March 2022







Our Vision to Move People, **Goods & Services**

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DENVER'S TRANSPORTATION

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SECTION 1 DENVER MOVES EVERYONE OVERVIEW

Denver Moves Everyone State of the System illuminates our city's challenges and opportunities in creating a complete transportation system that moves everyone and everything. Section 1 introduces Denver's shared transportation vision and goals — crafted in coordination with thousands of Denverites — and the performance-based planning framework to achieve this vision.

This section provides an overview of:

- + The Denver Moves Everyone planning process.
- + Delivery of transportation services in Denver from past to present.
- + Responsibilities of the Denver Department of Transportation and Infrastructure.
- + Denver's commitment to an equitable transportation system.
- + Funding for transportation in Denver.



IMPROVING TRANSPORTATION 1.1

Denver Moves Everyone (DME) will prioritize equitable and safe transportation options for Denverites, and seek to improve the movement of goods and services, ensuring access to everything they need. The plan will lead to a prioritized list of transportation investments and recommendations to guide the Denver Department of Transportation and Infrastructure (DOTI) to achieve the plan's long-term vision.

THROUGH DME, DOTI IS ENHANCING OUR CAPABILITIES TO BECOME MORE:

VISIONARY

Looking 30 years ahead to understand what projects and policies we need to be planning for and building today. **COLLABORATIVE**

Crafting a shared transportation vision, goals, and solutions in partnership with residents, community leaders, stakeholders, and partner city agencies.

PERFORMANCE-BASED

Analyzing data and prioritizing projects to identify the right investments for Denver given limited financial resources.

TRANSFORMATIONAL

Identifying the bold solutions necessary to advance the vision and goals identified through DME.



FIGURE 1.1: DME Timeline and Phases

DME includes four key phases. Each phase engages residents and partners to answer foundational questions about our city's transportation system today and in the future. Together, this planning effort will produce a suite of tools to track how projects, programs, and policies are implemented and how progress is being made. These tools will position DOTI to be a future-ready and data-driven organization equipped to deliver Denver's mobility future.

DME builds on the foundation of resident input and recommendations identified in previous citywide and DOTI planning efforts to plan for Denver's entire transportation system.

DENVER'S TRANSPORTATION VISION AND GOALS 1.2

DENVER'S 2050 TRANSPORTATION VISION

Denver moves everyone and everything with respect and care. Denver is a city of safe streets connected by sustainable mobility options, providing equitable access and opportunity for the people who need it most.

SHAPING OUR FUTURE

Throughout the Spring of 2021, thousands of Denverites and community leaders provided insights on what they value and their vision for the future of mobility in Denver. This feedback was used to craft initial vision and goal statements. In the Summer of 2021, we then asked residents and partners if their values were reflected and what information was missing in the draft goal statements. Through this process, the DME vision and goals were crafted to reflect community voices.

Denver's vision is an aspirational statement describing what our city's transportation system will be in 2050. To achieve this vision, DME is a performance-based plan. This means that investments and actions we prioritize will be tracked by a series of performance elements, which together, put Denver on the path to achieve our vision.

Our transportation goals reflect all aspects of a complete transportation system. Transportation equity is a crucial cross-cutting theme that will be advanced through each goal.

Figure 1.2 defines the elements of the DME Performance Framework, including our vision, outcomes and goals, which are all supported by objectives and metrics to ensure continuous progress towards Denver's vision.

DME will position DOTI as a data-driven. performance-based organization so that we can measurably advance Denver's transportation goals. Goals will include specific objectives and performance metrics so we can track progress.

FIGURE 1.2: DME Performance Framework

FIGURE 1.3: Denver's 2050 Transportation Goals

DENVER MOVES **Our Vision to Move People**, EVERYONE 50 Goods & Services

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DELIVERING TRANSPORTATION – PAST TO PRESENT 1.3

Since Denver's founding, the city role in transportation has evolved. The Department of Parks and Improvements first delivered transportation improvements in Denver, which then later became the responsibility of the Department of Public Works. In 2020, Denver voters created today's Department of Transportation and Infrastructure (DOTI). This was more than just a change in name, as DOTI assumed new responsibilities, including the ability to operate transit services and expand multimodal transportation facilities. DOTI recognizes the need to respond to increasing mobility opportunities and challenges by adapting and becoming a more agile and transformational organization. As a new public agency, DOTI will focus on moving all people in all neighborhoods and reinventing Denver's mobility system.

FIGURE 1.4: Timeline of Significant Transportation Planning Milestones in Denver

1890

Past decisions have left a lasting mark — both positive and negative — on Denver's transportation system today. Some of these legacies have created challenges. DOTI is working to restore connectivity and improve mobility, while also working to eliminate social and racial inequities in transportation access, safety, and public health. Other legacies from our past provide opportunities for the future of our transportation system, like the formation of our streetscapes and parkway systems; neighborhood shops and centers remaining from the old streetcar stops; and space to expand other travel choices. Figure 1.4 provides an overview of how Denver delivered transportation services from our city founding to today.

1920

1850s TO 1880s **1890s TO 1920s 1930**s **1940s TO 1950s 1960s TO 1970s** From Denver's founding in 1858 through In the 1890s, the city's role in In the 1930s, while streetcar ridership grew. In the 1940s and 1950s, Policy decisions in the 1960s and 1970s the 1880s, most residents traveled by transportation grew to facilitate transit. By so too did private automobile ownership. the city added staff to razed historic buildings downtown and 1915, over half of travelers downtown rode oversee traffic engineering constructed Interstate highways through foot, horse, or by railroad. City government The city paved more roads and vehicle travel supported railroad construction with streetcars and bicycles were common. As grew into traffic problems. The Department of and widened roads. The communities of color. In 1969, RTD was public financing, and provided basic street established to consolidate public transit auto ownership grew, streetcars could not Public Works expanded its role in traffic safety last streetcar system compete with public subsidies for roads. maintenance and cleaning services. by installing stop signs and street signals. stopped operating in 1950. systems across the region. 1894 1929 1947 1956 The Denver Plan **Established Traffic** Transitioned from Department of Parks and Park and Boulevard Improvements to Department of Public Works + Denver Planning Commission Engineering System Plan created Division

1910

2000 TO 2010: A SHIFTING PHILOSOPHY

1880

1870

1850

1860

In 2008, Denver Public Works completed the first citywide Strategic Transportation Plan. This set the stage for how the system could expand to meet the challenges of a growing city, air quality, climate change, congestion, and safety. Since then, City responsibilities have expanded to redesign our streets for people; to track and manage transportation infrastructure assets; to coordinate construction and delivery more effectively; and to plan for citywide improvements for pedestrians, bicyclists, transit riders, freight deliveries, and travelers.

1900

2010 TO TODAY: NEW RESPONSIBILITIES TO MOVE EVERYONE

1950

1940

With the approval of DOTI, the City updated and expanded the department's charter to reflect a multimodal emphasis in 2020. DOTI now has the authority to build and operate transit services; to leverage new technologies and innovations to deliver infrastructure and services; to better manage curbside assets to accommodate freight delivery and ridesharing services; and to expand our role to provide safe and efficient travel choices for people. With DME, DOTI is looking to the future to understand how the department will continue to evolve to meet the mobility needs of all Denverites.

1960

1930

1980s TO 2000s

From the 1980s to the 2000s, the City continued to emphasize vehicle travel and focus on roadway paving, sweeping, plowing, and traffic operations. Regional organizations were formed to address air pollution and smog across the region.

DENVER DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE 1.4

DOTI MISSION

DOTI is a modern agency focused on increasing mobility and safety while reducing congestion and fighting climate change.

DOTI FUNCTIONS

DOTI plans, designs, and builds the City's infrastructure. DOTI also operates, maintains, and regulates infrastructure elements within the public right of way. Infrastructure is grouped into two core functions - utilities and mobility. Utilities deliver our City's water and waste, as well as Denver's green infrastructure and services. Mobility delivers transportation infrastructure, services, and initiatives for all travelers, which includes pedestrians, bicyclists, transit riders, commercial vehicles, and drivers. Together, we are responsible for most things transportation related within the public right of way - or all the public space between private property lines.

DOTI has the ability to connect and leverage the City's transport, water, waste, and environmental systems to build a better Denver. This State of the System document focuses on transportation functions. DOTI is organized to effectively plan, design, build, deliver, operate, maintain, regulate, and enforce transportation services. DOTI does not maintain and operate all transportation services and infrastructure in Denver. Section 3.5 Quality provides a description of the transportation services DOTI does not provide, or provides in partnership with other agencies.

FIGURE 1.5: DOTI Infrastructure Elements Within the Public Right of Way

PLANNING OUR SYSTEM AND DELIVERING PROJECTS

micromobility, walking, bicycling, transit, and freight. We responsibly manage investments to best leverage capital funds and grant opportunities.

Plan

Design

We coordinate with Denver's neighborhoods to provide project development, engineering, safety, and environmental services to advance projects identified in planning efforts and through the city's 311 resident service.

We engage residents and organizations to develop strategic plans for

plans. Core responsibilities include transportation safety, innovation,

all the ways people move, including citywide, area, and corridor mobility

Build

We manage the construction of capital projects including bridges, water systems, street reconstructions, sidewalks, bikeways, and transit projects.

Deliver

We provide support services to the Plan, Design and Build divisions to guide program development, facilitate project implementation, and evaluate success in reaching city goals.

OPERATING AND MAINTAINING OUR SYSTEM

Operate

We manage the operation of transportation system assets that help manage travel flow, including street markings, signs, traffic signals, and fiber optic connections.

Regulate

Enforce

Maintain

We conduct the upkeep and improvements to paved streets and alleys, clear snow, sweep and clean streets and bike lanes, and maintain curbs and gutters.

We review and permit capital projects and development to ensure transportation, water, waste, environmental elements of the public right of way are coordinated and consistent with standards.

We ensure compliance with standards and guidelines for parking, disabled accessibility, sidewalks, privately-built infrastructure, and other right-of-way codes.

TRANSPORTATION EQUITY IN DENVER 1.5

Equality means each one of us has the same access to the same opportunities. But one size bicycle does not fit all. Equity recognizes that each of us have different circumstances and that access to appropriate opportunities is needed to reach an equal outcome. The right size bicycle enables everyone to move forward.

EQUALITY VS. EQUITY

DOTI is working toward an equitable Denver where everyone has the opportunity to be successful and thrive, no matter their race, income, or zip code. Denver will achieve racial equity in transportation when one's race can no longer be used to predict economic and health outcomes. Through DME, DOTI is committed to acknowledging inequities in transportation services and systems and is working to enable access to opportunity for every resident.

Currently, lower-income and Black, Indigenous, and Peoples of Color (BIPOC) residents experience more barriers to mobility and more involuntary displacement pressures than white, affluent Denverites. Policy decisions and public investments of the past shaped the outcomes that residents of Denver's neighborhoods experience today. Neighborhoods that are adjacent to major roadways have less frequent and lower-quality transit routes; have fewer community trees and parks; lack adequate sidewalks or safe routes; and have streets in poor condition, tend to have a higher proportion of persons of color or lower-income residents living within them.

Transportation policy decisions are only part of the story. Racially-based housing lending practices and zoning regulations of the 1930s and 1940s created barriers to homeownership and limited public investment in neighborhoods with residents of color. Urban renewal policies and highway construction programs of the 1960s and 1970s demolished historic buildings and bisected communities with busy roads. Together, these policies and public infrastructure projects contributed to racial segregation across Denver by excluding BIPOC communities from building wealth through homeownership and limiting access to opportunity.

DME focuses on eliminating the barriers created over our city's history that disproportionately impact BIPOC communities in many of Denver's neighborhoods. Every resident in Denver has the right to clean air; a sense of safety in public spaces; connected, accessible, and convenient travel options; and affordable mobility choices to get where they need to go. DOTI is committed to social and racial equity by taking impacts of systemic racism into account when planning for the future of mobility in Denver. To achieve justice and eliminate racial disparities, DOTI's policies, programs, practices, and procedures will center on the voices, experiences, and desires of Denver's BIPOC communities to identify solutions and reverse harms of the past.

FIGURE 1.6: Equality Vs. Equity

SOURCE: Robert Wood Johnson Foundation, 2017

STATE OF THE SYSTEM REPORT **BIT.LY/DENVERMOVESEVERYONE**

DENVER'S PRIORITY AREAS FOR EQUITY

Throughout this document, key information is presented along with Denver's Transportation Equity Index. This index helps DOTI identify neighborhoods across the city where historical barriers and policy decisions have given rise to social, public health, economic, and transportation inequities.

Identifying these priority areas for equity is critical for DOTI to understand where and what improvements must be made to achieve an equitable Denver. Low-income residents and persons of color tend to rely on walking, bicycling, and taking transit to jobsites and for daily travel needs, and for many households who do not own a vehicle, these may be their only options. Older adults, primary caregivers, and persons with physical limitations depend on safe sidewalks and comfortable transit stops to get around. Residents with language barriers or health limitations may require very different levels of mobility services to have equitable access to transportation.

Denver's equity index considers a range of social, economic, and accessibility factors, that when combined, indicate where there are concentrations of vulnerable populations. To develop the equity index, DOTI employed a data-driven approach to identify areas of need across the city with the goal of informing project development and delivery processes. Data from the U.S. Census and City and County of Denver highlight priority areas for equity where residents may have enhanced mobility, safety, and public health challenges.

MAP 1.1: Denver Priority Areas for Equity

SOURCE: City and County of Denver. DOTI. 2020

DOTI'S 2020 EQUITY INDEX FACTORS

- + Race and ethnicity
- + Older adults and persons with disabilities
- + Households with a single female caregiver
- + Poverty levels and employment status levels
- + Educational attainment and language spoken at home
- + Households without vehicle access and household transportation costs
- + Traffic safety outcomes
- + Proximity of youth to schools and recreation centers
- + Public health indicators of obesity and asthma

FUNDING TRANSPORTATION IN DENVER 1.6

TRANSPORTATION **FUNDED SOURCES**

Transportation is an essential service provided by the city and supported by taxpayers. In Denver, transportation is primarily funded by property taxes, general fund transfers, grants from state and regional agencies, and bond programs approved by voters. Fuel taxes and vehicle registration fees primarily fund statewide improvements. The share of these revenues distributed to the city account for just 7% of the citywide Capital Improvement Fund, and only a portion of those dollars are used to fund transportation improvements in Denver. The average residential property owner in Denver contributes \$50 a year in property taxes that directly support DOTI's transportation projects (CCD, 2021).

FIGURE 1.7: Denver's **Transportation Funding Sources**

Between 2017 and 2021, Denver allocated an average of \$222 million in funding each year to transportation improvements, maintenance, and operations.

SOURCE: 5-year average annual appropriated funds by revenue source (bond funds 2018-2021, all other sources 2017-2021)

The amount of funding available for DOTI to invest in Denver's transportation system varies from year to year. The City and County of Denver's Capital Improvement Fund is the primary source of funding for transportation projects. However, this fund is shared across the city to fund buildings, parks, venues, and all other city-owned property. General fund revenue, which supports the maintenance and operations of roadways, was adversely impacted by the COVID-19 pandemic. Compared to growth in Denver's population, funding for transportation is not keeping pace with new demands for transportation infrastructure and services. In 2022, Denver will create a new Transportation and Mobility Fund to provide dedicated support for bicycle, sidewalk, safety, and transit improvements made possible by an increase in parking meter fees. In 2022, \$9.2 million will be invested to support mobility projects.

FIGURE 1.8: Transportation Funding Per Denver Resident

OPERATIONS INVESTMENTS

MAINTENANCE INVESTMENTS

Includes city programs and capital projects that keep the system working. This includes repair, replacement, and ongoing funding for assets such as signals, communications, traffic management, and street signs.

Includes preventative maintenance like paying and repairing streets and bridges that minimize future replacement needs as well as repair or reconstruction of infrastructure assets that are due to be

IMPROVEMENT INVESTMENTS

Includes improvements to planned bicycle and trail networks, closing sidewalk gaps, new transit infrastructure, and other projects to expand the transportation choices available to Denverites.

replaced. Funding to address regular maintenance exceeds available funding every year.

SOURCE: CCD, 2021. Appropriated funding for capital discretionary, capital maintenance, and operations expenditures 2017-2021.

The majority of capital funding is used to repair and maintain streets within Denver. Funding for bicycle, pedestrian, and transit projects have grown recently, but still represent a relatively small portion of all the transportation investments DOTI makes.

DOTI is committed to investing in all neighborhoods across our city, particularly neighborhoods where infrastructure and maintenance have been overlooked for too long. Many neighborhoods with significant gaps in sidewalks or where streets are in poor condition are also home to persons of color or households with lower incomes. In 2020, about 55% of DOTI's capital maintenance projects and 83% of capital infrastructure projects were in neighborhoods with the highest needs (DOTI, 2020).

NOTE: Funding sources include average annual appropriated capital discretionary, capital maintenance, grants, and ELEVATE bond funds 2017 - 2021 to build and maintain the transportation system. Operations Investments (totaling \$49 million average annually) used for staff and equipment costs associated with the delivery and maintenance of transportation assets are not inclu Categories have been established for DME purposes only SOURCE: CCD, 2021. Appropriated funds by revenue source (bond funds 2018-2021, all other sources 2017-2021).

TYPES OF TRANSPORTATION INVESTMENTS

FIGURE 1.9: Average Annual Maintenance and Improvement Investments by Expenditure Type, 2017-2021

SECTION 2

DENVER'S TRANSPORTATION EVOLUTION

Understanding the rich history of Denver's neighborhoods over the last 170 years demonstrates how past decisions shaped the transportation system of today. This section weaves together historical milestones to tell the story of how transportation evolved in Denver, including:

- + Significant mobility milestones and the legacies of those past decisions.
- + Rapid growth and evolution of Denver in the past decade.
- + Disruptions to travel patterns resulting from the COVID-19 Pandemic.

OUR TRANSPORTATION HISTORY: 1850 TO 2020 2.1

THE NEW CITY: 1850 TO 1890

As long as 600 years ago, the Ute, Chevenne, and Arapaho tribes were present near the confluence of the South Platte River and Cherry Creek waterways, trading and hunting along their banks. With the discovery of gold in 1858, miners and other white settlers arrived at the confluence and began to settle what became the City of Denver. The initial city was laid out on a 45-degree grid that ran parallel to the South Platte River. Settlers established Auraria and Highland, two distinct towns in Denver, that also followed similar development patterns, allowing their streets to drain into the two waterways. In 1860, Denver and Auraria joined to become Denver City, and in 1864, the new city was recognized with a congressional grant. In 1870, the railroads arrived linking Denver to the transcontinental railroad and a growing mining industry attracted immigrants looking for work. Between 1870 and 1890, Denver's population grew to over 22 times its original size, becoming the 26th largest city in the nation. The common ways of getting about in this early city were by foot, by horse (if you were wealthy), or the horsecar, a public conveyance which began service in 1872.

TIMELINE LEGEND

Our transportation system evolved around five key themes that also represent Denver's 2050 Transportation Goals including: mobility; safety; sustainability regarding climate and the environment; our communities; and actions to improve the quality of our transportation system. Reference these icons to see how these factors shaped our transportation history:

1872: FIRST STREETCAR The first horsecar

line began service in 1872 and ran from 7th Street to Larimer Street, along Champa Street to Curtis Park.

1873: FIRST VIADUCT OVER THE SOUTH PLATTE RIVER

The first viaduct on 23rd Street (today near Park Avenue and I-25) allowed horsecars to cross the rail lines and South Platte, linking the Town of Argo and the Argo Smelter to the City of Denver via an easy hour commute. Viaducts were usually constructed as a partnership between the city, the tramway company, and private interests.

1850

1860

1858: INITIAL TOWNS

Denver and Auraria were founded in 1858. In 1860, Denver City joined with the Town of Auraria as one entity at the confluence of the South Platte River and Cherry Creek. In 1864, Congress recognized Denver as a city granting Denver the land surrounding the confluence.

1870

1870: RAILROADS TO DENVER

In 1870, the railroads arrived in Denver and connected the city to the transcontinental line in Wyoming. Denver's low-lying land along the South Platte River provided the railroads a prime location for operation in the heart of a growing economy.

1870s: MILLIONAIRES ROW

Millionaires Row, along 14th Street, was the first area where wealthy Denverites built their homes following Governor John Evans, who built a house at 14th and Arapahoe.

1870s: CHINATOWN

1880

Chinese and Japanese migrants were among the growing population of railroad workers in the 1870's, and Denver's Chinatown emerged on what today is Wazee Street near Coors Field.

MAP 2.1: Parcel Development from 1850 to 1890

NOTE: This map displays parcels that were first developed during this time period. Some areas of the city have been redeveloped since initial develop

1878: COMPANY TOWNS

The Silver Boom of the 1870s brought economic prosperity and people to Denver. Beginning in 1878, the Argo, Holden (Globe), Omaha, and Grant Smelters were established near the railroads. Quickly after, the Towns of Globeville, Argo, Elyria, and Swansea all developed with the area's growing industry. These towns were settled largely by Eastern-European and Welsh immigrants who came to find jobs in these company towns.

1890

1888: COLFAX STREETCAR

In 1887, wealthy landowners offered the Denver Tramway Company a cash bonus of \$200,000 (over \$5 million today) to build streetcar service along Colfax and Broadway. By 1888, cable car service was running along Colfax to York with service to City Park.

THE EXPANDING CITY: 1890 TO 1950

Denver faced many economic challenges in its early history, including the Silver Panic of 1893, World War I, and the Great Depression. Despite these challenges, the city continued to grow, drawing people from all over with the lure of jobs and a healthful environment. At the time, many people believed that the dry air was good for mitigating tuberculosis, giving rise to Denver's strong medical industry.

The turn of the century brought new technologies like the bicycle, the electric streetcar, and the automobile, allowing people of means to move farther away from the city center, leaving people of color and low-income within the core urban neighborhoods. Mobility was supported by the expansion of street cars that linked neighborhoods outside downtown to the center city. Denver adopted its first zoning code in 1925, beginning to separate land uses across town. Redlining was adopted nationwide in the early 1930s and, coupled with restrictive racial covenants, conspired to keep people of color concentrated in the Five Points Neighborhood and other industrial, flood prone neighborhoods that straddled the South Platte.

During World War II, Denver drew the interest of the military and became home to multiple military bases and increasing passenger travel through Stapleton Airport. Following the war, population growth surged in Denver and suburbanization of the metro area continued.

1900s: CONFLICT BETWEEN MODES

The idea of shared streets is not a new one. In the early 1900s, pedestrians, bicyclists, trolleys, and horse cars faced the challenges of multimodal demands for street space.

EVERYONE ²⁰ Goods & Services

DENVER MOVES

Our Vision to

Move People.

1900s: ELECTRIC

STREETLIGHTS With his election in 1904, Denver Mayor Robert Speer began lighting Denver's streets. Poles supporting trolley lines were rebuilt with ornamental streetlights. Lit so that pedestrians could safely enjoy the night, 16th Street quickly became known as Denver's 'Great White Way.'

STATE OF THE SYSTEM REPORT

1910s: CITY BEAUTIFUL

The City Beautiful movement in Denver began with the election of Mayor Speer in 1904 and took off with his reelection in 1908. Speer was dedicated to a vision for Denver that would bring Paris to America and championed the expansion of the park system. He inspired the design of Civic Center Park, and added parkways for motor travel including his namesake, Speer Boulevard, that was built in an effort to control persistent flooding along Cherry Creek.

1930s: REDLINING

In the 1930s, Residential Security Mapping, or redlining, identified areas of the city that financial institutions found 'desirable' for lending and investment, which was largely based on race and ethnicity. Areas of the city adjacent to industrial uses were home to many communities of color and were redlined as 'hazardous' for investment. Because of this, residents in these areas were largely restricted from obtaining home or business financing and, consequently, families were deprived of generational wealth.

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MAP 2.2: Parcel Development from 1890 to 1950

NOTE: This map displays parcels that were first developed during this time period. Some areas of the city have been redeveloped since initial develop

1940s: FIVE POINTS AREA

Because of restrictive racial covenants and redlining practices, by the 1940s about 90% of the African-American population in Denver lived in the area known as Five Points. This area also had the only hotel that allowed African-Americans to stay, including visiting performers who contributed to Denver's nationally recognized music scene. Consequently, Five Points became the center of African-American culture for years to come.

1950

1947: FIRST CITY TRAFFIC ENGINEER

Henry A. Barnes was hired in 1947 as Denver's first traffic engineer to relieve congestion in downtown. In his six years with the City, he converted 62 miles of Denver streets to oneways, introduced the midblock traffic light, and created what is known as the 'Barnes Dance' - diagonal pedestrian crossing at intersections by adding 'WALK' signals and stopping all vehicles. He also installed 20,000 street signs and 375 additional traffic lights.

THE AUTO CITY: 1950 TO 1990

Following World War II, the Denver metropolitan area became a popular place to live, especially with veterans who had previously lived on military bases. Denver scrambled to account for the mass adoption of the automobile with highway development, and to accommodate the influx in population in the housing market, despite the scarcity of materials.

The 1960's civil rights movements ended redlining and racial covenant practices. However, white flight, facilitated by the highway system and rapid development of suburbs, shifted Denver's wealthier white population away from the urban core. Business was drawn southward by the establishment of the Denver Technical Center in the 1970s, located just west of the Cherry Creek Dam and Reservoir. Denver's outward expansion was halted in 1974 with the passage of the Poundstone Amendment requiring voter approval from both Denver and the county being annexed. In response to this shift, the Denver Urban Renewal Authority, established in 1958, attempted to draw investment and development back to the central business district. Urban renewal projects during this time changed the urban and social fabric and impacted some communities of color including the Hispanic/Latino community in Auraria. DURA's efforts to revitalize the urban core were inhibited with the 1980s oil collapse, but over time, development interest began to again increase in the urban core.

1955: DENVER MUNICIPAL AIRPORT

Denver Municipal Airport opened in 1929 and during World War II passenger demand grew. In 1944, the city renamed the airport Stapleton Airfield The airport expanded to include parts of Rocky Mountain Arsenal in the 1950s accommodating increased jet sizes and landing strips. In 1955, the airport saw one million passengers pass through its gates.

Denver Urban Renewal Authority (DURA) was founded in 1958 to address the decline of the Central Business District with the decentralization and suburbanization of the Denver Metro Area. DURA operated on the belief that the freeway system would revitalize the area. In the 1970s, 30 blocks of downtown Denver were demolished in anticipation of the Skyline Highway which never became a reality, leaving a large area of downtown Denver to become long-standing parking lots.

After the South Platte River flooded part of Auraria in 1965, DURA relocated residents out of a 'blighted' Auraria community, which had been largely Hispanic and Latino since the 1920s. Between 1972 and 1976, this founding portion of Denver was converted, despite protests from the people who lived there, from neighborhood to campus in the name of greater access to education for minorities. This area is now known as Auraria Higher Education Center.

1980

1958: I-25

1950

In 1948, work began on the 11 mile stretch of I-25 through Denver. I-25 took ten years to complete and impacted working-class residents of adjacent neighborhoods, especially Athmar Park and Valverde, through land acquisition, freeway infrastructure, increased industrial traffic and operations, and increased neighborhood separation.

1960

In the late 1940s, plans by the National System of Interstate Defense Highways for the interchange of I-25 and I-70 were configured in the heart of the immigrant Globeville community, separating the neighborhood into four disconnected quadrants. In 1964, I-70 was completed and industrial uses north of downtown and surrounding the Globeville and Elyria Swansea neighborhoods expanded to include trucking and warehouse operations.

In the 1960s, the Denver Tramway Company, Denver's primary provider of bus service, was declining due to the popularity of the car. The Regional Transportation District was created in 1969 by the Colorado General Assembly to develop, operate, and maintain a mass transportation system to provide service to additional counties in the metro area. The Denver Tramway Company went out of business in 1970, selling the buses and facilities to the City. Denver Metro Transit, the city's attempt to bail out bus service, only lasted until it was absorbed by RTD which began service in 1974.

1970

1974: POUNDSTONE AMENDMENT 资

Drafted by Freda Poundstone and passed in 1974, this measure prohibited Colorado county governments from annexing property without the approval of voters in the areas being annexed. This greatly prohibited Denver from expanding outward toward development opportunities and it also prevented the spread of court-ordered busing from the city-core into the suburbs slowing desegregation of schools.

1970: FEDERAL CLEAN AIR ACT

The Federal Clean Air Act law was passed to prevent air pollution, protect the ozone layer, and promote public health. The law was drafted in response to prevalent air pollution in the U.S. due to incrreased industry and auto travel. EPA officials established the National Ambient Air Quality Standards to address pollutants that threaten public health.

MAP 2.3: Parcel Development from 1950 to 1990

NOTE: This map displays parcels that were first developed during this time period. Some areas of the city have been redeveloped since initial develop

1960s: URBAN RENEWL & AURARIA

RTD began light rail service in Denver on October 7, 1994, RTD's first line through Denver's central corridor, runs from 30th Avenue and Downing through the Five Points Business District through downtown Denver to I-25 & Broadway.

1990

1980s: ECONOMIC BUST

The economic stagnation of the 1980s spurred efforts to support redevelopment of land that had remained empty through the 1970s. These efforts included the removal of the 15th Street viaduct in 1991 and the 16th Street viaduct in 1994 (among others), and the loss of many small bars and businesses that had grown in the shadow of the viaducts which had stood for nearly a century.

THE MODERN CITY: 1990 TO 2020

Denver's prospects began to turn around in the 1990s. Denver International Airport (formerly DIA and now referred to as DEN) opened in 1995, leaving the old Stapleton Airport property ripe for a mixedincome, mixed-use development, and putting Denver back on the map for international air travel. Additional development occurred in the city core, Cherry Creek, Lowry (the former air force base), Green Valley Ranch, and Gateway. Investment in infrastructure, housing and new mobility technology supported a return to the inner city.

Population expanded during this timeframe as Denver began to draw in millennials and act as a gateway to easily accessible outdoor recreation. In response to the influx, Denver focused on comprehensive planning efforts, publishing Blueprint Denver Plans in 2000 and 2018, and commencing a new Neighborhood Planning Initiative.

Denver is currently facing challenges around displacement, safety, and climate change. These challenges are being addressed through Vision Zero, the Climate Action Plan, and the City's continued mobility planning efforts. With recent social justice progress, Stapleton Neighborhood was renamed Central Park by the City in 2020.

space and began looking outside the

city for development opportunities.

In 1988 voters approved the

County and planning began.

In 1995, Denver International

Stapleton International Airport

closed permanently.

Airport opened for service and the

annexation of land from Adams

This historic section of town predominantly located in Five Points was once an industrial area along the railroad tracks. Now referred to as RiNo, short for River North, it is a growing residential and mixed-use development area. Demand for housing in Denver has increased causing property values to climb with RiNo redevelopment. As wealthy residents have moved into the area, lowincome and BIPOC residents are migrating outside of Denver seeking more affordable housing. Gentrification is an issue facing RiNo and many communities within Denver where our historic BIPOC communities are being displaced from west and north Denver.

2010

1990

2000

1990: DISABILITY RIGHTS RECOGNIZED

The Americans with Disabilities Act was signed into federal law in 1990 following years of activism and demonstrations throughout the country including the monumental 1978 protest blocking the intersection of Broadway and Colfax by the 'Gang of 19' until Denver and RTD agreed to make all buses accessible.

2001: TREX **I-25 EXPANSION**

Beginning in 2001, the Colorado Department of Transportation (CDOT) in coordination with the RTD began a project called TREX to expand I-25 south of Downtown Denver through the Tech Center. Included in the project was also the expansion of light rail, creating a consolidated central transportation corridor.

Following voter approval

in 2004, RTD begins the

build-out of its FasTracks

consisted of six new light

lines including service to

DEN and the renovation

of Denver Union Station.

rail and commuter rail

program, which

2013: UBER AND LYFT The two ride-hailing services debuted in Denver in September of 2013.

2007: CLIMATE ACTION PLAN

In 2007, Denver unveiled its Climate Action Plan and set a greenhouse gas reduction goal to reduce emissions by 10 percent per capita below 1990 levels by 2020.

MAP 2.4: Parcel Development from 1990 to 2020

NOTE: This map displays parcels that were first developed during this time period. Some areas of the city have been redeveloped since initial development

2017: **VISION ZERO**

In 2017, Denver released the Vision Zero Action Plan, setting the city on a clear path to achieve zero traffic deaths and serious injuries by 2030.

2020

2018: SCOOTERS AND BIKE-SHARE

In May of 2018, a number of scooter companies released hundreds of scooters across the city. Since then, Denver has passed regulations for the number of operators, the number of scooters, and bike share opportunities within the city.

GROWING FASTER – 2010 TO 2020 2.2

THE PAST 10 YEARS HAVE BEEN ONE OF THE FASTEST GROWING AND MOST TRANSFORMATIONAL PERIODS IN DENVER'S HISTORY

In 2020, Denver's population grew to 715,500 (U.S. Census 2020) to become the 19th largest cities, Denver was the fifth fastest growing over the past decade. More residents, visitors, and businesses mean more people and goods moving within and through Denver. New development and rising housing prices have increased gentrification and displacement in neighborhoods while also creating more dense, mixed-use communities in other neighborhoods. Not every Denverite has benefited from the economic expansion of the past decade. Section 2.2 highlights key changes Denver has undergone over the past decade, demonstrating the extent and scale of transformation in recent years, as well as the positives and negatives of these changes.

GROWING POPULATION

Denver has grown by 115,000 new residents since 2010 - that's 31 people per day for the past 10 years. This growth has brought new challenges to our City and region. The metro area population reached 2.9 million people in 2020 and saw increased travel and economy activity. New mobility solutions are needed to move more and more residents each and every day.

SOURCE: U.S. Census Bureau

STABLE COMMUTE PATTERNS

The ways that Denverites travel to work and the time we spend commuting has not changed much since 2010. With continued population growth and more people and goods moving around Denver, more dramatic shifts in how we travel are needed to make Denver more equitable, safe, and sustainable. Some neighborhoods in Denver with significant new investment in transit options have experienced greater shifts in non-vehicle commutes.

As Denver's economy has grown, wages and income have grown for most but not all residents.

affordable areas of the region. Lower-income households are more likely to not own a vehicle

and to depend on walking, bicycling, carpools, and transit to get to work and travel in Denver.

SOURCE: U.S. Census Bureau, American Community Survey. *Poverty is defined as the percentage below 100% of the Federal Poverty Level.

Income inequality in Denver is increasing and many lower-income residents have moved to more

23% of Denver Commuters **Do Not Drive Their Personal Vehicle to Work**

SOURCE: U.S. Census Bureau, American Community Survey

PEOPLE OF LOWER-INCOMES

2010

2019

2019

Do Not Drive Their Personal Vehicle to Work

125.750 Residents

INCREASING TOURISM

important to visitors as well as the businesses and industries that rely on tourism.

SOURCE: City and County of Denver, 2021

RISING HOUSING COSTS

Development, particularly near new transit improvements, that is not accompanied with affordable housing can lead to rising home prices. Residents who cannot afford to live within the city may face longer travel times and have more limited commute options.

SOURCE: U.S. Census Bureau, American Community Survey

PEOPLE OF COLOR

Denver is a city of neighborhoods with distinctive cultures and character. Since 2010, Denver has become less racially and ethnically diverse. Residents of color are more likely to face challenges accessing affordable, safe, and convenient travel options. This makes addressing transportation inequities across marginalized areas and peoples even more important.

SOURCE: U.S. Census Bureau, American Community Survey

SOURCE: U.S. Bureau of Labor Statistics, 2020

GREENHOUSE GASES

Over the past 10 years, total greenhouse gas emissions in Denver have decreased with more energy efficient buildings and power generation. However, transportation related emissions have increased over the same period. The impact of driving on climate change will continue unless significant shifts in vehicle fuels and driving patterns are achieved.

SOURCE: City and County of Denver, 2020

Not every resident in Denver has the same ability to move around independently. comfortably, and easily. Whether younger or older; moving by wheelchair or with other mobility aids; or with different work arrangements and education levels, all Denverites rely on different travel options and have different mobility needs.

STATE OF THE SYSTEM REPORT

Living in Povertv*

83.500 Residents

Living in Poverty*

EXPANDING ECONOMY

Denver's \$80 billion dollar economy has expanded over the past decade and the number of businesses operating in the city grew by 40% between 2010 and 2020. Businesses depend on efficient movement of goods and services to meet customer demands and deliver the parcels and products that keep Denver's economy competitive.

PEOPLE WITH DIFFERENT ABILITIES

29.250 Residents with Physical Mobility Limitations

30.500 Residents with Physical Mobility Limitations

SOURCE: U.S. Census Bureau, American Community Survey

TRAVEL AND THE PANDEMIC – 2020 TO 2021 2.3

HOW DENVER MOVES IS RAPIDLY CHANGING AS OUR COMMUNITIES RESPOND TO THE CHALLENGES OF THE COVID-19 PANDEMIC

The global pandemic began creating new challenges for Denver's businesses and residents in March 2020. Social distancing practices instantly changed the way Denverites commute, play, live, and move around the city. Many businesses closed in major urban centers and workers that could perform jobs remotely worked from home. These shifts impacted travel activity in centers of the city, including school and shopping, were done online instead, reducing daily needs for personal travel, but increasing goods deliveries across the city. As of Fall 2021, life in Denver has not returned to the same level of activity as before the pandemic and many online activities are continuing as the new normal. This section explores some of the critical mobility changes Denver underwent due to the pandemic, an analysis which is helpful to understand what changes could have travel implications beyond the pandemic.

RIDING TRANSIT

As Denver and the nation responded to stay-at-home guidelines in early 2020, transit ridership on RTD's system fell by 80%. A survey by RTD in May of 2020 found that two-thirds of customers said they would wait to see what happens before resuming using RTD services (RTD, 2020).

By Fall 2021, ridership has continued to increase, but remains roughly half of pre-pandemic levels. Ridership on RTD's routes within Denver remain the strongest in the region with some local bus routes recovering 60-70% of pre-pandemic ridership. Transit service has been impacted by lower ridership, as well as concerns over the health and safety of transit workers, the availability of skilled bus and rail operators, and reduced revenues from sales taxes.

RTD is now resuming more and more service, but the long-term future of transit remains uncertain. Fast and frequent transit service for all Denverites is critical for Denver to meet mobility goals.

FIGURE 2.1: RTD Transit Ridership Retention, 2020-2021

SOURCE: National Transit Database, 2020-2021

TRAVELING SAFELY

As online activities replaced personal trips often made by vehicle, traffic levels in and around the city declined compared to 2019. But trends in national and Denver traffic crashes suggest that the severity of crashes has increased even with less traffic on the roads at peak travel times. Slower traffic is safer traffic. Trafficrelated deaths in Denver reached the highest number since 2000 with 84 lives lost on Denver roads.

FIGURE 2.2: 2000-2021 Fatalities in Denver

SOURCE: National Highway Traffic Safety Administration. Denver Police Department.

WORKING FROM HOME

As the world went virtual, those workers who could work from home did. Nationally, the share of workers working from home some days doubled in 2020 (U.S. Census). A lasting shift in remote work may have significant impacts on commute travel patterns and levels of activity in Denver's employment clusters.

Research by the Downtown Denver Partnership (DDP) suggests that downtown activity fell from a pre-pandemic average of 250,000 people every day to a low of 50,000 in April 2020. As of July 2021, average daily activity has rebounded, but remains 70% less than before (DDP, 2021).

RETHINKING PUBLIC SPACES

As residents spent more time at home and less time commuting, walking and the use of scooters and bicycles increased. Demand for bicycles and e-bikes surged across the country during 2020 and continues today. City programs transformed sidewalks and streets into shared spaces, outside dining, and public parks. Streets in residential neighborhoods were repurposed to welcome walking, biking and recreational activities by limiting vehicle access to local traffic and slowing speeds of vehicles. The pandemic provided DOTI a living laboratory to examine the impacts and benefits of creating shared streets and emphasizing shared spaces. This opportunity enables DOTI to rethink how the public right of way is used in Denver, today and into the future.

Denver's Commercial Streets program permitted businesses to expand dining activities into the right-ofway. This program typically involved closure of a full or partial block to vehicle traffic and included dining and public seating, landscaping, lighting elements, and other amenities. Denver's evaluation of this program found that diverse amenities encouraged people to stay and enjoy public spaces.

NOTE: Some of the averages are based on a series of 10-minute counts of people staying and moving through each space over the course of the study. Some of the findings are based on data collected April through August 2020 based on observations of activity across three surveyed neighborhood streets SOURCE: CCD, 2021. DOTI, 2021.

FIGURE 2.4: Community Benefits of Shared Streets

SECTION 3

DENVER'S TRANSPORTATION GOALS

This section provides detailed information and visualizations of transportation opportunities and challenges today within each of the Denver Moves Everyone goal areas. Critical issues and key social and racial equity concerns raised by Denverites through the engagement process are demonstrated.

3.1 **MOBILITY**

GOAL: A city that provides transportation choices that move all people, goods, and services reliably, easily, and affordably.

This section of the State of the System is organized into two components. The first component showcases Denver's citywide travel patterns and mobility challenges, including:

- + Trends and patterns in how, why, and where Denverites travel today.
- + Transportation accessibility, affordability, and reliability issues and the Denver residents most impacted by these challenges.

The second component then describes each element of Denver's complete transportation system, including the: Pedestrian, Bikeway, Micromobility, Transit, Freight, and Street Networks. For each system element, data is presented to summarize:

- + Current conditions and spotlights on significant challenges.
- + Existing programs for improving and addressing challenges.
- + Travel patterns and demand across the element today.

HOW DENVER MOVES 3.1.1

Denver moves. A lot. Residents make trips to and from school, work, stores, and for daily errands and needs. Visitors to Denver travel to and from major destinations and transportation hubs. Businesses rely on workers to travel to offices and job sites across the metro region and to move the tons of packages and products that support Denver's economy.

WEEKDAY TRIPS

Every weekday, 3.7 million trips are made in Denver. Half of those trips represent travel in and out of the city made by residents of Denver and residents of surrounding communities (DOTI, Locus, 2019). Transportation is a regional issue and requires cooperation among Denver and neighboring jurisdictions.

More than 3 million trips a day may seem like a large number, but it represents about four trips per person each and every day. Each time Denverites leave their homes - whether for work, daycare, school, shopping, socializing, dining, exercise, or just for fun – residents should have access to safe. reliable, and affordable ways of getting around.

HOW PEOPLE TRAVEL

Denverites rely on cars for most trips. 1 in 4 trips within Denver are made by walking, bicycling, scooter, bus, or train. Since most trips are made by driving, this has impacts on safety, our communities, the sustainability of Denver, and the quality of our infrastructure. The impacts of how we travel today are documented within Section 3 under each respective goal.

FIGURE 3.1.2: Average Daily Weekday Trips by Mode In, Out, and Around Denver

TYPES OF TRIPS

Denverites travel for all sorts of reasons at all times of the day. Most trips residents make are not to or from work. These non-work trips are frequent but tend to be shorter in distance and account for a smaller proportion of all miles driven by vehicles. Work related trips to workplaces and job sites represent 30% of all trip purposes but 60% of all miles traveled by single occupant vehicles in Denver.

The choice to drive a vehicle is often an economic choice. For many Denver residents, driving a vehicle to work, instead of taking transit, is faster. For an average trip in Denver, transit takes 2.6 times longer (DOTI, 2021). For families, reliable travel times are critical when working jobs without flexible hours or to meet daily needs for childcare or healthcare appointments. Driving may be the only option in some neighborhoods of Denver to reach daily destinations such as schools and stores. Driving also represents independence for many residents, including older residents. Older adults may have greater concerns about the safety and reliability of public transit (CDOT, Survey of Older Adults, 2014). Access to a vehicle is often necessary to travel around the greater metro region and around Colorado. Residents without access to a vehicle are faced with less competitive or available options to travel within and out of Denver.

FIGURE 3.1.4: Daily Trips Made by Denver Residents

Denverites working full and part-time make the most trips each day and the most trips made by driving. Today's transportation system is designed for commuting and accommodating the significant number of vehicles on our streets during rush hour. But many trips are made by older adults, family workers, caregivers, and students throughout the day, in ways that do not include driving a vehicle.

SOURCE: DOTI, Focus Model, 2020

FIGURE 3.1.3: Comparison of Work Trips in Denver vs. Trips For All Purposes Made in Denver, 2020

TOTAL WORK TRIPS: 1.5M PER DAY

10 MILES AVERAGE DISTANCE

75% OF TRIPS MADE BY CAR

12.7 MILLION VEHICLE MILES DRIVEN

ALL OTHER TRIPS: 2.5M PER DAY

5 MILES AVERAGE DISTANCE

34% TRIPS MADE BY CAR

8.1 MILLION MILES DRIVEN

SOURCE: DOTI, Focus Model, 2020

3.1.2 TRAVEL IN DENVER

FIGURE 3.1.5: Total Trips Made Within Metro Denver

Through Denver Moves Everyone, DOTI is using new data sources and analyses to better understand how people in Denver are traveling and where they are going. Figure 3.1.5 shows the major trip flows in-and-out of Denver from the north, south, east and west.

FIGURE 3.1.6: Trips Made To and From Downtown and Surrounding Denver Areas

average weekday trips occurring within Denver, both how many trips occur in different areas of Denver and stay there, and how many trips are longer and travel to other areas of Denver. For example, Southwest Denver generates NORTHWEST the most trips within the city with more DENVER than half a million trips made each day. Of trips within this area, 69% **54**% 46% include a destination within Southwest OF TRIPS WITHIN Denver, while 31% of trips include LEAVE a destination in another area of the TOTAL WEEKDAY TRIPS city. Arrows indicate where these trips 277,000 connect to other areas of the city. SOURCE: DOTI, Locus, 2019 SOUTHWEST DENVER **69**% 31%

Figure 3.1.6 shows estimates of

OF TRIPS WITHIN

LEAVE

TOTAL WEEKDAY TRIPS 564,000

DISCLAIMER REGARDING DATA AND SOURCES: Data presented in this section come from a variety of sources. In each instance, care was taken in providing the best estimate based on the data available. When possible, recent and directly observed data was the preferred source of data, this includes Census data, traffic counts, and transit ridership. In some cases, it is cost prohibitive to measure or observe every travel behavior and the next best is sampling behaviors or travel characteristics and then expanding that data to represent the City and County of Denver. Examples of sampled data include recent LOCUS location-based services data from 2019, which uses cellphone data to understand travel patterns, and the 2010 Front Range Travel Counts Household Travel Survey. A travel demand model (Denver Focus) simulates travel behavior, estimated and validated based on observed travel data, to provide estimates of comprehensive travel characteristics across the region for all types of people and travel modes

STATE OF THE SYSTEM REPORT | BIT.LY/DENVERMOVESEVERYONE

MOBILITY

3.1.3 COMMUTING TO WORK

HOW DENVERITES GET TO WORK

Beginning in 2011, Denver started to scale investments in bicycle infrastructure and in 2017 started to construct sidewalks. These investments in walking and bicycling infrastructure enable more people to safely and easily commute to work without a vehicle. New services such as ride-sharing, scooters, and e-bikes have also emerged and expanded in popularity. Transit ridership on RTD's rail lines has grown as the system has expanded over the past decade, but ridership on bus routes has declined (APTA, 2020). Despite recent investments within Denver and regional transit service expansion, the share of Denver residents commuting to work without a vehicle has not significantly changed since 2010. Today, nearly 7 out of 10 workers drive alone to get to their workplaces (U.S. Census, 2019).

FIGURE 3.1.7: Denver Residents Commute to Work

The proportion of Denverites driving alone to work has remained stable since 2010, ranging from 67% to 70% of commuters.

DROVE ALONE CARPOOL TRANSIT WALK OR BICYCLE WORK FROM HOME

SOURCE: US Census, American Community Survey , 2010-2019

HOW DOES DENVER **COMPARE?**

Cities such as Boston, Seattle, Portland, and Minneapolis demonstrate that cities where homes and jobs are nearby and made accessible by investments in frequent and reliable transit systems can make it easier to get to work without a vehicle.

FIGURE 3.1.8: Share of Commuters Not Driving to Work

HOW LONG DENVERITES SPEND COMMUTING

Denver is an employment center for the entire metro region with over 550,000 persons working in the city. 55% of people working in Denver commute in from neighboring communities. Nearly 40% of Denver workers commute out of the city to get to work (U.S. Census, 2019). Regional roadway and transit connectivity are critical for moving workers in and out of the city.

The average worker spends 26 minutes traveling to work (U.S. Census, 2019), that amounts to more than 7 days every year spent commuting, often in traffic. Compared to 40 years ago, more Denverites are spending more time commuting. Travel time represents real costs for working families and impacts Denver's economic competitiveness. Travel times rise because of traffic delays, transit reliability, distance between workplaces and homes, distances between regional employment centers, and willingness of workers to travel farther for high-quality jobs.

COMMUTE TO WORK WITHIN DENVER

by Walking, Bicycling, or Transit

Within some of Denver's neighborhoods, the share of residents getting to work without a car is substantial. In and around downtown Denver, more than half of workers choose not to drive to work.

This indicates that significant shifts away from driving are possible in areas of the city that are close to commercial districts and job centers, that have complete sidewalk networks, are connected by frequent and reliable transit options, and have safe and comfortable bicycling options.

However, the workers living in these areas are also more likely to be higher income and hold jobs in professional or technical services that allow for flexible hours or work from home options (U.S. BLS, 2019). For residents who commute into downtown or to neighborhood centers to fill retail and service jobs, more reliable and affordable travel options are necessary to connect all workers to jobs without the need to drive.

MOBILITY

SOURCE: U.S. Census Bureau, American Community Survey, IPUMS 2019 5-year estimates

DENVER MOVES **Our Vision to Move People** EVERYONE 50 Goods & Services

STATE OF THE SYSTEM REPORT

FIGURE 3.1.9: Percentage of Denver Commuters **Traveling More Than 30 Minutes to Work**

Today 75% more Denverites commute 30 minutes

MAP 3.1.1: Share of Denver Residents Commuting to Work

INCREASING ACCESS FOR EVERYONE 3.1.4

DEMOGRAPHIC TRAVEL PATTERNS IN DENVER

Commuting patterns differ across household income levels and racial and ethnic identities. Getting to work reliably and within a reasonable time can be a challenge for many Denverites. Owning a vehicle is expensive and out of reach for many. In Denver, 10% of households do not own a car. Of these households, 80% are lower-income households and nearly 90% are residents who rent their homes (DOTI, Focus, 2020). Without a car, getting to work on-time every day means depending on transit options, informal carpools, or biking and walking routes.

Denver's bus and rail system doesn't work for every resident. On average and for any given trip in Denver, transit takes 2.6 times as long as driving. For underserved populations in Denver's priority areas for equity, transit can take 2.7 times longer.

Denver local bus and rail service is primarily utilized by BIPOC and low-income populations (RTD, 2019). Time spent traveling to and from work or for any trip is time spent away from family and represents a real cost for these households.

FIGURE 3.1.10: Non Drive Alone Commute to Work Choices

FIGURE 3.1.11: Average Commute Time by Race

Commute times for persons of color in Denver are longer on average than for white residents. A commute that is just 5 minutes longer each way can add up to over 40 additional hours spent traveling to work each year.

SOURCE: U.S. Census, PUMS 2019 National Equity Atlas

FIGURE 3.1.12: Average Commute Time by Race and Mode

Residents who rely on transit to get to work face longer travel times than driving, even though those trips are likely covering less distance. Persons of color relying on public transit spend an average of 1.5 hours a day commuting.

SOURCE: U.S. Census, PUMS 2019 National Equity Atlas

THE BURDENS OF DRIVING

Denver's higher-income households make more trips per person each day than households with lower incomes, and are more likely to make a greater share of total trips driving alone.

11%

16%

39%

Low-income workers are more likely to hold jobs with less flexible working hours, tend to have more limited options to work from home, and have less convenient transit options to commute between their workplace and home. Recent national studies examining lowincome commute patterns during the pandemic found that work travel for low-income residents did not decline as much as high-income households (Ohio State University, Center for Urban and Regional Analysis, 2021).

The result is that Denver's higher-income households benefit more from the policies and infrastructure that make driving cheap and easy for those with access to a vehicle, but bear less of the social costs of the choice to drive.

THE COSTS OF TRAVEL TIME

The time Denverites spend traveling to work depends on who they are, where they live, where they work, the options available to them, and the choices they make when commuting. Workers living in Denver's neighborhoods near downtown and commercial centers spend less time getting to their jobs. These areas also have more reliable and frequent transit service and higher quality walking and bicycling infrastructure.

SOURCE: U.S. Census, American Community Survey, 2019

FIGURE 3.1.13: Denver Daily Trips Per Person

TRIPS MADE BY OTHER MODES

SOURCE: DOTI. Focus Model. 2020

MAP 3.1.2: Average Commute Time to Work

MOBILITY

TRANSPORTATION AFFORDABILITY IN DENVER 3.1.5

TRANSPORTATION COSTS

Nearly half of the average Denver households' budget every year is spent on housing and transportation. Transportation costs are second only to housing and represent 17% of annual spending (BLS, CES 2020). On average, Denver households spend more than \$12,700 on direct transportation costs. Nearly all of these expenses are related to the cost of owning and operating a vehicle. Spending on public transit and other transportation services In Denver costs the average household just \$700 annually.

As a share of income, transportation costs are similar for low- and high-income households but vary across racial and ethnic groups (BLS, CES, 2020). Nationally, Hispanic and Black persons spend more than White persons on transportation as a share of total household income.

Cost of transportation are higher for workers that rely on vehicles to get to work and who work in occupations that may not have fixed work locations in offices, but rather travel to jobsites and provide services in different homes and offices. Jobs in these occupations offer lower wages and benefits than professional occupations. Denver's transportation system must be affordable for all residents and workers.

Together, housing and transportation costs strongly reflect aspects of the built environment. Neighborhoods within Denver that have more homes, jobs, and destinations in close proximity are also the areas with the transportation infrastructure to get around more safely and easily without a car. This leads to savings on transportation for households in dense areas.

More urban, walkable neighborhoods have market appeal, and in Denver, tend to be more expensive and less affordable for low-income Denverites (FHWA, 2017). As a result. lower-income residents and essential workers often live in areas of the city that are not as accessible without a vehicle or further from job centers.

FIGURE 3.1.14: **Transportation Costs Comparison**

AVERAGE METRO DENVER HOUSELAND SPENDING ON VEHICLE OWNERSHIP COSTS

\$400

SOURCE: BLS, 2020 | RTD 2021 | Bicycling Magazine 2017

MAP 3.1.3: Denver Transportation-Related Costs

FIGURE 3.1.15: U.S. Share of **Income Spent on Transportation** by Ethnicity and Race

SOURCE: US Bureau of Labor Statistics, 2020

TRANSIT **AFFORDABILITY**

In 2019. RTD raised fares for the first time since 2016, to \$3.00 base fare for local service. As a result, fares for RTD are currently the most expensive in the country. In 2021, the Colorado Legislature eliminated a mandate on RTD that impacted fares. Going forward. RTD will have the flexibility to lower fares or offer free service. Discounted passes are available for Denver residents living below poverty levels and discounts for annual, commuter, and employer-sponsored passes are also available.

Even with RTD's discount programs, current fares for low-income riders, students, older adults and persons with disabilities remain higher than other peer transit agencies around the country (APTA, Fare Database, 2020).

In Denver, the median income of commuters relying on public transportation to get to work is lower than those who drive. The average transit commuter spends 6% of their income to purchase monthly regional RTD passes for a year.

HOW DOES DENVER COMPARE?

On average, transportation costs as a share of income are lower in the nation's largest cities, compared to smaller urban areas. Households living in compact communities can spend as little as 9% of income on transportation, compared to 25% of income for households living in suburban areas (FHWA, 2015)

This pattern reinforces the connection between transportation costs to households and city land use and multimodal connectivity. Denver is relatively more expensive to own and operate a vehicle and to get around than larger cities with high-quality transit service such as Seattle. Minneapolis, and Boston,

FIGURE 3.1.17: Transportation Costs As A Share of Income

SOURCE: Center for Neighborhood Technology, 2017

FIGURE 3.1.16: Adult Base Fares 2020

SOURCE: American Public Transit Association, 2020

COMPLETING DENVER'S TRANSPORTATION SYSTEM 3.1.6

Denver's transportation system provides access for residents, businesses, and visitors to travel where they need to go, whether walking, rolling, bicycling, riding the bus or train, driving, or delivering goods. Safety, comfort, convenience, and reliability is not equal across all the ways people in Denver travel today. DOTI is committed to prioritizing access for Denver's most vulnerable travelers and maintaining access for everyone. This section first explores how all elements of the Denver's transportation system are integrated, and then explores in detail Denver's pedestrian, bicycling, transit, street, and freight networks and how people use each of these transportation elements.

PRIORITIZING STREETS FOR PEOPLE

Transportation is an essential service provided by the city and supported by taxpayers. For more than 70 years, cities in the United States, including Denver, have prioritized the movement of vehicles over the needs of people walking, bicycling and taking transit. Denver is committed to shifting how streets are designed to prioritize access for people. Figure 3.1.18 displays DOTI's contemporary approach to designing streets.

PEOPLE WALKING

AND WHEELING

PEOPLE BICYCLING,

ROLLING AND

TAKING TRANSIT

PEOPLE SHARING RIDES

AND TRANSPORTING FREIGHT

PEOPLE DRIVING

ALONE

A COMPLETE TRANSPORTATION SYSTEM

PEDESTRIAN

Pedestrians, bicyclists, transit riders, delivery drivers and people driving cars all travel on the same streets. Not every street in Denver must accommodate every travel option, but the system must work together to enhance mobility. Denver Moves Everyone is planning for how we as a city can develop a complete transportation system that prioritizes people and meets the needs of everyone traveling.

Pedestrian street elements include sidewalks, trails, crosswalks and other infrastructure that make it safe and easy to walk or roll. Every Denverite is a pedestrian at some point during a trip and prioritizing pedestrian space is foundational. Significant gaps exist in Denver's pedestrian network and DOTI is committed to creating a complete pedestrian network.

BICYCLE

The bikeway network consists of bikeways of all types, designed based on how much vehicle traffic is on the street, as well as off-street trails and paths, crossing treatments, bike parking and wayfinding. Denver has rapidly expanded the bikeway network in recent years, though a more complete system that connects everyone to safe and comfortable bikeways is needed.

TRANSIT

The transit network consists of rail lines, bus lines and stops, and stop amenities. Transit is very efficient, meaning it can move more people than any other type of vehicle on Denver's streets. Denver collaborates with RTD to provide a high-quality transit experience in Denver. Enhancements are needed so every Denverite has access to frequent and reliable transit service.

AUTO AND GOODS

The street system provides access for people driving and people moving freight around Denver and is the most complete of all the transportation system elements. The needs for vehicles that move autos and goods both overlap and have differences. Many of these vehicles travel on the same streets. Large freight vehicles require different roadway designs, and freight vehicles have unique parking and loading needs. These nuances must be accommodated within the auto and goods street network to create a complete transportation system.

STREETS MOVE MORE THAN PEOPLE

GREEN **INFRASTRUCTURE**

Streets provide space to implement green infrastructure, trees, planting and other treatments to keep Denver cool, beautify streets, and manage stormwater.

FIGURE 3.1.18: DOTI Transportation Hierarchy

SOURCE: DOTI

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COMPLETE STREETS DESIGN GUIDELINES

In 2020, DOTI published the Complete Streets Transportation Hierarchy into the fabric of every street in Denver. DOTI is using these guidelines to update the City's Traffic Engineering Standards, a critical step to creating a consistent, people-first

STATE OF THE SYSTEM REPORT

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STREETS ARE DENVER'S LARGEST PUBLIC SPACE

The space between buildings is called the public right of way which is owned publicly by the city and managed by DOTI. This asset is the largest public space in Denver, representing 25 square miles, or 25% of the city's total 100 square mile land area (excluding the area of Denver International Airport). While most of this public space today is dedicated to moving vehicles, that was not always the case in Denver, and increasingly more space is being allocated to people who use streets - through wider sidewalks and dedicated bikeways and bus lanes. During the COVID-19 Pandemic, some streets were closed to vehicles entirely, providing more space for people and commerce. These examples demonstrate how the public right of way is used, looks and evolves. DOTI is committed to maintaining the highest and best use of the right of way to move everyone better.

••••••

STORMWATER MANAGEMENT

Streets in Denver are one of the main methods to manage and convey stormwater along curbs and using inlets.

CURB SPACE

The curb space is a nexus between many elements of street life parking bikes and vehicles and loading and unloading people and goods, making it an ever changing component of our streets.

3.1.7 WALKING IN DENVER

Walkable neighborhoods with guality sidewalks are the foundation of Denver's complete transportation system. Every Denverite is a pedestrian and walks at some point during every trip. Pedestrians are most at risk to serious injury or fatal traffic crashes when traveling, and therefore are the most vulnerable roadway users and highest priority to accommodate. Pedestrians of different abilities are most disadvantaged by deficiencies in the sidewalk network, including sidewalk gaps, unsafe intersection conditions, and lack of wide sidewalks or curb ramps to accommodate wheelchairs, strollers, and carts.

DENVER'S SIDEWALK NETWORK

There are approximately 2,300 miles of sidewalk in Denver. Sidewalks are the most important elements of Denver's transportation system and sidewalk gaps are the weakest links. Missing or deficient sidewalks, meaning sidewalks that are too narrow, present barriers for everyone, especially for people with different abilities.

SOURCE: DOTI. 2019

NOT ALL DESTINATIONS ARE ACCESSIBLE

Deficient sidewalks are less than 4 feet wide, which is the minimum width required to meet standards in the Americans with Disabilities Act (ADA). Narrow sidewalks may not be comfortable or provide an accessible route, particularly for people in a wheelchair or for someone with a stroller.

31%

GROCERY

PERCENT OF SIDEWALKS THAT **ARE TOO NARROW WITHIN** WALKING DISTANCE OF COMMUNITY DESTINATIONS: STORES

SOURCE: Denver Moves Pedestrians and Trails, 2017

NOT ALL STREETS ARE EASY TO CROSS

Crosswalks, signals, beacons and signage make it easier and safer for pedestrians to cross streets. Crossing wide, multi-lane arterial roadways pose particular challenges for pedestrians, due to long crossing distances and high traffic volumes and speeds. Along Denver's arterial roadways, 58% of intersections – 2,783 out of 4,839 intersections – do not have traffic signals (FHWA, 2021; DOTI, 2021).

1/5 mile AVERAGE DISTANCE

BETWEEN SIGNALIZED

5 minute walk

39%

TRANSIT

STOPS

39%

SCHOOLS

AVERAGE WALKING TIME TO REACH SIGNALIZED CROSSING ALONG ARTERIAL

ARTERIAL STREET CROSSINGS

SOURCE: DOTI, 2021

DENVER'S PEDESTRIAN PROGRAMS

Denver residents set a vision for the city's complete pedestrian network in Denver Moves: Pedestrian and Trails. This plan resulted in new programs to accomplish the Denver's vision.

SIDEWALK GAP PROGRAM

In 2017, DOTI initiated a new program to complete the estimated \$1.1 billion dollar effort to close all sidewalk gaps in Denver. Since then, nearly 27 miles of new sidewalks have been constructed. DOTI did not begin tracking sidewalks built by private development until 2019 and total miles completed may be greater. The Sidewalk Gap Program is currently funded at \$5-7 million per year and sidewalk construction costs are as high at \$2 million dollars per mile. At current funding levels, it could take 100 years to complete the sidewalk network in Denver. No city funded program currently exists to address the 830 miles of narrow sidewalks in the city.

PEDESTRIAN INTERSECTION PROGRAM

This program has identified over 6.000 high priority intersection improvements. At current completion rates, it will take approximately 300 years to address these critical pedestrian safety needs. Denver is committed to improving pedestrian crossing conditions, including installing 1,500 new curb ramps each year that in compliance with Americans with Disabilities Act standards.

NEIGHBORHOOD SIDEWALK REPAIR PROGRAM

By working with property owners, this program improves damaged or uneven sidewalks. Denver property owners are responsible for building and maintaining sidewalks adjacent to their property.

FIGURE 3.1.19: Miles of New Sidewalk Gaps Completed

SOURCE: DOTI, 2021

Every trip begins and ends with a walk. DOTI estimates that nearly 1 out of every 10 trips in Denver are made just by walking (DOTI FOCUS Model, 2020). In Denver's most dense neighborhoods, as many as 1 out of every 3 trips are made just by walking. Trips made by transit also involve walking to and from final destinations, which are not always reflected in walk only trip data. It is likely that even more walking trips are completed daily than available data suggests.

Residents within Denver's priority areas for equity are more likely to walk than those living in all other areas of the city. This underscores the need to develop safe, comfortable, and easy pedestrian access in all areas of the city, while concentrating investment in Denver's mobility disadvantaged neighborhoods (DOTI, LOCUS, 2019).

MAP 3.1.4: Share of All Trips Made by Walking, 2019

DENVER MOVES **Our Vision to Move People** EVERYONE 50 Goods & Services

STATE OF THE SYSTEM REPORT **BIT.LY/DENVERMOVESEVERYONE**

8% of all trips by Denver residents are made walking

SOURCE: DOTI LOCUS. 2019

WHERE DENVERITES WALK AND HOW OFTEN

BICYCLING IN DENVER 3.1.8

Safe and comfortable bicycling facilities for residents to travel within neighborhoods and to destinations across the city are a critical element of Denver's complete transportation system. Denverites rely on pedal and electric-powered bicycles to get to and from workplaces, for trips to school or stores, and for recreation. Denver businesses rely on bicycles to deliver goods and visitors to Denver tour the city by bicycle. Denver recognizes bicycling infrastructure as a key element to support Denver's vision for a healthy and vibrant city.

DENVER'S BIKEWAY NETWORK

Expanding Denver's network of high-comfort bikeways is a priority for DOTI. In 2011, only 36% of residents had easy access to a high-comfort bikeway and today, 42% of households do. Easy access means that anyone is within a quarter mile, or about a 2-minute bicycle ride, from a bikeway that is comfortable. High-comfort bikeways include: trails and paths separated from vehicle traffic; bicycle lanes with physical barriers such as curbs or posts; and neighborhood bikeways with design elements to slow traffic and prioritize bicycle and pedestrian travel. Most metro region residents (70%) indicate they would ride a bicycle if high comfort bikeways were available (DRCOG, 2018). The majority of Denver's 177 total miles of high-comfort bikeways are trails and paths (94%), with the small remainder on-street facilities (6%). Rapidly expanding on-street high-comfort bikeways will be necessary to link more households to safe and comfortable bicycle routes, given limited opportunities to build new trails and paths.

FIGURE 3.1.20: High Comfort Bikeways

TRAILS	
	113 MILES
SHARED USE PATHS 39 MILES	
PROTECTED BIKE LANES 21 MILES	183
NEIGHBORHOOD BIKEWAYS	MILES TOTAL OF HIGH COMFORT BIKEWAYS

SOURCE: DOTI, 2021

BICYCLING GETS DENVER TO WORK

Of the total bike trips made, 2/3rds are made during weekdays (STRAVA Metro, 2020). Most bicycle trips made in Denver are to commute to work, school, and other regular destinations. Data from the activity tracking application STRAVA suggests citywide bike lanes are busiest during regular commute times when traffic volumes are also at their highest.

FIGURE 3.1.21: Moderate **Comfort Bikeways**

3PM

6PM

FIGURE 3.1.22: Biking Volumes

by Hour in Denver

5AM 7AM 9AM 12PM

SOURCE: Strava Metro, 2021

DENVER'S BICYCLE PROGRAMS

Denver residents set a vision for the city's complete bikeway network in Denver Moves: Bicycles. This plan established priorities to complete Denver's bikeways.

DOTI set a goal of completing 125 new miles by 2023 and has reached 40% of this goal as of 2021. To achieve this goal, DOTI is using three methods: 1) implementing 50 miles of high-comfort bikeways funded through the 2017 Elevate Denver Bond; 2) through the Community Transportation Networks Program, which will rapidly install bikeways in west, central and south-central Denver, with the goal to expand the program across all Denver's neighborhoods; 3) coordinating bikeway installation with planned street repaying.

Since 2011, DOTI has coordinated bikeway installation when streets are repaved. When a street is due for paving, bikeways and crosswalks can be installed with minimal additional cost to the overall cost of the repaying project. In 2020, 20 miles of bikeways were added through the coordinated paving program.

510 TOTAL MILES OF	118	206	1
PROPOSED	MILES	MILES	MILE
BIKEWAYS BY DOTI:	BICYCLE LANES	NEIGHBORHOOD BIKEWAYS	PRO BIC

18 53 MILES FS DTECTED OTHER

YCLE LANES

SOURCE: Denver Moves Bicycles, 2019

WAYFINDING PROGRAM

In 2019, DOTI adopted bicycle wayfinding guidelines, to make it easier for bicyclists to navigate Denver and access destinations. All future bikeways will receive wayfinding signs.

BICYCLIST DATA COLLECTION PROGRAM

In 2019, DOTI established a bicycle count program to understand changes in bicycle ridership across the network. DOTI collects bicycle data at 50 locations annually with the goal to expand the program to gain a better perspective of bicycle travel in Denver.

SAFE ROUTES TO SCHOOL (SRTS) PROGRAM

Of Denver Public School students, only 18% ride a bike or walk to school (CDPHE, Youth Behavioral Risk Survey, 2019). DOTI's SRTS Program coordinates with schools to enhance safe travel options, including better bicycling routes.

WHERE DENVERITES

The average annual cost of a bicycle is \$300 compared to \$8,900 to own and operate a vehicle. Additionally, bicycling is a sustainable form a travel that does not produce greenhouse gases or emit air pollution and supports public health. It is estimated that bicycling represents 1% of all weekday trips in Denver but bicycling trips may be underepresented in current counts. Data from the activity tracking application Strava, which represents a small sample of all bike trips in Denver, shows that **annual bicvcling trips** have been increasing steadily over the past four years from 287,015 trips in 2017 to 447,687 trips in 2020.

Denverites	
make over	
30,000	
biking	1
trips on an	
average	38th Are
weekday.	
Bicycling	
trips are	
more	Coltax Ave
frequent in	
and around	
employment	Alameda Ave
clusters,	
universities	Mississippi Ave
and	
schools,	la la
and park	
and open	1.1
space	Hampden Ave
areas.	_

SOURCE: DOTI, LOCUS, 2019

Move People

1% of all trips

by Denver residents are made bicycling

SOURCE: DOTI LOCUS, 2019

2% of commute trips by Denver residents are made bicycling

SOURCE: ACS 5-Year 2019

BICYCLE AND HOW OFTEN

FIGURE 3.1.23: **Bicycle Trips in Denver,** 2017-2020

SOURCE: Strava Metro, 2021

MAP 3.1.5: Share of All Trips Made by Bicycling, 2019

MOBILITY

SCOOTERS AND E-BIKES IN DENVER 3.1.9

Convenient options to travel short distances without a vehicle are critical to providing a complete and sustainable transportation system in Denver. The availability and ease of electric scooters and bicycles has grown significantly in the last few years. These electric-powered personal vehicles are described as micromobility options. Denver is a national leader in micromobility programs, beginning with the first large-scale bike sharing program launched in 2010 and continuing with today's partnership with private providers of electric scooters and bicycles.

DENVER'S MICROMOBILITY NETWORK

Since the launch of Denver's micromobility pilot program in 2018, trips made by scooter and e-bike have continued to increase across Denver. Between 2019 and summer 2021, Denverites completed more than 5.9 million scooter trips and 215,800 e-bike trips.

MICROMOBILITY TRIPS

1 in 5 micromobility trips are less than a mile in distance with the average trip in Denver being 1 mile long and taking 10 minutes (National Household Travel Survey, 2017).

IMPACTS TO VEHICLE TRIPS

The North American Bikeshare Association evaluates micromobility programs across the country and found that 36% of scooter trips replace a trip that would otherwise be made be vehicle. An evaluation of Denver's program by DOTI found a similar substitution effect. These data suggest that **since the licensed** program began in 2021, over 1 million vehicle trips have been eliminated in Denver which could reduce greenhouse gas emissions by as much as 470 metric tons (NABSA; DOTI, 2021).

DENVER'S MICROMOBILITY PROGRAM

In July 2018, Denver introduced a scooter and e-bike pilot program to understand the benefits these vehicles could provide to residents and visitors. The pilot program was successful, and in May of 2021, a formal licensed program was launched. This innovative partnership between the city and private operators provided an estimated \$70 million in value and benefits to residents, including free rides, infrastructure investments, system operations, and e-bikes and scooters placed in priority areas for equity. This model, pioneered by Denver to provide semi-exclusive operations in exchange for the operation of the micromobility system, is fast becoming the industry standard and is being replicated across North America. Scooter and e-bike fleets are managed by private operators and overseen and regulated by DOTI.

Micromobility options offer significant benefits for travelers and a path toward meeting citywide transportation goals. The safety of riders and and non-riders continues to present challenges that DOTI is working to resolve through enforcement and education. With the launch of the licensed program, DOTI has instituted new requirements for operators to park vehicles properly and continually monitors and enforces parking under the licensed program.

MICROMOBILITY EOUITY PROGRAMS

In 2021, DOTI rolled out two new programs to increase access to micromobility: the 5280 Program and the Need Based Program. The 5280 Program is aimed at reducing barriers to trying e-scooters and e-bikes. Through this program, each operator is required to provide 5,280 free passes for people to try micromobility. The Need Based Program is aimed at reducing cost barriers for low-income residents. Any Denver resident that qualifies for local, state, or Federal income-based aid programs receives either free or significantly reduced rides. To increase access in priority areas for equity, operators are also required to make 30% of vehicles available in neighborhoods with low-vehicle ownership and high transit ridership. Trips originating from underserved areas are also discounted. Together these programs are intended to provide more affordable mobility choices for Denver's lower income residents.

FIGURE 3.1.24: Daily Scooter Trips from January 2019 through September 2021

WHERE DENVERITES RIDE AND HOW OFTEN

Micromobility in Denver has proved popular. According to data available, peak ridership occurs during the summer and early fall. During the first year of the pilot program, peak ridership hovered around 15,000 trips per day. Following the licensed program launch in 2021, the peak doubled to more than 30,000 trips per day. In September 2021, the average e-scooter completed 6.5 trips per day in Denver, 4 times the national average (North American Bikeshare Association, 2020; RideReport, 2021).

Nationally, micromobility options are used more frequently by higher income earners, and less frequently by people who identify as persons of color. In Denver, the median cost for each trip for users is approximately \$3.75. Scooter rides, even with discounted pricing for some residents, can be relatively expensive and represent a barrier to use for some residents. Recognizing these barriers, DOTI is making micromobility options more affordable by providing free passes and discounted and free rides for lower income residents (North American Bikeshare Association, 2020).

MAP 3.1.6: Scooter Trip Volumes, 2020

and does not represent an entire year of data SOURCE: RideReport, 2021

NOTE: Average daily ridership figure calculated from 5/17/2021 when the licensed program launched to 12/13/2021

3.1.10 TRANSIT IN DENVER

Transit can move more people per vehicle than any other form of travel, making transit service in Denver the most 'space' efficient way for people to access jobs and other destinations. A single bus can carry 40 to 60 passengers at the same time using just 40 feet of street space; to move the same amount of people in single occupant vehicles would take up 800 feet of street space – about 2.5 city blocks in length. Buses, trains, and on-demand van transportation are crucial service for Denver residents, especially those who do not have regular access to a vehicle.

DENVER'S TRANSIT NETWORK

In Denver, the Regional Transportation District (RTD) is responsible for providing bus and light and commuter rail service within Denver and connecting to the region, and Denver's role providing space and operating transit is expanding. The transit network in Denver consists of the following elements:

SOURCE: RTD, 2021

15% OF DENVER BUS STOP SIDEWALK ACCESS IS IN POOR CONDITION

Many bus stops lack benches, shelter, lighting, trash removal, and ongoing maintenance that can make them inviting and comfortable for all residents in every neighborhood. RTD is responsible for managing and maintaining the approximately 2,700 bus stops in Denver, including upkeep of signs, shelters and benches, as well as snow and garbage removal. DOTI is expanding its role in stop maintenance and working with RTD to evaluate the condition of all bus stops and make needed improvements (DOTI, 2020).

25% OF DENVER RESIDENTS ARE WITHIN A SHORT WALK TO ALL-DAY FREQUENT TRANSIT

Residents are more likely to use transit when buses and trains arrive every 15 minutes or less, run at the times of day that are needed, and is easy to reach within a short walk -5 minutes (quarter mile) of bus stops and 10 minutes (half mile) to rail stations. 75% of Denver residents lack this access to fast, frequent and reliable transit (DenverMoves Transit, 2019).

8% OF COMMUTES TO WORK ARE MADE USING TRANSIT

Since 2000, the share of commuters in Denver using transit to travel to and from work has not grown. Over the past 20 years, RTD has expanded light rail service to surrounding cities and major destinations such as the airport. However, the bus system that serves Denver has not grown and service frequency and some local routes have been scaled back, cuts accelerated by the COVID-19 Pandemic (U.S. Census, 2019).

10% OF DENVER HOUSEHOLDS DO NOT OWN A VEHICLE

For many Denver residents, including people who do not own a vehicle and Denver's youth, older adults, and others who do not drive, transit is their primary travel option. Lower-income workers and residents of color rely more on transit options to get to work. For residents with different abilities, accessible buses and trains and para-transit service provides ways to get to medical appointments and to run daily errands with a wheelchair (U.S. Census, 2019).

DENVER'S TRANSIT PROGRAMS

RTD serves eight counties and 3 million residents in the metro area. Across that system, 45% of regional transit service, including rail and bus stops and route miles, is provided within the boundaries of Denver. Ridership in Denver accounts for 61% of all weekday boardings on the regional system (RTD, Average Weekday Boardings, 2019). Denver is the most populous county in the metro area with more dense neighborhoods and job centers that are transit accessible.

In 2019, Denver voters approved the creation of the Department of Transportation and Infrastructure, giving DOTI the authority to operate transit. DOTI's Transit Program includes two parts: Transit Capital Program and Transit Programs and Services, which together expand transit service and make taking transit faster, more reliable and comfortable.

Transit capital programs include major capital investments that reshape how transit looks and feels along corridors, as well as speed and reliability improvements, which include dedicated transit lanes, infrastructure that improves the efficiency of bus passenger loading, and traffic signal modifications that speed up transit service.

TRANSIT CAPITAL PROGRAM

Completed in 2019, Denver Moves: Transit established a transit vision and guiding framework for improving the quality of transit options in Denver- by making transit more reliable, more frequent, and more convenient for daily use. A 2022 update to the plan will identify high-priority transit investments including, Bus Rapid Transit routes on Colfax and Federal and identify citywide bus stop and signal reliability improvements to be made by 2030.

TRANSIT PROGRAMS AND SERVICES

These include DOTI's Passenger Amenity Program, aimed at improving the condition and amenities at the City's bus stops and Transportation Demand Management, which includes a suite of programs and incentives to encourage people to try and continue using transit. The third element is the Transit Services Program, which in 2021, launched DOTI's first on-demand transit service in Montbello and also manages the city's micromobility program.

WHERE AND HOW DENVERITES TAKE TRANSIT

Of trips by Denver residents, 4% are made using transit, which equates to 120,000 transit trips on an average weekday. (DOTI Focus Model, 2020). Denver remains well below the transit ridership levels of large multimodal cities across the country. The pandemic decreased ridership across Denver and as of Winter 2021 has yet to fully rebound to pre-pandemic levels.

Lower-income residents are more likely to rely on transit. Among low-income workers in Denver, 36% use transit to travel to and from their jobs compared to 14% of high-income workers. Among households that do not own a vehicle, 40% use transit to commute. The legacies of discrimination also affect travel choices today. Past housing policies segregated people of color in specific neighborhoods, so that today, people who rely on transit and the need for transit services are concentrated in these neighborhoods (International Journal of Environmental Research and Public Health, 2019). In Denver, Black residents use transit at nearly twice the rate of all residents to get to work (U.S. Census, CTPP, 2019).

MAP 3.1.7: Weekday Bus and Rail Boardings in Denver, 2019

Denverites make over 120.000 bus and rail trips on an average weekday. Transit use in Denver tends to be concentrated in areas with safe and comfortable access to stations and stops and where light rail and bus transfer stations provide access to different routes and options to get to work.

SOURCE: Regional Transportation District, 2019

4% of all trips by Denver residents are made by bus or rail

SOURCE: DOTI LOCUS 2019

8% of commute trips by Denver residents are made by bus or rail SOURCE: ACS 5-Year 2019

3.1.11 | FREIGHT DELIVERY IN DENVER

Denverites rely on the daily delivery of parcels, packages, and products to keep the city's economy moving. Transporting goods safely and efficiently is critical for deliveries to be on-time, to keep store shelves stocked, and to enhance the competitiveness of Denver's economy. Denver's transportation system must ensure that people driving trucks can move safely and predictably alongside pedestrians, bicyclists, busses and trains, and vehicles.

DENVER'S FREIGHT NETWORK

Denver consumes more goods than are produced in the region. An imbalance in the flow of goods means that more trucks, railcars, and planes may be leaving the city empty after delivering goods. Growing the value of international exports and manufactured goods produced in Denver can offset this inefficiency

380 pounds of goods per resident

MOVE THROUGH DENVER EACH DAY

SOURCE: Transearch, 2015

FREIGHT CONGESTION AND DELAY

Congestion and resulting delay in truck movements directly impact business and drivers and can result in missed deliveries, regulatory violations, extended parking needs, and other direct costs to both businesses and consumers. Truck traffic impacts, as highlighted in **Figure 3.1.25**, are a visible issue for many residents. Illegal parking, noise, air pollution, and safety issues caused by trucks are growing as demand for deliveries expands.

FREIGHT RAILROAD MOVEMENTS

There are over 170 public freight railroad crossings within Denver; more than 2/3rds of those are not separated from traffic (Federal Railroad Administration, 2019). Many of Denver's historic industrial and railroad areas are being redeveloped to provide new housing and commercial centers. Growth in neighborhoods, such as River North, creates new conflicts including safely moving hazardous materials carried by rail, railroad crossing noise, and rail crossing safety issues.

FIGURE 3.1.25: Total Freight Tonnage In, Out, and Around Denver

SOURCE: CDOT, IHS Transearch, 2015

DENVER'S FREIGHT PROGRAMS

Denver is committed to planning and developing a freight system that provides for safe and efficient deliveries and minimizes community impacts. Curbside space in Denver is limited and is shared by pedestrians, bicyclists, buses, and car shares, in addition to freight delivery needs. Trucks parked for deliveries and loading in this shared space can create safety hazards, block travel lanes, and delay buses. Safe and convenient parking for larger semi-trucks must be provided so that drivers can meet Federal regulations limiting hours behind the wheel without parking in neighborhoods or along side streets. As freight volumes grow, alternative and sustainable parcel delivery strategies such as cargo bikes, package lockers and pick-up stations, and neighborhood distribution centers must be explored in concert with freight providers.

DOTI is beginning to plan more proactively for the safe and efficient movement of goods across Denver. Coordinated planning efforts will help balance parking needs, design and manage curbspaces for delivery, implement sustainable delivery policies, and encourage adoption of electric vehicles for medium and heavy-duty trucks.

FIGURE 3.1.26: Heavy Commercial Trucks in Denver

WHERE AND HOW DENVER MOVES GOODS

As Denverites continue to order more things online with the expectation of next-day delivery, this means more trucks will be moving more packages at all times of the day. Transporting those packages from major distribution hubs to their final destination at the doorsteps of residents and businesses is a growing challenge. Businesses must fullfill consumer expectations for next day delivery, but more vehicles in neighborhoods increases potential for safety, parking, and noise conflicts.

Two of the top 100 most congested roadways in the country for trucks are in Denver — the junction of I-70 and I-25 and the Central I-70 corridor (American Transportation Research Institute, 2021). With corridors such as I-70 and I-25, Denver is a critical crossroads for truck movements across the state and Mountain West region. Trucks move the majority of goods in Denver and provide essential connections to rail and air terminals and final destinations. Traffic from heavy commercial trucks, such as semi-trailers, can be estimated using available freight data. The lighter trucks and vans used to deliver goods to homes are not well represented in current data. Based on national increases in e-commerce services it is evident that those trucks are increasing in volume and frequency.

MAP 3.1.8: Truck Travel Time Reliability, 2019

SOURCE; CDOT, INRIX, 2019

3.1.12 | STREETS IN DENVER

The street network represents the foundation of Denver's complete transportation system. Streets are shared spaces for pedestrians, bicyclists, and buses as well as vehicles and freight delivery vehicles. Maintaining Denver's streets in good condition benefits all travelers. However, today most Denverites drive when traveling, which has social, economic, and environmental impacts on our city, our neighborhoods, and our residents.

350

TRAFFIC

SIGNALS

DENVER'S STREETS NETWORK

Denver is the 19th most populous urban area in the U.S. and the 17th most congested. Metro area residents spend an average of 2.5 days per year sitting in traffic. The cost of that delay to the average commuter is \$1,260 in time lost and excess fuel wasted (TTI, 2021). The cost to Denver's communities, economy, and climate are much greater.

21% OF ALL VEHICLE TRIPS MADE ARE LESS THAN A MILE

Driving trips are often made for multiple purposes and often include several stops or errands. In the U.S., nearly half (45%) of all vehicle trips are under 3 miles. This amounts to about a 6-minute bike ride or 20 minute walk (National Household Travel Survey, 2017).

81% OF TRIPS BY DENVER RESIDENTS ARE MADE IN PERSONAL VEHICLES

Most trips made by residents are completed by people driving alone to a single destination, like to work, daycare, or the grocery store, and back. Driving is a part of life in Denver, and frequently, the only readily available option for many residents. Denver is working to make travel easier for residents to get around without a vehicle (DOTI Focus Model, 2021).

FIGURE 3.1.27: Registered Passenger Vehicles in Denver

Our Vision to

Move People

EVERYONE ²⁰ Goods & Services

75% OF DENVER HOUSEHOLDS HAVE AS MANY, OR MORE, VEHICLES THAN WORKERS IN THE HOUSEHOLD.

Vehicles serve multiple purposes, including travelling out of the city and carrying family members and things. As Denver's population continues to grow, so does the number of vehicles owned. More people and more vehicles moving around the city will amplify the safety, mobility, congestion, and sustainability challenges Denver faces today (U.S. Census, 2019).

SOURCE: Colorado Department of Revenue, 2021

DENVER MOVES

DOTI STREETS PROGRAMS

Denver invests about 77% of financial resources available for transportation in the maintenance, repair, and operations of streets and bridges. Streets are the backbone of a multimodal mobility system and must be kept in a state of good repair to make walking, bicycling, and riding transit comfortable. DOTI regularly maintains Denver's streets and alleys through sweeping and snow and ice removal. Repairs to potholes and repaying of each street in Denver occurs regularly and as needed. Bridges are routinely inspected and maintained to ensure they are safe for travel. DOTI's operations group is responsible for managing the street markings, signs, signals, and communications infrastructure that keeps people moving and control the flow of traffic. Parking programs manage and enforce restrictions, metering, permit programs, and curbside spaces.

FIGURE 3.1.28: Impacts of Congestion in the **Denver Metro Region, Annual Per Commuter**

SOURCE: Texas Transportation Institute, 2021

Most trips on Denver's streets are completed by driving. Denverites make over 1.8 million vehicle trips on an average weekday. Of these trips, 49% are completed by people driving alone and 37% with more than one person in a vehicle. Denver's streets, major roadways, and Interstates carry a lot of vehicles every day. I-70 carries an average daily traffic volume of 150,000 vehicles per day, and I-25 caries as many as 250,000 vehicles per day. For comparison, two of Denver's busiest streets, Colfax Avenue and Colorado Blvd, each carry about 45,000 vehicles per day on average.

Over the past 5 years, Denver has grown by more than 50,000 people and more and more driving trips are made. The average daily vehicle miles traveled on Denver's streets was estimated at 15 million in 2015 and 16.5 million in 2020. However per resident. Denverites drove an average of 23 miles each day in 2015 and in 2020. Nationally and regionally, the rate of growth in average miles driven per capita has slowed in recent years (DRCOG, 2020).

Denverites make over 1.8 million vehicle trips on an average weekday. Driving trips are concentrated along Denver's highways and multi-lane roadways.

SOURCE: DOTI Focus Model, 2020

WHERE AND HOW DENVERITES DRIVE

MAP 3.1.9: Total Vehicle Miles Driven. 2020

MOBILITY

3.2 SAFETY

GOAL: A city with zero traffic deaths and serious injuries, where everyone feels safe and comfortable traveling throughout the city, regardless of their age, gender, race/ethnicity, or how and when they travel.

This section of the State of the System spotlights progress made and challenges remaining to reach Denver's Vision Zero goal of zero traffic-related deaths and serious injuries. Key information presented includes:

- + Trends in traffic safety and behavioral factors contributing to serious traffic crashes in Denver.
- + Analyses concluding pedestrians, bicyclists, and motorcyclists are more frequently involved in serious traffic crashes.
- + Factors overrepresented among serious traffic crashes, including specific street designs, locations of crashes, and people involved in crashes.

3.2.1 STREET SAFETY TODAY

SAFETY TRENDS IN DENVER

Denver is committed to making streets safe for everyone – no matter where a person travels, no matter their means, and no matter their choice to walk, bike, roll, ride transit, or drive.

As Denver's population grew over the past 10 years, the total number of trafficrelated fatalities trended up. When adjusted for population growth, the per capita rate of traffic fatalities also increased. Since 2012, Denver averaged approximately 390 traffic crashes that resulted in deaths or serious injuries each year.

2021 marked the most traffic fatalities in Denver over the past 20 years. This increase is consistent with a nationwide increase in traffic fatalities during the COVID-19 pandemic. The U.S. experienced the largest ever annual increase in traffic deaths in the first half of 2021, since the nationwide dataset was established in 1975 (NHTSA, 2021).

FIGURE 3.2.1: Denver Traffic Deaths and Rate Per 100,000 People

SOURCE: Deriver Police Department, 2012-20211 U.S. Census, 2020. Note: Deriver population for 2021 estimated using 10 year annual growth rate

FATAL CRASH RISKS

Most trips in Denver are completed by people driving, but the majority of people involved in fatal traffic crashes are not driving vehicles. Figure 3.2.2 compares the proportion of trips to traffic fatalities per mode from 2017 to 2021 and demonstrates the modes of travel that are overrepresented in fatal traffic crashes:

- + Vulnerable roadway users: People who are walking, bicycling, and riding e-scooters are comparatively more at risk if involved in a crash with a vehicle. Vulnerable roadway users represent less than 10% of all trips but are 37% of all traffic fatalities.
- + Motorcyclists: These people are comparatively most at risk when involved in a crash, representing less than 1% of all trips and 19% of all traffic fatalities.

There were no recorded deaths in the past five years for people riding transit. This is consistent with national research that found people riding transit are less frequently involved in fatal crashes and that cities with higher transit ridership tend to have lower overall rates of traffic fatalities (Victoria Transport Policy Institute, 2021).

data for scooters sourced from Ride Report, 2021. Trip data for motorcycling based on commute mode share sourced from U.S. Census, 201

FIGURE 3.2.4: Behaviors and Serious Crashes*

DOTI coordinates with the Colorado Department of Transportation (CDOT) and the Denver Police Department to understand individual behaviors linked to serious traffic crashes. DOTI also investigates street design characteristics associated with serious crashes, and combines targeted infrastructure improvements with safety and educational campaigns to reduce the prevalence of these behaviors:

SPEEDING Speeding was suspected in 25% of Denver traffic fatalities

SUBSTANCE USE Substance use was suspected in 28% of Denver traffic fatalities in 2020 (DPD, 2021).

DISTRACTED DRIVING

Statewide, it is estimated that 10% of traffic fatalities and serious injuries were associated with distracted driving (CDOT, 2019).**

Statewide, 59% of motorcyclists who died on Colorado roadways were not wearing a motorcycle helmet (CDOT, 2010-20).

*Colorado statewide statistics cited where equivalent local data sources not available ** Statistic relies on driver self-reporting and likely underestimates total contribution.

in 2020 (DPD, 2021).

NO HELMET

IMPROVING STREET SAFETY

Traffic deaths and severe injuries are unacceptable and preventable, and safety is most important consideration for every Denver street. Recognizing the need to improve street safety, in 2016, Denver committed to Vision Zero and the goal of achieving zero traffic fatalities and

serious injuries by 2030. To achieve this, DOTI developed a Vision Zero Action Plan to guide policies and infrastructure improvements. Denver's Action Plan identifies five strategies: 1. Enhance City Processes and Collaboration, 2. Build Safe Streets for Everyone, 3. Create Safe Speeds, 4. Promote a Culture of Safety and 5. Improve Data and Be Transparent. These themes provide a framework to achieve Vision Zero in Denver and affirm achieving Vision Zero requires collaboration and innovation.

HOW DOES DENVER COMPARE?

More than 40 cities in the U.S. have committed to Vision Zero and are working to eliminate traffic deaths and serious injuries. Denver's streets can be safer when compared to peer multimodal cities. The national average traffic fatality rate is 11 per 100,000 population.

FIGURE 3.2.3: Traffic Deaths Per 100,000 People

SOURCE: National Highway Safety Administration, 2015-2019, FARS Database | U.S. Census Bureau, 2019 Note: Fatality and population data are reported for county of primary city. Fatality data represents 5-year average using most recent comparable dat

NO SEATBELT

Statewide, 52% of traffic fatalities involved occupants not wearing a seatbelt (CDOT, 2010-20).

3.2.2 THE HIGH INJURY NETWORK

Crashes in Denver happen more often on a small proportion of all of Denver's streets. These streets are defined as the High Injury Network and represent 5% of the city's entire street network, or 161 miles, but accounts for 40% of all traffic related crashes and 47% of serious injuries and deaths. High Injury Network streets are primarily high-speed, multi-lane arterial roadways.

5% of Denver streets **ACCOUNT FOR 50% OF TRAFFIC FATALITIES**

SOURCE: Denver Police Department crash data from September 2016 to September 2021

2x more crashes per mile **ON DENVER'S HIGH INJURY NETWORK ROADWAYS**

MAPPING SERIOUS TRAFFIC CRASHES

Map 3.2.1 shows the High Injury Network with concentrations of fatal and serious injury crashes from 2016 to 2021 in Denver. The proportion of all crashes on this network has declined by about 2% since 2017. Many of Denver's most traveled streets, including Federal Boulevard, Colfax Avenue, S. Broadway, and Evans Avenue, have higher frequencies of crashes than other less traveled streets. Similarly, areas of the city, such as Downtown, have greater numbers of people walking, bicycling, using transit, and driving, which can lead to high occurrences of crashes.

MAP 3.2.1: The High Injury Network and Serious Crash Concentrations

SERIOUS CRASH AREAS

This map shows where serious crashes occurred more frequently in Denver. Concentration of crashes indicate areas where studies can be conducted to understand crash patterns, and target improvement for street safety.

SOURCE: Denver Police Department, Sept 2016 to Sept 2021

IMPROVING SAFETY ON THE HIGH INJURY NETWORK

Denver's Vision Zero program targets safety improvements and initiatives on the High Injury Network and other safety hotspots to advance Denver towards achieving Vision Zero. Currently, DOTI is advancing several initiatives to help reduce traffic crashes along the High Injury Network, including:

RAPID RESPONSE PROGRAM

DOTI staff meet every morning to review recent crashes on Denver's streets. The Vision Zero program identifies the circumstances and patterns of crashes and develops recommendations to reduce the likelihood of a crash occurring at the same location again. For example, after frequent crashes at E. Colfax Ave and Pearl St., DOTI implemented design improvements reduce vehicle speeds and improve pedestrian safety. Denver continues to construct safety projects and to create programs and policies to reduce speeds and increase awareness.

TARGETED SAFETY IMPROVEMENTS

Denver continually makes changes to street design and street elements to improve safety proactively. For example, DOTI recently upgraded 10 traffic signals along S. Federal Blvd with pedestrian indicators and late-night signal timing. Evaluation of these changes showed a 17% reduction in crashes and zero traffic related deaths reported in 2018 through 2019, down from eight deaths in 2016 through 2017.

ADVANCED DATA AND ANALYSIS

The Vision Zero Crash Data Dashboard provides crash information throughout the city and is updated daily. This tool helps city staff and other agencies within the city identify high crash locations and the supporting infrastructure improvements to address safety issues.

5x more likely that travelers are seriously injured

ZEROING-IN ON SERIOUS CRASHES 3.2.3

Where Denverites are travelling, street designs, who is travelling, and travel speeds are all factors found to influence the prevalence of serious bodily injury (SBI) crashes in Denver. This section presents factors found to be more associated with SBI crashes, factors that can be targeted to reduce the frequency of SBI crashes in the future.

FREQUENT CRASH FACTORS

Figure 3.2.4 shows the results of analysis conducted to isolate factors more associated with SBIs in Denver. This data demonstrates factors that are overrepresented in SBI crashes, compared to the prevalence of these factors citywide. For example, "Downtown" Denver accounts for 2% of Denver's land area, yet 20% of all traffic-related deaths and serious injuries occurred in Downtown.*

FIGURE 3.2.5: Factors Overrepresented in Serious Crashes

50% of crashes in Denver involve people living outside the city

THIS IS WHY REGIONAL COORDINATION ON SAFETY IMPROVEMENTS, EDUCATION, AND BEHAVIOR CAMPAIGNS ARE CRITICAL TO IMPROVING SAFETY NOT JUST FOR DENVERITES, BUT ALL RESIDENTS OF THE METRO REGION.

SOURCE: Where Denverites Travel and How Denver Streets are Designed: Data sourced from Denver Police Department, Sept 2016 to Sept 2021. Downtown Denver is defined by Speer Blvd from Bannock St to I-25, I-25 from Speer Blvd to Park Ave West, Park Ave West to Glenarm PI, Glenarm PI to Lincoln St, Lincoln St to W 9th Ave, and W 9th Ave to Bannock St, Trip data for Priority Areas for Equity sourced from DOTI LOCUS 2019 | Who Travels: Data sourced from Colorado Department of Public Health and Environment, Environmental Public Health Tracking, 2015-2020 average.

SPEED AND CRASHES

High speed is a significant factor in the likelihood of severe injury or death in the event of a crash. In Denver, more than half of all traffic deaths and serious injuries occur on roadways posted at or above 35 mph (DOTI, 2021). This data does not consider the speed at which the collision occurred, which could be in excess or below the posted speed limit.

High speed is particularly impactful for vulnerable roadway users involved in crashes with vehicles. National data indicates that 5 out of 10 pedestrians hit by a vehicle traveling at 42 mph will be killed (AAA Foundation, 2011). Recognizing the link between high speeds and serious crashes, DOTI evaluates opportunities to combine reduced posted speed limits with streets design changes to effectively reduce travel speeds.

DENVER DEATHS AND

SOURCE: Denver Police Department, Sept 2016 to Sept 2021.

STREET TYPES AND CRASHES

Serious traffic crashes are most likely to occur on high-speed, multi-lane arterial roadways -- SBI crashes on these streets account for 83% of all SBIs. Arterial streets carry more traffic and the probability of a crash occurring is highest along these corridors. Arterial streets also tend to have higher speed limits, and higher speeds are associated with more severe crashes. In total, fewer serious crashes occur along collector or local streets, despite these streets representing the majority of all streets in Denver. Combined, 17% of SBI crashes occur along collector and local streets, which together, comprise 81% of Denver's street network. Denver's most vulnerable roadway users are most at-risk traveling along arterials. 32% of SBI crashes involve a bicyclist or pedestrian. Of these crashes, 78% occur along arterial roadways.

FIGURE 3.2.7: Traffic Related Deaths and Serious Injuries by Roadway Type and Persons Involved

SOURCE: Denver Police Department, Sept 2016 to Sept 2021.

DENVER MOVES Our Vision to **Move People** EVERYONE ²⁰ Goods & Services

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FIGURE 3.2.6: Traffic Related Deaths and Serious Injuries by Speed

SOURCE: American Automobile Association (AAA), 2011.

3.2.4 ADDRESSING SAFETY AND COMFORT FOR ALL TRAVELERS

PERCEPTION AND COMFORT

Denverites perceive street safety differently. Streets in Denver historically have been designed to prioritize the efficient movement of vehicles. This orientation of street design means that the perception of street safety can be different depending on how people are traveling, whether they are driving, walking, rolling, bicycling, or taking transit.

Differences in speed, greater noise, lack of dedicated infrastructure, or lighting can make vulnerable roadway users feel less comfortable while traveling on Denver's streets. Safety perceptions can also change during inclement weather, when it rains or snows, or at night when streets are darker and people are less visible to drivers. People driving vehicles may feel more comfortable traveling the same streets, due to noise dampening and safety features within vehicles, such as seatbelts and airbags. Achieving comfortable streets in Denver requires improving both physical safety as well as enhancing the perception of safety and comfort while traveling in Denver, for people of all backgrounds, abilities, and regardless of how people choose to travel.

FIGURE 3.2.8: Enhancing Comfort for All Street Users

INTERSECTION DESIGNS

Intersection designs can enhance safety and comfort for pedestrians, including marked crosswalks, curb extensions that shorten crossing distances, and pedestrian activated beacons and signals that make it easier to cross streets.

GREEN INFRASTRUCTURE

Green infrastructure, such as street trees, creates visual friction along corridors, a factor linked to slower speeds, and provides a buffer space between people and vehicles, which enhances comfort for those using sidewalks (ITE, 2008).

TRANSIT SHELTERS

Covered transit shelters with benches make waiting for transit more comfortable, and provide protection from inclement weather.

WIDER SIDEWALKS AND CURBSPACE AMENITIES Wider sidewalks and amenities, such as benches, make using streets more inviting and comfortable for

pedestrians. Wider spaces are necessary to install this infrastructure. **BICYCLE LANES** Protected bicycle lanes provide dedicated space for bicyclists to ride separated from vehicle traffic, making travel by bicycle safer and more enjoyable.

EQUITY AND CRASHES

Denver's priority areas for equity represent 53% of Denver's land area and 46% of the High Injury Network streets traverse through or adjacent to these communities. However, 58% of all traffic-related deaths and serious injuries occur within these priority areas. Targeting Vision Zero investments can help to reduce disparities in where crashes are occurring in Denver.

MAP 3.2.2: Safety in Denver's Priority Areas for Equity

SOURCE: Denver Police Department, Sept 2016 to Sept 2021.

SOURCE: City and County of Denver, Denver Moves Downtown, 2017

3.3 **SUSTAINABILITY**

GOAL: A city with a transportation system that is pollution free and resilient in the face of climate change, making Denver healthier for all people with health inequities caused by the transportation system eliminated.

This section of the State of the System synthesizes the direct impacts of how we travel in Denver today on climate change and air quality and who is most affected by these impacts. Key information presented includes:

- + Demonstration of the effects of transportation-generated greenhouse gas emissions on Denver's changing climate.
- + Analysis of the pollution caused by transportation in Denver and its impacts on air quality.
- + Links between a changing climate and air pollutants on the health and wellness of Denver's vulnerable residents.

TRANSPORTATION AND CLIMATE CHANGE 3.3.1

Denver's current reliance on personal vehicles for daily travel contributes to climate change. Transportation is the second largest source of greenhouse gas emissions, and represents a real opportunity to mitigate climate risks and make Denver more resilient to a changing climate, changes which have accelerated in recent years.

61%

Personal and

Commercial

Light Trucks

32% Personal Vehicles

TRANSPORTATION RELATED GREENHOUSE GAS EMISSIONS

Energy consumed by buildings is the largest source of greenhouse gas (GHG) emissions in Denver. Transportation, primarily gas and diesel powered vehicles, aviation, transit, and railroads, represents 31% of total greenhouse gas emissions making transportation the second largest source of GHG emissions in Denver. Most people today travel using fossil fuel powered vehicles, representing a significant contributor to Denver's changing climate and quality of life. Vehicles burning gasoline and diesel fuels are responsible for 95% of transportation-related emissions. More than half of those vehicle-related emissions are generated from light trucks, which include pickups, SUVs, minivans, and cargo vans used for both commercial and personal purposes (CCD, GHG Inventory, 2020).

IMPACTS OF CLIMATE CHANGE

Denver's Climate Adaptation Plan identified the top climate change risks Denver faces as: rising urban temperatures, increasing frequency of severe weather events, and declining precipitation and earlier snowpack melt. Urban heat effects are compounded by the asphalt used to pave roadways and the lack of trees and green infrastructure along streets. Extreme weather impacts travel reliability, safety, and the costs of moving goods. More intense storm events increase the costs of regular maintenance and repair costs to critical infrastructure.

FIGURE 3.3.1: Transportation Contributions to Greenhouse Gases in Denver

FIGURE 3.3.2: Denver Extreme Weather Trends. 1955-2021

DESIGNING FOR RESILIENCY

DOTI is designing the transportation system to mitigate climate change and create a sustainable and resilient city. Green infrastructure such as urban trees, parks, drainage basins, permeable pavers, and cooler street surfaces such as concrete, instead of asphalt, can help offset urban heat effects.

Complete streets projects, such as Brighton Boulevard, design streets with green infrastructure. Improving street spaces for pedestrians, bicyclists, and transit riders makes these forms of travel safer, more convenient and attractive.

SOURCE: Severe Weather Event Alerts Denver County (National Oceanic and Atmospheric Administration, 2021), Number of Days Over 100 Degrees Denver (National Weather Service, 2021)

The Brighton Boulevard Complete Streets design focused on green infrastructure for all: pedestrians, bicyclists, and transit riders.

SUSTAINABILITY

GREENHOUSE GAS TRENDS

Fossil fuel vehicles are the most significant contributors to Denver's transportation-related greenhouse gas and air quality emissions. Denver tracks travel by estimating the total miles driven by vehicles each day using a metric known as vehicle miles travelled. In the Denver metro area, total miles driven per resident has trended downward since the Great Recession. However, total miles driven across the region continues to increase due to population growth.

Denver remains a car-oriented city, where policies and investments have prioritized convenient and efficient travel by personal vehicle. Greenhouse gas emissions from transportation sources grew by 10% between 2010 and 2019 in Denver. In 2020, transportation emissions dropped by 16% with the impacts of the COVID-19 pandemic on air travel and driving. (CCD, 2021). Research by the Colorado Health Institute suggests that carbon monoxide air pollution levels dropped by 60% in May of 2020 compared to the average of 2010-2019. The travel changes resulting from the pandemic demonstrate the significant impact that driving less and driving more efficient or alternative fuel vehicles can have on emissions levels.

Denver's Climate Action Plan calls for significant action to make Denver a leader in sustainable, smart transportation through innovative partnerships, policies, programs, and technology. This plan documents how increasing non-driving mobility options and shifting to zero-emission vehicles can improve local air quality and help achieve Denver's climate goals. Additionally, the plan emphasizes that rates of electric vehicle adoption need to increase, given that electric vehicles are more efficient than gasoline vehicles, with lower lifecycle greenhouse gas emissions and zero air pollutant emissions.

FIGURE 3.3.3: Daily Vehicle Miles Traveled vs. Vehicle Miles Traveled Per Capita Denver Metro Region

DAILY VEHICLE MILES TRAVELED DAIL

DAILY VEHICLE MILES TRAVELED PER CAPITA

SOURCE: DRCOG, Annual Congestion Report, 2019

HOW DOES DENVER COMPARE?

Cities with lower driving rates tend to have higher transit ridership, more robust bicycling and walking infrastructure, more walkable and transit-oriented neighborhood developments, and lower rates of Green House Gas Emissions per capita (FHWA, 2016; Denver Greenhouse Gas Inventory, 2019).

FIGURE 3.3.4: Greenhouse Gas Emissions per Capita, Metric Tons of Carbon Dioxide Equivalent

SOURCE: Denver Greenhouse Gas Inventory, 2019. Values are presented for illustration purposes and may not represent direct comparisons due to differences in inventory methodologies and time periods.

electrified city fleet vehicles, encouraging electric vehicle ownership, and transitioning to alternative fuels for public transit and freight transportation.
In 2020, voters approved dedicated funding to create the Climate Protection Fund. This new fund is expected to raise up to \$40 million annually to support eliminating greenhouse gas emissions and air pollution, supporting climate adaptation, and improving quality of life across the City.

CLIMATE ACTION IN DENVER

Denver's Office of Climate Action, Sustainability, and Resiliency works to enable a sustainable, resilient, climate-safe future for all of Denver. Denver's Climate Action Plan sets climate goals including increasing electrified city fleet vehicles, encouraging electric vehicle ownership, and transitioning to alternative fuels for public transit and freight transportation.

TRANSPORTATION AND AIR QUALITY 3.3.2

Transportation is the number one source of air pollutants in Denver (EPA, 2017). Along with sources such as powerplants, industrial activity, and natural sources, driving fossil fuel vehicles emits fine particles and harmful gases that contribute to air pollution. Air pollution is hazardous to public health and negatively affects the quality of life of Denver's residents and the competitiveness of Denver's economy. Air pollution is most hazardous to the city's most vulnerable residents and is more prevalent in communities of color and neighborhoods near congested roadways or industrial areas. Denver's air quality is made worse by the rising summer temperatures and wildfire smoke – both driven by climate change.

AIR QUALITY MATTERS

Hundreds of chemicals are emitted from vehicle tailpipes. The most significant pollutants include carbon monoxide, particulate matter, nitrogen oxides, volatile organic compounds, sulfur dioxide, and ozone (U.S. Environmental Protection Agency (EPA), 2020). These major sources are regulated by the Federal government, monitored by regional agencies, and tracked in daily air quality index reports.

CARBON MONOXIDE

This is leading source of air pollution and can cause heart and respiratory illnesses in adults and youth.

NITROGEN OXIDES AND **VOLATILE ORGANIC COMPOUNDS**

PARTICULATE POLLUTION

This is very fine airborne matter

SOURCES OF AIR POLLUTION

Transportation-related emissions account for 77% of all air pollutant emissions in Denver. More than half of transportation emissions are generated by personal and commercial vehicles. Other sources include airports, railroads, and fuel use in outdoor or construction equipment Of vehicles, gasoline powered passenger vehicles are the primary source of all transportation emissions. The impact on air quality of driving a vehicle alone is significant compared to utilizing transit (low-emission per passenger) and walking or bicycling (zero-emission).

FIGURE 3.3.6: Transportation Contributions to Air Pollutants in Denver

SOURCE: EPA National Emissions Summary, 2017

FIGURE 3.3.5: Major Causes of Air Pollution in Denver

SOURCE: EPA National Emissions Summary, 2017

AIR QUALITY TRENDS

In the 1970s, Denver exceeded national air quality standards nearly 200 days each year. This persistent smog came to be known as the Brown Cloud. Since then, Denver's air quality has improved with stricter vehicle emissions standards, technological advances in vehicle designs, and regional air quality initiatives. Since 1995, Denver is in federal attainment status for all air pollutants except ozone. Denver's air quality today is better than it has been in previous decades. However, Denverites still breathe air that is moderately hazardous nearly half the year. Denver is also among the top 10 metro areas in the country for high ozone days. Between 2011 and 2020, Denver averaged 175 days with air quality alerts, an increase of 10 days on average over the period between 2000 and 2010. In 2019, the EPA classified the Denver Metro area as a Serious Nonattainment area for ozone under the Clean Air Act. This designation will require regional action, including initiatives to reduce ozone-contributing pollutants from motor vehicles (RAQC, 2021).

FIGURE 3.3.7: Days Each Year with Air Quality Alerts

The Denver Metro Area ranked 8th worst for high ozone days out of 226 metropolitan areas in the U.S.

SOURCE: EPA AirNow, 2021 and American Lung Association, 2020

TRANSPORTATION AND HEALTH EQUITY

The burden of air pollution is not shared equally. Lower income neighborhoods and communities of color often face higher exposure to air pollutants because of where they live and may experience more significant impacts because of barriers to healthcare access. Air pollution is worse for residents living near major highway corridors and near industrial areas. In Denver, 70% of the top most congested highway segments are within neighborhoods with a high proportion of persons of color and low-income residents. (DOTI, 2021).

STATE OF THE SYSTEM REPORT

MAP 3.3.1: Denver Neighborhoods **Impacted More by Pollution**

ess Equitat Moro Equitab VMT >= 10.000 0.3-Mile Buffe

SOURCE: EPA AirNow, 2021

3.3.3 CLIMATE VULNERABILITY, AIR POLLUTION, AND HEALTH RISKS

VULNERABILITY TO EXTREME HEAT

Urban heat islands occur as a result of pavement, parking lots, buildings, and other surfaces that retain heat. Tree canopy and green infrastructure can help cool urban spaces. In Denver trees often are sparse in low-income neighborhoods and communities of color. The most critical risk factors for vulnerability to extreme heat are social and economic and reflect residents' access to healthcare, caregiver responsibilities, independent living abilities, income, and housing quality. Of the hottest areas in Denver, 92% percent of high urban heat islands are within a priority area for equity (DOTI, 2021). Denver's older adults, particularly those living alone or on fixed incomes, are vulnerable to higher temperatures and potential future heat waves.

HEALTH IMPACTS OF POOR AIR QUALITY

Denver has higher rates of asthma and chronic respiratory illnesses than the average across Colorado (CDPHE, 2020). Research from the America Lung Association and the Health Effects Institute concluded that traffic pollution causes onset of childhood asthma, impaired lung function, and death from cardiovascular diseases. Residents living within 1/3rd of a mile from highways are most at risk. Risk factors are compounded by social, economic, and demographic factors that contribute to inequality among Denver's residents.

MAP 3.3.3: Age-Adjusted Asthma Hospitalization Rate Per 100,000 Persons

SOURCE: City and County of Denver, Office of Climate Action, Sustainability, and Resiliency, 2021

DENVER'S VULNERABLE RESIDENTS

Poor air quality can contribute to health problems such as asthma in Denver's younger and older residents and those with respiratory and circulatory illnesses.

SOURCE: American Lung Association and U.S. Census Bureau, 2020

SOURCE: Colorado Department of Public Health and Environment, 2017

MAP 3.3.2: Urban Heat Islands in Denver

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SUSTAINABILITY

3.4 COMMUNITY

GOAL: A city where neighborhoods are connected to all the places people go, with streets designed for people, shaped by communities and cultures.

This section of the State of the System explores the interaction between community design and mobility in Denver. Key information presented includes:

- + Impacts of street design and the use of public right of way on community livability and mobility.
- + Trends in growth, development, and involuntary displacement in Denver's neighborhoods.
- + Connections between community density and transportation access and mobility.

TRANSPORTATION AND COMMUNITY ACCESS 3.4.1

Denver guides neighborhood development to coordinate how the city's built environment and transportation systems complement each other. Denver dedicates a large amount of the public space in our neighborhoods to moving people and goods. The way that the space is designed, and how safe, accessible, comfortable, affordable, and equitable transportation is, can support communities or present barriers to mobility between communities. As our city evolves, growth and development is placing new pressures on communities and our transportation system. Coordinating how our neighborhoods and transportation system are designed and interact will help Denver achieve a complete multimodal system that connects all Denverites.

MAKING THE MOST OF DENVER'S PUBLIC RIGHT OF WAY

The public right of way, or the space between private property lines occupied by streets, alleys, sidewalks, benches, trees and plantings, is the largest public space in Denver. Over 25% of Denver's land area is dedicated to transportation, a number which increases to nearly 40% when excluding the area of the city occupied by Denver International Airport. The space Denver has available to move people, goods, and services cannot expand significantly, even though our population and economy continues to grow.

DOTI is building new transportation infrastructure to expand Denver's capacity to move more people, including new sidewalks, dedicated bikeways, and transit corridors. These improvements are focused on maximizing the use of existing right of way. New dedicated transit lanes improve transit reliability and service. New bikeways enhance safety and comfort for bicyclists. New sidewalks complete sidewalks gaps and make it easer for everyone to get around.

As Denver continues to grow, greater demands are being placed on the public right of way. Every day, there are more pedestrians, bicycles, scooters, buses, ride shares, delivery trucks, and vehicles moving around Denver. Streets, sidewalks, and curbsides must accommodate this increasing demand.

Denver has historically dedicated most of the public right of way to move vehicles. In terms of moving people, driving represents the least efficient use of the public right of way. The National Association of City Transportation Officials estimates that a dedicated lane for buses can move 10 times more people than a single lane dedicated to moving vehicles (NACTO.2016). In Denver, it is estimated that 80% of the transportation system is dedicated to the movement of vehicles compared to 20% dedicated to moving pedestrians, bicyclists, buses and trains.

DOTI must make efficient use of the limited public street space as Denver continues to grow. Coordinated land use planning, efficient and quality development, and multimodal transportation options can make Denver a city of shared spaces and great places that are comfortable, enjoyable, safe, and accessible for everyone.

FIGURE 3.4.1: People Moving Capacity per Hour vs. Land Area in Denver

*How many people can be moved per lane per hour

SOURCE: National Association of City Transportation Officials, Transit Street Design Guide, 2016

TRANSPORTATION SHAPES OUR COMMUNITIES

Street systems across the United States, including Denver's, are the product of decades of transportation policy decisions that primarily emphasized moving vehicles. Nationally, and in Denver, a hierarchical classification system of streets was implemented to move vehicles from neighborhoods to highways. While improving vehicle access, this street network design created barriers between neighborhoods across Denver that are evident today.

LOCAL STREETS

These are Denver's streets with the lowest speed limits, commonly residential streets providing access to homes.

COLLECTOR STREETS

The next classification of streets collect traffic from neighborhoods and convey it to larger, regional routes known as arterial roadways.

ARTERIAL ROADWAYS

These roadways act as the main 'arteries' of Denver's transportation system. They have multiple travel lanes and high posted speed limits, and include roads such as Colorado Blvd, Federal Blvd, Santa Fe Ave, Broadway, Colfax Ave and others. These roadways have been designed to move vehicles quickly across the city and move traffic to Interstates and surrounding communities outside Denver.

FREEWAYS

The final classification in Denver's street system are Freeways, such as I-70 I-25, and the 6th Ave Freeway, which facilitate regional and Freeway travel, limiting access to just vehicles.

While enhancing vehicle access, Denver's system of large and fast Interstates, arterial, and collector roadways create barriers between neighborhoods for people who are walking, rolling, bicycling or taking transit. In 2020, Denver crafted new Complete Streets Design Guidelines to update how the public right of way is designed to better reflect land use and balance access for all people who use streets. DOTI is now using the Complete Streets Design Guidelines to update Denver's traffic engineering standards to better accommodate multimodal travel options and enhance neighborhood connectivity.

In Denver, the intersection of Colorado and Martin Luther King Boulevards divides four neighborhoods: Northeast Park Hill, North Park Hill, Skyland, and Clayton. Large high-speed, multi-lane arterial roads represent barriers to neighborhood connectivity and are challenging to cross for people who are not driving.

Through programs like Denver Vision Zero and DOTI's implementation of complete streets approaches, improvements are being made to create slow and comfortable streets for everyone. This floating bus island at West 14th near Speer Blvd provides a dedicated space for bicyclists to ride separated from traffic, shortens the crossing distance for pedestrians, and provides more efficient loading of bus passengers.

3.4.2 **COMMUNITY DEVELOPMENT IN DENVER**

DEVELOPMENT IN DENVER

Denver, like all cities, has always been a place of change. Development represents the continual evolution of cities as homes, offices, and neighborhood centers are built through private and public investment. This process can reinvent older industrial areas, vacant lots, and low-density buildings into multi-use neighborhood centers that provide new homes and business opportunities. Development can also lead to increased affordability challenges that make it harder for long-term residents to continue to live and work in Denver.

Denver's growing population and economy is attracting significant development activity and investment. In just the last 10 years, downtown has experienced a historic development cycle, adding 4.4 million square feet of office space, over 10,000 residential units, and 3,700 hotel rooms, resulting in \$6.6 billion of total investment in the center of Denver (DDP, 2021). That investment means that more people can live, work, learn, dine, and visit downtown.

When development is located within neighborhoods that are close to jobs or community centers and that have accessible options for walking, bicycling, or transit growth can benefit residents and businesses. Denser communities can lower transportation costs, enhance quality of life, be more comfortable and secure to travel in, and reduce dependence on vehicles and the associated climate, environment, and safety impacts of driving. Coordinating development with Complete Streets approaches to transportation improves access for everyone.

However, not all recent development in Denver has provided for equitable access to affordable housing for essential workers and lower-income residents. Denver has also seen continued growth and development in more suburban areas of the city which do not always offer the same accessible community benefits as denser neighborhoods do. Denver is proactively working to understand and mitigate the impacts of development on affordability and involuntary displacement.

MAP 3.4.1: Development Patterns in Denver, 2014-2021*

TRANSFORMING PUBLIC SPACES: UNION STATION

Development near multimodal transit centers expands opportunities for all Denverites. Denver's historic Union Station was transformed in 2014 into a world class destination. Over \$500 million in public investment at Union Station reinvigorated what was once a decommissioned rail-yard into a vibrant, mixed-use area, bringing more than \$3.5 billion in private development projects in the surrounding area as well as more than \$2 billion in annual economic impact.

*Development activity reflects the total dollar valuation of building permits approved. Building permit value is an indicator of commercial real estate changes and the overall scale of development SOURCE: City and County of Denver, CPD, 2021

GENTRIFICATION IN DENVER

Denver has experienced significant growth over the past decade. While this has brought prosperity for some residents, it has made it harder for many to continue to call Denver home and remain in their communities of choice.

The term gentrification captures a complex group of neighborhood dynamics, some positive and some negative, that occur when an area experiences new investment and an influx of higher-income residents. Involuntary displacement occurs when residents or businesses can no longer afford to stay in an area due to increasing property values and rents and is a negative impact of gentrification that the city can take action to mitigate.

Comparing income levels in Denver from 1980 to 2020, historically lower-income neighborhoods near downtown have become wealthier. A 2020 national analysis found that Denver was the 2nd most intensely gentrified city in the nation, following only San Francisco (National Community Reinvestment Coalition, 2020).

Neighborhoods vulnerable to gentrification tend to have certain characteristics, including a history of disinvestment, low-income residents, and a high proportion of renter households. Denver's challenge is to continue investing and improving transportation accessibility and housing affordability within areas that have been historically underinvested in - without involuntarily displacing long-time residents.

DOTI is partnering with city agencies, such as the Department of Housing Stability, Community Planning and Development, and Denver Economic Development & Opportunity, to better plan for transportation investments in evolving neighborhoods and mitigate negative impacts of growth.

MAP 3.4.2: Vulnerability to Displacement in Denver, 2018

SOURCE: U.S. Census, NHGIS. Adjusted for inflation

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COMMUNITY

DENSITY AND COMMUNITY ACCESS 3.4.3

DENVER IS BECOMING DENSER

Growth and development bring challenges, but also opportunities for seamless, accessible, safe, and comfortable mobility options. How Denver's neighborhoods are designed have significant implications for mobility. Neighborhoods that have a greater concentration of people living and working in them and a greater variety of destinations, including jobs, stores, services, parks, and community centers are more easily accessed by walking, bicycling, and transit. Areas of the city that are more spread out, with longer distances between the places Denverites travel to, tend to necessitate driving. But driving isn't an affordable option for everyone and reliance on vehicles has real implications for safety, climate, and health.

In 1950 many of Denver's residents lived close to downtown and the city had almost 10 persons per acre. As the region sprawled outward, Denver's population shrank and density declined. By 1980 many areas were half as dense as 30 years before. Today, Denver neighborhoods are gaining in population and density is returning to near 1950 levels. Coordinating development, land use, and transportation investments is necessary to encourage positive aspects of density and mitigate against negative effects of growth including displacement and gentrification.

MAP 3.4.3: Denver Population Density, 1980

SOURCE: U.S. Census, NHGIS. Population per square mile.

MAP 3.4.4: Denver Population Density, 2019

THE BENEFITS OF COMPACT COMMUNITIES

When Denver's neighborhoods are built as complete communities with seamless walking, bicycling, and transit networks, dense communities can provide efficiency, connectivity, health. and safety benefits for residents and travelers, including:

SAFETY

Speed is a primary factor in the likelihood a fatal or serious injury from traffic crashes. Dense communities can be served by smaller and slower local streets; rather than high-speed arterials. Complete street designs in dense areas slow vehicles and serve to enhance safety for all travelers.

EFFICIENCY

Dense communities may require smaller vehicles and more frequent deliveries to meet demand for goods from homes and businesses, but require less travel and stops than more spread out neighborhoods. In denser urban areas, final delivery distances are shorter, smaller, more efficient delivery vehicles are used more often, and delivery alternatives, like pick-up lockers and cargo bikes are possible.

LOWER COSTS

have lower rates of multimodal trips.

ACCESSIBILITY

In compact communities, destinations and critical services, such as pharmacies, health care and child services, are closer together. This shortens trip lengths for people. Shorter trip distances are particularly beneficial for people with mobility differences who cannot drive, such as older adults and people in wheelchairs, who may travel more slowly. Shorter distances to destinations also benefit single parents, who are solely responsible for their household's travel needs, by reducing the amount of time they have to travel from place to place.

ENVIRONMENTAL SUSTAINABILITY

Dense communities reduce the need to drive, and compared to less dense development patterns, are more energy efficient (National Academy of Sciences, 2016). In comparison to areas that are more spread out and more convenient to drive, density contributes fewer greenhouse gases and contributes less to air pollution from vehicles. Dense communities must be carefully planned to include green infrastructure to mitigate urban heat and improve environmental quality.

SOURCE: U.S. Census, 2019. Population per square mile.

HOW DENVER COMPARES

Across the country, cities with greater concentrations of people living and working in close proximity are able to move more people without relying on private vehicles.

FIGURE 3.4.2: Population Density. Persons Per Acre

SOURCE: U.S. Census Bureau, American Community Survey 2019. Total land area in Denver excludes Denver International Airport land area.

SOURCE: U.S. Census Bureau, American Community Survey 2019. Total land area in Denver excludes Denver International Airport land area

DENVER MOVES EVERYONE ²⁰ Goods & Services

Our Vision to Move People

STATE OF THE SYSTEM REPORT **BIT.LY/DENVERMOVESEVERYONE**

Neighborhoods that have close destinations and are walkable and bikeable or linked by transit may not require a car. Vehicles are expensive to own, operate, and maintain. Driving is often more convenient or the only viable option in less dense areas. Denver's most dense neighborhoods have the highest rates of walking, bicycling and transit trips, while more suburban areas of Denver

FIGURE 3.4.3: Percent of Commuters Traveling to Work by Transit, Walking, or Biking

3.4.4 COORDINATING LAND USE AND TRANSPORTATION

DEVELOPMENT AND TRANSPORTATION CHOICES

Updated in 2019, Blueprint Denver is the citywide land use plan that calls for growing an inclusive Denver through: complete neighborhoods and transportation networks; a measured, common-sense approach to new growth; and, for the first time, land-use decisions through the lens of social equity. Blueprint Denver is the mechanism for the city to coordinate land use with the transportation investments identified in Denver Moves Everyone. The way we design our communities impacts our travel choices. Mapping density and accessibility, as shown in **Map 3.4.5** and **Map 3.4.6** demonstrates a correlation between compact communities and more multimodal trips. Areas of Denver that are more dense, in general, tend to also have higher rates of walking, bicycling and transit.

MAP 3.4.5: Population Density in Denver, 2019

MAP 3.4.6: Trips Made by Walking or Bicycling in Denver, 2019

SOURCE: U.S. Census, 2019. Population per square mile

DENVER MOVES EVERYONE 20 Our Vision to Move People, Goods & Service SOURCE: DOTI, Locus, 2019 Share of trips made by walking and bicycline

3.5 QUALITY

GOAL: A city where the transportation system is maintained in a consistent state of good repair, using robust data to prioritize investments in neighborhoods that need it most and to minimize cost across the system.

This section of the State of the System summarizes how Denver maintains, operates, and expands the city's transportation system. Key information presented includes:

- + Denver's approach to maintaining a high quality transportation system and challenges associated with reaching this goal.
- + Responsibilities, roles, and resources dedicated to maintaining and operating the transportation system.
- + Investments, programs, and resources dedicated to expanding the transportation system.

HIGH-QUALITY TRANSPORTATION INFRASTRUCTURE IN DENVER 3.5.1

QUALITY INFRASTRUCTURE

Denver's transportation system represents a multibillion dollar investment in streets, bridges, alleys, bikeways, signals and signs, and other infrastructure assets that DOTI actively maintains and improves (2020, Denver Auditor). DOTI is responsible for evolving and maintaining this system to ensure the quality of transportation infrastructure assets meet safety standards and people's needs. Maintaining and improving the condition of the city's infrastructure enhances the safety, accessibility, reliability, and overall experience of traveling in Denver:

- + Neighborhoods with smooth and wide sidewalks make it safer and more comfortable for people walking or rolling with wheelchairs or strollers.
- + Streets and bridges with pavement in good condition and few potholes makes travel safer and more enjoyable for everyone, including pedestrians, bicyclists, transit riders, and drivers.
- + Well-maintained signs, signals, and street markings improve safety and accessibility for all travelers.
- Streets cleared of snow and debris makes travel safer and more reliable.

Denver participates in the National Citizen Survey to assess quality of life indicators. Residents are asked how satisfied they are about elements of the right of way that DOTI manages, including street repair and sweeping, sidewalk maintenance, and snow removal. Data from the 2019 survey shows a smaller percentage of Denver's population who identify as a person of color are satisfied with Denver's level of street repair (22%), vs people who identify as white (26%). DOTI is committed to ensuring all neighborhoods have high quality infrastructure across the system.

FIGURE 3.5.1: Resident **Perception of Street Repair**

Percent rating positively (e.g., excellent/good)

SOURCE: National Citizen Survey, 2019

To meet traveler expectations, DOTI is responsible for maintaining and operating Denver's transportation system in a state of good repair. This responsibility represents more than \$100 million dollars in annual investment and requires careful planning to identify which assets need repair to maximize quality across the system. Every time new assets are added, such as bikeways, transit lanes, or new traffic signals, maintenance responsibilities increase. DOTI does not presently have the funding necessary to keep up with the maintenance needs of the current transportation system, let alone the needs of new multimodal assets (DOTI, 2021).

Figure 3.5.2 illustrates the challenge associated with keeping up with an expanding transportation system, given that some assets today do not meet the city's quality standards. Many of the city's signals, bus stops, sidewalks, and trails are in need of repair and improvement to meet city standards. Specifically, upgrades to the city's pedestrian infrastructure is necessary to meet and exceed Americans with Disabilities Act standards, which became law in 1990, after many of these assets were first constructed. Street payement and bridges are rigorously inspected and maintained to ensure they are safe, but adequate funding is needed to improve the condition of pavement and bridge assets citywide.

FIGURE 3.5.2: Condition of Select Assets in Denver

13%

SOURCE: DOTI | DOTI. Data and years represented vary.

MANAGING ASSETS

Maintaining Denver's transportation system in a state of good repair is a strategic approach to making preventive improvements that minimize long-term replacement costs. DOTI uses asset condition data collection, funding and condition projections, and technologies to identify maintenance strategies and rehabilitation schedules within asset management tools. These tools track factors such as age, condition, and risk to optimize the timing of maintenance strategies in order to cost-effectively preserve Denver's transportation system in a state of good repair.

Denver's overall approach to preventative maintenance is similar to what residents' do to maintain homes, cars, or bicycles. By making regular and routine small investments in maintenance and needed repairs, the city can avoid replacing an entire asset at greater cost and sooner than expected.

Consistent and reliable system-wide asset condition data is critical to guiding investments, maximizing the lifespan of existing infrastructure, and making data-driven asset maintenance decisions. DOTI has made significant strides in the past decade to improve asset management systems for the city's expanding catalog of assets, but a comprehensive inventory of all assets remains incomplete.

Data for foundational system elements, such as streets and bridges, is robust and well established. Within the last 10 years, DOTI went from having no data on sign condition to having all signs in dozens of neighborhoods inventoried. However, data for other key assets, such as bikeways, transit lanes and bus stops, and signal infrastructure, is more limited. Figure 3.5.3 demonstrates data variability across select assets.

3.5.2 MAINTAINING AND OPERATING DENVER'S TRANSPORTATION SYSTEM

Denver's \$113 million annual investment to maintain and operate the system are allocated across major assets and programs. For DOTI, maintenance means repairing existing infrastructure, while operations means managing and improving system assets to facilitate the movement of people and goods.

AVERAGE ANNUAL ALLOCATION TO MAINTAIN AND OPERATE DENVER'S TRANSPORTATION SYSTEM

SOURCE: 5-Year Average Annual funding from 2017-2021. Funding includes CIP, ELEVATE bond, grants, and operations costs associated with staff and equipment for planning, designing, operating, and maintaining Denver's transportation system.

DOTI'S MAINTENANCE RESPONSIBILITIES

PAVING AND REPAIR

DOTI maintains and repairs streets by fixing potholes, repaving streets and alleyways, constructing pedestrian ramps, and repairing curbs and gutters. On average, potholes are repaired within two days of notification. Funding for maintenance and improvement accounts for nearly half of DOTI's annual operating and maintenance budget.

SWEEPING AND PLOWING

Denver's streets and bikeways are swept and cleared of snow regularly. DOTI employs a fleet of 73 snowplows, 37 street sweepers, and three sweepers for bike lanes to maintain these assets. The city will need to make additional investments in equipment and staff to keep new Denver's expanding multimodal infrastructure safe and clean.

BRIDGE INSPECTION & MAINTENANCE

DOTI's Bridge Program inspects and maintains 640 bridges routinely and delivers major bridge replacement projects. A 2017 DOTI capital maintenance report showed that the bridge program is underfunded by about \$15 million each year. As a result, approximately 13% of the city's bridges are in poor condition. For comparison, only 6% of bridges owned by the Colorado Department of Transportation are in poor condition.

RO PEDESTRIAN AND VEHICLE BRIDGES

DOTI'S OPERATIONS RESPONSIBILITIES PARKING AND CURBSIDE ACCESS

DOTI manages the curbside space between streets and sidewalks by allocating space to different users to maximize mobility, safety, and access. Curbside assets include parking meters, on-street parking regulations, curbside signage, and administering the annual parking permit programs.

SIGNS & PAVEMENT MARKINGS

DOTI is responsible for 78,000 pavement signs and 1,500 miles of street lane markings and other street striping within the city. DOTI monitors conditions and implements a cyclical strategy for maintaining signage and pavement striping in a state of good repair. The program aspires to replace all signage within the city every 10 years through the Neighborhood Sign Replacement program. Signs that are faded or covered by graffiti are prioritized for replacement. Signage and pavement marking maintenance responsibilities are increasing as new multimodal assets, such as bike and transit lanes, are implemented.

TRAFFIC SIGNAL INFRASTRUCTURE

DOTI's Signal Maintenance, Design and System Operations teams monitor the performance of approximately 1,350 signalized intersections to ensure the system operates reliably and safely. DOTI develops and maintains standards for all signals within the city, signal timings, signal coordination, interfacing with Traffic Management Centers, and rebuilds or replaces underperforming signals. The city responds to outages and malfunctioning signals within two hours and inspects and maintains approximately a quarter of the city's signals each year.

INTELLIGENT TRANSPORTATION SYSTEMS

DOTI's Systems Operations Program oversees capital improvements and maintenance of Intelligent Transportation Systems including over 300 miles of city-owned fiber optic communication networks, and the city's two Traffic Management Centers. Without a funding source, the Systems Operations program has relied on grants to expand the fiber optic system.

OF FIBER OPTIC COMMUNICATION NETWORKS

SHARED INFRASTRUCTURE RESPONSIBILITIES

While DOTI is responsible for maintaining most transportation assets in Denver, the Department is not responsible for maintaining all infrastructure within the public right-of-way. **Table 3.5.1** below describes assets that DOTI co-manages, or which it is not responsible for. Often it is not clear to the public that transportation assets are managed by different agencies. It is essential for DOTI to coordinate with private property owners and regional partners, such as RTD and CDOT, to ensure a seamless travel experience for residents and visitors.

TABLE 3.5.1: Assets DOTI Does Not Maintain and Operate

11

SIDEWALKS & TRAILS	In Denver, pr properties. T
TRANSIT STOPS & INFRASTRUCTURE	RTD is respo including up removal. Lig crossings, a Program is a focused on v targeted imp
INTERSTATES & HIGHWAYS	The Colorad interstates i bridges and control of se and Colfax fi signs on mo
RAILROAD CROSSINGS	Private railro
STREETLIGHTS	Xcel Energy 63% of Denv streetlights
PLANTINGS & STREETSCAPE ELEMENTS	In some area such as thos districts coll of-way withir

ANNUAL ALLOCATION TO EXPAND

rivate property owners are required to maintain sidewalks adjacent to their Trails are maintained by the Denver Department of Parks and Recreation.

onsible for managing and maintaining the 2,700 bus stops in Denver, okeep of signs, shelters and benches, as well as snow and garbage ght rail stations and transit infrastructure, including at-grade light-rail are also maintained and repaired by RTD. DOTI's Passenger Amenity aimed increasing the role DOTI has in bus stop maintenance, and is working with RTD to evaluate the condition of all bus stops and make provements to improve condition of these assets.

do Department of Transportation (CDOT) owns, operates and maintains the in Denver, such as I-70 and I-25, including interstate and state highway I structures. Over the years, CDOT devolved, or transferred ownership and everal segments of state highways such as Colorado Blvd., Federal Blvd, from the state to Denver. DOTI is responsible for maintain signals and ost major CDOT roadways within the city.

bads maintain safety warnings, gates, and signals on railroad crossings in with the Colorado Department of Transportation.

owns most streetlights within the public right-of-way, and has converted ver's streetlights to high-efficiency LEDs. DOTI owns and maintains in limited areas of the city.

eas of Denver, planter boxes and other streetscape elements like benches, use along the 16th Street Mall, are maintained by special districts. These llect fees from local businesses to maintain assets within the public rightin the district.

EXPANDING DENVER'S TRANSPORTATION SYSTEM 3.5.3

Over the past decade, DOTI has significantly expanded Denver's transportation system by adding new bikeways, dedicated transit lanes, bus stop improvements, traffic signal infrastructure, bridges, and sidewalks. This new infrastructure has been largely funded by annual capital resources, bond programs, grants, as well as built through private development.

EXPANDING DENVER'S MULTIMODAL TRANSPORTATION SYSTEM

Through public investment and private development, the transportation system in Denver has significantly expanded over the past ten years. Figure 4.53 demonstrates the growth in select assets across the system, which have increased the maintenance and operations responsibilities of DOTI.

FIGURE 3.5.4: Growth in Select Transportation Assets, 2010-2021

AVERAGE ANNUAL ALLOCATION TO EXPAND DENVER'S TRANSPORTATION SYSTEM:

ANNUAL ALLOCATION TO MAINTAIN AND OPERATE

SOURCE: 5-Year Average Annual funding from 2017-2021. Funding includes CIP, ELEVATE bond, grants, and operations costs associated with staff and equipment for planning, designing, operating, and maintaining Denver's transportation system

PRIVATE INVESTMENTS LEAD TO QUALITY INFRASTRUCTURE

Private development has contributed to the city's growing assets, which DOTI often maintains after installation. Private development represents a significant opportunity to upgrade and expand transportation assets in Denver. Developers are required to build infrastructure within the public right-of-way adjacent to their property to city standards, which DOTI establishes. City standards change over time in response to changes in city priorities or national standards. In recent years, DOTI has upgraded design standards to ensure high-quality infrastructure is built through development, such as wider sidewalks along busier streets, planted spaces between streets and sidewalks, and streets and bridges with dedicated sidewalks and bikeways.

MAINTAINING A GROWING TRANSPORTATION SYSTEM

Denver maintenance and operations are supported by the General Fund and the Capital Improvement Fund. Between 2017 and 2019, funding to operate and maintain the system grew by an average of 2%. In 2020, DOTI faced significant budget cuts due to the COVID-19 pandemic. The cuts that occurred in 2020 resulted in an 8% average decline in total maintenance and operations revenue. Change in maintenance and operation funding does not account for low growth in city General Fund support for DOTI staff who perform maintenance work. During this same five-year period, investment to expand Denver's transportation system amounted to more than \$550 million, increasing DOTI's maintenance and operations responsibilities. Additionally, more people are using Denver's streets than five years ago, causing more wear-and-tear to infrastructure. Over the past five years Denver's population has grown by approximately 50,000 residents and 1.5 million miles more each day are driven in the city (U.S. Census Bureau; DOTI FOCUS). Despite modest budget increases in 2021, funding for operations and maintenance is not projected to return to pre-pandemic levels by 2022.

FIGURE 3.5.5: Funding Trends for Transportation System Expansion and Maintenance

SOURCE: 2017-2021 DOTI (\$2021)

8% Average Decline

IN MAINTENANCE AND OPERATIONS FUNDING

ALLOCATION FROM 2017-2021

COST EFFECTIVE INVESTMENTS

Infrastructure projects can take many years to complete due to costs and complexities associated design and construction. To expedite realizing the benefits of improvements that slow vehicles or enhance pedestrian and bicyclist safety. Denver has been implementing "paint-and-post" treatments in recent years, using low-cost, quick-build materials. These improvements, while safer, also increase maintenance responsibilities of DOTI, which must be accounted for as these improvements become more common. A recent report completed by DOTI found that even after a 20-year period, inclusive of all maintenance of paint-and-post treatments, these treatments are less expensive to construct and maintain for DOTI compared to the concrete versions of the same treatments. However, the effectiveness of paint-and-post treatments rely on ongoing maintenance.

\$107 Million

SOURCE: Denargo Market image courtesy of DenverInfil

SECTION 4 OUR PATH FORWARD

The DME State of the System report illuminates our city's challenges and opportunities creating a complete transportation system that moves everyone and everything with respect and care.

The insights and information shared in this report reinforce community values and concerns of residents from across the city. Highlighted data across our city's shared goals illuminate all aspects of mobility and strengthen Denver's focus on building a complete system of safe streets that are connected by sustainable mobility options and provide equitable access and opportunity for everyone.

Barriers and obstacles are evident. But Denver's future is brilliant.

Growth and development, technological innovation, transformations in transportation, and the voices and preferences of our communities and cultures will shape Denver through 2050. DME is DOTI's mobility blueprint to complement these evolutions and to balance new pressures with new pathways to advance our city's goals.

To reach our vision for the future of mobility in Denver, DOTI is committed to moving people first in everything we do. DOTI will be a bold and transformative organization using data-driven decisions to advance priority investments, to continuously measure our performance, and to adjust and flex to reach Denver's mobility targets over the next thirty years.

DOTI is ready to act on the priorities and recommendations established in the DME suite of multimodal plans and to do so better and faster.

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More information about the project can be found on the project website: bit.ly/denvermoveseveryone

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