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CHAPTER 3

WHAT IS CHANGING

Minnesota broadly and transportation specifically is in a period of change and transition. Some of the changes have been underway for years and others are just starting to be felt. Understanding and planning for these changes is complicated by the COVID-19 pandemic. It remains unclear what the lasting impacts of the pandemic will be on the state and specifically transportation.

This chapter describes opportunities and challenges that will impact Minnesota under six trend categories: population, economy, environment, technology, safety and transportation behavior. Recent data throughout this chapter will highlight the effects of COVID-19 across the transportation system. It is not possible to draw firm conclusions on the long-term future for Minnesota and transportation. However, reviewing trends over time can highlight opportunities and challenges for ongoing recovery efforts

Chapter 4 explains MnDOT's work to understand how these trends are informing transportation in Minnesota and how the policy direction in Chapter 5 can prepare the transportation system for the changes to come. See Minnesota GO's Trend Library to find trend papers.

READ CHAPTER 3 TO LEARN ABOUT TRENDS IMPACTING TRANSPORTATION:

- Population
- Economy
- Environment
- Technology
- Safety
- Transportation Behavior

POPULATION

Minnesota continues to grow and become more diverse. Strong population growth continues to occur in the seven-county metro area, in the Rochester and Mankato areas, as well as along the Interstate-94 corridor toward the Fargo-Moorhead area. While the state demographer estimates that most Minnesota counties will lose population in the next 30 years, the counties experiencing the most population decline are predominantly rural.

Most counties with growth rates 10% and higher include urbanized areas with populations of 50,000 or more. Given the strong historical trend of Minnesota's population becoming more urbanized, it is projected that Minnesota's population growth will continue to occur predominately in urban areas. The seven-county metro area has approximately 56% of the state's population, according to the Minnesota State Demographic Center, and is expected to add nearly 800,000 more people by 2050. This represents most of the state's forecasted population growth over this time period. In 2040, the state's population is expected to reach over six million people. At the same time, deaths will outnumber births, which means that population growth will come from people moving to the state from other states and countries.[1] See Minnesota's population by county in Figure 3-1.

Minnesota is becoming more diverse. Black, Indigenous, Asian, Hispanic and other communities of color (collectively referred to as BIPOC) are expected to increase by more than one million residents between 2018 and 2053. These communities will exceed one-third of the total population.[2] This trend is most profound in children and youth as BIPOC now make up 32% of the population age 17 and under. Conversely, BIPOC Minnesotans are only 8% of the state's demographic population age 60 and older.[3] Immigration to Minnesota is one contributing factor to Minnesota's increasing diversity with nearly 9% of the state's population being foreign-born. The share of foreign-born residents coming from Asia, Africa and Central and South America stands at 65% as of 2018.

Minnesota continues to get older. Over 920,000 Minnesotans are currently age 65 and older, and that number is projected to grow to more than 1.3 million by the year 2040. The percentage of Minnesotans in that age group is projected to grow from 16% to 21% over the next 20 years. Now and into the future, the median age in Greater Minnesota will be substantially higher than in the seven county metro area.

While older adults have the highest proportion of disability status by age group, most Minnesotans with a disability are younger than 65 years old. According to the U.S. Census Bureau, one in nine Minnesotans have a disability, which is 11% of the total state population.[4]

[1] Minnesota State Demographic Center "Long Term Population Projections for Minnesota," October 2020, https://mn.gov/admin/assets/Long-Term-Population-Projections-for-Minnesota-dec2020_tcm36-457300.pdf.

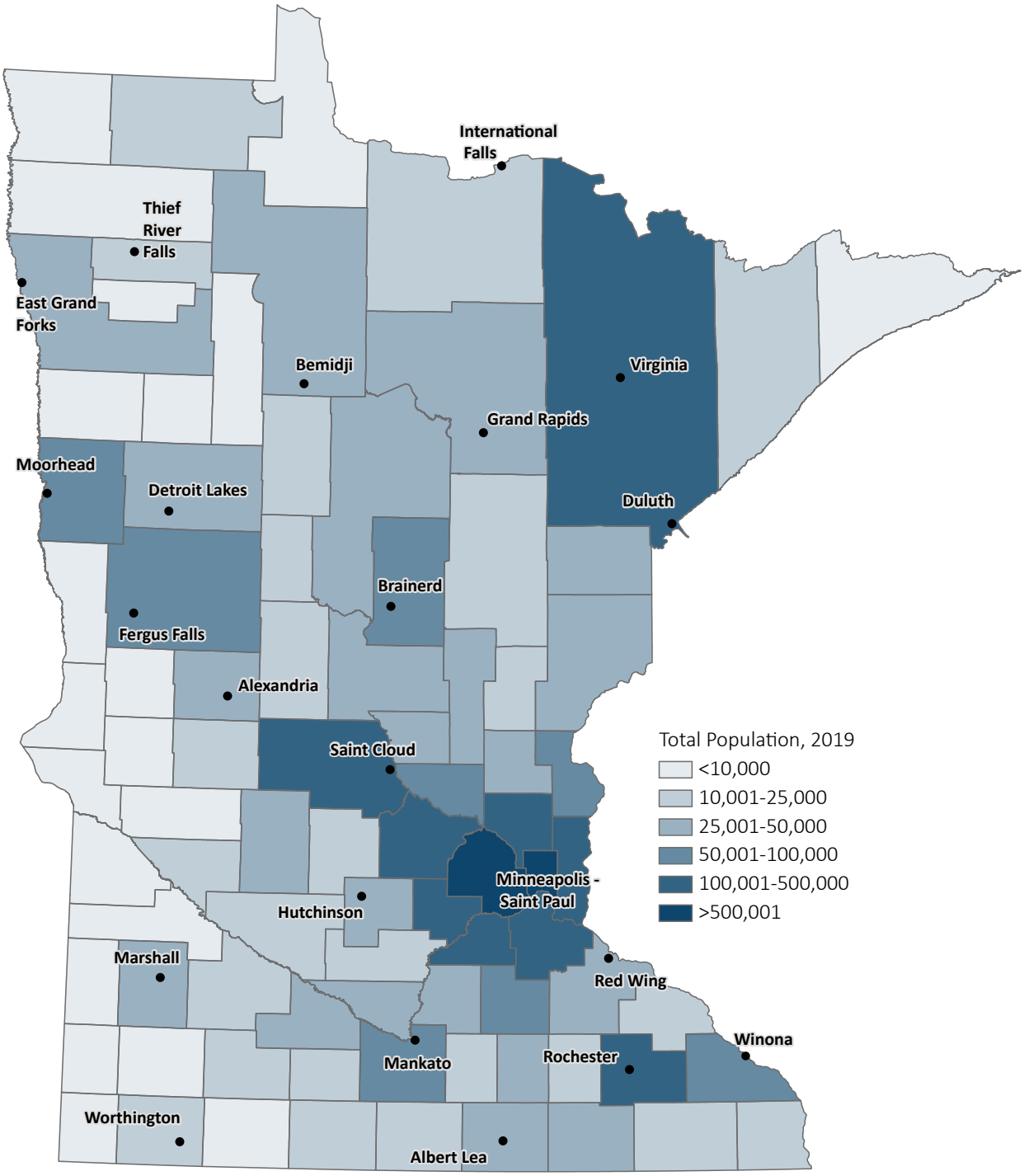
[2] Minnesota State Demographic Center, "Minnesota State Demographer Population Projections," Department of Administration, October 2020, https://mn.gov/admin/demography/data-by-topic/population-data/our-projections/

[3] U.S. Census, American Community Survey, 2015-2019 5-year estimates, generated by MnDOT using data.census.gov.

[4] U.S. Census Bureau, American Community Survey, 2019 American Community Survey 1-year estimates, S1810; generated by MnDOT using data.census.gov.

Different communities, including those within relatively small geographies, have different transportation needs. Understanding these changing demographic patterns and how they shape travel behavior will help transportation agencies plan future investments that will allow Minnesota to meet its transportation needs and support the people of Minnesota.

Figure 3-1: Minnesota Population by County, 2019



CHAPTER 3

ECONOMY

Minnesota's economy today is diverse and varies regionally. Historically, the state's economy was focused on agriculture, natural resources and manufacturing, which continue to be important sectors in our economy. Over time service-oriented sectors and others have grown. Despite this shift, Minnesota has strength in a broad range of industries within manufacturing. Among the most robust manufacturing clusters are food production, computer and electronics, fabricated metal, machinery and medical devices.

Minnesota's strong manufacturing sector relies on an efficient transportation system to move goods. The movement of goods is the transfer of raw materials and finished goods from point of origin through manufacturing to the consumer. This can involve trucks, trains, airplanes, pipelines, ships and barges. Projections show that the volume of freight moved nationally is expected to grow 25% to 45% by 2040 according to the U.S. Department of Transportation.[5]

Changes in supply chain management, the growth in e-commerce, technological advances and new product delivery options are also affecting the manufacturing sector and freight. Additionally, supply chain disruptions throughout the freight industry slow or impede the efficient movement of goods. As a result of supply chain disruptions, there has been a rise in the construction of distribution centers. These centers provide more flexibility to online retailers and for on-demand availability of products.

On-demand shipping will continue to change the way that people think about delivery and courier services, and the way that those services use the transportation system. Freight destinations used to be focused on hubs and businesses, but now have expanded to include individual homes. Logistics continue to adapt and evolve rapidly, but these changes sometime occur more quickly than transportation infrastructure can respond. A modern and safe freight system is key to a strong economy.

[5] U.S. Department of Transportation, "Freight Activity in the U.S. Expected to Grow Fifty Percent by 2050," November 21, 2021, https://content.govdelivery.com/accounts/USDOT/bulletins/2fd6c0b.

Generally, roads are reconstructed every 70 to 80 years. In Minnesota, about 30% of state highway pavements are 60 to 79 years old and needing to be reconstructed. While they usually have longer lives, many bridges and large culverts on the state highway system are nearing their useful life as well.[6] Railroads, ports and waterways, public drinking water and wastewater systems all face similar challenges as infrastructure that is aging.

Aging infrastructure, a lack of preventive maintenance and not replacing assets in poor condition can result in leaky pipes and pothole filled streets. Protecting public and private resources invested in the transportation system is important to be good stewards of tax payers' dollars. Asset management is key when making decisions about prioritizing investments, balancing trade-offs and ultimately adapting and improving the transportation system.

The transportation system will also need to adapt to changing employment environments following the COVID-19 pandemic. Even prior to the pandemic, many employers were reinventing workplaces and providing more flexible work environments. Overall demand for office real estate is expected to decrease if remote and hybrid work trends continue. This may be most felt in downtowns, central business districts and suburban office parks. However, downtowns and urban centers are not likely to disappear.

The future of work and resulting economic and transportation shifts remain uncertain. Though the mix of office, housing, recreation and other amenities may change, the economics of dense urban centers and a growing population are expected to continue to support urban cores.

The specific near- and long-term changes and the resulting impacts to the transportation system are unclear and may take decades to materialize.[7]

It is known that inflation has increased during the recovery from the pandemic. Over the long term, restoration of global supply chains will help balance demand for goods and services. Interest rate increases are anticipated to also slow inflation to lower, steadier levels like what was seen in the 2010s. But transportation is expected to continue to face an inflation premium above consumer levels. Infrastructure investment relies on crude oil products and other volatile commodities like steel.

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[6] Minnesota Department of Transportation, "MnDOT Transportation Asset Management Plan," Asset Management, June 2019, https://www.dot.state.mn.us/assetmanagement/pdf/tamp/tamp.pdf.

[7] Federal Reserve Bank of Kansas City, Hybrid Officing Will Shift Where People and Businesses Decide to Locate, date accessed February 28, 2022, https://www.kansascityfed.org/research/economic-bulletin/hybrid-officing-will-shift-where-people-businesses-decide-to-locate/

CHAPTER 3

ENVIRONMENT

The transportation system can have significant short- and long-term impacts on people and communities. In Minnesota, the transportation sector is a leading source of air pollution, with on-road vehicles and other mobility equipment accounting for about half of overall air pollution emissions.[8] Fine particles and other toxins from industrial activity and transportation can negatively affect human health at all levels. Air pollution is estimated to be a major contributor to 3,200 to 6,400 deaths a year in Minnesota. Historically, the benefits and burdens of transportation have not been distributed equitably. The Minnesota Pollution Control Agency estimates that 91% of BIPOC communities have air pollution-related risks above health guidelines, compared to 46% for low-income communities and 32% for the statewide average.[9]

Minnesota's transportation sector is also contributing to climate change. Since 2016, transportation has been the largest contributor to greenhouse gas emissions in the state. Climate change impacts from high temperatures, large storms and more are impacting transportation.[10] Transportation practices need to change to reduce the sector's contribution to climate change and to ensure the system can adapt to and mitigate the impacts of extreme temperatures and weather.

8 Minnesota Pollution Control Agency, The Air We Breathe: The State of Minnesota's Air Quality, Amanda Jarrett Smith, Ralph Pribble, Fawkes Steinwand. Saint Paul, Minnesota: Minnesota Pollution Control Agency, 2019. https://www.pca.state.mn.us/sites/default/files/lraq-1sy19.pdf.

9 Minnesota Pollution Control Agency, "Disproportionate impacts in Minnesota," date accessed January 11, 2022, https://www.pca.state.mn.us/air/disproportionate-impacts-minnesota

10 Elizabeth Dunbar and Dan Kraker, "Climate Change in Minnesota: More Heat, More Big Storms," MPR News, February 2, 2015, http://www.mprnews.org/story/2015/02/02/climate-change-the-proof

Transportation's effect on the environment extends beyond tailpipe emissions. Construction activities and transportation infrastructure can have long term environmental impacts. Infrastructure disrupts habitats, restricts the movement of animals, contributes to water, air and noise pollution and more.

Infrastructure like roads, airports and railways can divide habitats making it difficult for wildlife to safely navigate through its habitat. Habitat loss, degradation and fragmentation are the three leading causes of biodiversity decline in the state. Populations of monarch butterflies[11], rusty-patched bumble bees[12] and little brown bats[13] in particular have declined dramatically in recent years. Species at the edges of these ecosystems such as moose, loons and wild rice are most vulnerable to climate change and at risk of disappearing from Minnesota. Transportation-related activities have contributed to the degradation of ecosystems and natural habitats over time, including the loss of agricultural land.

Rethinking the role of transportation right-of-way can act as a powerful catalyst for the future of transportation, environment and economy. Alternative uses of the right-of-way can help accommodate utilities, allow opportunities to increase clean and renewable energy production, protect agricultural land and provide strategies to revive and maximize the health of the environment. Alternative uses of transportation right-of-way, when implemented properly, provide community benefit, ensure a high quality of life, maximize investments and protect the environment.

[11] Minnesota State Agency Pollinator Report, "2017 Annual Report," Environmental Quality Board, 2018, https://www.eqb.state.mn.us/sites/default/files/documents/2017 State Agency Pollinator Report_ accessible.pdf.

[12] U.S. Fish and Wildlife Service Midwest Region, "In a Race Against Extinction, Rusty Patched Bumble Bee Is Listed as Endangered," Newsroom, January 10, 2017, https://www.fws.gov/midwest/news/861.html.

[13] Minnesota Department of Natural Resources, "Bat Population Decline Continues as Expected," Newsroom, March 28, 2019, https://www.dnr.state.mn.us/news/2019/03/28/bat-population-decline-continues-as-expected.

CHAPTER 3

TECHNOLOGY

New technologies are constantly transforming the way the transportation system is used, planned, designed, built and maintained. Things like traffic condition monitoring, maps, on-board vehicle monitors and real-time transit information have improved the ability for people and goods to move around Minnesota. Increasingly, communications and technology need to be integrated into the system to ensure transportation can meet its goals like reducing greenhouse gas emissions, improving air quality and supporting economic development.

Digital infrastructure like broadband is necessary to integrate technology and transportation. Digital infrastructure can be supported by sensors, utilities and data-collecting devices embedded in roads, surrounding infrastructure and right-of-way. The information collected helps improve road conditions, inform first responders, update drivers, promote safety for people traveling and more. For transportation, connected devices and sensors need a reliable, accurate, always-on way to send data and information. But developing digital infrastructure requires significant public and private investment.

Many places in United States, particularly in rural and economically depressed areas, have inconsistent internet and cellular service. Many homes and businesses do not have a fixed high-speed internet connection (also called broadband). These access disparities leave people behind as many higher-paying jobs require a high-speed internet connection. This was made obvious in the differences of who was able to work remotely during the stay-at-home orders for the COVID-19 pandemic. Though some people substitute cellular wireless for a high-speed internet connection, this is not a long-term solution.

Even when there is little or no opportunity for remote work, technology can have a profound impact on the economy, transportation, education, etc. As communications technology becomes more advanced and cheaper, it can replace some reliance on the transportation system. The COVID-19 pandemic demonstrated that some trips—whether for shopping, school, work or medical care—can be replaced by high-speed internet connectivity.

Technology is also changing the way people get from one point to another. People are now using internet and smartphones to hail rides, compare transportation options and rent cars, bikes and scooters. Transportation services and resources that are shared by users are known as "shared mobility."[14] These services can be used concurrently or one after another. Shared mobility includes services such as public transit, micromobility (bikeshare and scooter share), automobile-based services (carshare and rideshare) and commute modes such as car or vanpooling. Many of these services are improved by or rely entirely on technology to work.

"While [teleworking] doesn't work for me in general, one of the major limitations is access to reliable and affordable Internet."

– Policy Panel and Online Discussion Board Participant

[14] Shared-Use Mobility Center, "What is Shared Mobility," accessed February 2, 2022, https://sharedusemobilitycenter.org/what-is-shared-mobility/.

Connected and automated vehicle (CAV) technology especially requires communications and other digital infrastructure to function properly. Connected vehicles can provide information and alerts to drivers and other vehicles to reduce crashes, improve traffic flow and save energy. Highly automated vehicles may not have a steering wheel or a human driver. Widespread use of fully "driverless" vehicles is not anticipated for many years, potentially decades. However, partially automated vehicles are already on Minnesota roads, with companies developing new advancements every day.

As transportation becomes increasingly connected by technology, data is getting larger and more complex. These datasets are sometimes referred to as big data, defined as data gathered from devices like smartphones and services like online shopping.[15] The breadth of big data creates opportunities to reimagine how people live. Big data helps the healthcare system understand how treatments and procedures impact patient populations. Retailers use big data to better target customers and to suggest products to consumers. MnDOT uses big data to maintain roads and bridges, understand travel patterns and improve safety.

As the abundance of collectible data grows—generated from smartphones, Wi-Fi enabled devices, and automated vehicles—security concerns multiply. Transportation departments have already been attacked. Cyber security is vital for the future reliability of the transportation system.

[15] Michael Mattioli, "Disclosing Big Data," Minnesota Law Review, November 2014: 539-40.

SAFETY

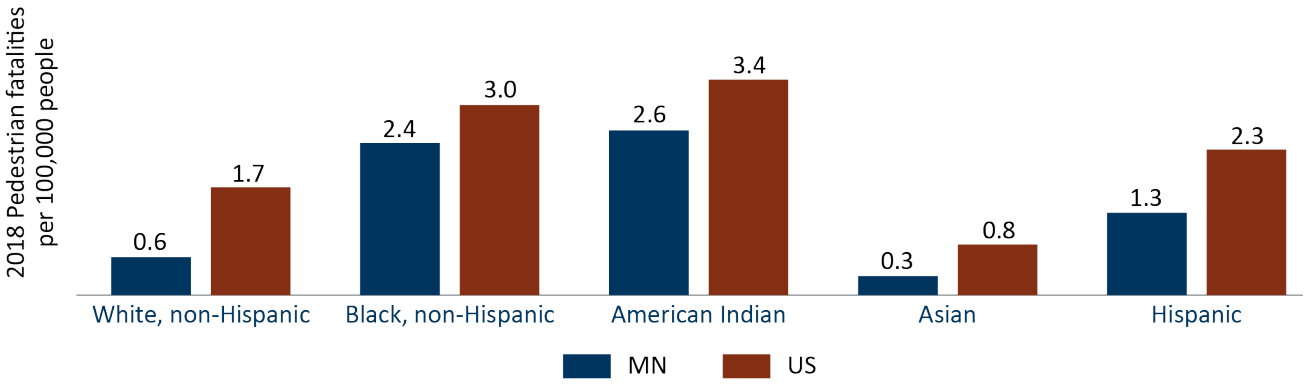
For much of the 20th Century, deaths or serious injuries related to traffic crashes were seen as an unfortunate, but an unavoidable, side effect of the automobile. However, this sentiment is changing. The federal government began enacting requirements for vehicle safety starting in the 1970s. Initiatives like Vision Zero and Minnesota's Toward Zero Deaths program have grown over the previous two decades. U.S. roadways have become safer for people in motor vehicles. These initiatives contend that even a single death on the nation's roadways is one too many. However, during the COVID-19 pandemic, the trend of reducing traffic deaths reversed as unsafe driving behaviors increased. Minnesota saw 488 deaths on Minnesota roads in 2021, up from 394 deaths in 2020 and 364 in 2019.[16]

While pedestrian and bicyclist deaths are down slightly from earlier peaks, there has been a backslide in recent years. Now more Americans are dying on foot or bicycle than any year since 1990.

In 2021 in Minnesota, 64 of 488 roadway deaths were people walking or bicycling. Minnesota rural counties continue to experience a higher traffic fatality rate than metro counties. People walking and bicycling in rural Minnesota communities are more likely to be struck and killed by drivers than in Minnesota metro communities.

As seen in Figure 3-2, pedestrian death rates by race and ethnicity are similar to national trends, although lower overall.[17, 18] American Indians had the highest pedestrian death rate per 100,000 people in both Minnesota and the United States. Black people had the second highest rate of pedestrian deaths, with 2.4 pedestrian deaths per 100,000 people in Minnesota and 3.0 pedestrian deaths per 100,000 people in the United States. Transportation safety is a top priority for Minnesota and applies to all people who use the transportation system regardless of their mode of travel. A one-size-fits-all approach does not work for transportation safety.

Figure 3-2: Pedestrian death rates by race and ethnicity, 2018



[16] Minnesota Department of Public Safety, "Monthly Preliminary Fatal Crash Numbers," Office of Traffic Safety, accessed February 2, 2022, https://dps.mn.gov/divisions/ots/reports-statistics/Pages/monthly-preliminary-fatal-crash-numbers.aspx.

[17] Fatality and Injury Reporting System Tool, "Pedestrians Killed in Fatal Crashes," 2013 and 2018, National Highway Traffic Safety Administration," date accessed March 11, 2022, https://cdan.dot.gov/query.

[18] U.S. Census Bureau, "Annual Estimates of the Resident Population by Sex, Race, and Hispanic Origin for the United States: April 1, 2020 – July 1, 2019,"accessed March 11, 2022, generated by MnDOT using data.census.gov.

TRANSPORTATION BEHAVIOR

Vehicle miles traveled (VMT) is the sum of all distances traveled by all motor vehicles on all roadways during a year. From 2000 to 2019, statewide total VMT rose approximately 16.5%, from 52.1 billion VMT to 60.7 billion VMT.[19] This growth in VMT correlates closely with population growth, growing 14.6% over the same period. Greater Minnesota saw a slight increase in per capita VMT over the same period of time. However, from 2010 to 2019, there was a slight per capita VMT decline (-0.1%) mostly driven by the Twin Cities metro area, which had lower per capita VMT than Greater Minnesota. The pandemic significantly impacted VMT in 2020 and 2021, and long-term trends remain unclear. Figure 3-3 shows per capita vehicles miles traveled by year in Minnesota from 2000 to 2019.

VMT looks different for different communities. For example, rural communities can have higher average VMT because they have farther distances between destinations, fewer convenient multimodal options and less access to high-speed internet. In urban communities where development is denser, there may be more opportunities for walking, bicycling, and transit options potentially resulting in lower average VMT.

Transit is an essential component of the transportation system in Minnesota and helps to connect people with employment, education, new opportunities, entertainment and shopping. As Minnesota's economy and population change, public transit systems adapt to continue to serve residents, especially those who have no other means to access essential services. In 2019, public transit provided millions of trips, including over 91 million rides in the Twin Cities metro area and 11.5 million rides in Greater Minnesota.[20] [21] Transit ridership levels significantly decreased because of the COVID-19 pandemic. In 2020, the Twin Cities metro area saw a decrease in ridership by as much as 60% on local routes, 70% on light rail and 95% on express bus routes and Northstar commuter rail.[22] There was a further decline in total ridership of 6.5% from 2020 to 2021. The long-term impacts of the pandemic on public transit are yet to be determined.

[19] Minnesota GO, "Transportation Behavior," Trend Library, 2022, https://minnesotago.org/trends/transportation-behavior.

[20] Metropolitan Council, "Metropolitan Area Transit Finance Report," 2020, https://metrocouncil.org/Transportation/Publications-And-Resources/Transit/FINANCE/2020-Metropolitan-Area-Transit-Finance-Report.aspx.

[21] Minnesota Go Performance Dashboard, "Annual Greater Minnesota Transit Ridership," date accessed January 26, 2022, https://performance.minnesotago.org/critical-connections/access/annual-boardings-recorded-public-transit-providers-serving-greater-minnesota-counties-amtpr.

[22] Metropolitan Council, "Metropolitan Area Transit Finance Report,"2020, https://metrocouncil.org/Transportation/Publications-And-Resources/Transit/FINANCE/2020-Metropolitan-Area-Transit-Finance-Report.aspx.

Prior to the COVID-19 pandemic, the percentage of individuals working from home in the United States had been increasing. In 2014, 4.5% of workers worked from home. By 2018, 5.3% of workers worked from home.[23] In 2019, the U.S. Bureau of Labor Statistics estimated that more than 26 million Americans worked remotely at least part of the time—16% of the total workforce.[24] The way people have worked since March 2020 has broken down cultural and technological barriers that prevented remote work in the past. The pandemic gave more than half of employed adults the opportunity to experience working from home full-time.

While the rates have gone down since the mandatory stay at home orders, full- and part-time teleworking is likely to be a more common option in the workforce. As communications technology becomes more advanced and affordable, it can replace reliance on the transportation system, like it did in the COVID-19 pandemic, by transferring reliance on transportation connectivity to high-speed internet connectivity.

The COVID-19 pandemic dramatically impacted travel in all of 2020. In 2020, total VMT decreased to 51.5 billion, almost back to 2000 levels. In 2020, reductions in daily traffic were typically in the range of 30%-50% and reached their lowest traffic volume levels on April 12 at 66% below 2019 traffic levels.[25] The long-term impacts of the COVID-19 pandemic in reducing single occupancy vehicle trips on freight demand is not yet known. Further, not all reductions in driving have resulted in reductions in VMT. For example, online shopping may eliminate several trips to stores, but those trips are replaced with deliveries.

"My son does not have a car and he really struggles with the insane cost of Uber or Lyft on a daily basis. For low-income wage earners, the % of income spent on transportation can be most of their earned wages - over 50%. Increased access is essential and in the Twin Cities area, there is a dearth of transportation choices in the suburbs."

– Comment shared during SMTP engagement

[23] U.S. Census Bureau, American Community Survey, 1-Year Estimates 2014-2018, B08301, accessed August 25, 2020, generated by MnDOT using data.census.gov.

[24] U.S. Bureau of Labor Statistics, "Table 6. Employed Persons Working at Home, Workplace, and Time Spent Working at Each Location by Full- and Part-Time Status and Sex, Jobholding Status, and Educational Attainment, 2019 Annual Averages," Economic News Release, June 25, 2020, https://www.bls.gov/news.release/atus.t06.htm.

[25] Minnesota Department of Transportation, "Traffic Safety Impact of COVID-19," June 2020, https://www.dot.state.mn.us/trafficeng/safety/docs/traffic-safety-impact-of-covid19.pdf.

Since 2020, traffic volumes have returned to or exceed pre-pandemic levels in most of the state. Recent evidence from traffic volume data in the Twin Cities[26] suggests that while daily volumes are rebounding to near pre-pandemic levels, the distribution of trips throughout the day is different.[27] It is yet to be determined what near- and long-term VMT trends could look like and can be influenced by transportation and economic recovery efforts following the pandemic.

The pandemic also affected walking, rolling and bicycling. Data collected from automated pedestrian and bicyclist counters from 2017 through 2020 showed declines in walking and bicycling from 2017 to 2019. However, numbers rebounded in 2020, but were lower than volumes in 2017.[28] One limitation of these findings is that they reflect volumes at a limited number of specific locations. Also, the volumes do not fully reflect how people are moving throughout a transportation network due to closures, construction projects, daily routines affected by a pandemic or other factors. This limitation can be addressed through additional monitoring, which MnDOT is committed to.

Much of the travel behavior data available focuses on people traveling to and from work. Commuting, however, accounts for less than 20% of all trips.[29] Commutes have a unique role in determining peak travel demand across many modes. But people use transportation for a variety of reasons. People need to access grocery stores, health services, educational opportunities, social activities and more. The transportation system ensures people can reach all destinations safely, reliably and conveniently whatever their reason for travel.

[26] Minnesota Department of Transportation, "Traffic Operations," date accessed March 9, 2022, https://www.dot.state.mn.us/rtmc/trafficoperations.html.

[27] Metropolitan Council, "Freeway Travel Trends," date accessed March 9, 2022, http://metrotransitmn.shinyapps.io/freeway-traffic-trends/.

[28] Institute of Transportation Engineers, "Trends in Bicycling and Walking in Minnesota: A Multi-Year Perspective on the COVID Surge," February 2022, https://ite.ygsclicbook.com/pubs/itejournal/2022/february-2022/#p=44.

[29] U.S. Department of Transportation, "Commute Mode Share," date accessed May 15, 2022, https://www.transportation.gov/mission/health/commute-mode-share#:~:text=Commutes%20account%20for%20less%20than,Federal%20Highway%20Administration%2C%202011).