB	Orchard Lake Rd / Exit 5	M-10 / Exit 10
3	PM	Detroit	I-96 WB	Novi Rd / Exit 162	I-696 / M-5 / Exit 165
4	PM	Ann Arbor	I-94 EB	Ann Arbor Saline Rd / Exit 175	I-94 BR / US-23 / Exit 180
5	PM	Ann Arbor	US-23 SB	I-94 / Exit 35	Plymouth Rd / Exit 41
6	PM	Detroit	I-94 WB	14th St.	John R St / Exit 215
7	PM	Grand Rapids	I-196 EB	Fuller Ave / Exit 79	I-96 / M-37
8	PM	Detroit	M-39 NB	US-21 / Michigan Ave / Exit 6	Joy Rd. / Exit 9
9	PM	Detroit	I-75 NB	John R Rd/Exit 60	14 Mile Road / Exit 65
10	PM	Detroit	I-75 SB	11 Mile Road / Exit 62	Rochester Road / Exit 67
11	PM	Detroit	I-94 EB	I-96 / Exit 213	French Rd. / Exit 220
12	PM	Grand Rapids	US-131 NB	36th St / Exit 80	Cherry St / Exit 84
13	PM	Detroit	I-96 EB	8 Mile Rd / Exit 167	M-14 / Jeffries Fwy
14	PM	Detroit	I-94 EB	I-696 / 11 Mile Rd. / Exit 229	12 Mile Rd. / Exit 230
15	PM	Ann Arbor	US-23 NB	Silver Lake Rd / Exit 55	I-96 / Exit 60
16	PM	Grand Rapids	US-131 NB	Pearl St / Exit 85	Leonard St / Exit 87
17	PM	Detroit	I-94 EB	Harper Ave. / Exit 234	Metropolitan Pkwy / Exit 236
18	PM	Detroit	I-94 WB	Ecorse Rd / Exit 200	M-39 / Southfield Fwy / Exit 204
19	PM	Detroit	I-96 WB	7 Mile Rd / Exit 169	I-275 / M-14
20	PM	Ann Arbor	US-23 NB	Barker Rd / Exit 52	M-36 / Exit 54

- In addition to reducing personal delays caused by traffic congestion, improved traffic flow in Michigan would support economic development by improving the efficiency and competitiveness of Michigan businesses.

- Based on current levels of funding in Michigan, statewide annual traffic congestion costs are currently $5.5 billion, or $1,382 per household. Under Scenario A, annual congestion costs are projected to total approximately $6 billion in 2031 - $1,520 per household. If the state is able to make improvements that result in maintaining current levels of traffic congestion (Scenario B), the annual cost of congestion is anticipated to be $5.5 billion, or $1,382 per household in 2031. If the state is able to invest adequately to make significant improvements in the reliability of the state's roadways (Scenario C), the annual cost of traffic congestion is expected to be reduced to $4.4 billion or $1,106 per household by 2031.



TRANSPORTATION RESILIENCY AND EMERGING TECHNOLOGIES

Recognizing that extreme weather, sea level change, and changes in environmental factors may threaten the condition and longevity of the nation's transportation infrastructure, transportation agencies have begun to assess vulnerabilities and consider the resilience of their transportation assets during the transportation planning process.

Based on the importance of maximizing the level and safety of mobility provided by its transportation system, transportation agencies are adopting Transportation Systems Management and Operations (TSMO) practices and incorporating improved resiliency into their transportation network. A TSMO program adopts an integrated set of strategies to improve traffic flow and safety on a portion of a roadway, including work zone management, traffic incident management, freight management, traveler information, traffic signal coordination, ramp management, transit management and improved bicycle and pedestrian crossings. The benefits of TSMO can include reduced traffic congestion, reduced fuel consumption and reduced emissions.

ECONOMIC BENEFITS OF TRANSPORTATION INVESTMENT

Transportation projects that improve the efficiency, condition or safety of a highway or transit route provide significant economic benefits by reducing transportation delays and costs associated with a deficient transportation system.

- The health and future growth of Michigan's economy is riding on its transportation system. Each year, $1.25 trillion in goods are shipped to and from sites in Michigan. The value of freight shipped to and from sites in Michigan, in inflation-adjusted dollars, is expected to increase 46 percent by 2045

- According to a report by the American Road & Transportation Builders Association, the design, construction and maintenance of transportation infrastructure in Michigan supports approximately 94,000 full-time jobs across all sectors of the state economy. These workers earn $4.1 billion annually. Approximately 1.9 million full-time jobs in Michigan in key industries like tourism, retail sales, agriculture and manufacturing are completely dependent on the state's transportation network.

The benefits of transportation improvements include the following:

- Improved business competitiveness due to reduced production and distribution costs as a result of increased travel speeds and fewer mobility barriers.

- Improvements in household welfare as a result of better access to higher-paying jobs, a wider selection of competitively priced consumer goods, additional housing and healthcare options, and improved mobility for residents without access to private vehicles.

- Gains in local, regional and state economies as a result of improved regional economic competitiveness, which stimulates population and job growth.

- A reduction in economic losses from vehicle crashes, traffic congestion and vehicle maintenance costs associated with driving on deficient roads.

- The creation and support of jobs. A 2021 macroeconomic analysis by IHS Markit , a global economic analysis firm, found that every $1 million spent on highways, bridges and public transit supports 21 jobs annually, with ten jobs in sectors related to providing the transportation improvements and 11 jobs induced elsewhere in the economy. That analysis found that every dollar spent on highway and bridge improvements results in $3.4 dollars in combined direct, indirect and induced output from industries throughout the economy, resulting in a multiplier for highway and bridge investment of 3.4.

- Transportation projects that expand roadway or transit capacity produce significant economic benefits by reducing congestion and improving access, thus speeding the flow of people and goods.

- Transportation projects that maintain and preserve existing transportation infrastructure also provide significant economic benefits by improving travel speeds, capacity, load-carry abilities and safety, and reducing operating costs for people and businesses.

Introduction

Michigan's roads, highways and bridges serve as the backbone of the state's transportation network, providing mobility to the state's residents, visitors and businesses. The state's transportation system allows Michiganders to travel to work and school and to access recreation, healthcare, social and commercial activities. The system also provides the state's industries and businesses with access to customers, suppliers and employees.

But Michigan's roads, highways and bridges have significant deficiencies that could limit the state's economic competitiveness, hamper economic recovery and increase costs to Michigan households. In order to boost the state's economy and enhance long-term economic competitiveness, Michigan must improve road and bridge conditions, relieve traffic congestion and enhance traffic safety. Investing adequately in improvements to Michigan's transportation network will support economic growth and recovery, improve road and bridge conditions, enhance the reliability of the transportation system, improve safety and reduce household costs.

Modernizing Michigan's transportation system is critical to quality of life and economic competitiveness in the Great Lakes State. Inadequate transportation investment, which will result in deteriorated transportation facilities and diminished access, will negatively affect Michigan's economic competitiveness and quality of life.

To facilitate economic growth, maintain its level of economic competitiveness and achieve further growth, Michigan will need to invest adequately in the maintenance and modernization of its roads, highways and bridges to provide efficient, reliable and safe mobility for residents, visitors and businesses. Making needed improvements to Michigan's roads, highways, bridges and transit systems could also provide a significant boost to the state's economy by creating jobs in the short-term and stimulating long-term economic growth as a result of enhanced mobility and access. The importance of Michigan's surface transportation system and the reliable movement of goods it provides has been heightened during the COVID-19 pandemic.

This report begins by examining and evaluating the current condition and performance of Michigan's roads, highways and bridges. Based on multiple investment scenarios, TRIP projects the condition and performances of the state's surface transportation system over the next decade. The report also examines the future impact and financial burden on Michigan households and the state's economic competitiveness and quality of life.

Population, Travel and Economic Trends in Michigan

Highways are vitally important to fostering economic development in Michigan. Supporting Michigan's economic recovery and growth will require that the state build and maintain a transportation system that provides reliable and safe mobility to enhance business competitiveness.

Michigan's population grew to approximately 10 million residents in 2020.[1] Michigan had approximately 7.1 million licensed drivers in 2019.[2] In 2019, the state's transportation system carried 102.2 billion vehicle miles of travel (VMT), a five percent increase from 2014 to 2019.[3]

Due to the Covid-19 pandemic, vehicle travel in Michigan dropped by as much as 54 percent in April 2020 (as compared to vehicle travel during the same month the previous year), but rebounded to five percent above November 2019 levels by November 2021.[4] From 2000 to 2020, Michigan's gross domestic product (GDP), a measure of the state's economic output, increased by two percent, when adjusted for inflation.[5] U.S. GDP increased 40 percent during the same period.[6]

Investing in the state's transportation system can help spur and sustain needed economic growth and recovery in Michigan. Michigan's economic growth has been slower than the national average in recent years. The state's five-year average annual GDP growth rate was just 0.4 percent, less than one-third of the

national growth rate of 1.4 percent.[7] Michigan's monthly unemployment rate peaked at 23.6 percent in April 2020, and has since decreased to 4.7 percent in August 2021.[8]

Impact of Michigan Transportation Investment Strategies

Over the next ten years, the level of investment in Michigan's roads, highways and bridges will have a significant impact on future conditions, travel reliability and traffic congestion levels, economic competitiveness, and levels of traffic safety. To project the result of various levels of future transportation investment in Michigan, TRIP asked MDOT to estimate the level of funding required to meet the goals as described in three possible scenarios and their outcomes in four critical transportation areas: road and highways conditions, bridge conditions, traffic safety, and traffic congestion. The data provided by MDOT incorporates the impact of additional funds as a result of the passage of the five-year federal Infrastructure Investment and Jobs Act (IIJA), signed into law in November 2021, which will provide Michigan with $9 billion in road, highway and bridge funding from 2022 to 2026, resulting in a 33 percent increase in federal funding in 2022.[9]

In each of these areas, MDOT was asked to estimate the level of funding that would be needed from 2021 to 2031 to achieve the goals of each scenario and to describe the likely outcomes in 2031 of each funding strategy under the three following scenarios:

- **Scenario A** assumes *anticipated expenditures based on current funding formulas*, regardless of whether they are adequate to maintain or improve conditions and performance into the future.

- **Scenario B** assumes anticipated expenditures based on current funding levels, regardless of whether they are adequate to maintain or improve conditions and performance into the future.

- **Scenario C** assumes a level of funding is made available that would *provide a significant improvement* in near-term conditions and performance and a significant improvement in future conditions and performance.

Pavement Surfaces in Michigan

The life cycle of Michigan's roads is greatly affected by the state's ability to perform timely maintenance and upgrades to ensure that road and highway surfaces last as long as possible. The pavement condition of the state's major roads is evaluated and classified as being in poor, fair or good condition.

Michigan's major trunkline roads and highways have substantial deficiencies, which will worsen significantly by 2031 under current funding formulas. However, with adequate funding, pavement condition on Michigan's roads could be improved significantly by 2031.

Currently, approximately one quarter (24 percent) of the pavements of Michigan's major roads and highways are rated in poor condition, 43 percent are rated in fair condition and 34 percent are rated in good condition.[10]

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 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 receive timely, ongoing rehabilitation to delay the need for major repairs or reconstruction, which costs approximately four times more than resurfacing them.[11] As roads and highways continue to age, they will reach a point of deterioration where routine paving and maintenance will not be adequate to keep pavement surfaces in good condition and costly reconstruction of the roadway and its underlying surfaces will become necessary.

Rough roads and highways represent an economic burden to motorists because driving on them increases the cost of operating a motor vehicle. TRIP has calculated the additional cost to motorists of driving on rough roads. When roads are deteriorated – which may include potholes, rutting or rough surfaces – the cost to operate and maintain a vehicle increases. These additional vehicle operating costs (VOC) include accelerated vehicle depreciation, additional vehicle repair costs, increased fuel consumption and increased tire wear.[12]

Currently, TRIP estimates that additional VOC borne by Michigan motorists as a result of deteriorated road conditions is $4.3 billion annually, an average of $1,093 per household.

Under current funding formulas (Scenario A), by 2031 the share of Michigan's major roads and highways in poor condition is forecast to more than double, reaching 49 percent.[13] Roads rated fair will drop from 43 to 20 percent, and the share of roads rated in good condition would drop to 31 percent.[14] This further deterioration in pavement conditions will significantly increase vehicle operating costs for Michigan motorists.

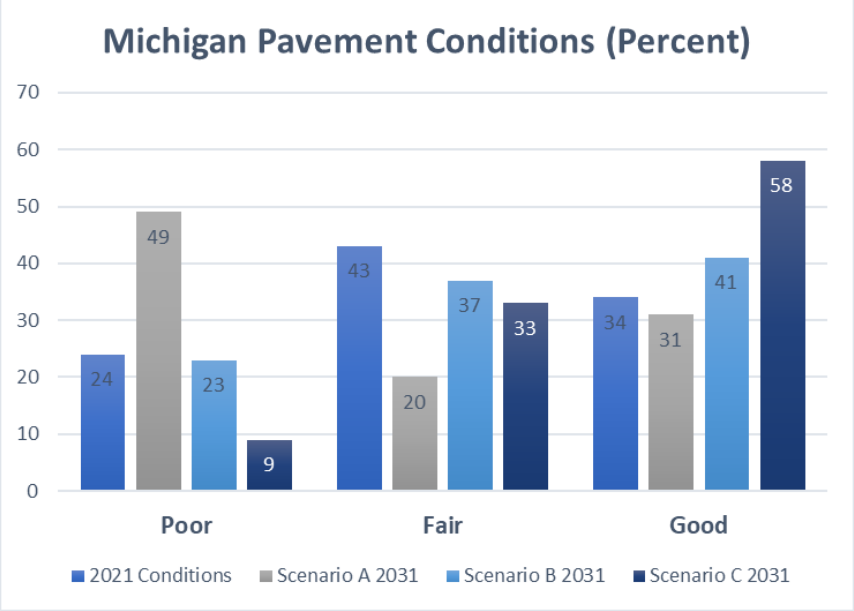
A boost in funding for road and highway repairs and reconstruction would result in a significant reduction in the share of the state's major roadways in poor condition. It would also provide for significant reconstruction of the state's major roadways, which would allow for more cost-effective maintenance in the future.

If a level of funding is made available that allows the state to maintain current conditions and performance (Scenario B), by 2031 the share of Michigan's major roads and highways in poor condition is forecast to decrease slightly to 23 percent.[15] Thirty-seven percent of major roads would be in fair condition, and the share of roads rated in good condition would increase to 41 percent.[16]

If the state's investment in major roads and highways was adequate to achieve significant improvement in the condition of these roads (Scenario C), by 2031 the share of Michigan's major roads and highways in poor condition is forecast to decrease to nine percent, with 33 percent rated in fair condition and 58 percent rated in good condition.[17]

The chart below details the share of Michigan's major roads and highways that are currently in poor, fair and good condition and the projected condition of the state's major roads and highways in 2031 under the three possible funding scenarios.

Chart 1. Current & Anticipated Future Condition of Major Roads under Three Funding Scenarios.



Source: TRIP analysis of Michigan Department of Transportation data.

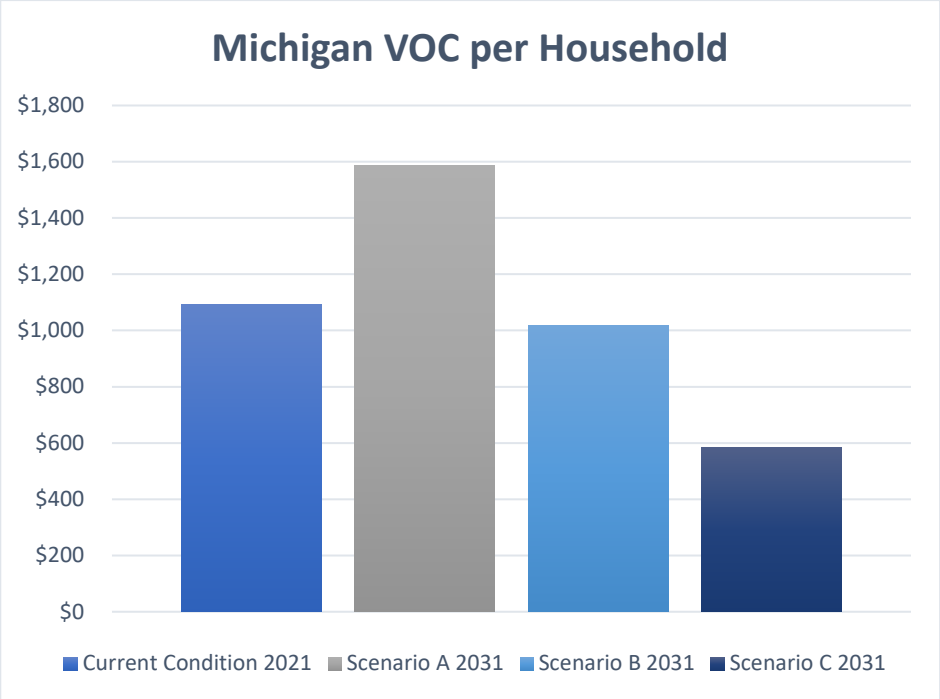
The future condition of Michigan's major roads and highways will have a significant effect on the amount of additional operating costs paid by Michigan motorists as a result of driving on rough roads.

Under current levels of funding, Michigan households will see their additional costs to operate a motor vehicle as a result of driving on rough roads increase significantly over the next decade as a result of a more than doubling in the share of the state's roads in poor condition. Statewide additional vehicle operating costs are anticipated to increase from $4.3 billion annually -- $1,093 per household -- to $6.3 billion annually -- $1,586 per household -- in 2031 if the current funding levels and formulas are kept in place (Scenario A).[18]

If a level of funding is made available that allows the state to maintain current conditions and performance (Scenario B), by 2031 additional VOC would be $4.1 billion, an average of $1,019 per household.[19] And, if the state's investment in major roads and highways was adequate to achieve significant improvements in the condition of the roads (Scenario C), by 2031, additional VOC borne by Michigan motorists would drop to $2.3 billion, an average of $583 per household.[20]

The following chart shows the current additional cost of operating a vehicle in Michigan as a result of driving on rough roads and what those costs will be under three different funding scenarios.

Chart 2. Current & Anticipated Future Additional VOC under Three Funding Scenarios.



Source: TRIP analysis of Michigan Department of Transportation data.

Halting the decline in statewide pavement conditions or making substantial improvements in overall pavement conditions on the state's major roads will require a significant increase in funding for roadway preservation and reconstruction.

The chart below details the current and average amount of annual spending on roadway preservation and reconstruction from 2021 to 2031 that would be required under the three funding scenarios, and the needed average annual investment per Michigan household.

Chart 3. Current and projected annual statewide and per-household investment under three funding scenarios.

	Average Annual Statewide Investment	Average Annual Investment Per Household
Current Funding 2021	$1,267,000,000	$318
Scenario A 2031	$1,267,000,000	$318
Scenario B 2031	$1,978,000,000	$497
Scenario C 2031	$2,822,000,000	$709

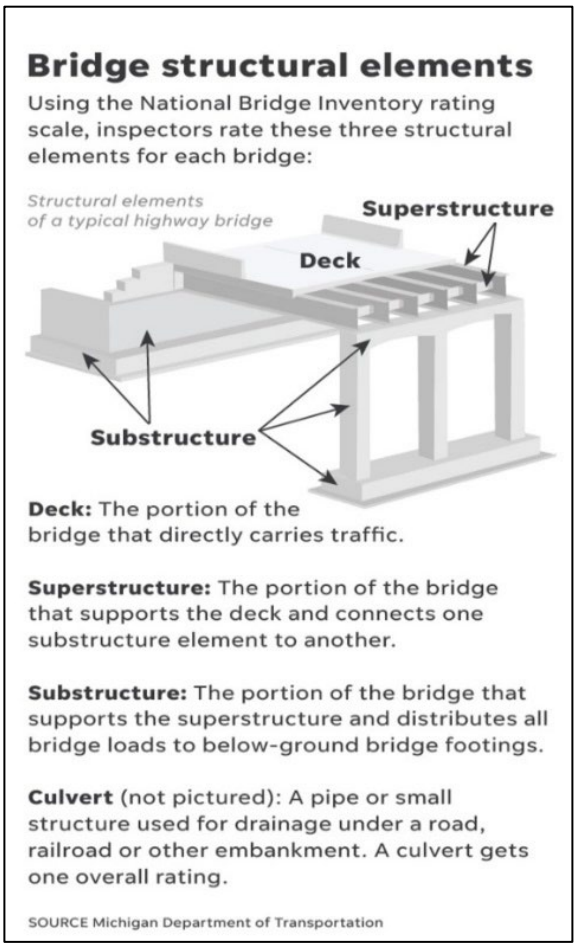
Source: TRIP analysis of Michigan Department of Transportation data.

Bridge Conditions in Michigan

Michigan's bridges form key links in the state's highway system, providing communities and individuals access to employment, schools, shopping and medical services, and facilitating commerce and access for emergency vehicles.

Michigan's bridges currently have significant deficiencies, with more than one-in-ten of the state's bridges rated structurally deficient. Over the next decade, bridge conditions will worsen significantly under current funding formulas. With increased funding Michigan's bridges could be improved considerably by 2031.

Currently, 11 percent – 1,252 - of the 11,195 bridges in Michigan are rated as structurally deficient.[21] A bridge is structurally deficient if there is significant deterioration of the bridge deck, supports or other major components. Bridges that are structurally deficient may be posted for lower weight limits or closed if their condition warrants such action. Deteriorated bridges can have a significant impact on daily life. Restrictions on vehicle weight may cause many vehicles – especially emergency vehicles, commercial trucks, school buses and farm equipment – to use alternate routes to avoid posted bridges. Redirected trips lengthen travel time, waste fuel and reduce the efficiency of the local economy.



Structurally deficient bridges are a significant burden on Michigan residents because they represent a future financial liability in the cost to repair or replace the bridge. The cost to repair or replace every structurally deficient bridge in Michigan is currently $5.1 billion - $1,286 per Michigan household.[22] Based on current levels of funding in Michigan (Scenario A), the number of structurally deficient bridges in the state is projected to increase by 724 bridges by 2031, a 58 percent increase to 1,976 total structurally deficient bridges.[23] This will increase the liability of needed repairs of structurally deficient bridges to $8.2 billion or $2,054 per household.[24]

If a level of funding is made available that allows the state to maintain current bridge conditions (Scenario B), by 2031 the share of Michigan bridges rated structurally deficient would remain at 11 percent

(1,251 of 11,195 bridges).[25] However, if Michigan invests in a robust bridge improvement program over the next decade (Scenario C), the number of structurally deficient bridges will decline by 1,204 bridges by 2031, leaving just 48 bridges in structurally deficient condition.[26]

Chart 4. Current and anticipated condition of bridges and the cost to repair or replace all structurally deficient bridges in the state under three funding scenarios

	Bridges Structurally Deficient	Total Bridges	Share of Bridges Structurally Deficient	Cost to Repair All Structurally Deficient Bridges	Cost per Household to Repair All Structurally Deficient Bridges
Current Investment	1,252	11,195	11%	$5.1 Billion	$1,286
Scenario A 2031	1,976	11,195	18%	$8.2 Billion	$2,054
Scenario B 2031	1,251	11,195	11%	$4.7 Billion	$1,180
Scenario C 2031	48	11,195	0%	$158 Million	$40

Source: TRIP analysis of Michigan Department of Transportation data.

Halting the decline in statewide bridge conditions will require a modest increase in funding for the repair or replacement of structurally deficient bridges. Making significant improvements in overall statewide bridge condition will require a boost in future investment.

The following chart details the current and average amount of annual spending required under the three funding scenarios to complete the repair or reconstruction of structurally deficient bridges from 2021 to 2031.

Chart 5. Annual funding for repair or replacement of structurally deficient bridges in Michigan from 2021-2031 under three funding scenarios.

	Average Annual Bridge Investment (Millions)	Average Annual Investment per Household
Current Investment	$232 Million	$58
Scenario A 2031	$232 Million	$58
Scenario B 2031	$418 Million	$105
Scenario C 2031	$1.280 Billion	$322

Source: TRIP analysis of Michigan Department of Transportation data.

Traffic Safety in Michigan

Traffic safety levels on Michigan's roads represent a significant factor in the quality of life of the state's residents and visitors. In 2020, 1,083 people were killed in crashes on Michigan's roads and highways. [27]

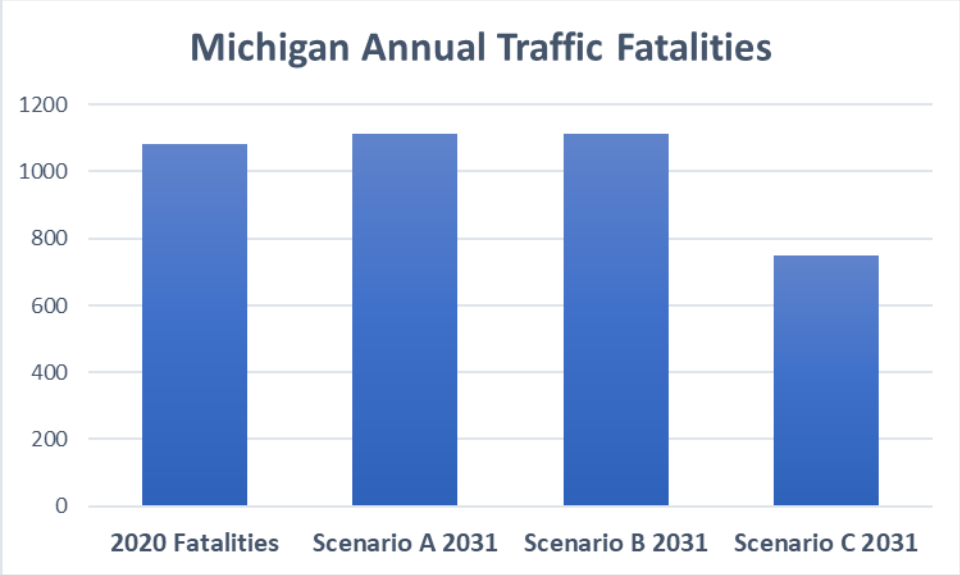
The economic costs of traffic crashes include work and household productivity losses, property damage, medical costs, rehabilitation costs, legal and court costs, congestion costs, and emergency services. Currently, traffic crashes in which a lack of adequate roadway safety features, while not the primary factor, were likely a contributing factor imposed $4.3 billion in economic costs on Michigan households each year – an average of $1,084 per household.[28]

Three major factors are associated with fatal vehicle crashes: driver behavior, vehicle characteristics and roadway design. Based on an analysis of roadway safety data, TRIP estimates that roadway design is a contributing factor in approximately one-third of all fatal and serious traffic crashes. Improving safety on Michigan's road and highway system can be achieved through further enhancements in vehicle safety; improvements in driver, pedestrian, and bicyclist behavior; and the implementation of a variety of additional roadway safety features.

Where appropriate, roadway improvements such as providing rumble strips, adding turn lanes, removing or shielding obstacles, adding or improving medians, widening lanes, widening and paving shoulders, improving intersection layout, providing better road markings, and upgrading or installing traffic signals could reduce the severity of serious traffic crashes.

The future level of funding available for roadway safety improvements in Michigan will have a significant impact on the number of traffic fatalities in the state over the next decade. Under current funding formulas (Scenario A) the number of annual traffic fatalities in Michigan in 2031 is anticipated to increase to 1,112.[29] The same number of annual traffic fatalities is projected in 2031 if the state's level of transportation investment is adequate to sustain the current conditions and performance of the transportation system (Scenario B). If the state's investment in roadway safety improvements was adequate to achieve significant safety improvements on these routes (Scenario C), it is projected that the number of annual traffic fatalities in Michigan would drop to 750 in 2031, a decrease of 333 fatalities.[30]

Chart 6. Current and projected annual traffic fatalities from 2020 to 2031 under three funding scenarios.



Source: TRIP analysis of Michigan Department of Transportation data.

A significant improvement in safety features on Michigan's roads and highways will also provide a substantial benefit to Michigan households by lowering the economic costs of serious traffic crashes.

Based on current levels of funding in Michigan (Scenario A), the annual economic cost of traffic crashes in 2031 would be $4.4 billion annually - $1,113 per household. The annual and household costs under Scenario B would be the same as Scenario A. But if the state's investment in roadway safety improvements was adequate to achieve significant safety improvements (Scenario C), the annual statewide economic cost of traffic crashes in Michigan would drop to $3 billion in 2031 - $750 per household.

Chart 7. Current and anticipated annual cost of fatal traffic crashes in Michigan.

	Statewide Cost of Traffic Crashes in Michigan	Average Annual Investment per Household
Current Investment	$4.3 Billion	$1,084
Scenario A 2031	$4.4 Billion	$1,113
Scenario B 2031	$4.4 Billion	$1,113
Scenario C 2031	$3 Billion	$750

Source: TRIP analysis of Michigan Department of Transportation data.

Providing a significant reduction in traffic fatalities in Michigan will require a modest increase in funding for numerous roadway safety improvements in the state.

The following chart details the current and average amount of annual spending from 2020 to 2031 that would be required under the three funding scenarios in order to improve roadway safety features.

Chart 8. Annual funding for roadway safety improvements in Michigan from 2020-2031 under three funding scenarios.

	Average Annual Investment	Annual Investment per Michigan Household
Current Investment	$34 Million	$9
Scenario A 2031	$34 Million	$9
Scenario B 2031	$37.6 Million	$9
Scenario C 2031	$69.7 Million	$18

Source: TRIP analysis of Michigan Department of Transportation data.

Cost of Congestion in Michigan

Traffic congestion in Michigan continues to be a burden, particularly in the state's largest urban areas, and threatens to impede the state's economic development.

Traffic congestion represents a significant financial burden on Michigan residents, currently costing the state approximately $5.5 billion annually - $1,382 per household.[31] These costs include time lost and wasted fuel due to traffic congestion.

Traffic delays due to congestion in the Detroit area increased by 15 percent from 2000 to 2019 from approximately 139 million hours to 160 million hours, and have increased by 69 percent in the Grand Rapids area from approximately 10 million hours to 17 million hours.[32]

The chart below, based on an MDOT analysis of freeway and congestion reliability, lists the state's highways rated as being the least reliable based on a measure of travel time consistency during the AM and PM peak travel hours.[33] Travel time reliability measures how consistent the travel time is from one point to another, from one day to the next. When travel times are unreliable, travelers are more likely to experience unexpected delays.

Chart 9. Michigan's least reliable highway segments during AM and PM hours.

Rank	AM or PM	Metro Area	Route	From	To
1	AM	Detroit	I-75 SB	Chrysler Drive / Exit 78	I-75 BL / M-24 / Exit 81
2	AM	Ann Arbor	M-14 WB	US-23	Gotfredson Rd / Exit 15
3	AM	Ann Arbor	I-94 WB	State St / Exit 177	US-12 / Michigan Ave / Exit 181
4	AM	Detroit	I-75 NB	I-696 / Exit 61	14 Mile Road / Exit 65
5	AM	Detroit	I-75 SB	8 Mile Road/Exit 59	14 Mile Road / Exit 65
6	AM	Grand Rapids	I-196 EB	Fuller Ave / Exit 79	I-96 / M-37
7	AM	Ann Arbor	US-23 SB	Plymouth Rd / Exit 41	M-14 / Exit 42
8	AM	Detroit	M-10 SB	Webb St / Elmhurst St.	Wyoming St
9	AM	Detroit	I-96 EB	Milford Rd / Exit 155	Beck Rd / Exit 160
10	AM	Detroit	I-94 EB	30th St. / Exit 212	14th St.
11	AM	Detroit	I-696 WB	Southfield Rd / Exit 12	M-1 / Woodward Ave / Exit 16
12	AM	Grand Rapids	US-131 SB	Ann St / Exit 88	I-96 / M-37/Exit 98 (N)
13	AM	Detroit	I-94 WB	M-35 / Van Dyke / Exit 218	Cadieux Rd / Exit 223
14	AM	Detroit	I-275 NB	M-153 / Ford Rd / Exit 25	I-96 / M-14 / Exit 29
15	AM	Detroit	M-39 SB	Plymouth Rd / Exit 10	I-96 / Exit 11
16	AM	Detroit	I-75 NB	I-96/Ambassador Bridge/Exit 47 & 48	Grand River Ave Exit 50
17	AM	Detroit	I-75 SB	Clay Street / Exit 54	Caniff St. / Exit 55
18	AM	Grand Rapids	I-96 EB	Leonard St / Exit 36	M-21 / Exit 39
19	AM	Detroit	M-53	23 Mile Rd	26 Mile Rd
20	AM	Detroit	I-75 NB	M-59 / Exit 77	Chrysler Dr / Exit 78
1	PM	Detroit	I-75 NB	I-75 BL / Exit 75	Joslyn Rd / Exit 83
2	PM	Detroit	I-696 EB	Orchard Lake Rd / Exit 5	M-10 / Exit 10
3	PM	Detroit	I-96 WB	Novi Rd / Exit 162	I-696 / M-5 / Exit 165
4	PM	Ann Arbor	I-94 EB	Ann Arbor Saline Rd / Exit 175	I-94 BR / US-23 / Exit 180
5	PM	Ann Arbor	US-23 SB	I-94 / Exit 35	Plymouth Rd / Exit 41
6	PM	Detroit	I-94 WB	14th St.	John R St / Exit 215
7	PM	Grand Rapids	I-196 EB	Fuller Ave / Exit 79	I-96 / M-37
8	PM	Detroit	M-39 NB	US-21 / Michigan Ave / Exit 6	Joy Rd. / Exit 9
9	PM	Detroit	I-75 NB	John R Rd/Exit 60	14 Mile Road / Exit 65
10	PM	Detroit	I-75 SB	11 Mile Road / Exit 62	Rochester Road / Exit 67
11	PM	Detroit	I-94 EB	I-96 / Exit 213	French Rd. / Exit 220
12	PM	Grand Rapids	US-131 NB	36th St / Exit 80	Cherry St / Exit 84
13	PM	Detroit	I-96 EB	8 Mile Rd / Exit 167	M-14 / Jeffries Fwy
14	PM	Detroit	I-94 EB	I-696 / 11 Mile Rd. / Exit 229	12 Mile Rd. / Exit 230
15	PM	Ann Arbor	US-23 NB	Silver Lake Rd / Exit 55	I-96 / Exit 60
16	PM	Grand Rapids	US-131 NB	Pearl St / Exit 85	Leonard St / Exit 87
17	PM	Detroit	I-94 EB	Harper Ave. / Exit 234	Metropolitan Pkwy / Exit 236
18	PM	Detroit	I-94 WB	Ecorse Rd / Exit 200	M-39 / Southfield Fwy / Exit 204
19	PM	Detroit	I-96 WB	7 Mile Rd / Exit 169	I-275 / M-14
20	PM	Ann Arbor	US-23 NB	Barker Rd / Exit 52	M-36 / Exit 54

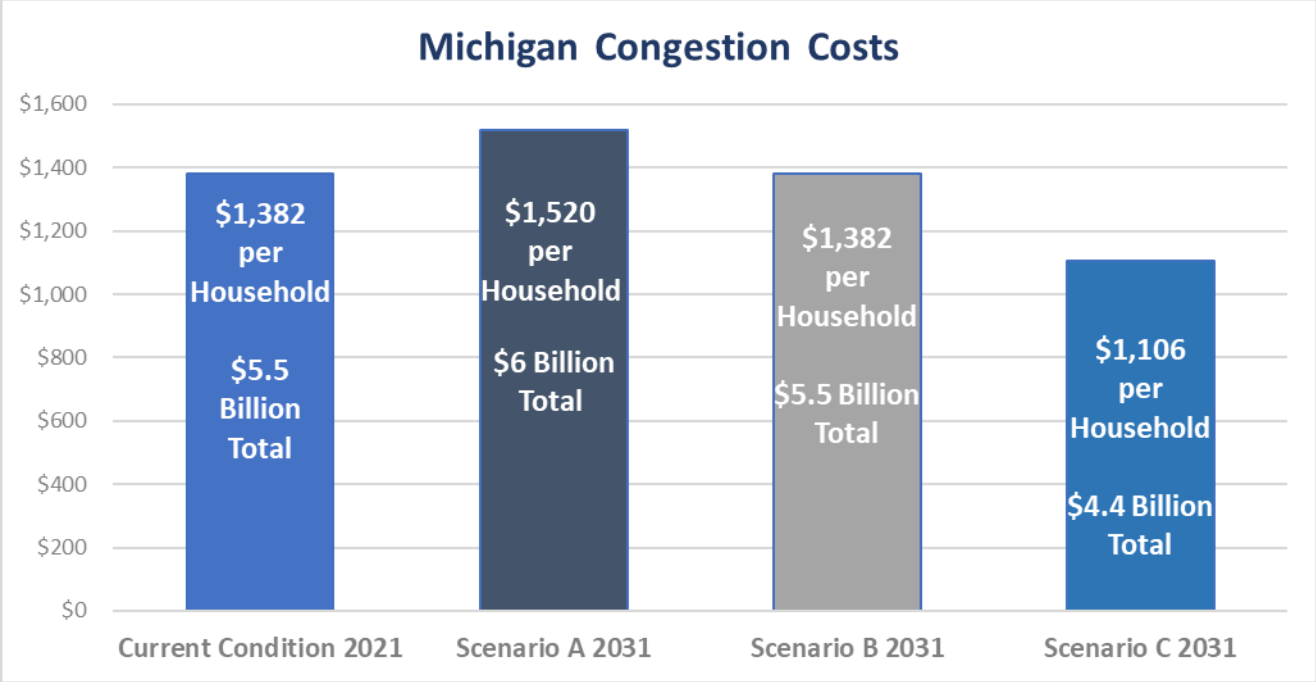
Source: TRIP Analysis of MDOT Congestion & Reliability Performance Report.

Based on current levels of funding in Michigan for projects that would alleviate the state's traffic congestion, it is anticipated that traffic congestion levels will increase modestly over the next decade. But if the state is able to make a significant investment in projects and programs to improve reliability, there will be a significant decrease in delays and the cost per household of traffic congestion.

In addition to reducing personal delays caused by traffic congestion, improved traffic flow in Michigan would also support economic development and growth in the state by improving the efficiency and competitiveness of Michigan businesses. A significant reduction in traffic congestion and enhanced reliability on Michigan's roads and highways will also provide a significant benefit to Michigan households by lowering the economic costs of traffic congestion.

Based on current levels of funding in Michigan, statewide annual traffic congestion costs are anticipated to total approximately $6 billion in 2031 - $1,520 per household (Scenario A).[34] If the state is able to make improvements that result in maintaining current levels of traffic congestion (Scenario B), the annual cost of congestion is anticipated to be $5.5 billion or $1,382 per household in 2031 and if the state is able to invest adequately to make significant improvements in the reliability of the state's roadways (Scenario C), the annual cost of traffic congestion is expected to be reduced to $4.4 billion or $1,106 per household by 2031.[35]

Chart 10. Current and anticipated cost of traffic congestion in Michigan.



Source: TRIP analysis of Michigan Department of Transportation data.

Providing a significant improvement in the reliability of Michigan's roads and highways will require an increase in funding for numerous projects and programs to improve the system's reliability.

The following chart indicates the current and average amount of annual spending from 2021 to 2031 that would be required under three funding scenarios in order to reduce traffic congestion and improve mobility in Michigan.

Chart 11. Annual funding for improvements needed to reduce traffic congestion in Michigan from 2021-2031 under three funding scenarios.

	Average Annual Congestion Investment	Average Annual Investment per Household
Current Investment	$203.1 Million	$51
Scenario A 2031	$203.1 Million	$51
Scenario B 2031	$536.5 Million	$135
Scenario C 2031	$1.036 Billion	$260

Source: TRIP analysis of Michigan Department of Transportation data.

Improving Transportation Safety, Resiliency and Efficiency

Recognizing that extreme weather, sea level change, and changes in environmental factors may threaten the condition and longevity of the nation's transportation infrastructure, transportation agencies have begun to assess vulnerabilities and consider the resilience of their transportation assets during the transportation planning process. Transportation agencies across the country have begun to incorporate resilience in asset management plans, addressing resilience in project development and design and optimizing operations and maintenance practices. [36]

Based on the importance of maximizing the level and safety of mobility provided by its transportation system, transportation agencies are adopting Transportation Systems Management and Operations (TSMO) practices and incorporating improved resiliency into their transportation network. While a TSMO program does not eliminate the need for capacity expansions along some routes, it helps enhance the mobility of an existing corridor as much as possible.

A TSMO program adopts an integrated set of strategies to improve traffic flow and safety on a portion of a roadway, including work zone management, traffic incident management, freight management, traveler information, traffic signal coordination, ramp management, transit management and improved bicycle and pedestrian crossings.[37] The benefits of TSMO can include reduced traffic congestion, reduced fuel consumption and reduced emissions.

How Transportation Investments Support Economic Growth

Because it impacts the time it takes to transport people and goods, as well as the cost of travel, the level of mobility provided by a transportation system and its physical condition play a significant role in determining a region's economic effectiveness. Today's culture of business demands that an area have well-maintained and efficient roads, highways and bridges if it is to remain economically competitive. Global communications and the impact of free trade in North America and elsewhere have resulted in a significant increase in freight movement, making the quality of a region's transportation system a key component in a business's ability to compete locally, nationally and internationally.

Every year, $1.25 trillion in goods are shipped to and from sites in Michigan.[38] The value of freight shipped to and from sites in Michigan, in inflation-adjusted dollars, is expected to increase 46 percent by 2045.[39]

Investments in transportation improvements in Michigan play a critical role in the state's economy. A report by the American Road & Transportation Builders Association found that the design, construction and maintenance of transportation infrastructure supports the equivalent of approximately 94,000 full-time jobs across all sectors of the state economy, earning these workers approximately $4.1 billion annually.[40]

These jobs include approximately 47,000 full-time jobs directly involved in transportation infrastructure construction and related activities. Spending by employees and companies in the transportation design and construction industry supports an additional 47,000 full-time jobs in Michigan.[41] Transportation construction in Michigan contributes an estimated $741 million annually in state and local income, corporate and unemployment insurance taxes and the federal payroll tax.[42]

Approximately 1.9 million full-time jobs in Michigan in key industries like tourism, retail sales, agriculture and manufacturing are dependent on the quality, safety and reliability of the state's transportation infrastructure network. These workers earn $76.9 billion in wages and contribute an estimated $14 billion in state and local income, corporate and unemployment insurance taxes and the federal payroll tax.[43]

Businesses have responded to improved communications and the need to cut costs with a variety of innovations including just-in-time delivery, increased small package delivery, demand-side inventory management and e-commerce. The result of these changes has been a significant improvement in logistics efficiency as firms move 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. These improvements have made mobile inventories the norm, resulting in the nation's trucks literally becoming rolling warehouses.

The economic benefits of a well-maintained, efficient and safe transportation system can be divided into several categories, including the following.

Improved competitiveness of industry: An improved transportation system reduces costs of production and distribution by lowering barriers to mobility and increasing travel speeds. Improved mobility provides the manufacturing, retail and service sectors improved and more reliable access to increased and often lower-cost sources of labor, inventory, materials and customers.[44] An increase in travel speeds of 10 percent has been found to increase labor markets by 15 to 18 percent and a 10 percent increase in the size of labor markets has been found to increase productivity by an average of 2.9 percent.[45]

Improved household welfare: An improved transportation system gives households better access to higher-paying jobs, a wider selection of competitively priced consumer goods, and additional housing and healthcare options. A good regional transportation system can also provide mobility for people without access to private vehicles, including the elderly, disabled and people with lower incomes.[46]

Improved local, regional and state economies: By boosting regional economic competitiveness, which stimulates population and job growth, and by lowering transport costs for businesses and individuals, transportation improvements can bolster local, regional and state economies. Improved transportation also stimulates urban and regional redevelopment and reduces the isolation of rural areas.[47]

Increased leisure/tourism and business travel: The condition and reliability of a region's transportation system impacts the accessibility of activities and destinations such as conferences, trade shows, sporting and entertainment events, parks, resort areas, social events, and everyday business meetings. An improved transportation system increases the accessibility of leisure/tourism and business travel destinations, which stimulates economic activity.[48]

Reduced economic losses associated with vehicle crashes, traffic congestion and driving on deficient roads: When a region's transportation system lacks some desirable safety features, is congested or is deteriorated, it increases costs to the public and businesses in the form of traffic delays, increased costs

associated with traffic crashes, increased fuel consumption and increased vehicle operating costs. Transportation investments that improve roadway safety, reduce congestion and improve roadway conditions benefit businesses and households by saving time, lives and money.

Transportation investment creates and supports jobs: A 2021 macroeconomic analysis by IHS Markit, a global economic analysis firm, found that every $1 million spent on highways, bridges and public transit supports 21 jobs annually, with 10 jobs in sectors related to providing the transportation improvements and 11 jobs being induced elsewhere in the economy.[49]

Highway and bridge spending multiplies through the economy by stimulating additional output: A 2021 macroeconomic analysis by IHS Markit found that that every dollar spent on highway and bridge improvements results in $3.4 dollars in combined direct, indirect and induced output from industries throughout the economy, resulting in a multiplier for highway and bridge investment of 3.4.[50]

Needed transportation projects that expand capacity and preserve the existing transportation system generate significant economic benefits. Transportation projects that provide additional roadway lanes, expand the efficiency of a current roadway (through improved signalization, driver information or other Intelligent Transportation Systems), or provide additional transit capacity, produce significant economic benefits by reducing congestion and improving access, thus speeding the flow of people and goods.[51] Similarly, transportation projects that maintain and preserve existing transportation infrastructure also provide significant economic benefits. The preservation of transportation facilities improves travel speed, capacity, load-carry abilities and safety, while reducing operating costs for people and businesses.[52] Projects that preserve existing transportation infrastructure also extend the service life of a road, bridge or transit vehicle and save money by postponing or eliminating the need for more expensive future repairs.[53]

Conclusion

Michigan's roads, highways and bridges are the backbone of the state's transportation system and their good condition and performance are critical to the quality of life and the health of Michigan's economy. Improvements in the condition, reliability and safety of Michigan's roads, highways and bridges will be critical to the state's ability to achieve its economic goals by improving the competitiveness of the state's businesses and enhancing quality of life to Michiganders.

The transportation investment decisions made in Michigan over the next decade will determine where the state is going. Making transportation improvements in Michigan can provide the state with a transportation system that is safer, more efficient and better maintained, while inadequate investment in the state's transportation system could lead to reduced reliability, declining road and bridge conditions, higher household costs and reduced safety.

# # #

ENDNOTES

[1] U.S. Census Bureau (2020).
[2]Highway Statistics (2019). Federal Highway Administration. DL-1C.
[3] U.S. Department of Transportation - Federal Highway Administration: Highway Statistics 2000 and 2019. (2020) https://www.fhwa.dot.gov/policyinformation/travel_monitoring/tvt.cfm
[4] Federal Highway Administration – Traffic Volume Trends. https://www.fhwa.dot.gov/policyinformation/travel_monitoring/tvt.cfm
[5] TRIP analysis of Bureau of Economic Analysis data (2019). https://apps.bea.gov/itable/iTable.cfm?ReqID=70&step=1#reqid=70&step=1&isuri=1
[6] Ibid.
[7] U.S. Bureau of Labor Statistics. Annual GDP change, Q4 2015 to Q4 2020.
[8] Detroit Regional Chamber. COVID-19 Business Restart Center, Unemployment and Payroll Indicators.
[9] American Road & Transportation Builders Association (2021). Economic Impact of the Infrastructure Investment & Jobs Act: Michigan. https://www.artba.org/economics/iija-impact/states/?profile=MI

[10] Michigan DOT response to TRIP survey, 2021.
[11] Selecting a Preventative Maintenance Treatment for Flexible Pavements. R. Hicks, J. Moulthrop. Transportation Research Board. 1999. Figure 1.
[12] TRIP calculation.
[13] Michigan DOT response to TRIP survey, 2021
[14] Ibid.
[15] Ibid.
[16] Ibid.
[17] Ibid.
[18] TRIP analysis of MDOT data, 2021.
[19] Ibid.
[20] Ibid.
[21] Michigan DOT response to TRIP survey, 2021
[22] TRIP analysis of MDOT data, 2021.
[23] Michigan DOT response to TRIP survey, 2021.
[24] TRIP analysis of MDOT data, 2021.
[25] Michigan DOT response to TRIP survey, 2021.
[26] Ibid.
[27] NHTSA (2011).
[28] TRIP analysis of MDOT data.
[29] Ibid.
[30] Michigan DOT response to TRIP survey, 2021.
[31] TRIP analysis of MDOT data.
[32] Texas A & M Transportation Institute (2021). 2021 Urban Mobility Report. https://mobility.tamu.edu/umr/
[33] Michigan Department of Transportation 2019 Freeway Congestion and Reliability Performance Report. https://www.michigan.gov/mdot/0,4616,7-151-9622_11045_25024_75677---,00.html
[34] Based on an analysis of Texas A & M Transportation Institute data and MDOT future investment levels.
[35] Ibid.
[36] Federal Highway Administration (2019. Resilience. https://www.fhwa.dot.gov/environment/sustainability/resilience/
[37] Federal Highway Administration (2019). What is TSMO? https://ops.fhwa.dot.gov/tsmo/index.htm#q1
[38] TRIP analysis of Bureau of Transportation Statistics, U.S. Department of Transportation Freight Analysis Framework. Data is for 2017. https://ops.fhwa.dot.gov/freight/freight_analysis/faf/
[39] TRIP analysis of Bureau of Transportation Statistics, U.S. Department of Transportation Freight Analysis Framework. https://ops.fhwa.dot.gov/freight/freight_analysis/faf/
[40] American Road & Transportation Builders Association (2015). The 2015 U.S. Transportation Construction Industry Profile. https://www.transportationcreatesjobs.org/pdf/Economic_Profile.pdf

[41] Ibid.
[42] Ibid
[43] Ibid.
[44] National Cooperative Highway Research Program. Economic Benefits of Transportation Investment (2002). p. 4.
[45] The Transportation Challenge: Moving the U.S. Economy (2008). National Chamber Foundation. p. 10.
[46] Ibid.
[47] Ibid.
[48] Ibid.
[49] IHS Markit (2021). Economic Impacts of Transportation Infrastructure. ARTBA_EIA_IIJA_Report_Sept2021.pdf
[50] Ibid.
[51]The Transportation Challenge: Moving the U.S. Economy (2008). National Chamber Foundation. p. 5.
[52] Ibid.
[53] Ibid.