

**PROVIDING SAFE AND EFFICIENT
MOBILITY IN HAWAII:
The Cost to Drivers of Deficient Roads, Highway Congestion
and Traffic Crashes**

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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, construction and finance; labor unions; and organizations concerned with an efficient and safe surface transportation network.

Executive Summary

Transportation is more than just driving on Hawaii's roads and bridges or using public transit. It's about receiving packages in a timely manner, easily grabbing groceries on the way home, or safely traveling to recreational and tourist destinations. Transportation provides the connections that keep businesses up and running. It not only moves people, it makes the movement of goods and services possible and provides the state's residents with a high quality of life. The quality of Hawaii's extensive system of roads, highways and bridges has a significant impact on the level of safety and mobility of the state's residents, visitors and businesses.

As the backbone that supports the Aloha State's economy, Hawaii's transportation system affects each resident every day. It provides for travel to work and school, visits to family and friends, and trips to tourist and recreational attractions. Transportation connects Hawaii businesses with customers and the world. It provides the goods and services people need each day and plays a role in every product manufactured in the state and every customer served by one of the state's businesses.

With a current unemployment rate of 6.5 percent and with the state's population continuing to grow, Hawaii must improve its system of roads, highways, bridges and public transit to foster economic growth and keep businesses in the state. In addition to economic growth, transportation improvements are needed to ensure safe, reliable mobility and a high quality of life for all Hawaiians.

The Safe, Accountable, Flexible, and Efficient Transportation Equity Act – A Legacy for Users (SAFETEA-LU), the current long-range federal surface transportation program, was originally set to expire on Sept. 30, 2009. Following a series of short term extensions, the program now expires March 31, 2012. The level of funding and the provisions of a future federal surface transportation program will have a significant impact on future highway and bridge conditions and safety as well as the level of transit service in Hawaii, which, in turn, will affect the state's ability to keep its residents safe, improve their quality of life and enhance economic development opportunities.

An inadequate transportation system costs Hawaii residents a total of approximately \$1.1 billion every year in the form of traffic crashes, additional vehicle operating costs (VOC) and congestion-related delays.

- TRIP has calculated the total statewide cost to Hawaii's residents of driving on roads that are deteriorated, congested and lack some desirable safety features and the average cost per motorist in the Honolulu metro area. The following chart shows the cost breakdowns statewide and for the Honolulu area.

| | VOC | Congestion | Safety | TOTAL |
|----------------------------|---------------|---------------|---------------|------------------------|
| Honolulu per driver | \$701 | \$620 | \$206 | \$1,527 |
| STATEWIDE | \$485 million | \$350 million | \$255 million | \$1.090 billion |

- TRIP estimates that Honolulu roadways that lack some desirable safety features, have inadequate capacity to meet travel demands or have poor pavement conditions cost the region’s average motorist \$1,527 annually in the form of traffic crashes, additional vehicle operating costs and the cost of lost time and wasted fuel due to traffic congestion.

Population and economic growth in the Aloha State have resulted in increased demands on the state’s major roads and highways.

- Hawaii’s population reached approximately 1.37 million in 2010, an increase of 24 percent since 1990. The state’s population is expected to grow to 1.47 million by 2030.
- Vehicle travel in Hawaii increased 24 percent from 1990 to 2010. Vehicle miles of travel (VMT) jumped from 8.1 billion in 1990 to 10 billion VMT in 2010.
- By 2025, vehicle travel in Hawaii is projected to increase by another 25 percent.
- From 1990 to 2010, Hawaii’s gross domestic product, a measure of the state’s economic output, increased by 25 percent, when adjusted for inflation.

Nearly two-thirds of Hawaii’s major roads are deteriorated. Without additional funding, conditions could worsen in the future. This report contains a list of the 25 sections of roadway in the state that are the most deteriorated and in need of repair or replacement.

- According to the Hawaii Department of Transportation (HDOT), 61 percent of lane miles on major roadways are in poor or mediocre condition. A total of 47 percent of lane miles of major roadways were rated in poor condition and an additional 14 percent were rated in mediocre condition. Seventeen percent of lane miles of major roadways were in fair condition and an additional 22 percent were rated in good condition. These include roads that are maintained by the Hawaii Department of Transportation as well as individual counties.
- Roads rated in poor condition may show signs of deterioration, including rutting, cracks and potholes. In some cases, poor roads can be resurfaced, but often are too deteriorated and must be reconstructed.
- Roads in need of repair cost each Hawaii motorist an average of \$549 annually in extra vehicle operating costs – \$485 million statewide. Costs include accelerated vehicle depreciation, additional repair costs and increased fuel consumption and tire wear.

- In Honolulu, 62 percent of major roads are in poor condition, the third highest share among cities with a population of 500,000 or more. Driving on roads in need of repair costs each Honolulu motorist an average of \$701 each year in the form of accelerated vehicle depreciation, additional repair costs and increased fuel consumption and tire wear. Honolulu’s extra vehicle operating cost is the fourth highest in the nation among cities with a population of 500,000 or greater.
- The functional life of Hawaii’s roads is greatly affected by the state’s ability to perform timely maintenance and upgrades to ensure that structures last as long as possible. It is critical that roads are fixed before they require major repairs because reconstructing roads costs approximately four times more than resurfacing them.
- HDOT has identified the 25 sections of roadway throughout the state that are the most deteriorated and in need of repair or replacement. . The list includes sections of roadway that are at least two miles in length and carry at least 2,500 average daily traffic (ADT). The top ten are listed below, with the full list included in the body of the report.

| Rank | Route | Location | Length (Mi.) | ADT |
|------|--|----------|--------------|---------|
| 1 | Hawaii Belt Road, M.P. 19.00 to Laupahoehoe (Route 19) | Hawaii | 5.00 | 7,236 |
| 2 | Interstate H-1, Kalihi to Puowaina (Route H-1) | Oahu | 2.10 | 236,200 |
| 3 | Kamehameha Highway, Pupukea to Kuilima (Route 83) | Oahu | 6.02 | 13,689 |
| 4 | Akoni Pule Highway, Maulili to Pololu Valley (Route 270) | Hawaii | 4.45 | 2,581 |
| 5 | Mamalahoa Highway, Napoopoo to Kealakekua (Route 11) | Hawaii | 5.62 | 9,911 |
| 6 | Hawaii Belt Road, Honomu to M.P. 19.00 (Route 19) | Hawaii | 5.75 | 7,236 |
| 7 | Kamehameha Highway, Kuilima to Polynesian Cultural Center (Route 83) | Oahu | 6.85 | 12,579 |
| 8 | Kamehameha Highway, Punaluu to Crouching Lion (Route 83) | Oahu | 3.40 | 9,963 |
| 9 | Farrington Highway, Dillingham Airfield to Puuiki (Route 930) | Oahu | 3.35 | 6,745 |
| 10 | Hawaii Belt Road, Hilo to Papaikou (Route 19) | Hawaii | 4.54 | 16,254 |

Nearly half of Hawaii’s bridges show significant deterioration or do not meet current design standards. This includes all bridges that are more than 20 feet in length.

- Thirteen percent of Hawaii’s bridges (more than 20 feet in length) were rated structurally deficient in 2011. A bridge is structurally deficient if there is significant deterioration of the bridge deck, superstructure or substructure or if the bridge was designed to carry light loads. Structurally deficient bridges may be closed in some situations, but more often are posted for lower weight limits, which restricts or redirects larger vehicles, including commercial trucks, school buses and emergency services vehicles.
- Thirty-two percent of Hawaii’s bridges (more than 20 feet in length) were rated functionally obsolete in 2011. Bridges that are functionally obsolete no longer meet current highway design standards, often because of narrow lanes, inadequate clearances or poor alignment.
- HDOT projects that the current cost to replace or rehabilitate all structurally deficient bridges in the state totals \$500 million.

- HDOT has identified the 25 structurally deficient bridges that are most in need of repair or replacement. The top ten bridges are listed below with the full list included in the body of the report.

| Rank | Route | Location | Route or feature intersected | ADT | Year Built |
|------|-------|----------|------------------------------|---------|------------|
| 1 | 560 | KAUAI | WAIPA STRM | 5,555 | 1912 |
| 2 | 560 | KAUAI | WAIKOKO STRM | 5,555 | 1913 |
| 3 | 560 | KAUAI | WAIOLI STRM | 6,265 | 1912 |
| 4 | 50 | KAUAI | NAWILIWILI STR/LIHUE M | 27,145 | 1936 |
| 5 | 99 | OAHU | UP POAMOHO STRM | 22,120 | 1936 |
| 6 | 50 | KAUAI | WAHIWA STRM | 14,175 | 1936 |
| 7 | 0 | MAUI | IAO STRM #59 | 3,000 | 1955 |
| 8 | 3080 | MAUI | STRM(KAHANA-NUI #93) | 3,000 | 1964 |
| 9 | H1 | OAHU | KAPALAMA CANAL | 183,925 | 1938 |
| 10 | 31 | MAUI | KULANIHA KOA DITCH #76 | 1,920 | 1911 |

Improving safety features on Hawaii’s roads and highways would likely result in a decrease in traffic fatalities in the state. Roadway design may have been a contributing factor in approximately one-third of all fatal and serious traffic crashes.

- Between 2006 and 2010, 628 people were killed in traffic crashes in Hawaii, an average of 126 fatalities per year.
- Hawaii’s traffic fatality rate was 1.13 per 100 million vehicle miles of travel in 2010, slightly higher than the national average of 1.11.
- The cost of serious traffic crashes in Hawaii in 2010, in which roadway design may have been a contributing factor, was approximately \$255 million. The cost of serious crashes includes lost productivity, lost earnings, medical costs and emergency services.
- In the Honolulu area, where there were 60 traffic fatalities in 2010, traffic crashes in which roadway design may have been a contributing factor cost the average driver approximately \$206 per year.
- Several factors are associated with vehicle crashes that result in fatalities, including driver behavior, vehicle characteristics and roadway design. It is estimated that roadway design may be a contributing factor in approximately one-third of fatal traffic crashes.
- Where appropriate, highway improvements can reduce traffic fatalities and accidents while improving traffic flow to help relieve congestion. Such improvements include removing or shielding obstacles; adding or improving medians; adding rumble strips, wider lanes, wider and paved shoulders; upgrading roads from two lanes to four lanes; and better road markings and traffic signals.
- 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.

Commerce and commuting in Hawaii are constrained by growing traffic congestion, which will increase in the future unless additional highway and transit capacity is provided.

- In 2008, 45 percent of the state's urban highways carried a level of traffic likely to result in significant delays during peak travel hours. The statewide cost of lost time and wasted fuel due to congestion is \$350 million annually.
- The average rush hour trip in the Honolulu metropolitan area takes approximately eighteen percent longer to complete than during non-rush hour. Congestion related delays cost the average peak-hour driver in Honolulu \$620 each year in lost time and wasted fuel.

The efficiency of Hawaii's transportation system, particularly its highways, is critical to the health of the state's economy. Businesses are increasingly reliant on an efficient and reliable transportation system to move products and services. Expenditures on highway repairs create a significant number of jobs.

- The [Federal Highway Administration estimates](#) that each dollar spent on road, highway and bridge improvements results in an average benefit of \$5.20 in the form of reduced vehicle maintenance costs, reduced delays, reduced fuel consumption, improved safety, reduced road and bridge maintenance costs, and reduced emissions as a result of improved traffic flow.
- Every year, \$22 billion in goods are shipped from sites in Hawaii and another \$32.4 billion in goods are shipped to sites in Hawaii. Forty-seven percent of the goods shipped annually from sites in Hawaii are carried by trucks and another five percent are carried by parcel, U.S. Postal Service or courier services, which use trucks for part of their deliveries.
- A [2007 analysis by the Federal Highway Administration](#) found that every \$1 billion invested in highway construction would support approximately 27,800 jobs, including approximately 9,500 in the construction sector, approximately 4,300 jobs in industries supporting the construction sector, and approximately 14,000 other jobs induced in non-construction related sectors of the economy.

Two 2010 reports, one by the Treasury Department with the Council of Economic Advisers and the other by a bipartisan group of transportation experts, found that the U.S. is falling far behind internationally in providing a modern transportation system and will need to adopt a more ambitious and focused transportation program to maintain the nation's standard of living. The reports call for increased investment to relieve traffic congestion, improve freight and intermodal access, improve road and bridge conditions, improve traffic safety, and reduce emissions.

The reports found that now is an optimal time to invest in infrastructure because of reduced costs due to the economic downturn and that providing adequate resources to modernize the nation's transportation system will require increased use of innovative

funding tools including vehicle-miles-traveled fees, public-private partnerships and capital budgeting.

- The report, “[*An Economic Analysis of Infrastructure Investment*](#)” (The Treasury report), was prepared by the U.S. Department of the Treasury with the Council of Economic Advisers.
- The report, “[*Well Within Reach: America’s New Transportation Agenda*](#)” (The Miller report), was prepared by a group of the nation’s top transportation policy experts chaired by former U.S. Secretaries of Transportation, Samuel Skinner and Norman Mineta. The group was assembled by the Miller Center at the University of Virginia to develop solutions for the funding and planning challenges that confront the nation’s transportation system.
- The Miller report found that the U.S. faces an annual funding shortfall to maintain conditions and traffic congestion levels on its transportation system from between \$134 and \$194 billion and from between \$189 and \$262 billion to improve conditions and reduce traffic congestion.
- The Treasury report found that U.S. infrastructure spending as a percentage of gross domestic product (GDP) has fallen by 50 percent and now accounts for two percent of the nation’s GDP. In contrast, China spends about nine percent of its GDP on infrastructure and Europe about five percent.
- The Treasury report found that now is an optimal time to invest in transportation infrastructure because well-designed projects can provide significant, long-term economic benefits, significant needs exist and construction and other costs associated with infrastructure projects are especially low because of high unemployment and a high level of underutilized resources.

Key recommendations of the reports include:

Program format:

- Adopt an integrated approach to transportation planning that includes freight and goods movement and stresses intermodal connectivity (Miller).
- Prioritize projects that provide the greatest returns in terms of future U.S. competitiveness, economic growth and employment (Miller).
- Increase emphasis on urban congestion relief, including adding additional roadway and transit capacity, making the existing system work more efficiently and adopting regional policies that may reduce some travel demand (Miller).
- Improve the delivery of transportation projects by reforming the project planning, permitting and review process to speed actual implementation (Miller).

Funding:

- Establish a National Infrastructure Bank (NIB) that would create conditions for greater private sector co-investment in infrastructure. The NIB would also perform rigorous analysis to identify projects with the greatest possible societal and economic benefits (Treasury).
- Save the public money by investing adequately in transportation to reduce delays, vehicle maintenance costs, traffic crashes and vehicle emissions (Miller).

All data used in the report is the latest available. Sources of information for this report include the Hawaii Department of Transportation (HDOT), the Federal Highway Administration (FHWA), the Federal Transit Administration (FTA), the Treasury Department, the Council of Economic Advisers, the U.S. Census, The Bureau of Transportation Statistics (BTS), the National Highway Traffic Safety Administration (NHTSA), and the Texas Transportation Institute (TTI).

Introduction

Hawaii's roads, highways, bridges and public transit systems form vital transportation links for the state's residents, visitors and businesses, providing daily access to homes, jobs, shopping, tourist destinations and recreation, as well as to agricultural centers and industrial zones.

Today, with the state continuing to experience growth in population and travel, the preservation and modernization of Hawaii's transportation system is crucial to providing safe and efficient mobility, while improving the economic livelihood of the state and accommodating future growth.

As the nation looks to rebound from the recent economic downturn, improving Hawaii's transportation system could play an important role in advancing the state's economic well-being by providing critically needed jobs in the short term and by improving the productivity and competitiveness of the state's businesses in the long term.

This report examines the condition, use and safety of Hawaii's roads, highways and bridges and the future mobility needs of the state.

All data used in the report is the latest available. Sources of information for this study include the Hawaii Department of Transportation (HDOT), Federal Highway Administration (FHWA), the Treasury Department, the Council of Economic Advisers, the U.S. Census, The Bureau of Transportation Statistics (BTS), the National Highway Traffic Safety Administration (NHTSA), and the Texas Transportation Institute (TTI).

Population, Travel and Economic Trends in Hawaii

Hawaii residents and businesses require a high level of personal and commercial mobility. Despite the recent economic downturn, population and economic growth in the Aloha State over the past two decades resulted in a significant increase in the demand for mobility and an increase in vehicle miles of travel (VMT). To foster a high quality of life in Hawaii, it will be critical that the state provide and preserve a safe and modern transportation system that can accommodate future growth in population, vehicle travel and economic development.

Hawaii's population grew 24 percent between 1990 and 2010, increasing from 1.11 million in 1990 to approximately 1.37 million residents in 2010.¹ The population of Hawaii is projected to increase to 1.47 million by 2030.²

Hawaii also has experienced moderate economic growth since 1990. From 1990 to 2010, Hawaii's gross domestic product (GDP), a measure of the state's economic output, increased by 25 percent, when adjusted for inflation.³

Steady population and economic growth in Hawaii have resulted in increases in vehicle travel in the state. From 1990 to 2010, annual vehicle miles of travel in Hawaii increased 24 percent, from 8.1 billion miles traveled annually to 10 billion miles traveled annually.⁴ Based on population and other lifestyle trends, TRIP estimates that travel on Hawaii's roads and highways will increase 25 percent by 2025.⁵

Condition of Hawaii's Roads

The life cycle of Hawaii's roads is greatly affected by the state and local governments' 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, mediocre, fair or good condition.

According to HDOT, a total of 61 percent of lane miles of major roadways are in poor or mediocre condition. Forty-seven percent of lane miles of major roadways were rated in poor condition and an additional 14 percent were rated in mediocre condition.⁶ These include roads that are maintained by the Hawaii Department of Transportation as well as individual counties.

Roads rated poor may show signs of deterioration, including rutting, cracks and potholes. In some cases, poor roads can be resurfaced but often are too deteriorated and must be reconstructed. Most pavements in mediocre condition can be repaired by resurfacing, but some may need more extensive reconstruction to return them to good condition. Seventeen percent of lane miles of major roadways were in fair condition and an additional 22 percent were rated in good condition.

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.⁷

As Hawaii’s roads and highways continue to age, they will reach a point 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.

Based on information provided by HDOT, TRIP has identified the 25 sections of major roadways in the state that are the most deteriorated and in need of repair or replacement. The list includes sections of roadway that are at least two miles in length and carry at least 2,500 average daily traffic (ADT).

Chart 1. Sections of major Hawaii roadways that are most deteriorated and in need of repair or reconstruction.

| Rank | Route | Location | Length (Mi.) | ADT |
|------|--|----------|--------------|---------|
| 1 | Hawaii Belt Road, M.P. 19.00 to Laupahoehoe (Route 19) | Hawaii | 5.00 | 7,236 |
| 2 | Interstate H-1, Kalihi to Puowaina (Route H-1) | Oahu | 2.10 | 236,200 |
| 3 | Kamehameha Highway, Pupukea to Kuilima (Route 83) | Oahu | 6.02 | 13,689 |
| 4 | Akoni Pule Highway, Maulili to Pololu Valley (Route 270) | Hawaii | 4.45 | 2,581 |
| 5 | Mamalahoa Highway, Napoopoo to Kealakekua (Route 11) | Hawaii | 5.62 | 9,911 |
| 6 | Hawaii Belt Road, Honomu to M.P. 19.00 (Route 19) | Hawaii | 5.75 | 7,236 |
| 7 | Kamehameha Highway, Kuilima to Polynesian Cultural Center (Route 83) | Oahu | 6.85 | 12,579 |
| 8 | Kamehameha Highway, Punaluu to Crouching Lion (Route 83) | Oahu | 3.40 | 9,963 |
| 9 | Farrington Highway, Dillingham Airfield to Puuiki (Route 930) | Oahu | 3.35 | 6,745 |
| 10 | Hawaii Belt Road, Hilo to Papaikou (Route 19) | Hawaii | 4.54 | 16,254 |
| 11 | Volcano Road, Keeau-Pahoa to Kurtistown (Route 11) | Hawaii | 3.44 | 24,978 |
| 12 | Kahekili Highway, Kahaluu to Haiku (Route 83) | Oahu | 3.10 | 21,740 |
| 13 | Interstate H-1, Waiuu to Halawa (Route H-1) | Oahu | 3.34 | 233,600 |
| 14 | Honoapiilani Highway, Maalaea Bay to M.P. 11.70 (Route 30) | Maui | 4.10 | 25,665 |
| 15 | Mamalahoa Highway, M.P. 90.00 to M.P. 95.00 (Route 11) | Hawaii | 4.83 | 3,670 |
| 16 | Kamehameha Highway, Joseph P. Leong to Pupukea (Route 83) | Oahu | 4.47 | 17,610 |
| 17 | Wilikina Drive, Kamananui to Kamehameha Highway (Route 99) | Oahu | 2.10 | 43,000 |
| 18 | Kuhio Highway, M.P. 18.00 to Kilauea (Route 56) | Kauai | 5.90 | 12,100 |
| 19 | Farrington Highway, Puuiki to Kamehameha (Route 930) | Oahu | 2.42 | 8,554 |
| 20 | Hawaii Belt Road, Papaikou to Honomu (Route 19) | Hawaii | 6.21 | 14,400 |
| 21 | Volcano Road, Glenwood to M.P. 25.00 (Route 11) | Hawaii | 5.19 | 6,300 |
| 22 | Akoni Pule Highway, M.P. 14.25 to Hawi (Route 270) | Hawaii | 5.08 | 5,849 |
| 23 | Kamehameha V Highway, M.P. 2.00 to M.P. 7.00 (Route 450) | Molokai | 5.00 | 2,700 |
| 24 | Nawiliwili Road, M.P. 0.00 to M.P. 2.06 (Route 58) | Kauai | 2.06 | 12,019 |
| 25 | Volcano Road, M.P. 15.00 to Glenwood (Route 11) | Hawaii | 4.84 | 6,300 |

Source: Hawaii Department of Transportation response to TRIP survey.

The Costs to Motorists of Roads in Inadequate Condition

TRIP has calculated the additional cost to motorists of driving on roads in poor or unacceptable condition. Roads in poor condition – which may include potholes, rutting or rough surfaces – increase the cost to operate and maintain a vehicle. These additional vehicle operating costs include accelerated vehicle depreciation, additional vehicle repairs, increased fuel consumption and increased tire wear. TRIP estimates that additional vehicle operating costs borne by Hawaii motorists as a result of poor road conditions total \$485 million annually, or \$549 per motorist.

In Honolulu, 62 percent of major roads are in poor condition, the third highest share in the nation among large cities (500,000+ population). Driving on roads in need of repair costs each Honolulu motorist an average of \$701 annually in the form of accelerated vehicle depreciation, additional repair costs and increased fuel consumption and tire wear.⁸ This is the fourth highest extra vehicle operating cost among large cities with a population of more than 500,000.⁹

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.¹⁰

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 motorist, calculating current vehicle operating costs based on AAA's 2010 vehicle operating costs and then using the HDM model to estimate the additional vehicle operating costs paid by drivers as a result of substandard roads.¹¹ Additional research on the impact of road conditions on fuel consumption by the Texas Transportation Institute (TTI) is also factored into TRIP's vehicle operating cost methodology.

Bridge Conditions in Hawaii

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

In 2011, nearly half of Hawaii's bridges were rated as structurally deficient or functionally obsolete. This includes all bridges that are more than 20 feet in length and are maintained by state, local and federal agencies. Thirteen percent of Hawaii's bridges were rated as structurally deficient in 2011.¹² A bridge is structurally deficient if there is significant deterioration of the bridge deck, superstructure or substructure or if the bridge was designed to carry light loads. Bridges that are structurally deficient may be closed in some situations, but more often are posted for lower weight limits 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 also lengthen travel time, waste fuel and reduce the efficiency of the local economy.

Thirty-two percent of Hawaii's bridges were rated as functionally obsolete in 2011.¹³ Bridges that are functionally obsolete no longer meet current highway design standards, often because of narrow lanes, inadequate clearances or poor alignment with the approaching roadway.

The service life of bridges can be extended by performing routine maintenance such as resurfacing decks, painting surfaces, insuring that a facility has good drainage and replacing deteriorating components. But, most bridges will eventually require more costly reconstruction or major rehabilitation to remain operable.

HDOT has identified the 25 structurally deficient bridges in the state that are most in need of repair or replacement. The bridges are listed below.

Chart 2. The 25 structurally deficient bridges that are most in need of repair or replacement.

| Rank | Route | Location | Route or feature intersected | ADT | Year Built |
|------|-------|----------|------------------------------|---------|------------|
| 1 | 560 | KAUAI | WAIPA STRM | 5,555 | 1912 |
| 2 | 560 | KAUAI | WAIKOKO STRM | 5,555 | 1913 |
| 3 | 560 | KAUAI | WAIOLI STRM | 6,265 | 1912 |
| 4 | 50 | KAUAI | NAWILIWILI STR/LIHUE M | 27,145 | 1936 |
| 5 | 99 | OAHU | UP POAMOHO STRM | 22,120 | 1936 |
| 6 | 50 | KAUAI | WAHIWA STRM | 14,175 | 1936 |
| 7 | 0 | MAUI | IAO STRM #59 | 3,000 | 1955 |
| 8 | 3080 | MAUI | STRM(KAHANA-NUI #93) | 3,000 | 1964 |
| 9 | H1 | OAHU | KAPALAMA CANAL | 183,925 | 1938 |
| 10 | 31 | MAUI | KULANIHAKOA DITCH #76 | 1,920 | 1911 |
| 11 | 7521 | OAHU | PAUOA STRM | 14,878 | 1932 |
| 12 | 93 | OAHU | KAUPUNI STRM | 26,970 | 1937 |
| 13 | 92 | OAHU | NUUANU STRM (W.B) | 70,400 | 1932 |
| 14 | 92 | OAHU | KAPALAMA CANAL (E.B) | 73,935 | 1949 |
| 15 | 83 | OAHU | KAIPAPAU STRM | 13,030 | 1932 |
| 16 | 270 | HAWAII | NIULII STRM | 5,760 | 1918 |
| 17 | 72 | OAHU | IHHILAUAKEA STRM | 9,800 | 1931 |
| 18 | 93 | OAHU | MAIPALAOA STRM | 33,735 | 1967 |
| 19 | 0 | OAHU | WAALOA WY BR#2/MANOA STR | 4,000 | 1965 |
| 20 | 0 | OAHU | FERN ST/MAKIKI STRM | 2,030 | 1931 |
| 21 | 83 | OAHU | WAIPILOPILO STRM | 13,030 | 1932 |
| 22 | 50 | KAUAI | HANAPEPE RIVER | 19,155 | 1938 |
| 23 | 0 | OAHU | WAALOA BR#4/WAIAKEAKUAS | 4,200 | 1963 |
| 24 | 6045 | OAHU | KAELEPULU STREAM | 12,657 | 1925 |
| 25 | 93 | OAHU | UNMD STRM(MAKAHA #3) | 6,565 | 1937 |

Source: Hawaii Department of Transportation response to TRIP survey.

HDOT projects that the current cost to replace or rehabilitate all structurally deficient bridges in the state totals \$500 million.¹⁴

Traffic Congestion in Hawaii

Traffic congestion in Hawaii is a growing burden in key urban areas and threatens to impede the state's economic development. Congestion on Hawaii's urban highways is growing as a result of increases in vehicle travel and population.

In 2008, 45 percent of Hawaii's major urban highways were congested, carrying traffic volumes that result in significant rush hour delays.¹⁵ Highways that carry high levels of traffic are also more vulnerable to experiencing lengthy traffic delays as a result of traffic accidents or other incidents. The statewide cost of lost time and wasted fuel due to traffic congestion totals \$350 million each year.¹⁶

The average rush hour trip in the Honolulu metropolitan area takes approximately 18 percent longer to complete than during non-rush hour. Congestion related delays cost the average peak-hour driver in Honolulu \$620 each year in lost time and wasted fuel.¹⁷

Traffic Safety in Hawaii

A total of 628 people were killed in motor vehicle crashes in Hawaii from 2006 through 2010, an average of 126 fatalities per year.¹⁸

Hawaii's traffic fatality rate was 1.13 fatalities per 100 million vehicle miles of travel in 2010, slightly higher than the national average of 1.11.¹⁹

Chart 3. Traffic fatalities in Hawaii from 2006 – 2010.

| <i>Year</i> | <i>Fatalities</i> |
|--------------|-------------------|
| 2006 | 161 |
| 2007 | 138 |
| 2008 | 107 |
| 2009 | 109 |
| 2010 | 113 |
| Total | 628 |

Source: National Highway Traffic Safety Administration

The cost of serious traffic crashes in Hawaii in 2010, in which roadway design may have been a contributing factor, was approximately \$255 million.²⁰ The cost of serious crashes includes lost productivity, lost earnings, medical costs and emergency services.

In the Honolulu area, where there were 60 traffic fatalities in 2010, traffic crashes in which roadway design may have been a contributing factor cost each driver approximately \$206 each year.²¹

Three major factors are associated with fatal vehicle accidents: driver behavior, vehicle characteristics and roadway design. It is estimated that roadway design may be a contributing factor in approximately one-third of all fatal and serious traffic crashes. Improved safety on Hawaii's roadways 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.

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

Roads with poor geometry, with insufficient clear distances, without turn lanes, inadequate shoulders for the posted speed limits, or poorly laid out intersections or interchanges, pose greater risks to motorists, pedestrians and bicyclists.

Importance of Transportation to Economic Growth

All of Hawaii's businesses are dependent on an efficient, safe, and modern transportation system that will foster continued business diversification and opportunity. Today's culture of business demands that an area have well-maintained and efficient roads, highways, bridges and public transit if it is to remain economically competitive. 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. Consequently, the quality of a region's transportation system has become a key component in a business's ability to compete locally, nationally and internationally.

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 by accepting customer orders through the Internet. 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.

Highways are vitally important to continued economic development in Hawaii. As the economy expands, creating more jobs and increasing consumer confidence, the demand for consumer and business products grows. In turn, manufacturers ship greater quantities of goods to market to meet this demand, a process that adds to truck traffic on the state's highways and major arterial roads.

Every year, \$22 billion in goods are shipped from sites in Hawaii and another \$32.4 billion in goods are shipped to sites in Hawaii.²² Forty-seven percent of the goods shipped annually from sites in Hawaii are carried by trucks and another five percent are carried by parcel, U.S. Postal Service or courier services, which use trucks for part of their deliveries.²³

A [2007 analysis by the Federal Highway Administration](#) found that every \$1 billion invested in highway construction would support approximately 27,800 jobs, including approximately 9,500 in the construction sector, approximately 4,300 jobs in industries supporting the construction sector, and approximately 14,000 other jobs induced in non-construction related sectors of the economy.²⁴

The cost of road and bridge improvements are more than offset because of the reduction of user costs associated with driving on rough roads, the improvement in business productivity, the reduction in delays and the improvement in traffic safety. The [Federal Highway Administration](#) estimates that each dollar spent on road, highway and bridge improvements results in an average benefit of \$5.20 in the form of reduced vehicle maintenance costs, reduced delays, reduced fuel consumption, improved safety, reduced road and bridge maintenance costs and reduced emissions as a result of improved traffic flow.²⁵

The employment impact of highway construction is particularly important during periods of high unemployment. Hawaii's unemployment rate increased significantly from 3.0 percent in January 2008 to 6.5 percent in January 2012.²⁶

Federal Funding for Hawaii's Surface Transportation System

The construction, repair and upkeep of Hawaii's roads, bridges, highways and public transit systems are paid for by local, state and federal governments. Roads and highways are maintained largely by state and local governments, and transit systems are operated largely by local transit agencies.

Significant federal funding for highways and transit is provided to both state and local governments. Federal funding for Hawaii's highways and bridges comes from the Federal Highway Trust Fund, under funding levels and formulas determined by Congress. Federal spending levels for highways and public transit are based on the current federal surface transportation program, the Safe, Accountable, Flexible, and Efficient Transportation Equity Act – A Legacy for Users (SAFETEA-LU), which was approved by Congress in 2005. Following a series of short-term extensions since its original expiration date of Sept. 30, 2009, SAFETEA-LU is scheduled to expire on March 31, 2012.

As a result of this level of federal support, since 2000 Hawaii has been able to complete numerous projects on the state's highway system, rehabilitate deteriorated roadways and bridges, and expand transit systems and access to improve traffic safety, relieve traffic congestion and enhance economic development opportunities.

National Reports Highlight Need for Increased Transportation Investment

Two 2010 reports, one by the Treasury Department with the Council of Economic Advisers and the other by a bipartisan group of transportation experts, found that the U.S. is falling far behind internationally in providing a modern transportation system and will need to adopt a more ambitious and focused transportation program to maintain the nation's standard of living. The reports call for increased investment to relieve traffic congestion, improve freight and intermodal access, improve road and bridge conditions and reduce emissions.

[*"An Economic Analysis of Infrastructure Investment"*](#) (The Treasury report) was prepared by the U.S. Department of the Treasury with the Council of Economic Advisers.

The report, [*"Well Within Reach: America's New Transportation Agenda"*](#) (The Miller report) was prepared by a group of the nation's top transportation policy experts chaired by former U.S. Secretaries of Transportation, Samuel Skinner and Norman Mineta. The group was assembled by the Miller Center at the University of Virginia to develop solutions for the funding and planning challenges that confront the nation's transportation system.

The reports concluded that now is an optimal time to invest in infrastructure because of reduced costs due to the economic downturn. The report also found that providing adequate resources to modernize the nation's transportation system will require increased use of innovative funding tools including vehicle-miles-traveled fees, public-private partnerships and capital budgeting.

The Miller report found that the nation faces an annual funding shortfall between \$134 and \$194 billion to maintain conditions and traffic congestion levels on its transportation system.

The report also found an annual funding shortfall to improve conditions of America's transportation system and reduce traffic congestion from between \$189 and \$262 billion.²⁷

The Treasury report found that U.S. infrastructure spending as a percentage of gross domestic product (GDP) has fallen by 50 percent and now accounts for two percent of the nation's GDP. In contrast, China spends about nine percent of its GDP on infrastructure and Europe about five percent.²⁸

The Treasury report found that now is an optimal time to invest in transportation infrastructure because well-designed projects can provide significant, long-term economic benefits, because significant needs exist and construction and other costs associated with infrastructure projects are especially low due to high unemployment and a high level of underutilized resources. The report found that the unemployment rate among those likely to gain employment from infrastructure investment is currently over 15 percent.²⁹

The reports included a number of key recommendations for the nation's transportation program to insure that it keeps America's roads, skies, rails and waterways well-funded, in good repair, and functioning with optimal efficiency and safety.

The following are some of the key recommendations from the Miller report.

- ✓ Improved planning and increased investment in state-of-the-art freight transportation facilities and systems would improve the efficiency of the supply chain, improve business efficiency and enhance economic competitiveness. It was recommended that an integrated approach to transportation planning be adopted that includes freight and goods movement and stresses intermodal connectivity.³⁰
- ✓ To insure that investments in infrastructure build a foundation for prosperity, the Miller report recommended that a priority be placed on funding projects that provide the greatest returns in terms of future U.S. competitiveness, economic growth and employment.³¹

- ✓ Notwithstanding the recent economic downturn, traffic congestion continues to be a significant burden to the public and businesses. The Miller report recommends an increased emphasis on urban congestion relief, including adding additional capacity roadway and transit capacity, making the existing system work more efficiently and adopting regional policies that may reduce some travel demand.³²
- ✓ Just as the nation's roadways are slowed by congestion, the process of planning, winning approval for, and implementing transportation improvements can be stymied by gridlock among the many federal, state and local agencies involved. The Miller report recommended improved delivery of transportation projects by reforming the project planning, permitting and review process to speed actual implementation.³³

There is very little direct private investment in our nation's highway and transit systems due to the current method of funding infrastructure. The Treasury report also recommended the establishment of a National Infrastructure Bank (NIB) that would create conditions for greater private sector co-investment in infrastructure. The NIB would also perform rigorous analysis to identify projects with the greatest possible societal and economic benefits.

The Miller report called for the adoption of a federal capital budget that would recognize that transportation expenditures are an investment and that takes into account future returns on those investments. An increased investment in transportation would actually save the public money by reducing delays, vehicle maintenance costs, traffic crashes and vehicle emissions, the Miller report found.

Conclusion

Hawaii's network of roads and bridges provides the lifeline of the Aloha State's economy. Today, Hawaii's surface transportation system is under multiple pressures from aging roads and bridges and increasing traffic congestion. As it looks to enhance and build a thriving, growing and dynamic state, it will be essential that Hawaii is able to provide a 21st Century network of roads, highways, bridges and public transit that can safely and efficiently accommodate the mobility demands of a modern society.

Hawaii has an immediate need to move forward with numerous projects that would repair, rehabilitate and expand the state's transportation system, but without a substantial level of federal, state and local funding, many vital projects will remain unfunded.

As the nation looks to rebound from the recent economic downturn, the U.S. will need to modernize its surface transportation system, improve the physical condition of its transportation network and enhance the system's ability to provide efficient and reliable mobility for motorists and businesses. Making needed improvements to Hawaii's roads, highways, bridges and transit could 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.

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Endnotes

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- ¹ U.S. Census Bureau annual population estimate.
- ² Hawaii Department of Business, Economic Development and Tourism.
- ³ TRIP analysis of data from the U.S. Bureau of Economic Analysis. The nation's Gross Domestic Product has been adjusted for inflation based on the Consumer Price Index.
- ⁴ U.S. Department of Transportation – Federal Highway Administration: Highway Statistics 1990 and Federal Highway Administration.
- ⁵ TRIP calculation based on Census and FHWA data.
- ⁶ Hawaii Department of Transportation response to TRIP survey.
- ⁷ Selecting a Preventative Maintenance Treatment for Flexible Pavements. R. Hicks, J. Moulthrop, Transportation Research Board. 1999. Figure 1.
- ⁸ Hold the Wheel Steady: America's Roughest Roads and Strategies to Make our Pavements Smoother. TRIP, September 2010.
- ⁹ Ibid.
- ¹⁰ Highway Development and Management: Volume Seven. Modeling Road User and Environmental Effects in HDM-4. C. Bennett, I. Greenwood. 2000.
- ¹¹ Your Driving Costs. AAA. 2010.
- ¹² USDOT Federal Highway Administration National Bridge Inventory 2011.
- ¹³ Ibid.
- ¹⁴ Hawaii Department of Transportation response to TRIP survey.
- ¹⁵ TRIP analysis of FHWA data. Highway Statistics 2008, Table HM-61. Interstate and Other Freeways and Expressways with a volume service ratio above 0.70, which is the standard for mild congestion, are considered congested.
- ¹⁶ TRIP estimate based on Texas Transportation Institute methodology.
- ¹⁷ Texas Transportation Institute. 2010 Urban Mobility Report.
- ¹⁸ National Highway Traffic Safety Administration data.
- ¹⁹ Ibid.
- ²⁰ TRIP estimates based on National Highway Traffic Safety Administration (NHTSA) data.
- ²¹ Ibid.
- ²² Bureau of Transportation Statistics, USDOT. 2007 Commodity Flow Survey, State Summaries.
- ²³ Ibid.
- ²⁴ Federal Highway Administration, 2008. Employment Impacts of Highway Infrastructure Investment.
- ²⁵ FHWA estimate based on its analysis of 2006 data. For more information on FHWA's cost-benefit analysis of highway investment, see the 2008 Status of the Nation's Highways, Bridges and Transit: Conditions and Performance.
- ²⁶ Bureau of Labor Statistics. Local unemployment statistics.
- ²⁷ Miller Center of Public Affairs (2010). "Well Within Reach, America's Transportation Agenda." P. 28.
- ²⁸ Department of the Treasury with the Council of Economic Advisors (2010). "An Economic Analysis of Infrastructure Investment." p. 13.
- ²⁹ Ibid. p. 2.
- ³⁰ Miller Center of Public Affairs (2010). "Well Within Reach, America's Transportation Agenda." P. 38.
- ³¹ Ibid. p. 34.
- ³² Miller Center of Public Affairs (2010). "Well Within Reach, America's Transportation Agenda." P. 40.
- ³³ Ibid. p. 45.