OUALITY OF LIFE STUDY Sustainability Report





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EXECUTIVE SUMMARY

Report Purpose

This report is an extension of RTD's Quality of Life Study, a multi-year monitoring program that began in 2006 to evaluate the progress toward meeting the FasTracks Program goals. The same year that the Quality of Life Study began, the RTD Board of Directors also adopted a FasTracks Sustainability Policy. This report is inspired by this policy but expands the area of focus from the FasTracks Program to the entire RTD service area. The following report covers four primary areas where RTD has made an impact on regional sustainability including: air quality, transportation greenhouse gas emissions, electric vehicles, and public health.

Key Findings



Regional Air Quality: Air quality in the Denver Metro Region has significantly improved over the last 40 years with the number of unhealthy days decreasing by almost 90% from 1980 to 2019. However, the region has been classified by the EPA as a 'Serious' nonattainment area for ozone.



Transportation Sector Emissions: In the Metro Denver Region, the transportation sector produces the majority of greenhouse gas (GHG) emissions (64%). Emissions from transit vehicles (transit & intercity buses) account for less than 1% of GHG emissions, while passenger vehicles (cars, vans, SUVs, and light-duty trucks) account for 50% of all GHG emissions.



RTD Carbon Emissions: In 2019, RTD vehicles and facilities produced approximately 185,000 tons of carbon dioxide (CO2) emissions. Most of these emissions (59%) are directly emitted from diesel and gasoline vehicle tailpipes, while the rest (41%) are indirect emissions from electricity generation. As Xcel Energy fulfills its commitment to transition to renewable energy, RTD's electricity usage will result in fewer CO2 emissions.



Transit-Oriented Development (TOD): TOD is a sustainable approach to developing the built environment that integrates higher density new construction with transit. From 2005 to 2019, 43% of multi-family developments and 55% of office developments within the Denver Metro Region have been built within a half mile of an RTD rail or BRT station.



Zero Emission Transit: RTD operates several types of transit services (light rail, commuter rail, and electric buses) that are powered by electricity and therefore have no tailpipe emissions. In 2019, electric transit accounted for 43% of boardings and 26% of revenue miles for RTD's fixed route services. RTD's fleet of 36 battery electric buses operating the Free MallRide service is one of the largest electric bus fleets in the country.



Public Health: In the Denver Metro Region, transportation emissions are a major source of particulate matter and nitrogen oxides (a main ingredient in ozone) which lead to poor health outcomes. RTD provides an alternative to driving which helps reduce transportation emissions. RTD also provides critical access to health facilities in the region.

Next Steps

In order to achieve the sustainability goals set out by the state and local governments in the Denver Metro Region, a shift from driving to sustainable transportation modes will be essential. The transit service provided by RTD will be key for replacing long distance driving trips that are less feasible for walking and biking. RTD will gain insight from the RTD Accountability Committee on how RTD can continue to help reduce greenhouse gas emissions and address the state's climate action goals (House Bill 19-1261). In addition, RTD will plan for the transportation needs of the future through the Reimagine RTD Mobility Plan for the Future.

Since its founding, one of the primary goals of the Regional Transportation District (RTD) has been to reduce vehicle emissions and improve the quality of life for District residents, employees, and visitors. RTD was created by the Colorado Legislature in 1969 in order to "develop, maintain, and operate a mass transportation system for the benefit of the inhabitants of the district." The RTD Act states that "such a system is necessary for economic development, commerce, and the reduction of air pollution." This legislation also declares that these "services are provided to assist the transit-dependent and the poor, to relieve congestion, and to minimize automotive pollution; public transportation service should be provided at the lowest possible cost consistent with desired service and safety." These goals, in essence, represent the three pillars of sustainability: environment, community, and economy. The goal of sustainability, derived from the U.S. National Environmental Policy Act of 1969 (NEPA), is to create and maintain conditions, under which humans and nature can exist in productive harmony that permit fulfilling the social, economic, and other requirements of present and future generations.

Quality of Life Study

This report is an extension of RTD's <u>Quality of Life Study</u>, a multi-year monitoring program that began in 2006 to evaluate the progress toward meeting the FasTracks Program goals. *Each annual report focuses on the "quality of life" in the context of those areas most affected by transit improvements and those specifically addressed in the FasTracks Plan: mobility, environment, economic activity, development, and land use.*

The same year that the Quality of Life Study began, the RTD Board of Directors also adopted a <u>FasTracks</u> <u>Sustainability Policy</u>:

"Every effort should be made to incorporate sustainability in the implementation and operation of the FasTracks Program within its authorized schedule and budget and in all other RTD activities as well. With this goal in mind, a series of recommendations has been incorporated in the attached RTD Sustainability Guidelines to encourage and foster sustainability in all aspects of the FasTracks program, from planning through design and construction of FasTracks facilities and systems and beyond the FasTracks program to all capital projects District wide. This will include developing and adopting Best Practices for sustainable planning, design, construction, operations, and maintenance activities. The ultimate goal is to instill a culture of sustainability throughout the RTD organization."

This report is inspired by the FasTracks Sustainability Policy but expands the area of focus from the FasTracks

Program to the entire RTD service area. The following sections cover four primary areas where RTD has made an impact on regional sustainability including: air quality, transportation greenhouse gas emissions, electric vehicles, and public health.

Local and State Sustainability and Climate Action Goals

During the last few years, sustainability and climate action planning have become a major priority at the state and local level. The following policies and legislation describe Colorado's commitment to sustainability planning and practices.

Colorado Climate Action Plan

In May 2019, Governor Polis signed <u>House Bill 19-1261</u>, the Climate Action Plan, into law. This legislation seeks to mitigate climate change impacts by increasing renewable energy generation and eliminating statewide greenhouse gas emissions. *The Bill sets ambitious goals to reduce greenhouse gas pollution by at least 26% by 2025, 50% by 2030, and 90% by 2050* (compared to 2005 levels). RTD will play a major role in reducing greenhouse gas emissions produced by vehicles since public transportation provides a low carbon alternative to driving.

Colorado Electric Vehicles

In January 2019, Governor Polis signed Executive Order B 2019 002 "Supporting a Transition to Zero Emission Vehicles" which outlined several directives that will accelerate transportation electrification. In April 2020, the Colorado Energy Office (CEO) published the <u>Colorado Electric Vehicle Plan</u> which set specific goals to accomplish a large-scale transition of Colorado's transportation system to zero emission vehicles. *The plan states that transit fleets should transition to 100% zero emission vehicles (ZEV) no later than 2050, with an interim target of at least 1,000 ZEVs by 2030.* Since RTD operates almost half of the transit vehicles in the state, it will be a key partner in accomplishing these goals.

County Policy & Legislation

The RTD service area includes all or part of eight counties including, Boulder, Broomfield, Denver, Jefferson, Adams, Arapahoe, Douglas, and Weld as shown in Figure 1. Most of these counties have plans and programs related to sustainability and climate change, including:

- <u>Sustainable Adams County 2030 Plan</u>
- Boulder County Office of Sustainability, Climate Action & Resilience
- <u>City & County of Broomfield Environmental Stewardship</u>
- <u>City & County of Denver Office of Climate Action, Sustainability & Resiliency</u>
- Jefferson County Sustainability Program

Since the transportation sector is a major source of emissions in the Denver Metro Region, transit is often included as a part of the solution for improving air quality and reducing carbon emissions. By tracking the sustainability metrics in this report, RTD can help support these ambitious goals and programs.



Figure 1: Map of RTD Boundary and Counties within the District



Note: Many metrics in this report use data from the seven of the eight counties in the RTD service area. Weld County is excluded since only a very small portion of that county is included in the District.

Overview of Air Pollutants and Standards

Clean Air Act

The <u>Clean Air Act</u> is the comprehensive federal law that regulates air emissions from stationary and mobile sources. This law authorizes the Environmental Protection Agency (EPA) to establish standards to protect public health and public welfare and to regulate emissions of hazardous air pollutants. There are many types of air pollutants regulated under the Clean Air Act, including six criteria pollutants as well as 187 hazardous air pollutants specifically listed in the statute.

Types of Air Pollutants

The <u>EPA's National Emissions Inventory (NEI) database</u> includes estimates of annual air pollutant emissions from point, nonpoint, and mobile sources for three types of pollutants: hazardous air pollutants, criteria air pollutants, and greenhouse gas emissions.

Hazardous Air Pollutants - Emissions Impacting Health

Hazardous air pollutants, also known as toxic air pollutants, are those pollutants that are known or suspected to cause cancer or other serious health effects. The Clean Air Act has classified 187 pollutants as hazardous. Examples include benzene, asbestos, mercury, formaldehyde, arsenic, and cyanide. Health effects can include damage to the immune system, as well as neurological, reproductive (reduced fertility), developmental, respiratory, and other health problems. In addition, some toxic air pollutants can deposit onto soils or surface waters, where they are taken up by plants and ingested by animals and are eventually magnified up through the food chain (EPA).

Criteria Pollutants - Emissions Impacting Air Quality

The Clean Air Act requires the EPA to set National Ambient Air Quality Standards for six common air pollutants, known as "criteria pollutants" including particulate matter, ground-level ozone, carbon monoxide, sulfur dioxide, nitrogen dioxide, and lead. *Criteria pollutants create poor air quality, which can damage human health as well as the environment*. Breathing in these pollutants has been linked to a significant increase in lung and respiratory issues, heart disease, childhood development issues, cognitive impairment, and premature death (<u>American Lung Association</u>). Impacts on the environment from criteria pollutants include dangerous levels of smog, acid rain, and

water pollution (EPA).

Greenhouse Gas Emissions - Emissions Contributing to Climate Change

Greenhouse gases (GHG) reside in the earth's atmosphere trapping heat and warming the planet. These gases include carbon dioxide, methane, nitrous oxide, and fluorinated gases. GHG emissions let sunlight through the atmosphere but prevent the heat that they generate from escaping. *GHG emissions from human activities are the most significant driver of climate change* (EPA). Climate change has direct and indirect impacts on the health of people. More extreme weather events, heat waves, spread of infectious diseases, and detrimental impacts on air and water quality negatively impact health outcomes (EPA).

Regional Air Quality Over Time

The <u>Air Quality Index (AQI)</u> is a tool used to report daily air quality. This index reports how clean or polluted the air is and what associated health effects might be a concern. The EPA calculates the AQI for the six criteria pollutants regulated by the Clean Air Act. When AQI values are above 100, air quality is considered to be unhealthy — at first for certain sensitive groups of people, then for everyone as AQI values get higher.

Air quality in the Denver Metro Region has significantly improved over the last 40 years, likely due to EPA regulations, with the number of unhealthy days decreasing by almost 90% from 1980 to 2019 as shown in Figure 2.







Source: EPA Air Quality Data

Ozone Non-Attainment

The Clean Air Act requires the EPA to set National Ambient Air Quality Standards for pollutants considered harmful to public health and the environment including the six criteria pollutants. The Denver Metro Region is in compliance with all of these standards with one exception. All seven counties in the Denver Metro Region are in ozone nonattainment, meaning that ozone levels are worse than the national standard (EPA). In fact, in December 2019, the EPA reclassified the Denver Metro ozone nonattainment area from 'Moderate' to 'Serious' nonattainment (EPA).

Ozone at ground level is a harmful air pollutant because of its effects on people and the environment. It is the main ingredient in "smog" and the notorious Denver brown cloud. Breathing ozone can trigger a variety of health problems including chest pain, coughing, throat irritation, and airway inflammation. It can also reduce lung function and harm lung tissue. Ozone can worsen bronchitis, emphysema, and asthma, leading to increased medical care (EPA).

Ozone is not directly emitted, but is formed when nitrogen oxides (NOx) and volatile organic compounds (VOCs) react in the presence of sunlight. In 2017, *the transportation sector was responsible for 49% of NOx and 21% of VOC emissions in the Denver Metro Region* as shown in Figure 3.



Figure 3: NOx and VOC Emissions by Source (7-County), 2017

Source: EPA National Emissions Inventory (2017)

Note: The EPA National Emissions Inventory is updated every three years. The most recent data available is from 2017.

Environmental Justice Areas

According to the EPA, environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. This goal will be achieved when everyone experiences the same degree of protection from environmental and health hazards and equal access to the decision-making process to have a healthy environment in which to live, learn, and work (EPA Environmental Justice).

An important first step to ensuring environmental justice is to identify the areas where people are most vulnerable or likely to be exposed to different types of pollution. For this reason, the EPA developed the EJSCREEN tool to help aid in efforts to *ensure programs, policies, and resources are appropriately inclusive and consider the needs of communities most burdened by pollution* (EPA EJSCREEN). EJSCREEN helps the EPA meet the intent of Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," to focus federal attention on the environmental and human health conditions of minority and low-income populations with the goal of achieving environmental protection for all communities.

The EJSCREEN "EJ Index for Traffic Proximity and Volume" was used to develop Figure 4, a map of the Denver Metro Region showing areas where vulnerable communities are in close proximity to high traffic volumes. EJSCREEN defines vulnerable populations as low income (less than or equal to twice the federal poverty level) and/or minority (all but Non-Hispanic White Alone). This index provides percentiles for each census block group to provide perspective on how an area compares to the entire state. For example, if a given location is at the 95th percentile statewide, this means that only 5 percent of the Colorado population has a higher index value than the average person in the location being analyzed.

Vehicle traffic is a major source of noise and air pollutants, such as particulate matter, nitrogen oxides, carbon monoxide, and ozone, which are known health hazards. Specifically, *exposure to traffic-related pollution is linked to asthma, other respiratory symptoms, and cardiovascular disease*. Also, research has demonstrated that traffic noise can also lead to stress and sleep disturbances, both of which can lead to a higher risk for type 2 diabetes (<u>USDOT</u>). Transit service can play a major role in reducing vehicle miles traveled and therefore reducing vehicle emissions and noise that impact vulnerable communities.



Figure 4: Environmental Justice (EJ) Index for Traffic Proximity in the Denver Metro Region, 2017



Source: <u>Colorado Department of Public Health and Environment (CDPHE) EJSCREEN Indices</u> *Note: This analysis is based on the most recent data available from CDPHE (2017).*

Transportation Sector GHG Emissions

In the Metro Denver Region, the transportation sector produces the majority of greenhouse gas (GHG) emissions (64%). Emissions from transit vehicles (transit & intercity buses) account for less than 1% of GHG emissions, while *passenger vehicles (cars, SUVs, vans, light-duty trucks) account for 50% of GHG emissions* as shown in Figure 5.





Source: EPA National Emissions Inventory (2017)

Note: The EPA National Emissions Inventory is updated every three years. The most recent data available is from 2017.

RTD Carbon Emissions

RTD's primary energy sources are diesel, gasoline, and electricity as shown in Table 1. The carbon dioxide (CO2) emissions associated with these energy sources are shown in Figure 6. In the Denver Metro Region, 99.97% of greenhouse gas emissions are from CO2 (<u>NEI</u>).

Table 1: RTD 2019 Fuel Use and CO2 Emissions by Source

Source	# Vehicles	Fuel Use	Fuel Type	CO2 Emissions (tons)
Diesel Bus Fleet	1,015	8,988,040	Diesel (gal)	91,768
Demand Response Vehicles	406	1,678,627	Gasoline (gal)	14,738
Support Fleet (Gasoline)	317	223,166	Gasoline (gal)	1,959
Support Fleet (Diesel)	57	51,252	Diesel (gal)	523
Light Rail Vehicles	191	76,829,593	Electricity (kWh)	38,927
Commuter Rail Vehicles	66	40,059,292	Electricity (kWh)	20,297
Electric Bus Fleet	37	1,498,578	Electricity (kWh)	759
Buildings & Facilities	—	30,820,592	Electricity (kWh)	15,616
TOTAL:				184,587

Figure 6: RTD 2019 CO2 Emissions by Source Percentage



Sources:

<u>National Transit Database</u>: Fuel/electricity use for bus, rail, and demand response vehicles and number of vehicles

RTD Internal Data (Maximus): Fuel use for support fleet and number of vehicles

RTD Internal Data (Facilities Database): Electricity use for RTD buildings & facilities

<u>EPA Emission Factors</u>: Used to calculate CO2 emissions for diesel and gasoline

<u>Xcel Energy Emission Intensities</u>: Used to calculate CO2 emissions for electricity

RTD Emissions from Electricity Generation

Most of RTD's carbon dioxide emissions (59%) are directly emitted from diesel and gasoline vehicle tailpipes, while the rest (41%) are indirect emissions from electricity generation. In 2019, electricity provided by Xcel Energy in Colorado consisted of 30% carbon-free sources (wind, solar, and other renewable energy sources) as shown in Figure 7 (Xcel Power Generation). Xcel is currently investing in wind and solar projects across the state and they plan to retire 660 megawatts of coal-fired generation which will result in nearly 55% renewable energy on the Colorado power grid by 2026 (Xcel Colorado Energy Plan). In addition, *Xcel has ambitious goals to provide 100% carbon-free electricity by 2050* and to reduce carbon emissions 80% by 2030 from 2005 levels (Xcel Carbon Reduction Plan). RTD's electricity usage for rail operations, electric buses, and facilities will result in fewer emissions as Xcel's grid becomes cleaner with increased use of renewable energy to generate electricity.



Figure 7: Xcel Energy Electricity Generation Sources in Colorado, 2019

Source: Xcel Energy 2019 Power Generation Portfolio

Solar Panels at RTD East Metro Facility

RTD installed solar panels on the roof of the East Metro Bus Maintenance Facility when the building was constructed in 1978. However, after many years of use, the system needed to be replaced. In 2012, RTD received grant funding from the Federal Transit Administration (FTA) to install a new photovoltaic (PV) system on the facility's roof. *This system has generated over 4,700 megawatts of solar power (equivalent to the annual electricity use of 435 households) since 2014*, as shown in Figure 8, which has resulted in almost \$430,000 in rebates from Xcel Energy. This solar power has displaced over 2,800 tons of carbon dioxide (CO2) that would have been emitted by coal and natural gas electricity generation (Xcel). By installing solar panels, RTD generates renewable energy and offsets the cost of electricity at the East Metro Facility.





Figure 8: Solar Power Generated by the East Metro Facility Photovoltaic (PV) System, 2014-2020

Source: RTD Internal Data (Facilities Database)

Emissions Displaced due to Transit

Every year, RTD helps reduce GHG emissions in the Denver Metro Region by providing transit service. If every transit user drove alone to their destination instead of using transit, this would result in an additional 240,000 tons of CO2 emissions per year (equivalent to 27 million gallons of gas). Over the last ten years, about 2.4 million tons of CO2 have been displaced by transit as shown in Figure 9.



Figure 9: Emissions Displaced due to Transit in the Denver Metro Region, 2010-2019

Sources:

<u>National Transit Database</u>: Annual RTD passenger miles (methodology assumes that each transit passenger mile equates to one passenger vehicle mile displaced)

<u>Federal Highway Administration (FHWA)</u>: Average fuel efficiency for passenger vehicles (used to calculate the gallons of gasoline displaced based on vehicle miles displaced)

EPA: Emission factors (used to calculate CO2 emissions for passenger vehicles)

Here is an example to illustrate the impact of transit on reducing emissions

If 30 people choose to take a 15L bus down Colfax from Peoria to Broadway, the total emissions would be about 19 kilograms of CO2. However, if each of those people chose to drive instead, this would result in 88 kilograms of CO2. Therefore, this transit trip carrying 30 people has saved about 69 kilograms of CO2.

In order to combat GHG emissions and congestion in the Denver Metro Region, it is essential to promote mode shift to get people out of cars and on to buses, trains, bikes, and sidewalks.

Transit-Oriented Development

Transit-Oriented Development (TOD) is a sustainable approach to developing the built environment that integrates higher density new construction with transit, creating synergies that enhance the value of both. TOD is characterized by a pedestrian-oriented environment that allows people to live, work, shop, learn, and play within a ten-minute walk of a transit station.

Clusters of TODs can create a system of transit-oriented communities, which enjoy number of benefits:

- Economically stable neighborhoods
- Reduced development sprawl
- Reduced commute times and related costs
- Improved environmental quality through alternative transportation modes
- Diminished automobile dependency in support of first- and last-mile connections



<u>RTD's TOD mission</u> is to help facilitate TOD opportunities that increase ridership or enhance transit investments throughout the District through station design and close coordination with local jurisdictions and developers. RTD plays a proactive role in facilitating transit-supportive development around transit stations and strives to realize the following goals:

- Promote multi-sector, cross-jurisdictional partnerships
- Encourage sustainable development that supports the transit system
- Ensure a hierarchy of multi-modal access
- Protect and enhance RTD's transit assets

Although RTD rail and BRT station areas represent only 0.6% of land area in Denver/Boulder Metropolitan Statistical Areas (MSAs), much of the new development for the region is located near these transit stations. From 2005 to 2019, *43% of multi-family developments and 55% of office developments within the Denver Metro Region have been built within a half mile of an RTD rail or BRT station* (TOD Status Report).



Affordable Housing

Because housing and transportation are an average household's two largest costs, co-locating affordable housing in transit-rich neighborhoods stands to offer the greatest public benefit for public investment. Equitable transit-oriented development promotes inclusive, connected, diverse neighborhoods for young professionals, working families, fixed-income seniors, and others to enjoy a wide variety of nearby amenities (<u>Rail-Volution</u>). *Roughly* **10%** *of housing units within a half mile of RTD rail or BRT stations are affordable (priced below market-rate)* as shown in Figure 10.



Figure 10: Affordable Transit-Oriented Development in the Denver Metro Region, 2019

Source: <u>RTD TOD Database</u>

RTD Transit-Oriented Development Survey

Since 2016, RTD has surveyed more than 1,300 TOD residents and nearly 100 property managers to understand residents' transportation behavior. In addition, RTD staff has tracked parking utilization at more than 100 TOD properties in an effort to inform RTD, municipal, and industry expectations for station-area development. According to both research projects, residents living in income-restricted housing use RTD transit services more often than their more affluent neighbors as shown in Figure 11 and Figure 12. Coincidentally, *61 percent of those same low-income households do not own a passenger vehicle, while 93 percent of their more affluent neighbors own at least one vehicle* as shown in Figure 13. This research emphasizes a mutually supportive relationship between transit service and low-income households. RTD is considering changes to its joint-development policy to encourage affordable housing in order to satisfy the agency's mission for mobility.





Source: RTD TOD Survey





Figure 12: Frequency of Riding RTD Rail

Source: RTD TOD Survey



Figure 13: Vehicles per Household



Source: RTD TOD Survey



Light Duty Electric Vehicles in Colorado

In Colorado, there is significant momentum around the expansion of electric vehicles (EVs). The timeline below shows the recent policy milestones indicating that EV adoption is a major priority for the state and local governments.

January 2019

2019

Governor Polis announced his first executive order, "Supporting a Transition to Zero Emission Vehicles."

August 2019

Colorado followed the example of California and adopted a Zero Emission Vehicle (ZEV) rule that requires automakers to increase sales of ZEVs from the current 2.6% of cars sold in Colorado to 6.23% by 2030.



May 2019

The Colorado Legislature passed Senate Bill 19-077, which included a requirement for utilities to "support widespread transportation electrification" and to introduce "investments or incentives to facilitate the electrification of public transit and other vehicle fleets."

April 2020

2020

The Colorado Energy Office (CEO) published their Colorado Electric Vehicle Plan which includes ambitious goals for transportation electrification including: 940,000 electric vehicles and 1,000 electric buses by 2030.



As of July 2020, there were **15,150 electric vehicles (EV's) registered in the Denver Metro Region (7-County)** compared to **11,137 in 2019** (Colorado Energy Office). Figure 14 shows the current distribution of EV's in the RTD district.

Figure 14: Electric Vehicles in Denver Metro Region, 2020



Source: Colorado Energy Office

RTD EV Charging Infrastructure

In 2016, RTD installed *two electric vehicle charging stations at the Central Park Station Park-n-Ride that are available for public use*. That same

year, RTD acquired two electric vehicles for its fleet with two electric vehicle charging stations at the Elati Rail Maintenance Facility. The acquisition of the equipment and the vehicles was made possible by a grant provided by the Regional Air Quality Council (RAQC).

In addition, there are *publicly available electric vehicle chargers at several other facilities adjacent to RTD services* including: Olde Town Arvada Transit Hub, Boulder Junction Garage, Westminster Station Garage, and Iliff Station Garage.

In April 2020, the City and County of Denver released the <u>Denver Electric</u> <u>Vehicle (EV) Action Plan</u> which included RTD as a stakeholder. Several proposed actions involving RTD partnerships included:



- Strengthen partnerships with businesses, regional organizations, and surrounding communities to accelerate the deployment of charging infrastructure at key locations, including homes, multi-family residential buildings, retail centers, mobility hubs, and high-traffic destinations such as the airport.
- Explore and assess the viability of a potential partnership with RTD to provide public charging at Park-n-Ride Stations in Denver.
- Partner to develop mobility hubs leveraging private/public funding (e.g., bring together multiple mobility services like RTD, EV charging, ride-hailing charging, first/last mile options, EV carshares).

RTD will continue to collaborate with the City and County of Denver to explore these partnership opportunities in order to promote electric vehicle adoption in Denver.



Zero Tailpipe Emission Transit

RTD operates several types of transit services that are powered by electricity and therefore have no tailpipe emissions. However, it should be noted that electricity generation from coal and natural gas does produce emissions.

All of RTD's light rail and commuter rail vehicles are powered by electricity. In addition, RTD has 36 battery electric buses that operate the Free MallRide service on the 16th Street Mall. As the rail network has been expanded through the FasTracks program, electric transit has grown to represent a larger share of RTD service. *In 2019, electric transit accounted for 43% of boardings and 26% of revenue miles for RTD's fixed route services.* Figure 15 shows the annual passenger miles for zero tailpipe emission transit from 1997 to 2019.



Figure 15: Zero Tailpipe Emission Transit Passenger Miles, 1997-2019

1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 Source: <u>National Transit Database</u>



Free MallRide Electric Bus Fleet

RTD is a leader in transit electrification in the United States. Since 2017, RTD has had one of the largest electric bus fleets in the country, with 36 battery electric buses operating on the 16th Street Mall in downtown Denver. Table 2 and Figure 16 show the top fifteen transit agencies with the most electric buses in active service according to the American Public Transportation Association (APTA) 2020 Vehicle Database. RTD has been recognized as a leader in this area by being invited to speak at many regional and national conferences. RTD is also a member of the Colorado Electric Vehicle Coalition (CEVC) and has taken a leadership role in forming the CEVC Transit Subgroup, which brings together stakeholders interested in transit electrification (RTD).

Table 2: Top Fifteen Electric Bus Fleets Across the Nation, 2020

Transit Agency	City/State	Active Vehicles
Denver RTD	Denver, CO	36
Foothill Transit	West Covina, CA	33
King County	Seattle, WA	26
SEPTA	Philadelphia, PA	25
IndyGo	Indianapolis, IN	21
RTC Washoe	Reno, NV	21
StarMetro	Tallahassee, FL	19
San Joaquin RTD	Stockton, CA	17
GTA	Greensboro, NC	16
CARTA	Chattanooga, TN	15
TARC	Louisville, KY	15
DDOT	Washington DC	14
SB MTD	Santa Barbara, CA	14
CAT	Clemson, SC	10
LBT	Long Beach, CA	10
Total Battery Electric Buses in Operation		437

Source: APTA 2020 Vehicle Database





Figure 16: Map of Top Fifteen Electric Bus Fleets Across the Nation, 2020

Source: APTA 2020 Vehicle Database

Over the last year, RTD has received grant funding to purchase 17 new battery electric buses, which will likely be in service in late 2022 or early 2023. Within the next two years, RTD will also be developing a zero-emission bus strategy as part of Reimagine RTD. In addition, RTD will be hosting the International Zero Emission Bus Conference in September 2021.

Autonomous Electric Vehicle Pilot Project

On January 29, 2019, RTD and its partners launched the <u>61AV demonstration project</u>, a *six-month demonstration of a potential "first and last mile solution" using an autonomous shuttle vehicle*. 61AV service was provided using an EasyMile EZ10 driverless electric shuttle vehicle with a capacity of 10-12 people. The project connected RTD's 61st and Pena rail station to the Panasonic building, an emerging apartment complex with over 200 units (Elevate at Pena Station), and the Pena Park-n-Ride (800 parking spots), owned and managed by Denver International Airport (DEN).

The demonstration project was a partnership between RTD, EasyMile (the autonomous vehicle provider), Transdev (the operator and provider of the on-board Customer Service Ambassador), Panasonic (co-developer of Pena Station Next), LC Fulenwider (co-developer of Pena Station Next) and the City & County of Denver (Public Works

and DEN). The project was conducted within the regulatory framework developed by the State of Colorado Autonomous Vehicle Task Force (AV Task Force). The AV Task Force was created as a result of legislation passed by the Colorado State Legislature in 2017 and consists of representatives of the Colorado Department of Transportation (CDOT), the Colorado State Patrol (CSP), and the Colorado Department of Revenue/Division of Motor Vehicles (CDOR/DMV).

This was the first deployment of an autonomous vehicle operating in mixed traffic on a public roadway in the City & County of Denver and in the State of Colorado. *This was also one of the first deployments nationally of an autonomous vehicle operating on a public roadway and integrated with a transit agency's service offering.* The 61AV demonstration project provided RTD with valuable information about AV shuttle technology and what role it may play in RTD's future service offerings.

Public health is one of the primary reasons that organizations and government agencies pursue sustainability. For example, the EPA regulates emissions of air pollutants in order to protect public health and public welfare. This section covers several topics related to public health in the Denver Metro Region and how transit can positively impact these issues.

Lung Health

Some groups of people are more sensitive to poor air quality than the general population including people with heart and lung disease, people with diabetes, older adults, children, and people of lower socio-economic status (EPA). The Colorado Department of Public Health and Environment collects data on several of these medical conditions including asthma. *Although asthma hospitalization rates have fallen in recent years due to many factors including advancements in medicine, the Denver Metro Region has consistently experienced higher rates than Colorado overall as shown in Figure 17.*



Within the RTD service area, approximately one third of the population in census tracts experiencing the highest asthma hospitalization rates visited the hospital for asthma treatment during 2018. Census tracts experiencing the highest hospitalization rates were concentrated in the dense urban areas near Downtown Denver as shown in Figure 18.



Figure 17: Asthma Hospitalization Rates, 2004-2017

Source: Colorado Department of Public Health and Environment (CDPHE)

Figure 18: Map of Asthma Hospitalization in RTD Service Area, 2018



Source: Colorado Department of Public Health and Environment

In the Denver Metro Region, transportation emissions are a major source of particulate matter and nitrogen oxides (a main ingredient in ozone). These pollutants can cause many adverse impacts to lung health including decreased lung function, development of asthma in children, worsened chronic obstructive pulmonary disease, and lung cancer (<u>American Lung Association</u>). Furthermore, people with these types of health conditions are at higher risk of hospitalization and death due to COVID-19. *Reducing transportation emissions is essential to improving public health outcomes. Transit plays a major role in reducing vehicle miles traveled and vehicle emissions.*

Access to Health Facilities

Transit service is often evaluated based on the quality of service that takes people from their homes to work. However, a sustainable public transportation system connects people to a wide variety of places that they may routinely visit, including schools, recreation centers, places of worship, grocery stores, and health facilities.

According to the <u>American Hospital Association</u>, each year, 3.6 million people in the United States do not obtain medical care due to transportation issues. Transportation issues include lack of vehicle access, inadequate infrastructure, transportation costs, and adverse policies that affect travel. This results in missed or delayed health care appointments, increased health expenditures and overall poorer health outcomes. Because transportation touches many aspects of a

person's life, adequate and reliable transportation services are fundamental to healthy communities. RTD provides high frequency transit service to roughly a third of all health facilities in the District including

RTD provides high frequency transit service to roughly a third of all health facilities in the District including 16 hospitals as shown in Figure 19. During COVID, *RTD has continued to provide transit service for people accessing healthcare and essential workers getting to their jobs at healthcare facilities across the region*.





Figure 19: Health Facilities near High Frequency Transit (HFT)



Note: The high-frequency transit area includes rail stations (within ½-mile) and bus stops (within ¼-mile) that are served by a transit route providing four or more trips per hour from 6 a.m. to 6:30 p.m.

Sources: <u>RTD;</u> <u>CDPHE Health Facilities</u>

Homelessness and Access to Transportation

Access to reliable transportation is the biggest factor in determining whether someone will escape poverty and avoid homelessness. If a person has access to reliable transportation, they can apply and interview for jobs, visit food banks and access other needed services, and pursue educational goals (Invisible People). Public transportation provides an affordable option for accessing these types of destinations.



According to the Centers for Disease Control and Prevention, homelessness is closely connected to declines in physical and mental health; people experiencing homelessness have high rates of health problems such as HIV infection, alcohol and drug abuse, mental illness, tuberculosis, and other conditions. Health problems among people experiencing homelessness result from various factors, such as barriers to care, lack of access to adequate food and protection, and limited resources and social services (<u>CDC</u>).

The <u>Colorado Coalition for the Homeless</u> estimated that *there were over 5,700 people experiencing homelessness (on the street or outside, in shelter, or in transitional housing) in the Denver Metro Region* in 2019. Compared to 2018, this was an increase of at least 8% or likely even more due to the challenge of counting unsheltered individuals. Although 2020 data is not yet available, the number of people experiencing homelessness is expected to rise due to the COVID crisis and the high unemployment rate in the Denver Metro Region.

RTD serves as the primary transportation for those experiencing homelessness, including many who need to get from one part of town to another to use city or nonprofit services such as shelters, food, job assistance or counseling. RTD also supports programs to address mental health issues and incidents from system riders and facility users. For example, RTD currently has a full-time mental health counselor working where needed in the transit system, riding along with security personnel for outreach and for incident response. RTD hopes to add a new full-time position for a homelessness services coordinator and liaison (RTD).

In addition, *RTD recently formed the Homeless Taskforce to better understand the complexities of homelessness in the District and address related issues in order to better serve all RTD customers.* Taskforce members include RTD staff as well as outside agencies like Urban Peak, Colorado Coalition for the Homeless, Denver Rescue Mission, St. Francis Center, Harm Reduction Action Center, Denver Public Library, and the City & County of Denver. The taskforce is currently working to develop partnerships with homelessness service providers, identify training options for RTD Safety and Security staff, and conduct a study for homeless mobility needs, among other activities.



Regional Crashes

Traffic accidents are another threat to public health that transit has the capacity to improve by reducing the overall number of vehicle trips and vehicle miles traveled. Approximately **75,000 crashes occurred in the Denver Metro Region in 2018** as shown in Figure 20. This equates to over 200 crashes on an average weekday.



Figure 20: Denver Metro Region Crashes, 2009-2018



Only 0.08 percent of crashes in the Denver region involved RTD transit vehicles in 2018. *By reducing regional vehicle miles traveled, RTD helps to avoid over 1,000 crashes annually,* or roughly three per day as shown in Figure 21. If more people choose to use transit instead of driving, the roadways will be safer for everyone.



Figure 21: Crashes Avoided Due to Transit, 2009-2018

Sources: DRCOG Regional Data Catalog, National Transit Database

NEXT STEPS FOR SUSTAINABILITY AT RTD

In order to achieve the sustainability goals set out by the state and local governments in the Denver Metro Region, mode shift from driving to sustainable transportation will be essential. The transit service provided by RTD will be key for replacing long distance driving trips that are less feasible for walking and biking. RTD will continue to work with our public agency partners to increase ridership and transit mode share and thereby reduce vehicle emissions.

One way that RTD will work with our partners is through the <u>RTD Accountability</u> <u>Committee</u>, a group created by the Governor of Colorado and the Transportation chairs of the General Assembly in collaboration with the RTD Board of Directors. The Committee's mission is to provide feedback and a set of recommendations for improvement to the operations and statutes related to RTD, to the board and staff of RTD, the Governor, the General Assembly, and the public. One of the topics this group will discuss is RTD's efforts to address the <u>state's climate action goals</u>. RTD will benefit from the diverse perspectives of the committee members who will provide insight on how RTD can continue to help reduce greenhouse gas emissions in Colorado.

In addition, RTD will continue to explore innovative strategies and technology like the 61AV Demonstration Project and the MallRide electric bus fleet. *RTD is planning for the future through Reimagine RTD, a two-year planning effort that seeks to understand and forecast the transportation needs of our region and create a mobility plan for the future*. Emerging technologies are rapidly changing how travel occurs in our region. The Mobility Plan for the Future will develop a long-term strategy for RTD to stay ahead of the curve of private sector innovation, develop mechanisms to integrate with them, and ultimately create a system that meets the future mobility needs of our region. By looking at RTD's transit network, services, and business practices to meet the transportation needs of the future, RTD is planning for the sustainability of the Denver Metro Region.

