

White Paper #1: The Negative Effects of Traffic Congestion on the Twin Cities and the State of Minnesota

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In general, congestion happens when the demand for a roadway is higher than its available capacity at a given point in time. Traffic congestion may be one byproduct of a thriving economy where people and goods are traveling throughout the region at certain times during the day. However, there are also a wide variety of negative impacts of congestion.

These negative effects will only grow as the Twin Cities metropolitan area is expected to add about 500,000 more people from 2020 to 2040.¹ Without a significant change in travel behavior, this population increase will result in more people traveling, and consequently more congestion. Both the Metropolitan Council and MnDOT long-range plans emphasize that eliminating congestion is not possible or feasible, especially in a rapidly growing metropolitan area. However, understanding the impacts of congestion is an important first step when determining what level of congestion is acceptable and what funding is needed to mitigate some of the negative impacts of congestion.

Based on available resources, the cost of congestion to the Twin Cities metropolitan area is estimated at \$2.6 billion per year (see Figure 1). However, the costs of congestion extend well beyond the negative impacts that can be quantified below. For example, it is difficult to quantify the diminished regional and statewide competitiveness as a result of congestion. On the following page, Figure 2 identifies some of these qualitative costs of congestion. Future study efforts may be needed to more specifically quantify some of these impacts.

Figure 1: Annual Cost of Congestion for the Twin Cities

Commuter Costs (lost time and wasted fuel) ²	\$2,078,000,000
Safety Costs (crash costs) ³	\$50,000,000
Freight Costs (lost time and wasted fuel) ²	\$217,000,000
Environmental and Public Health Costs ⁴	\$225,000,000
Reduced Economic Competitiveness	Undetermined
Total Annual Twin Cities Cost of Congestion	\$2,600,000,000

The 2019 Urban Mobility Report, which is produced by the Texas A&M Transportation Institute, analyzes congestion levels in the Twin Cities and identifies the following statistics⁵:

- \$980 per year is the average “congestion tax” paid in time lost and wasted fuel by commuters due to congestion on the Twin Cities’ principal arterial and minor arterial roadways.

¹ 2019 biennial population forecasts, Metropolitan Council.

² Texas A&M Transportation Institute, “2019 Urban Mobility Report.” August 2019.

³ Estimate by Metropolitan Council based on MnDOT crash costs.

⁴ Levy, Jonathan I., Buonocore, Jonathan J., and von Stackelberg, Katherine. “The Public Health Costs of Traffic Congestion: A Health Risk Assessment.” *Environmental Health*, 2010, www.ibtta.org/sites/default/files/The%20Public%20Health%20Costs%20of%20Traffic%20Congestion.pdf

⁵ Texas A&M Transportation Institute, “2019 Urban Mobility Report.” August 2019.

Figure 2: Negative Effects of Congestion



- 56 hours per year are spent in congestion for each auto commuter, the equivalent of seven full vacation days per year.
- 18 gallons of additional fuel are wasted each year by each peak period auto commuter in the Twin Cities from sitting in congestion.

The 2019 Urban Mobility Report focuses on the monetary cost of lost time and wasted fuel for auto commuters and truckers. Metropolitan Council staff also quantified the cost of rear-end and same direction, side-swipe crashes on freeways during peak periods on weekdays, described in detail below. This planning-level cost estimate of congestion-related crashes equates to at least \$50 million per year. In addition, 27 premature deaths per year are the direct result of increased emissions of nitrogen oxide, sulfur dioxide, and fine particulate matter caused by congestion.⁶ The public health cost of emissions amounts to \$225 million per year based on premature death rates and the statistical value of a life.

Negative Effects of Congestion: Commuter Costs

Lost Time, Wasted Fuel, Unreliable Trip Times, and Increased Vehicle Maintenance Costs: \$2.078 Billion Per Year

As mentioned previously, commuters in the Twin Cities metro area are faced with a \$980 “congestion tax” each year in wasted time and fuel. Additional time is wasted to account because travel times are unreliable when there are crashes, vehicle break downs, weather events, special events, hazardous material spills, and road construction. In the Twin Cities, the 2019 Urban Mobility Report identifies a planning time index of 1.6. This means that in order to be late to work only once per month, an average commuter needs to plan for 48 minutes for a 30-minute free-flow trip.⁷ This wasted time is another source of stress that congestion imposes on drivers.

Beyond travel time and wasted fuel that make up the \$980 “congestion tax,” other congestion costs include increased vehicle maintenance. For example, there is a higher need to replace brake pads because of frequent starting and stopping on congested roadways.

Increased Stress and Reduced Quality of Life

Another negative impact of congestion experienced by commuters is the increased stress from driving in stop-and-go traffic. These impacts are difficult to quantify, but frustrated drivers can feel helpless trying to get to their destinations. For daily commuters, additional stress comes from being late for work. Being stuck in congestion can have significant life consequences, for example being late for work may cause a person to miss an important meeting or can lead to job loss in certain occupations. Congestion can also cause parents to be late picking up a child from school or daycare, which frequently has financial penalties. Finally, there are quality of life costs to being late to events like a child’s soccer game or medical appointment due to congestion.

⁶ Levy, Jonathan I., Buonocore, Jonathan J., and von Stackelberg, Katherine. “The Public Health Costs of Traffic Congestion: A Health Risk Assessment.” *Environmental Health*, 2010, www.ibtta.org/sites/default/files/The%20Public%20Health%20Costs%20of%20Traffic%20Congestion.pdf

⁷ Texas A&M Transportation Institute, “2019 Urban Mobility Report.” August 2019.

Negative Effects of Congestion: Safety Costs

Increased Crashes: \$50 Million Per Year

As noted in MnDOT's 2018 Congestion Report, congestion can also increase the risk for collisions, specifically rear-end or sideswipe collisions.⁸ An increase in crashes because of congestion is most common on the freeway system at the edges of the peak periods when traffic flow is most unpredictable and starting to break down. Metropolitan Council staff focused on the freeway system (excluding all other MnDOT-owned roadways where the impact of congestion on crashes is unclear) to calculate a planning-level crash cost associated with congested periods. The analysis used rear-end and same direction side-swipe crashes on freeways during the weekday peak periods, 6 – 8 a.m. and 4 – 6 p.m. A crash cost was applied to each crash based on the latest MnDOT crash severity costs. This planning-level methodology for estimating crash costs, on freeways only, resulted in at least \$50 million/year based on 2016 – 2018 data.

When crashes happen on the freeway system during peak periods, the congestion experienced by other drivers intensifies, contributing to unreliability and causing even greater delay. These crashes can also lead to secondary crashes as drivers focus their attention on the crash instead of the roadway. Severe congestion also may lead to drivers being involved in “road rage” incidents that can have minor impacts like increased stress, or major impacts like damage to vehicles, injuries to drivers and passengers, or death.

Diversion onto the Local Road Network

Congestion on the roadway network also results in drivers diverting onto local alternate routes to escape gridlock and keep moving toward their destinations. This situation has become more prevalent given the increased use of smart phone and in-vehicle navigation systems rerouting drivers in real-time based on congestion and traffic incidents. This diversion of traffic onto local roads has many impacts including adding wear-and-tear to city and county-owned streets, and increased potential for crashes.

Bicycles and pedestrians are not allowed on the freeway system so there is minimal risk for this type of crash. But, when heavy commercial vehicles and cars divert to the local system, there is more potential for interactions with bicycles and pedestrians. For some drivers who divert, particularly those not familiar with local street network and intersection controls, the safety risk is increased both drivers and non-motorized local roadway users.

Increased Emergency Response Times

Emergency responders also experience delays from congestion when emergency vehicles are forced to weave through a highly congested roadway. Time is critical in an emergency response situation. The public benefits from emergency responders efficiently responding to incidents on the highway or other emergencies in the surrounding area.

Negative Effects of Congestion: Freight Costs

Freight Delays and Wasted Fuel: \$217 Million Per Year

The movement of freight to, from and through the Twin Cities metropolitan area is essential to the economic health of the region and the state. The 2019 Urban Mobility Report quantifies the cost of

⁸ Minnesota Department of Transportation, “2018 Congestion Report.” July 2019.

congestion to trucks in the Twin Cities at \$217 million per year.⁹ The lost time amounts to 4,355,000 hours lost per year by truck drivers. This \$217 million cost only accounts for the added time and fuel for the truck driver. The true cost of congestion related to freight is much higher as this does not account for many of the indirect costs to manufacturers and shippers.

Increased Shipping Costs and Resulting Cost of Goods, Negative Impacts to Supply Chain, and Less Reliable Delivery Times

Due to congestion, shippers are required to invest in larger truck fleets and more truck drivers to complete the same number of deliveries as would be required under a less congested system. As stated in Economic Implications of Congestion, National Cooperative Highway Research Program (NCHRP) Report 463, “Traffic congestion imposes costs to businesses beyond the mere vehicle and driver costs of delay, including potential effects on inventory costs, logistics costs, reliability costs, just-in-time processing costs, and reductions in market areas for workers, customers, and incoming/outgoing deliveries.”¹⁰ The combination of wasted fuel, wages for truck drivers sitting in traffic, larger delivery fleets, more truck drivers, higher inventory costs, and investments in enhanced transportation logistics all result in a higher cost of goods. These costs are rising given the dramatic increase in same-day or next day small parcel delivery that is offered by major retailers and grocery stores.

The freight costs of congestion are hidden in the prices paid at the supermarket or the price of merchandise like clothes purchased at the store. The increased cost of goods impacts both metro area residents and those living in Greater Minnesota. According to 2017 data from the StreetLight InSight platform, 58% of all truck freight traffic travelling within Minnesota enters the metro area region at some point during a trip. This suggests that the cost of goods purchased in many areas of the state is higher due to Twin Cities congestion. Similarly, the costs of production inputs to many Greater Minnesota manufacturers may also be impacted.

Negative Effects of Congestion: Reduced Economic Competitiveness

Reduced Job Accessibility/Limiting the Size of the Labor Pool

Congestion can also play a role in stifling the economic competitiveness of both the Twin Cities and the entire state. Workers can be limited in their access to available jobs and advancement opportunities. At the same time, employers are limited in attracting a large pool of specialized workers who are limited by travel times. According to the University of Minnesota’s Access Across America: Auto 2017,¹¹ congestion greatly limits the number of jobs accessible relative to an uncongested system. For instance, in Minneapolis during a typical morning peak congestion period in 2017, there was a 41% reduction in jobs accessible within 10 minutes of travel time, a 39% decrease in jobs accessible within 20 minutes, and a 26% decrease in jobs accessible within 30 minutes. Therefore, congestion has limited the pool of available workers that can reasonably be employed by an employer. This suggests that a person living in eastern St. Paul, for example, may not even consider a job in Plymouth, which

⁹ Texas A&M Transportation Institute, “2019 Urban Mobility Report.” August 2019.

¹⁰ National Cooperative Highway Research Program, “Report 463: Economic Implications of Congestion.” 2001, pp. 2.

¹¹ University of Minnesota Accessibility Observatory, “Access Across America: Auto 2016.” access.umn.edu/research/america/auto/2016/

has more jobs than residents, solely due to the trip's congestion and unreasonable commute times. Under less congested conditions, this 24-mile trip might be acceptable.

Congestion makes it difficult for low-income workers in parts of the metro that are "job poor" to reach their full potential because they do not have a full range of employment options or they cannot afford the time, expense, and reduced reliability of very long car commutes or by transit. Congestion also limits top-level talent from even considering some employers that should be reachable within the same metropolitan area. For example, someone living in Arden Hills may consider jobs in downtown Minneapolis, but they may dismiss job opportunities in Bloomington because of congestion. This stifling of options hurts both employees and employers.

Shrinking Business Market Areas

Beyond restricting access to workers, congestion also limits the market area for inputs and outputs of production. On the input side, congestion limits the number of potential suppliers for a business and this restriction results in increases to input costs since there are fewer choices to provide the needed inputs.¹² On the output side, the potential customer market area served by a company may be limited by congestion.

Congestion in the metro area reduces the benefits of similar business types locating near each other and doing business together, known as agglomeration. As stated in University of Minnesota research on agglomeration economies: "Without well-managed and well-maintained transportation networks, for example, the benefits from agglomeration can be offset by diseconomies due to congestion...there may be a valid rationale for pursuing projects and policies that limit the effects of congestion on the region's roadway networks."¹³ The level of impact depends on the type of business. For example, firms that have many physical inputs, receive deliveries, or are frequently shipping products can be negatively impacted.

The construction industry is another example of a shrinking market area that has been negatively impacted by congestion. Within this industry, a high number of workers and supplies need to travel to job sites across the metropolitan area. Congestion limits the number of different job sites that can be accessed in a reasonable amount of time. According to the Associated General Contractors of America's National Traffic Survey, 94% of Minnesota construction companies surveyed saw an increase in the cost of doing business because of congestion, costing Minnesota construction companies \$150 million and 77,000 days in lost worker productivity per year.¹⁴

MSP Airport and Highway Congestion

MSP Airport, one of the state's key competitive advantages, also underlies the importance of limiting congestion's negative effects. *The 2040 Transportation Policy Plan* states that it's an objective to "provide efficient movement to MSP and ports" because these locations are used to ship products to other regions in the United States and the world.

¹² National Cooperative Highway Research Program, "Report 463: Economic Implications of Congestion." 2001, pp. 2.

¹³ Levinson, David, Iacono, Michael, Cao, Jason, Cui, Mengying. "Agglomeration Economies," University of Minnesota's *CURA Reporter*, Winter 2018-19.

¹⁴ Associated General Contractors of America, "2010 National Traffic Survey." www.agc.org/news/2010/06/10/traffic-congestion-costs-construction-firms-estimated-23-billion-yearly-delays-lost

MSP Airport has recently added several nonstop flights to key business destinations across the globe, including Seoul, Mexico City, and Dublin. The 136 domestic and international markets served by nonstop flights out of MSP make Minnesota businesses more competitive, including the 16 Fortune 500 companies found in the Twin Cities. Missing one of these nonstop flights as a result of congestion can negatively impact business deals and relationships. There are also high-value, light weight goods, particularly in the medical device industry, that require efficient and reliable roadways to MSP to ensure that these goods leave on that evening's flight. The delayed transport of some medical devices, like heart valve stents, could delay a patient's emergency surgery by a full day.

Negative Effects of Congestion: Environmental and Public Health Costs

Wasted Fuel and Greenhouse Gases

As mentioned previously, congestion results in wasted fuel that not only has a significant economic cost, but a negative impact on emissions and public health. There is a substantial environmental cost of burning 18 gallons of wasted fuel per commuter per year. This equates to a total of 34 million gallons of wasted fuel per year in the metro area. The fuel wasted in congestion greatly increases greenhouse gas emissions in the form of carbon dioxide (CO₂) and negatively affects the air quality for individuals across the region. The 2019 MPCA report, "Greenhouse Gas Emissions in Minnesota" noted that the transportation sector has just surpassed power plants as the largest contributor to greenhouse gases in the state.¹⁵

As such, reducing congestion in the Twin Cities is one way to reduce the amount of wasted fuel and greenhouse gas emissions. In *Traffic Congestion and Greenhouse Gases*, the University of California at Riverside researchers remark: "Policy makers have placed less attention on reducing CO₂ emissions by reducing traffic congestion. As traffic congestion increases, so too do fuel consumption and CO₂ emissions. Therefore, congestion mitigation programs should reduce CO₂ emissions."¹⁶

The study identifies that the amount of emissions is tied to speed, so that if congestion drops speeds below 45 mph, then CO₂ emissions will increase. This threshold of 45 mph is also used to identify congested freeway segments in MnDOT's 2018 Congestion Report.

To reduce greenhouse gases, efforts should focus on the following types of highway mobility projects:

- Projects that increase speeds in corridors where the speeds are less than 45 mph to reach speeds between 45 mph and 65 mph.
- Projects that smooth out stop-and-go traffic and result in more constant vehicle speeds.

The research noted that applying multiple mobility strategies on a corridor could have the potential of reducing CO₂ emissions by up to 30 percent on heavily congested corridors.

Other Air Pollutants and Premature Deaths: 27 Deaths and \$225 Million Per Year

The wasted fuel from congestion translates into an increase in emissions. The public health impacts from these emissions are not as well documented. According to the Harvard Center for Risk Analysis,

¹⁵ Minnesota Pollution Control Agency, "Green Gas Emissions in Minnesota: 1990-2016."

www.pca.state.mn.us/sites/default/files/lraq-2sy19.pdf

¹⁶ Barth, Matthew, Boriboonsomsin, Kanok. "Traffic Congestion and Greenhouse Gases," Access, 35, Fall 2009, file:///rafsshare.mc.local/shared/MTS/Working/Planning/Highway%20Planning/Twin%20Cities%20Mobility%20Needs%20Analysis%202020/Memo%201_Effects%20of%20Congestion/Greenhouses%20Gases.pdf

increased emissions from congestion come in the form of nitrogen oxide, sulfur dioxide, and fine particulate matter.¹⁷ The Harvard Center Study estimates that the increased emissions caused by congestion currently result in 27 premature deaths per year in the Twin Cities at a monetized value of \$225 million per year. By 2030, this figure will increase to 32 premature deaths per year in the Twin Cities and a monetized cost of \$282 million per year. The premature deaths are primarily related to heart attacks and strokes. The pollutants also can cause asthma attacks and other respiratory illnesses. This analysis monetized the value of statistical life relative to predicted deaths rates, which is the approach used in most regulatory impact analyses.

Summary

The costs of congestion on the Twin Cities are at least \$2.6 billion per year, based on the negative impacts that can be quantified. For daily auto commuters, the negative impacts extend beyond money, they also greatly reduce quality of life. Congestion also increases crashes on the freeway and diverts freeway traffic onto the local system. Costs racked up by the trucking industry as a result of congestion are ultimately passed on to consumers. But this burden is not just to the region, congestion in the Twin Cities impacts the entire state. With 500,000 more people expected to live in the Twin Cities, these impacts will be more pronounced. Finally, there are many environmental impacts of congestion, namely from extra fuel wasted and emissions produced from the starting and stopping of rush hour traffic. Reducing severe congestion can positively impact both greenhouse gases and other air pollutants. While eliminating congestion is not practical, implementing a range of strategies (e.g., highway capital investment, operational improvements, investment in transit and other non-motorized modes of travel, telework programs, and land use changes) can help limit congestion's negative impacts on the region's residents and the economic engine that surrounds them.

¹⁷ Levy, Jonathan I., Buonocore, Jonathan J., and von Stackelberg, Katherine. "The Public Health Costs of Traffic Congestion: A Health Risk Assessment." *Environmental Health*, 2010, www.ibtta.org/sites/default/files/The%20Public%20Health%20Costs%20of%20Traffic%20Congestion.pdf