

The Region's Most Expensive Commutes: Congested Corridors in the Pittsburgh Area and Steps Needed to Relieve Traffic Congestion

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Executive Summary

The Pittsburgh area provides its residents with a high quality of life based largely on its diversity of people, communities, cultural and natural resources, and economic opportunity. The region continues to emerge from a significant economic downturn, buoyed by its strength in several key economic sectors including life sciences, education, manufacturing and materials and technology. But the strength of the region's economic growth is threatened by the failure of the region to address its looming transportation funding crisis. A lack of adequate transportation investment has resulted in a large number of congested corridors that are choking commuting and commerce in this and other key urban areas in Pennsylvania. And, while reduced economic growth over the last several years has bought the region and the state additional time to address its transportation needs, it is a limited reprieve, with anticipated economic growth likely to increase travel on the state's most congested corridors.

The Pittsburgh area's transportation system provides mobility to its 1.7 million residents and its visitors. But traffic congestion on many of the region's most important transportation corridors affects the quality of life in the area by lengthening commute times, diminishing business productivity and increasing vehicle emissions.

The Pittsburgh region is strategically located within less than a day's drive of 40 percent of the nation's population, and is poised to achieve a period of robust economic growth. But the speed of economic growth in the Pittsburgh area will be impacted significantly by the region's ability to provide a reliable transportation system that will allow the public and businesses to transport themselves and their products and services throughout the area in a predictable and efficient manner.

In this report, TRIP estimates the cost to commuters of time and fuel wasted on Pennsylvania's most congested corridors and outlines a comprehensive set of strategies to help relieve traffic congestion and enhance transportation reliability in the state.

TRIP's report is based on information obtained from the Federal Highway Administration (FHWA), the Texas Transportation Institute (TTI), the Pennsylvania Department of Transportation (PennDOT), and the Urban Land Institute. Following are the major findings of the report.

Traffic congestion costs Pittsburgh area travelers approximately \$1 billion annually in the value of wasted time and fuel. Some area commutes cost individual motorists as much as \$2,915 annually or \$56 weekly – including an additional 158 hours stuck in traffic per year and an additional 68 gallons of fuel wasted annually -- depending on which route they use for their daily commute.

- TRIP has compiled information on the most congested corridors for commuters in the Pittsburgh area. These corridors are ranked based on the financial costs to the motorists who travel these routes daily during peak hours. The costs include the

value of time lost and fuel wasted annually as a result of traffic congestion on these routes.

- TRIP has determined that Pittsburgh area commuters experience the highest levels of congestion on the following corridors.
1. **West Liberty Avenue and Crosstown Boulevard, including the Liberty Bridge and Tunnel from Brookline Boulevard to the Hazlett Street Interchange at Interstate 279 in the South Hills area of Pittsburgh.** This congested corridor costs rush hour drivers 158 hours, 68 additional gallons of gas, and \$2,915 annually or \$56 weekly. Traffic congestion could be relieved on this corridor by improved traffic light signalization, traffic management and transit service.
 2. **I-376 Parkway West from the SR 22/30/60 Interchange to the Fort Pitt Bridge in Western Allegheny County in the Pittsburgh Area.** This congested corridor costs rush hour drivers 142 hours, 61 additional gallons of gas, and \$2,608 annually or \$50 weekly. Traffic congestion could be relieved on this corridor by improving transit service, providing interchange improvements, and a park-and-ride facility.
 3. **Fifth Avenue West and Forbes Avenue East in downtown Pittsburgh from Bellefield Avenue to Sixth Avenue.** This congested corridor costs rush hour drivers 142 hours, 61 additional gallons of gas, and \$2,608 annually or \$50 weekly. Traffic congestion could be relieved in this corridor by improving bus rapid transit.
 4. **State Route 228 from Lovi Road to State Route 8 in the Cranberry area of Pittsburgh.** This congested corridor costs rush hour drivers 133 hours, 57 additional gallons of gas, and \$2,455 annually or \$47 weekly. Traffic congestion could be relieved on this corridor by widening and realignment, intersection improvements, and improved traffic signalization.
 5. **State Route 51 (Saw Mill Run Boulevard) from I-376 Interchange (Fort Pitt Tunnel) to Lewis Run Road in the South Hills area of Pittsburgh.** This congested corridor costs rush hour drivers 133 hours, 57 additional gallons of gas, and \$2,455 annually or \$47 weekly. Traffic congestion could be relieved on this corridor by improvements in intersection design, traffic signalization, and traffic management.
 6. **I-376 Parkway East from I-76 to the Fort Pitt Bridge in Eastern Allegheny County in the Pittsburgh area.** This congested corridor costs rush hour drivers 117 hours, 50 additional gallons of gas, and \$2,148 annually or \$41 weekly. Traffic congestion could be relieved on this corridor by improved ramp management and improved transit service.
 7. **Banksville Road from Cochran Road to I-376 in the Banksville area.** This congested corridor costs rush hour drivers 100 hours, 43 additional gallons of gas, and \$1,841 annually or 35 hours weekly. Traffic congestion on this corridor could

be improved by improved traffic signals, intersection improvement, and realignment.

8. Penn Avenue (S.R. 8) from I-376 to Negley Avenue in the Wilkesburg/Pittsburgh East End area. This congested corridor costs rush hour drivers 83 hours, 36 additional gallons of gas, and \$1,534 annually or \$30 weekly. Traffic congestion on this corridor could be improved by improved traffic signals and intersections.

9. S.R. 28 from S.R. 8 (Exit 5 – Etna) to I-279 in the Allegheny Valley area. This congested corridor costs rush hour drivers 71 hours, 30 additional gallons of gas, and \$1,304 annually or \$25 weekly. Traffic congestion on this corridor could be improved by widening and reconstruction, including new interchanges at the 31st and 40th St. Bridges.

- TRIP calculated each route's traffic congestion delay based on data provided by PennDOT on the average time it takes to travel each corridor during peak hours and during non-congested periods. To estimate the amount of time and fuel lost annually by commuters traveling on these segments, TRIP compared travel times during rush hour and non-congested periods.
- The amount of delay for drivers commuting on one of these routes may be higher or lower depending on the length of their commute, whether a portion of their commute is on another congested segment and the time of day that they travel.
- The annual cost of traffic congestion in the Pittsburgh area is approximately \$1 billion, which includes the cost of lost time and wasted fuel as a result of traffic delays caused by traffic congestion.
- The annual cost of traffic congestion statewide in Pennsylvania is \$3.7 billion, which includes the cost of lost time and wasted fuel as a result of traffic delays caused by traffic congestion.
- Traffic congestion in the Pittsburgh urban area results in the use of an additional 21 million gallons of fuel and the loss of 46 million hours annually.

As Pennsylvania's and the Pittsburgh area's economy strengthens, traffic congestion is likely to worsen unless a comprehensive set of transportation improvements are provided.

- Between 1990 and 2011, vehicle travel in Pennsylvania grew by 16 percent from approximately 86 billion miles traveled to approximately 99 billion miles.
- Vehicle travel in Pennsylvania is expected to increase by another 15 percent by 2030.

- From 1990 to 2011, Pennsylvania's gross domestic product, a measure of the state's economic output, increased by 35 percent, when adjusted for inflation.
- The unemployment rate in the Pittsburgh area was 6.4 percent in April, 2013.
- During recessions or periods of slow economic growth, fewer goods are purchased, commuting is constrained and tighter household budgets reduce travel demand. But as economic growth accelerates so does the level of traffic congestion.
- A transportation funding commission appointed by Governor Corbett in 2011 found that based on current funding levels the backlog of funding for transportation improvements needed to address Pennsylvania's traffic congestion is likely to increase significantly over the next 20 years.
- [The Pennsylvania Governor's Transportation Funding Advisory Commission](#) found that Pennsylvania currently needs to spend an additional \$552 million annually on projects to relieve traffic congestion. By 2030 the annual funding shortfall for needed congestion relief projects is expected to increase to approximately \$1.4 billion annually, based on current funding. These projects include improved traffic management, improved traffic signalization and providing additional road and highway capacity.

A high level of traffic congestion affects individuals by reducing the areas that can be reached within a reasonable time period, limiting opportunities for employment, education, shopping and services, recreational, and social opportunities. High rates of traffic congestion also can harm business productivity by reducing the potential labor pool, increasing delivery costs, and hampering the ability to serve regional clients. Areas with high levels of traffic congestion may lose jobs to less congested regions.

- A [Reason Foundation report](#) found that the level of mobility provided by a region's transportation system affects an individual's level of access to employment and other opportunities.
- A comprehensive [report from the Transportation Research Board](#) concludes that worsening traffic congestion will likely reduce the efficiency and competitiveness of some U.S. businesses. The report also found that some U.S. businesses may respond to increasing congestion by moving some facilities to less-congested parts of the U.S. or to other countries.

Relieving traffic congestion in Pennsylvania will require a comprehensive approach that includes expanding the capacity of the state's transportation system, improving the efficiency of the existing system and offering alternatives for some peak-hour trips. This approach to congestion relief should include many of the following elements.

- Effectively increasing the transportation system through expanded road and highway capacity including the addition of tolled lanes, improved freight movement corridors, an improved public transit system, and improved sidewalks and bike paths.
- Improving traffic flow and system efficiency through better traffic signalization, ramp metering, intersection design, reverse-flow lanes, faster accident response times, and driver information systems.
- Implementing programs to reduce the number of peak-hour vehicle trips, including telecommuting, flextime and ridesharing programs.
- Using tolls or variable-priced urban highway lanes to offer traffic congestion relief by providing needed revenue for the expansion of a region's highway or transit system.
- Assuring adequate, consistent and reliable funding to support ongoing and future efforts at the state and local levels to address congestion.

Sources of information for this report include the Pennsylvania Department of Transportation (PennDOT), the Federal Highway Administration (FHWA), the Texas Transportation Institute (TTI), the Transportation Research Board (TRB) and the Urban Land Institute..

Introduction

The Pittsburgh area has long enjoyed a reputation as a desirable place to live and visit. With its strength in a number of economic sectors including life sciences, manufacturing, education and healthcare, and its vibrant mix of urban communities, the Pittsburgh area is well-positioned to achieve sustained economic growth. But the pace and extent of the region's economic growth will be significantly impacted by the efficiency of the area's transportation system.

Traffic congestion in the Pittsburgh area is more than a time-wasting nuisance to commuters. High levels of traffic congestion have been found to reduce worker productivity and increase shipment costs of everything made in or moved through a region or state, including electronics, pharmaceuticals, agricultural products, machinery and energy, which impacts the competitiveness of a region's and state's economy. Traffic congestion slows transport and delivery and affects the price of goods and commodities, ultimately impacting consumers as well as local businesses.

In this report TRIP identifies the most expensive commutes in the Pittsburgh area based on an analysis of congestion-related delays and fuel losses to the drivers who use these routes regularly. The report also makes a set of recommendations for a comprehensive approach to relieving traffic congestion in the area.

The ability of communities to adequately address traffic congestion has a significant impact on an area's livability. The Urban Land Institute notes that traffic congestion has the potential to hinder a region's ability to attract residents and businesses and degrades local quality of life.¹

High levels of traffic congestion also have been found to result in diminished air quality. Conversely, steps that reduce congestion can result in improved air quality. The Transportation Research Board, an agency of the National Research Council, [reports](#) that strategies that reduce traffic congestion by improving traffic flow also reduce vehicle emissions, which improves air quality.²

Sources of information for this report include the Pennsylvania Department of Transportation (PennDOT), the Federal Highway Administration (FHWA) the Texas Transportation Institute (TTI), the Transportation Research Board (TRB) and the Urban Land Institute.

Population, Transportation and Economic Trends

While recent economic challenges have slowed the growth of vehicle travel over the last several years, congestion continues to be a problem on many of Pennsylvania's key streets and highways, particularly during peak hours, as a result of continued increases in population, vehicle travel and economic activity. From 1990 to 2010, Pennsylvania's population rose seven percent from approximately 11.9 million to 12.7 million.³ The population of the Pittsburgh urban area reached 1.7 million in 2011.⁴

Pennsylvania has also experienced moderate economic growth since 1990. From 1990 to 2011, Pennsylvania's gross domestic product (GDP), a measure of the state's economic output, increased by 35 percent, when adjusted for inflation.⁵

The increase in population and economic activity in Pennsylvania has resulted in similar increases in traffic on its roads and highways. From 1990 to 2011, vehicle travel

in Pennsylvania increased by 16 percent, from approximately 86 billion miles of travel annually to approximately 99 billion miles.⁶ Vehicle travel in Pennsylvania is expected to increase by another 15 percent by 2030.⁷

The rate of increases in travel on the state's roads and highways has likely been restrained recently because of the reduced pace of economic growth experienced in Pennsylvania as a result of the economic downturn that began in 2008. During recessions or periods of slow economic growth, fewer goods are purchased, commuting is constrained and tighter household budgets reduce travel demand. But as economic growth accelerates, traffic congestion levels are also likely to increase.

The unemployment rate in the Pittsburgh area was 6.4 percent in April, 2013.⁸

Traffic Congestion

Approximately a third -- 34 percent -- of Pennsylvania's urban highways and freeways are congested.⁹ These are routes that the state's residents, visitors and businesses use daily to travel to and from work, school, shopping and entertainment, and to access employees and customers.

The annual cost of traffic congestion in Pennsylvania is \$3.7 billion, which includes the cost of lost time and wasted fuel as a result of traffic delays caused by traffic congestion.¹⁰ In the Pittsburgh area, the annual cost of traffic congestion is approximately \$1 billion, which includes the cost of lost time and wasted fuel as a result of traffic delays caused by traffic congestion.

As a result of traffic congestion in the Pittsburgh area, an additional 21 million gallons of fuel are wasted annually and commuters spend an additional 46 million hours stuck in traffic each year.¹¹

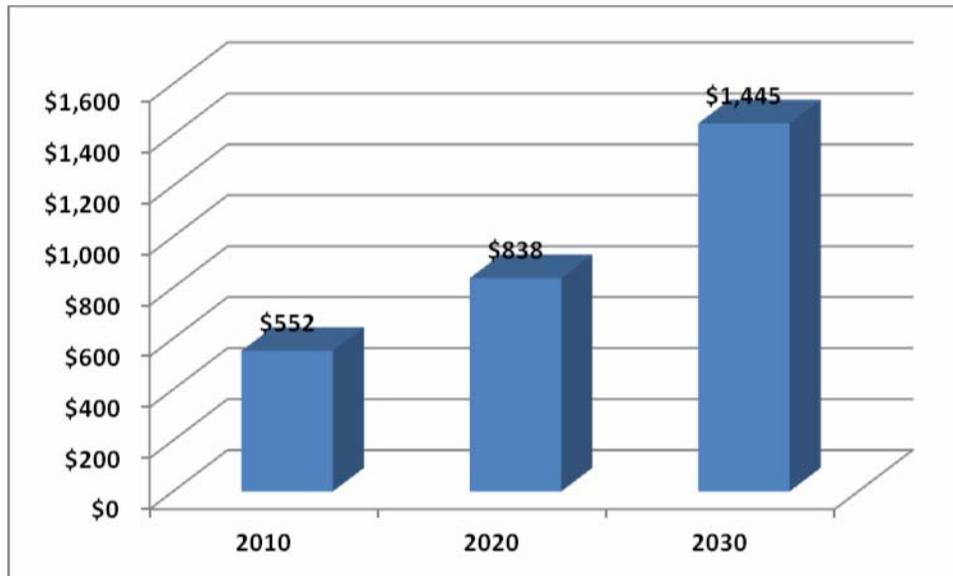
Transportation Funding in Pennsylvania

A transportation funding commission appointed by Governor Corbett in 2011 found that based on current funding levels the backlog of needed funding for transportation improvements in Pennsylvania to address traffic congestion is likely to increase significantly over the next 20 years.

[The Pennsylvania Governor's Transportation Funding Advisory Commission](#)

found that Pennsylvania currently needs to spend an additional \$552 million annually on projects to relieve traffic congestion and by 2030 the annual funding shortfall for needed congestion relief projects is expected to increase to approximately \$1.4 billion annually, based on current funding.¹² These projects include improved traffic management, improved traffic signalization, and providing additional road and highway capacity.

Chart 1. The Annual Need for Additional Funding in Pennsylvania for Roadway Improvements to Address Traffic Congestion



Source: Governor’s Transportation Funding Advisory Commission

Pennsylvania’s Congested Corridors

To identify and assess the Pittsburgh area’s most expensive commutes, TRIP analyzed data provided by PennDOT. Travel time data was provided for congested segments of the state’s urban transportation system. Each of these routes currently carries more traffic or riders than it can accommodate without experiencing some level of congestion. As a result, peak-hour travel on these congested corridors takes longer than it would take under non-congested conditions.

To estimate the number of additional hours spent driving and the additional fuel wasted because of traffic congestion on key urban routes, TRIP compared travel time on these routes during congested periods and non-congested periods. The value of time lost

due to congestion was estimated at \$16.79 per hour, based on the value used by TTI in its [2012 Urban Mobility Report](#).¹³

The most congested corridor in Pittsburgh region is a corridor along West Liberty Avenue and Crosstown Boulevard, including the Liberty Bridge and Tunnel from Brookline Boulevard to the Hazlett Street Interchange at Interstate 279 in the South Hills area of Pittsburgh. This congested corridor costs rush hour drivers 158 hours, 68 additional gallons of gas, and \$2,915 annually or \$56 weekly. Traffic congestion could be relieved on this corridor by improved traffic light signalization, traffic management and transit service.

The following table lists the most expensive commutes in the Pittsburgh region based on the value of the time lost and fuel wasted by a commuter traveling through this corridor twice daily during peak hours.

Chart 2. The Pittsburgh region’s Most Expensive Commutes Based on the Value of Lost Time and Wasted Fuel per Peak Hour Commuter

Rank	Urban Area / Suburb	Primary/Secondary Route	Start/End Location	Daily Traffic	Annual Hours lost due to Congestion per Commuter	Annual Gallons of Fuel Wasted due to Congestion per Commuter	Annual Value of Lost Time and Wasted Fuel due to Congestion per Commuter	Weekly Value of Lost Time and Wasted Fuel due to Congestion per Commuter	Improvements Needed to Reduce Congestion and Improve Reliability in this Corridor
1	Pittsburgh / South Hills	Liberty Bridge & Tunnels / West Liberty Avenue/Crosstown Boulevard (I-579)	Brookline Boulevard/I-279 Hazlett Street Interchange	33,000	158	68	\$ 2,915	\$ 56	Operations & safety project with traffic signal improvements (project underway); maintain & enhance transit service.
2	Pittsburgh / Western Allegheny County	I-376 Parkway West	S.R. 22/30/60 Interchange (Exit 60 - Robinson Township)/Fort Pitt Bridge	89,000	142	61	\$ 2,608	\$ 50	Interchange improvements; park-n-ride; maintain & enhance transit service.
3	Pittsburgh / Oakland	Fifth Avenue (one-way WB)/Forbes Avenue (one-way)	Bellefield Avenue (Oakland)/6th Avenue	34,000	142	61	\$ 2,608	\$ 50	Bus Rapid Transit.
4	Pittsburgh Area	S.R. 228/Freedom Road	Lovi Road/S.R. 8	23,000	133	57	\$ 2,455	\$ 47	Widening & realignment; traffic signal improvements (project underway); intersection improvements (project underway).
5	Pittsburgh / South Hills	S.R. 51 (Saw Mill Run Blvd)	I-376 (Fort Pitt Tunnel) Interchange?Lewis Road Run	24,000	133	57	\$ 2,455	\$ 47	Traffic signal improvements; intersection realignment / improvement; improved access management.
6	Pittsburgh / Eastern Allegheny County	I-376 Parkway East	I-76 (PA Turnpike)/Fort Pitt Bridge	90,000	117	50	\$ 2,148	\$ 41	Maintain & enhance transit service; Improve ramp management.
7	Pittsburgh / Banksville	Banksville Road	Cochran Road/I-376	13,200	100	43	\$ 1,841	\$ 35	Traffic signal improvements; intersection realignment / improvement.
8	Pittsburgh East End / Wilkinsburg	Penn Avenue (S.R. 8)	I-376/Negley Avenue	19,600	83	36	\$ 1,534	\$ 30	Traffic signal improvements; intersection realignment /
9	Pittsburgh / Allegheny Valley	S.R. 28	S.R. 8 (Exit 5 - Etna)/I-279	30,000	71	30	\$ 1,304	\$ 25	Widening & reconstruction including new interchanges at the 31st & 40th Street bridges (project underway).

Source: TRIP analysis of PennDOT data

The Impact of Traffic Congestion

Traffic congestion greatly affects a region’s motorists by reducing the areas that can be reached within a reasonable time period, limiting opportunities for employment, education, shopping and services, recreational and social opportunities. High rates of traffic congestion also can harm business productivity by reducing the potential labor pool, increasing delivery costs and hampering the ability to serve regional clients. Areas with

high levels of traffic congestion may lose jobs to less congested regions. A [Reason Foundation report](#) found that the level of mobility provided by a region's transportation system impacts an individual's level of access to employment and other opportunities.¹⁴ "The more mobility we enjoy, the more choices we have," noted the report, "Mobility gives us more of what's important in life."¹⁵

A comprehensive [Transportation Research Board \(TRB\) report](#) on the adequacy of U.S. freight movement capabilities found that an increase in traffic congestion is likely to lead to less efficient logistics practices by businesses, such as shipping more in bulk and holding larger inventories.¹⁶ This backwards step in an age of just-in-time delivery would affect consumers as well as local businesses.

The same TRB report also found that a region's ability or failure to relieve traffic congestion and provide reliable freight movement has a significant impact on whether jobs are created locally or are shifted elsewhere, including outside the U.S. The report found that "workplaces and residences will move away from congestion within metropolitan areas and from more congested to less congested regions within the United States. Some production will move from the United States to other countries if congestion costs cause the United States to lose comparative advantage in some industries."¹⁷

Relieving Traffic Congestion

Relieving traffic congestion will require a comprehensive approach that provides commuters and businesses with an improved, integrated transportation system. This approach should include strategies to increase the capacity of the state's transportation

system, improve the efficiency of the existing system and reduce some travel demand, particularly during peak periods.

Accommodating continued growth in vehicle travel, without experiencing a significant increase in traffic congestion, will require that the state and the region both expand the capacity of their roadway and transit systems and make further improvements in the efficiency of their transportation systems.

The Urban Land Institute has found that a key to minimizing traffic congestion is for local and state leaders to clearly identify and understand their constituents' needs. Leaders should then advocate a practical overall strategic solution that matches the public's known preferences and act in a coordinated fashion to implement these solutions. The strategy also should be well-publicized and include some way of measuring progress towards a consistent vision of the travel improvements being sought.¹⁸

Elements of a comprehensive approach to an area's traffic congestion relief should build on current efforts to provide local traffic congestion relief.

The use of tolls on urban roadways may be an effective way to offer traffic congestion relief by providing needed revenue for the expansion of a region's highway or transit systems. Tolloed or variable priced urban highway lanes may provide traffic congestion relief by providing an alternative to congested routes for time-sensitive trips, including emergency services and critical personal or business trips. Urban highways that are tollod or collect variable tolls depending on the time of day may also provide a less-congested route for transit vehicles, making transit more attractive to potential riders.

A regional approach to relieving traffic congestion is likely to include many of the following elements.

Expand capacity of the transportation system

- **Additional traffic lanes and turn lanes.** Expanding capacity, particularly on routes that are carrying significantly more travel than they were initially designed to carry, is a critical component of a traffic congestion relief program. Additional lanes on one route also have been found to reduce congestion on nearby routes by drawing some of the traffic from these secondary roads.
- **New roads and highway links.** New urban highway links continue to be built in some urban areas and additional road capacity may be appropriate in some regions, particularly where housing and job growth in a community have outstripped the level of service being provided by the current transportation system.
- **Additional transit service.** Increasing transit ridership can help relieve congestion, particularly along heavily-traveled corridors. Investment in additional transit capacity can be an effective part of a congestion solution.
- **Install or improve sidewalks and bike paths.** Sidewalks and bike paths can provide an alternative to driving, particularly for shorter trips.

Improve the efficiency of the existing transportation system

- **Improved signalization.** Traffic speeds can be increased by 12 to 25 percent by using coordinated traffic signalization, which improves traffic flow.
- **Improved incident management program.** Officials in many areas are improving the speed with which they can detect and respond to congestion-causing accidents and break-downs, which reduces the time that traffic is delayed.

- **Improved driver information.** Regional transportation centers that provide drivers with current information on road conditions are having some success in reducing congestion.
- **Ramp-metering and reverse-flow lanes.** Highway ramps can be metered to insure that cars enter freeways more smoothly. Reversal of direction for some key lanes on major roads during peak hours has been effective in reducing congestion.

Reduce travel demand during peak hours

- **Promote telecommuting, flex-time and ridesharing.** Improvements in technology have greatly increased the ability of workers to telecommute. Along with the use of flex-time and promotion of ridesharing by large employers, telecommuting can contribute to reductions in some peak-hour highway travel, which reduces regional traffic congestion.

Conclusion

Getting to and from work, running errands, dropping children off at school or activities, and getting to the show on time are becoming more challenging as congestion on the Pittsburgh area's most expensive commutes worsens. Traffic congestion in the Pittsburgh region and other urban areas in Pennsylvania has increased because of continued growth in population, vehicle travel and goods movement, without corresponding improvements being made in the state's transportation system. With travel

demands expected to continue to increase, the Pittsburgh area will continue to face a significant challenge in offering enhanced mobility and providing traffic congestion relief.

If the Pittsburgh area is unable to relieve traffic congestion and maintain sufficient mobility to support personal travel, provide timely goods movement and meet the mobility needs of its residents, visitors and businesses, the region will suffer economically.

Commuters in regions that respond to traffic congestion with a comprehensive set of transportation strategies can expect to see quicker commutes and experience less stress as a result. Implementing a comprehensive program of traffic congestion relief will be critical if the Pittsburgh region is to maintain and enhance the high quality of life in the area..

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Endnotes

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- ¹ Dunphy, R., “Moving Beyond Gridlock,” Urban Land Institute. 1997.
- ² Transportation Research Board, Special Report No. 245, “Expanding Metropolitan Highways: Implications for Air Quality and Energy Use”, 1995. P. 217.
- ³ TRIP analysis of U.S. Census data.
- ⁴ U.S. Census Bureau (2011).
- ⁵ 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.
- ⁶ TRIP analysis of Federal Highway Administration data for 1990 and 2011. See Chart VM-2.
- ⁷ TRIP analysis based on transportation and demographic factors.
- ⁸ Bureau of Economic Analysis (2013).
- ⁹ TRIP analysis of Federal Highway Administration data. Highway Statistics 2009. Charts HM-61
- ¹⁰ TRIP estimate based on an analysis of data from the Texas Transportation Institute and the Federal Highway Administration.
- ¹¹ Ibid.
- ¹² Transportation Funding Advisory Committee, Final Report. 2011. Pennsylvania Governor’s Transportation Funding Advisory Committee. P. 14-15.
- ¹³ T. Lomax, D. Schrank, Texas Transportation Institute. 2012 Urban Mobility Report.
- ¹⁴ Balaker, T., Reason Foundation. August, 2006. Policy Brief No. 43
- ¹⁵ Ibid.
- ¹⁶ Transportation Research Board. Special Report 271. Freight Capacity for the 21st Century. 2002. P. 4-4.
- ¹⁷ Ibid. P. ES-3.
- ¹⁸ Dunphy, R., “Moving Beyond Gridlock,” Urban Land Institute. 1997.