Transportation greenhouse gas report

Appendix I

Contents

Executive summary 3

What is the Greenhouse Gas Transportation Planning Standard? 5

Greenhouse gas emissions process and results 13

Progress made since 2022 39

Conclusion 43

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Executive summary

The Colorado Department of Transportation's Regulation Governing Statewide Transportation Planning Process and Transportation Planning Regions (2 CCR 601-22, known as the Greenhouse Gas Transportation Planning Standard), adopted in December 2021, requires the Denver region to reduce surface transportation greenhouse gas emissions through the transportation planning process. Through impactful changes to the 2050 Metro Vision Regional Transportation Plan since its original adoption in April 2021, the Denver region meets the rule's greenhouse gas emission reduction requirements for all staging years defined by the rule.

The regulation (2 CCR 601-22, Section 8.02.6) establishes greenhouse gas emission reduction levels from an established baseline for four analysis years: 2025, 2030, 2040 and 2050. As 2025 has passed, results are no longer shown for that analysis year. For the Denver region, baseline greenhouse gas values are established based on the defined transportation investments and planning assumptions identified in the Regional Transportation Plan adopted in April 2021. The target greenhouse gas emissions are determined by subtracting the rule's greenhouse gas emission reduction levels from the total baseline emissions for each analysis year.

The purpose of this report is to document the Denver Regional Council of Governments' process for complying with Colorado's transportation greenhouse gas rule. The analysis documented in this report demonstrates that the updated Regional Transportation Plan complies with the regulation's requirements. As outlined in Table 1 on the following page, DRCOG meets or exceeds the required greenhouse gas reduction levels in each staging year, demonstrating compliance with the Greenhouse Gas Transportation Planning Standard.

Table 1: Greenhouse gas emission reduction results, million metric tons per year

Greenhouse gas reduction metric	2030	2040	2050
Regional Transportation Plan 2026 update modeling (Demographic, land use and network updates; program investments)	0.76	0.60	0.44
Off-model calculations (Active transportation, Complete Streets retrofits and signal timing)	0.07	0.05	Not applicable
Total greenhouse gas reductions	0.83	0.65	0.44
Reduction level requirement from Table 1 of the greenhouse gas rule (2 CCR 601-22, Section 8.02.6)	0.82	0.63	0.37
Reduction level achieved?	**Yes**	**Yes**	**Yes**

The demonstration is based on analysis conducted using DRCOG's UrbanSim land use model and Focus travel demand model, and the Environmental Protection Agency's Motor Vehicle Emission Simulator (or MOVES) air quality model. Greenhouse gas reductions that could not be sufficiently modeled, such as signal timing and additional multimodal corridor enhancements, were calculated off-model using methodologies defined by the Colorado Transportation Commission's Policy Directive 1610.

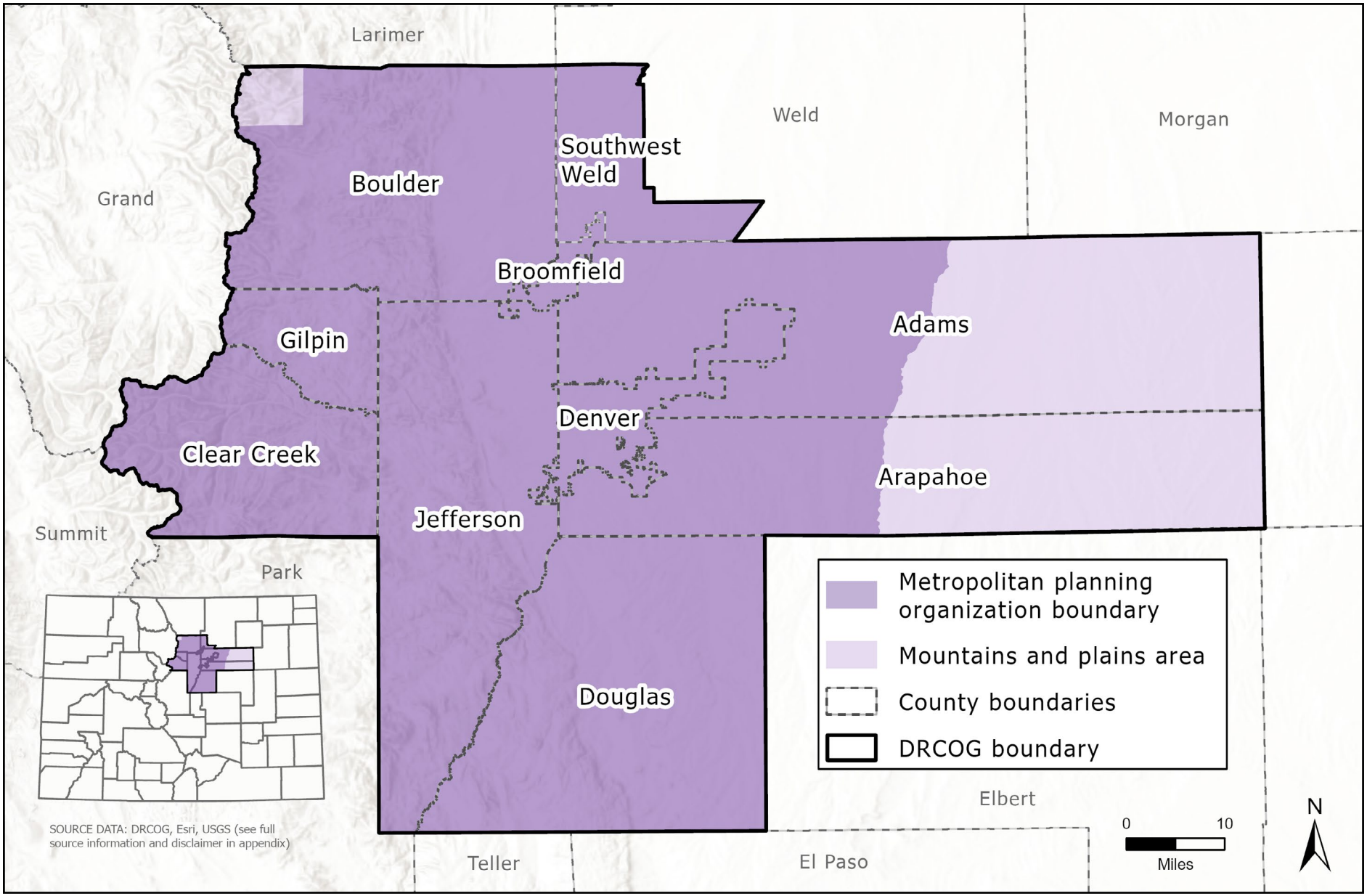
What is the Greenhouse Gas Transportation Planning Standard?

Colorado Senate Bill 21-260 (“Sustainability of the Transportation System”) was enacted in June 2021. The law directed CDOT to develop rules for the state and its five metropolitan planning organizations to reduce surface transportation greenhouse gas emissions through transportation planning processes. Emission reductions due to vehicle technology, such as fuel efficiency and zero-emission vehicles, are regulated through a separate process.

CDOT’s Regulation Governing Statewide Transportation Planning Process and Transportation Planning Regions (2 CCR 601-22), adopted December 2021, established annual reduction levels of greenhouse gas in million metric tons for four analysis years: 2025, 2030, 2040 and 2050. The rule applies to the metropolitan planning organization area within DRCOG, which includes all, or portions of, eight counties, as illustrated in Map 1 on the following page. This report presents the modeled total greenhouse gas emissions of future surface transportation associated with the 2026 update to the Regional Transportation Plan within DRCOG’s MPO area.

During the development of the Regional Transportation Plan, the DRCOG MPO boundary was expanded to include Clear Creek and Gilpin counties. However, this analysis uses the previously shared CDOT Greenhouse Gas Analysis Area developed in consultation with state partners. Future amendments or updates may use the new boundary.

Map 1: The Denver region



DRCOG's role

DRCOG is a planning organization where local governments collaborate to establish guidelines, set policy and allocate funding in the areas of transportation and personal mobility, growth and development, and aging and disability resources. The Denver area is a dynamic region of 3.4 million people and 59 communities along Colorado's Front Range. The region will add 800,000 more people and 400,000 more jobs by 2050.

The DRCOG planning area includes Adams, Arapahoe, Boulder, Clear Creek, Douglas, Gilpin and Jefferson counties, the City and County of Denver, the City and County of Broomfield, and southwest Weld County. As the federally designated MPO for the Denver region, DRCOG leads multimodal transportation planning activities in cooperation with CDOT, the Regional Transportation District and other stakeholders.

For more than 25 years, DRCOG has been actively involved in efforts to reduce the amount of motor fuel burned, vehicle miles traveled and associated greenhouse gas emissions. This task is challenging due to the region's growth. However, DRCOG remains strongly committed to efforts to reduce greenhouse gas emissions and has invested significant funding toward those efforts for many years.

Relevant planning efforts

DRCOG, in conjunction with its direct MPO partners CDOT and RTD, prepares and routinely updates three key planning documents:

Metro Vision

In addition to its role as an MPO, DRCOG serves as a regional planning commission under Colorado statutes. Metro Vision fulfills DRCOG's duty as a regional planning commission to make and adopt a plan for the physical development of the region. As such, it reflects the long-range vision for the Denver region, establishing a set of shared

outcomes and objectives that provide guidance and a framework for regional and local planning priorities, including the region's shared multimodal transportation planning priorities. While providing guidance and numerous example initiatives for regional and local implementation, Metro Vision acknowledges the unique characteristics and contributions of the region's 59 local governments.

To monitor progress toward Metro Vision outcomes, DRCOG staff incorporated vehicle miles traveled and greenhouse gas reduction targets, along with several other performance measures, into the plan — first in 2011 and again in the 2017 update. DRCOG continues to monitor and make progress toward these targets with strategic initiatives to achieve the shared outcome.

2050 Metro Vision Regional Transportation Plan

The Regional Transportation Plan helps DRCOG and its many partners implement the shared aspirational vision of Metro Vision by identifying specific project and program investment priorities for the region's multimodal transportation system and its operations. The Regional Transportation Plan identifies six priorities: reliability, safety, air quality, regional transit, freight and active transportation. The plan also identifies investments and regionally significant projects to be funded with "reasonably expected" future revenues over the next 25 years. The Regional Transportation Plan balances planning for an additional 800,000 residents in the region while also maintaining the current transportation system and expanding travel options.

In particular, the plan's project and program investment priorities include:

- Creating a safety program to increase the region's investments in projects to eliminate transportation fatalities and serious injuries.
- Continuing to invest in programs for community mobility planning and implementation, regional transportation operations and technology, regional air

quality, commute options, and human services transportation through DRCOG's Transportation Improvement Program.

- Investing in a regional bus rapid transit system of corridors that can leverage federal funding opportunities, attract high volumes of ridership, are ready for implementation and reflect regional geographic equity considerations.
- Continuing to implement DRCOG's Active Transportation Plan through a program to further develop the region's high-comfort active transportation corridors, eliminate gaps, and invest in pedestrian focus areas and short-trip opportunity zones.

DRCOG staff used these priorities, along with the agency's Regional Complete Streets Toolkit, as the foundation for the greenhouse gas emission reduction strategies described in this report.

Transportation Improvement Program

The Transportation Improvement Program is a four-year program of specific state and federally funded projects and programs to be implemented by CDOT, RTD, local governments, DRCOG and other partner agencies. The evaluation of projects selected to receive DRCOG-administered funds has always included criteria associated with the reduction of vehicle miles traveled and greenhouse gas emissions. This includes application questions on air quality reduction, improving multimodal mobility and connectivity, expanding transit, increasing safety, and reducing congestion delays.

Historically, DRCOG's funding allocations have gone toward the following project types that work toward reducing vehicle miles traveled and greenhouse gas emissions:

- Active transportation projects, including both new and upgraded facilities.
- Transit funding, including capital purchases, new and expanded service operations, bus rapid transit infrastructure, and passenger facilities.

- Grants for station area, transit-oriented development and urban center planning.
- Direct funding to support air quality improvement programs through the Regional Air Quality Council.
- Congestion management initiatives, including:
    - DRCOG's Way to Go Program.
    - Transportation demand management partnerships and non-infrastructure projects.
    - Transportation operations, traffic signal system upgrades, signal corridor retiming and intelligent transportation systems infrastructure.
    - Carpool, vanpool and Schoolpool programs.
    - One of the nation's largest Bike to Work Day events.
- Roadway operational improvement projects.

DRCOG administers a small percentage of total transportation funds used to build, operate and maintain the region's transportation system. More than 95% of funding is administered by CDOT, RTD, toll authorities and local governments.

Modeling greenhouse gas emissions

UrbanSIM model

DRCOG staff rely on a predictive model, the open source UrbanSim block model. UrbanSim is a microsimulation model designed to represent the behavior of individual agents (households, businesses and developers) and their interactions in real estate markets. UrbanSim simulates annual changes, capturing the dynamics of household moves, housing choices (renting versus owning), firm location decisions and developer

activities such as new construction or redevelopment. It incorporates land use policies, transportation plans and accessibility changes, which influence market conditions, prices and rents.

Key features of UrbanSim include:

- Agent-based modeling: Represents individual households, firms, jobs and their decisions.
- Spatial detail: Models land, blocks and real estate at fine-grained levels.
- Dynamic timeframe: Simulates annual changes, reflecting the evolving urban system and market mismatches.
- Real estate market focus: Emphasizes interactions between consumer and supplier choices and their effects on prices and vacancies.
- Discrete choice models: Uses models like multinomial logistic regression to simulate decision-making.

UrbanSim uses a dynamic, path-dependent approach, allowing it to closely mirror real-world urban development processes, including the gradual pace of housing additions and the cyclical nature of real estate markets.

Regional travel demand model

DRCOG's activity-based travel demand model, Focus, uses socioeconomic outputs from the UrbanSim model, along with numerous travel, demographic and human decision-making factors, to represent an average weekday of travel within the Denver region. The Focus model is calibrated to data obtained from regional and national travel surveys, along with several other data sources, to replicate the 15.3 million person-trips made every weekday on the regional transportation system. The model replicates the planned transportation system and land use attributes to generate trips across

travel modes and assigns applicable trips to the roadway and transit network. The Focus model is calibrated to match real-world observations of traffic volumes, transit boardings, and numerous other travel, demographic, and trip mode data metrics.

The key use of the Focus model is to forecast future travel metrics based on changes to the region's population, employment and transportation system.

MOVES emissions model

The Focus model does not calculate greenhouse gas emissions. The Environmental Protection Agency created the MOVES model to estimate transportation emissions for various pollutants from surface transportation, including greenhouse gas. To calculate greenhouse gas emissions for the DRCOG MPO area, the Colorado Department of Public Health developed and maintains region-specific inputs to the MOVES model.

Key inputs to the MOVES model to calculate greenhouse gas emissions include:

- Traffic volumes and speeds by time of day from the Focus travel model.
- Number, type and age of vehicles in the regional vehicle fleet.
- Vehicle fleet mix by roadway type.
- Meteorological conditions.
- Fuel economy of vehicles (miles per gallon).
- Increase of electric and other non-internal-combustion-engine motor vehicles.

For technical documentation, including a static travel model description and the model calibration and validation report, or to review the intergovernmental agreement regarding the execution of the MPO travel demand model and MOVES emissions model, visit DRCOG's air quality webpage. For more information on the methodology used to calculate greenhouse gas emissions using the MOVES model, review the 2025 MOVES methodolgy memo in CDOT's OnBase system.

Greenhouse gas emissions process and results

Setting the baseline

To establish the greenhouse gas emission baseline, DRCOG staff followed the guidance found in 2 CCR 601-22, Section 1.04, which defines the baseline as: "for each MPO area and for the non-MPO areas of the state, for each of the model years 2025, 2030, 2040 and 2050: the greenhouse gas emissions, in million metric tons, produced by the most recently adopted model for that area … as of the effective date of this rule."

For DRCOG, the "most recently adopted model" is the Regional Transportation Plan adopted in April 2021. As adopted, the plan identifies regionally significant transportation investments through the year 2050 along with other planning assumptions, such as demographic data, land use information, travel costs and travel time changes. The final baseline values, outlined in Table 2, were derived from running the most current version of the UrbanSim, Focus and MOVES models with the network and land use planning assumptions as adopted in April 2021 for the Regional Transportation Plan.

Table 2: DRCOG greenhouse gas baseline by analysis year, million metric tons per year

Description	2030	2040	2050
Greenhouse gas baseline (Regional Transportation Plan adopted April 2021)	10.17	6.58	4.62

The baseline emissions model run for 2026 included updates to land use assumptions, an updated emissions database from the state's Air Pollution Control Division and an update to the DRCOG Focus model from the 2024 model run. The large decrease in baseline greenhouse gas emissions over time is due to CDOT's estimates for large increases in the share of electric vehicles in the overall fleet. The model updates also resulted in lower emissions baselines for each of the horizon years included in Table 2.

Modeling the 2026 update to the Regional Transportation Plan

To comply with the greenhouse gas rule and reduce future surface transportation greenhouse gas emissions, DRCOG committed to meaningful changes to planned regionally significant transportation projects, analyzed the effects of program investments, and updated land use and travel parameters in light of recent data.

Demographic assumptions

DRCOG staff collaborate with the Colorado State Demography Office and local jurisdictions to take county-level growth projections and allocate them across more than 50,000 census blocks, using a predictive model that simulates household and employment location choices while accounting for real estate market dynamics and natural and regulatory constraints. By 2050, the Denver region is projected to reach 4.1 million people, 1.8 million households and 2.8 million jobs — growth of 24%, 29% and 23%, respectively, from 2023. While regional and state growth rates continue to surpass national trends, the pace of growth is slowing significantly compared to the prior 30 years. From 1990 to 2023, the region's population grew 82%, households grew 83%, and jobs grew 98%. The slowdown is driven by lower birth rates, an aging population and slowing net migration. The 65-plus age group will see the largest proportional increase (66%), driving up retirement rates and increasing the need for growth in the number of households to sustain the labor force. For more information on demographic assumptions, refer to Appendix C.

Land use assumptions

DRCOG staff compile point-level housing data from a variety of local and proprietary sources. When the Regional Transportation Plan was adopted in 2021, the most recent observation available was 2018. The same date applied to point-level employment data licensed from the Colorado Department of Labor and Employment, which was processed and cleaned by DRCOG staff. Staff use this data as a supplementary UrbanSim model input applied during the scheduled development step. Staff incorporated housing and employment data through 2020, along with preliminary data from proprietary housing datasets, to update the observations into 2022. Staff also incorporated insights from the same proprietary housing datasets to include anticipated housing construction through 2032. To accommodate observations of more multifamily housing in denser locations and counties, DRCOG staff had to make several adjustments to the previous county forecasts. For more information on land use assumptions, refer to Appendix C.

Transportation network assumptions

To originally comply with the greenhouse gas rule and reduce future surface transportation greenhouse gas emissions, DRCOG committed to meaningful changes to planned regionally significant projects. The changes discussed on the following pages remain reflected in the 2026 update to the Regional Transportation Plan, in addition to further multimodal investments.

- Freeway managed lane projects: Originally modified in 2022 and carried forward. Modified C-470 and central Interstate 25 projects to focus on safety, operational, transit, and other multimodal aspects and associated greenhouse gas benefits; redirected or financed CDOT funds to advance bus rapid transit corridors and fund additional regional multimodal program investments.

- DRCOG-administered funded roadway projects: Originally modified in 2022 and carried forward. Modified the scope of several projects to limit road expansion components to four lanes and refocus the projects on multimodal, safety and Complete Streets investments.
- Regional transit network: Expanded the identified bus rapid transit network in 2026 to include the Havana Street/Hampden Avenue bus rapid transit corridor in the 2040-2050 staging period. The bus rapid transit network still includes Colfax Avenue, East Colfax Avenue Extension, State Highway 119, Federal Boulevard, Colorado Boulevard, Broadway and Lincoln Street, 38th Avenue and Park Avenue, Alameda Avenue, State Highway 119 Extension, North I-25, and the Speer Boulevard/Leetsdale Drive/Parker Road bus rapid transit corridors.
- Additional multimodal investments: Expanded active transportation project investments in 2026 to $1.3 billion, including multiple Complete Streets improvements, roundabouts, and bicycle and pedestrian bridges; and expanded safety and Vision Zero improvements to $1.2 billion.

Representation of adopted Regional Transportation Plan program funding

As developed for the 2026 update, DRCOG's fiscally constrained Regional Transportation Plan contains more than $16 billion in funding for regional programs, a combination of historical programs and expanded multimodal investments. The investments are listed as lump sums across various programs, and individual projects are not yet identified within the programs. Program funding categories include transit investments, active transportation, safety and Vision Zero, transportation demand management, and intelligent transportation investments, all of which are key strategic investments to improve the region's multimodal transportation system, improve air quality and reduce greenhouse gas emissions.

DRCOG staff evaluated the Regional Transportation Plan program funding, which had not yet been reflected in the travel model, and determined there was approximately $2.3 billion worth of investments associated with greenhouse gas emission reductions. To reflect these investments in the travel model, DRCOG staff carried forward the method originally developed in coordination with CDOT and North Front Range Metropolitan Planning Organization travel modelers.

Table 3: Greenhouse gas emission results, million metric tons per year

Description	2030	2040	2050
Greenhouse gas baseline (Regional Transportation Plan adopted April 2021)	10.17	6.58	4.62
Regional Transportation Plan 2026 update	9.41	5.98	4.18
Greenhouse gas reduction from modeling for the 2026 update to the Regional Transportation Plan	**0.76**	**0.60**	**0.44**

Methodology

DRCOG staff evaluated the categorical and programmatic Regional Transportation Plan funding and estimated the approximate percentage of total funds in each pool associated with additional projects and investments not yet reflected in the travel model. The results are detailed in Table 4.

Table 4: Regional Transportation Plan investment categories with potential greenhouse gas reductions

Investment category	2025-2029 funds	2030-2039 funds	2040-2050 funds	Total funds
Regional transit	$0	$526 million	$102 million	**$628 million**
Regional bus rapid transit ancillary improvements	$618 million	$796 million	$151 million	**$1.6 billion**
Active transportation	$207 million	$634 million	$420 million	**$1.3 billion**
Multimodal components of DRCOG-funded widening projects	$442 million	$1.4 billion	$535 million	**$2.4 billion**
Multimodal components of CDOT-funded widening projects	$868 million	$1.8 billion	$742 million	**$3.5 billion**
DRCOG Transportation Demand Management Set-Aside	$17 million	$34 million	$34 million	**$85 million**
Total	**$2.2 billion**	**$5.2 billion**	**$2 billion**	**$9.4 billion**

Staff estimated the percentage of the total funds by category by evaluating historical and intended uses of funding for infrastructure and services with the potential to reduce greenhouse gas emissions. The intention was to determine funding or enhancements in the use of funds that were not reflected in the previous model. The results are detailed in Table 5.

Staff used the resulting estimates, along with an estimated cost per unit to approximate the quantity of infrastructure (such as new multiuse paths) or service levels (such as increased transit service), to be mimicked in the travel model.

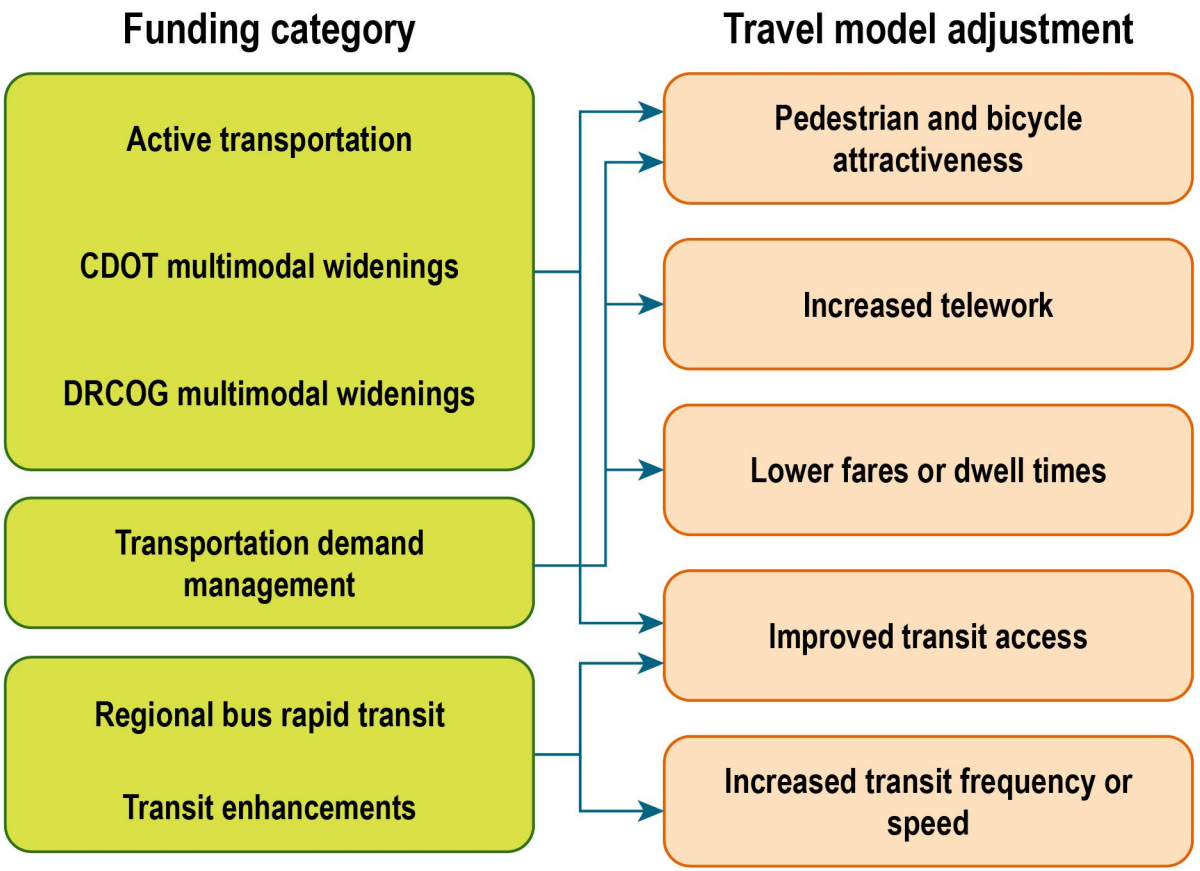
Table 5: Regional Transportation Plan investments associated with additional greenhouse gas reduction

Estimated percent of category	2021-2030 funds	2031-2040 funds	2041-2050 funds	Total funds
90% of regional transit	$0	$473 million	$92 million	**$565 million**
5% of regional bus rapid transit ancillary improvements	$31 million	$40 million	$8 million	**$80 million**
100% of active transportation	$207 million	$634 million	$420 million	**$1.3 billion**
10% of DRCOG multimodal widenings	$44 million	$140 million	$53 million	**$240 million**
5% of CDOT multimodal widenings	$43 million	$90 million	$37 million	**$175 million**
10% of Transportation Demand Management Set-Aside	$1.7 million	$3.4 million	$3.4 million	**$8.5 million**
Total	**$327 million**	**$1.4 billion**	**$613 million**	**$2.3 billion**

Next, DRCOG staff evaluated how to represent the pools of funds in the Focus travel model. Staff leaned heavily on the methodologies used during a scenario planning exercise from early 2020, as well as methodologies used by CDOT in defining the greenhouse gas targets. DRCOG staff linked each funding category with the types of model factors that could be adjusted based on the intended use of the funds.

Figure 1 illustrates how the Regional Transportation Plan funding pools are associated with various adjustments in the model.

Figure 1: Model adjustments associated with funding pools



For funding pools that are associated with multiple types of model adjustments, staff divided the total funds evenly between model adjustment categories. The total funding available by model adjustment category, broken down by staging year, is detailed in Table 6.

Table 6: Total funding available by model category

Model adjustment	2021-2030 funds	2031-2040 funds	2041-2050 funds	Total funds
Pedestrian and bicycle attractiveness	$148 million	$433 million	$256 million	**$837 million**
Increased telework	$567,000	$1.1 million	$1.1 million	**$2.8 million**
Lower fares or reduced dwell times	$567,000	$1.1 million	$1.1 million	**$2.8 million**
Improved transit access	$163 million	$689 million	$305 million	**$1.2 billion**
Increased transit frequency and speed	$16 million	$257 million	$50 million	**$322 million**
Total	**$327 million**	**$1.4 billion**	**$613 million**	**$2.3 billion**

DRCOG staff then estimated the level of adjustment to each model component based on the funding available, scaled in proportion to the methodologies used in CDOT's cost/benefit document developed in relation to the state's greenhouse gas rulemaking.

Model adjustments

The model adjustments, reasoning and funding summaries that support the adjustments are documented in the following section. DRCOG staff will continue to conduct research and monitor travel trends to ensure the model adjustments reflect real world conditions in the future.

Increased telework

Multiple factors influence work location choice and work commutes. Previously, DRCOG modeled 20% of workers working at home on a given day. Based on current conditions, staff believe 20% is now an underestimate. An increase to 25% is warranted because of pandemic-prompted changes to work location in the region, along with increased efforts in travel demand management programs.

"Work at home" encompasses not just office workers working remotely, but also part-time and self-employed workers, small businesses, home offices, flexible and hybrid working schedules, and people who work alternative schedules such as three 12-hour shifts a week. It is also important to note that people who work from home may still take trips during the day, whether for personal or work-related reasons.

Following the pandemic, there has been an increase in businesses, schools, agencies or other communities moving to a four-day compressed workweek model. Before the pandemic, observed data demonstrated a significant increase in people working from home in the Denver region. Post-pandemic, DRCOG staff continue to observe elevated levels of remote working or working at home some days of the week.

Table 7: Model adjustments associated with increased telework

Adjustment	2030	2040	2050
Work-at-home rate for workers	25%	25%	25%

Pedestrian and bicycle attractiveness

Increase sidewalk density

One of many factors correlated with the attractiveness of active transportation modes is sidewalk density. Before running the travel model, DRCOG staff assigned each transportation analysis zone a sidewalk density value based on the quantity of sidewalks and shared-use paths within the zone, divided by the area. Sidewalk density is one factor that represents the ease and comfort of active transportation modes in specific geographic areas.

To reflect the funds dedicated to active transportation infrastructure in each staging period, staff incrementally increased the sidewalk density values for urban and suburban area types over the life of the plan.

The increased values do not represent an absolute increase in sidewalks, but rather an effective increase in density from select, strategic projects that focus on key gaps and missing links. Through planimetric data and data shared by local governments, staff can optimize the addition of new sidewalk mileage to create more complete, connected networks. The value increases over the staging period because these infrastructure investments are additive over the years.

Increase walking and bicycle operating speeds

When DRCOG staff assign walk or bike modes in the model, they assign an operational travel speed that reflects the average speed for the trip — including, for example, wait time at intersections. Walk speeds were previously set at 3 miles per hour and bike speeds at 8 miles per hour.

DRCOG staff increased walk and bicycle speeds incrementally in future staging years, as outlined in Table 8. The increase in walk and bike speeds represents the electrification of active modes through the adoption of e-bikes and e-scooters. Not only

does electrification increase the speed of active modes, but it may make the mode more attractive.

The speed increase also represents additional priority for active modes through legislation and infrastructure, such as:

- Right of way and priority signal treatments for cyclists.
- Legal permissions for traversing intersections.
- Improved sidewalk conditions.
- Completion of new key connections.
- Perception of faster travel time when a walking journey is comfortable and on a well-connected network.

Modify person-specific negative attractiveness factors for bike and pedestrian mode choice

In both real life and in the model, an individual's propensity to walk or bike is influenced by their age and gender. Based on travel survey data from 2010, DRCOG staff calibrated the model to make walking and bicycling less attractive for women and older adults to reflect the observed data.

However, enhancements to the region's active transportation system, observed cultural changes and electrification trends that provide additional mobility to older adults prompted DRCOG staff to remove the negative factors applied to individuals in the model based on gender and to adjust the age at which negative factors are applied to older adults. Staff believe that enhanced multimodal facilities will reduce some barriers to cycling for older adults and women.

Examples of enhancements that might affect the attractiveness of biking and walking include lighting on paths, safe crossings with appropriate time to cross, all new paths

having appropriate widths and added space at potential conflict points. DRCOG staff also know local governments are working to build bike facilities based on comfort for all ages and abilities and targeting key connections to make complete, high-comfort routes.

In addition, research demonstrates the perception of increased safety in numbers. For example, knowing other cyclists and walkers will be on a path can help some users feel safer. Similarly, knowing drivers are used to seeing cyclists can boost comfort and offer a sense of safety.

Table 8: Model adjustments associated with bicycle and pedestrian attractiveness

Adjustment	2030	2040	2050
Increase sidewalk density	8%	16%	25%
Increase walk operating speeds	4 miles per hour	5 miles per hour	5 miles per hour
Increase bicycle operating speeds	11 miles per hour	12 miles per hour	12 miles per hour

Transit

Reduce transit fares

In the travel model, the cost of a trip influences people's mode choice, as it does in real life. In the model, the cost of a transit fare is a single value that represents RTD's complex real-world pricing system, which includes EcoPasses, free and discounted fares, monthly passes, fare zones and more.

DRCOG staff reduced the transit cost value by 20% for all staging years. This does not suggest there will be a blanket 20% reduction in fares; rather, it reflects the perception of lower fares among users through programmatic investments and strategic partnerships, including:

- Transportation demand management efforts that will allow more people in the region to use transit for free or at a reduced cost through commuter benefits like EcoPass and other programs.
- Ongoing efforts to increase eligibility for discounted fares.
- RTD's simplified fare structure, which reduced fares for some trips and psychologically lowered the cost for users by reducing confusion.
- RTD's ongoing Zero Fare for Youth initiative, which provides rides at no cost for people ages 19 and under.

Reduce transit dwell time

In the travel model, staff assign a dwell time to transit buses based on the type of route. To reflect some of the ancillary benefits of enhanced transit investments, staff reduced the overall dwell time by 20%.

This change reflects investments that enhance the travel-time competitiveness of transit, primarily through streamlined payment and faster boardings. It also reflects

investment in transit signal priority equipment, which allows a bus to travel through an intersection before or after a stop or more quickly re-enter the flow of traffic.

Reduce headways

The frequency of each transit route is included in the model. The time between buses or trains at a particular stop is considered the headway. The 5% decrease in headway for all staging years reflects an increase in vehicle revenue miles across the region. Because these model adjustments represent programmatic investments, DRCOG staff cannot model specific route changes, which are adaptable based on the region's future needs.

Cap waiting time for longer headway routes

In the travel model, DRCOG staff assign travelers a wait time equal to half of the transit route's headway for that time period. For all routes, staff capped the total wait time at 15 minutes. Previously, the model assumed some people would arrive 30 minutes before their bus arrived. This significantly increased the travel time for some transit trips and did not reflect how most people use transit for long-headway routes.

The adjustment reflects how smartphones and real-time transit service information, such as bus tracking, have changed how people plan transit trips to reduce wait time.

Reduce transit walk access time

The model includes information on how people get to transit. For trips where people access transit though active transportation modes, staff removed the access time penalties.

The adjustment reflects the significant investment being made in active transportation access across the region and DRCOG's prioritization of pedestrian projects near transit. More direct walking routes and pedestrian infrastructure improvements increase the ease of accessing transit.

Increase speed on transit walk links

The pedestrian links that have a distinct connection to transit have a defined user travel speed in the model. DRCOG staff doubled the speed for these short links to reflect investments in active transportation and the pedestrian environment near transit, including elements like sidewalks, lighting and more.

More comfortable and direct infrastructure, such as a pedestrian bridge over a high-volume roadway, allows people to travel faster and has a psychological impact on how people experience the length of a journey.

Table 9: Model adjustments associated with transit

Adjustment	2030	2040	2050
Reduce fares	20%	20%	20%
Reduce dwell time	20%	20%	20%
Reduce headways	5%	5%	5%
Cap waiting time	15 minutes	15 minutes	15 minutes
Reduce transit walk access time	Remove penalties	Remove penalties	Remove penalties
Increase speed on transit walk links	100%	100%	100%

Table 10: Baseline and greenhouse gas action socioeconomic modeling outputs for the MPO area

Category	2030 baseline	2030 action	2040 baseline	2040 action	2050 baseline	2050 action
Population	3,537,409	3,542,018	3,871,672	3,871,504	4,081,250	4,088,233
Households	1,470,918	1,472,591	1,624,243	1,624,600	1,734,100	1,736,949
Employment	2,397,503	2,397,298	2,604,475	2,604,571	2,741,399	2,741,541

Table 11: Baseline and greenhouse gas action vehicle and transit modeling outputs for the MPO area on a typical weekday

Category	2030 baseline	2030 action	2040 baseline	2040 action	2050 baseline	2050 action
Vehicle miles traveled	92,279,241	86,221,965	102,395,800	94,295,419	109,958,621	100,669,791
Vehicle miles traveled per capita	26.09	24.34	26.45	24.36	26.94	24.62
Person-miles traveled	124,576,976	116,399,653	138,234,330	127,298,816	148,444,138	135,904,218
Person-miles traveled per capita	35.22	32.86	35.70	32.88	36.37	33.24

Table 11: Baseline and greenhouse gas action vehicle and transit modeling outputs for the MPO area on a typical weekday (continued)

Category	2030 baseline	2030 action	2040 baseline	2040 action	2050 baseline	2050 action
Average vehicle speed (miles per hour)	35.75	36.99	35.15	36.87	34.58	36.41
Average vehicle trip length (miles)	9.05	9.22	9.16	9.51	9.28	9.62
Vehicle hours traveled	2,581,353	2,331,161	2,913,094	2,557,308	3,179,876	2,765,121
Vehicle hours delay	451,413	359,579	551,115	411,206	649,680	477,297
Transit boardings	297,625	288,626	348,384	329,140	384,810	362,499

Table 12: Baseline and greenhouse gas action trip mode share modeling outputs for the MPO area

Mode	2030 baseline	2030 action	2040 baseline	2040 action	2050 baseline	2050 action
Single-occupancy vehicle	8,426,320	7,694,384	9,286,980	8,231,735	9,883,067	8,726,948
Shared ride	5,344,643	4,926,108	5,811,942	5,161,046	6,107,956	5,403,999
School bus	203,702	176,602	214,069	175,674	225,167	182,593
Bicycle	421,481	556,530	456,453	556,149	472,876	590,877
Walking	1,621,483	2,362,794	1,757,123	3,091,822	1,826,605	3,303,388
Transit	201,032	218,446	233,974	258,405	258,264	283,851
Total daily trips	**16,218,661**	**15,934,864**	**17,760,541**	**17,474,831**	**18,773,935**	**18,491,656**

Table 13: Baseline and greenhouse gas action lane miles modeling outputs for the MPO area

Roadway type	2030 baseline	2030 action	2040 baseline	2040 action	2050 baseline	2050 action
Freeway (CDOT)	1,490	1,490	1,490	1,490	1,490	1,490
Tollway (E-470 and Northwest Parkway)	354	289	375	400	375	400
Freeway (express lanes)	164	161	251	229	262	229
Expressway	485	481	490	487	490	489
Principal arterial	4,424	4,397	4,701	4,695	4,795	4,846
Minor arterial	2,678	2,683	2,790	2,793	2,813	2,821
Collector or local road	4,782	4,784	4,814	4,817	4,818	4,820
Ramp	319	318	319	320	319	321
Ramp (freeway-to-freeway)	78	82	82	82	82	82
Centroid connectors	3,585	3,587	3,585	3,586	3,585	3,586
Total lane miles	**18,359**	**18,272**	**18,897**	**18,899**	**19,029**	**19,029**

Table 14: Baseline and greenhouse gas action vehicle miles traveled modeling outputs for the MPO area

Roadway type	2030 baseline	2030 action	2040 baseline	2040 action	2050 baseline	2050 action
Freeway (CDOT)	30,987,411	29,896,534	32,860,693	31,512,976	34,551,862	32,956,496
Tollway (E-470 and Northwest Parkway)	2,660,936	2,397,672	3,288,430	2,989,509	3,898,304	3,506,748
Freeway (express lanes)	1,114,973	942,269	2,181,402	1,938,791	2,831,543	2,349,686
Expressway	5,371,123	5,081,870	5,863,365	5,439,366	6,163,064	5,710,983
Principal arterial	28,856,545	26,770,785	32,081,685	29,318,632	34,309,716	31,317,192
Minor arterial	9,085,249	8,182,868	10,155,129	8,951,584	10,988,766	9,639,846
Collector or local road	5,394,717	4,787,266	6,213,042	5,318,558	6,811,830	5,814,411
Ramp	2,353,412	2,171,906	2,575,039	2,340,932	2,708,836	2,464,666
Ramp (freeway-to-freeway)	920,253	889,785	978,366	918,874	1,033,574	963,527
Centroid connectors	5,534,621	5,101,009	6,198,649	5,566,196	6,661,126	5,946,238
Total lane miles	**92,279,240**	**86,221,964**	**102,395,800**	**94,295,418**	**109,958,621**	**100,669,793**

Additional program investments

Investments in DRCOG's Regional Transportation Plan have always included projects and programs. The previous section highlights ways DRCOG staff have attempted to capture program and multimodal investments in the travel model. However, there are multiple instances in which a project in the Regional Transportation Plan cannot be accurately reflected in the travel model. The following section highlights investments in the plan that are not considered mitigation measures, as they are part of the plan's investment mix and provide greenhouse gas emission reduction benefits, but use methods described in Policy Directive 1610 to calculate the anticipated emission reduction benefits. DRCOG staff carried forward the strategy originally developed with CDOT that reallocated $900 million in the Regional Transportation Plan's fiscally constrained financial plan toward additional program investments to help meet the greenhouse gas reduction levels.

Signal timing

Since 1989, DRCOG has worked with CDOT and local governments to coordinate traffic signals across jurisdictional boundaries on major roadways in the region. DRCOG has a proven record and the resources to continue to reduce traffic congestion and improve air quality through signal timing coordination support.

The 2026 update to the Regional Transportation Plan continues investments in the Regional Traffic Operations Program above the baseline to retime and optimize an additional 50 signals per year. Survey results show agencies retimed and optimized 300 signals in 2025. DRCOG staff estimate that the same number of signal retimings will be completed in 2026. The Regional Traffic Operations Program works above that baseline to retime and optimize an additional 50 signals on average per year. Additionally, a growing number of signals are operating in adaptive and responsive mode, meaning the intersections are continually optimizing operations. Currently, there are 130 intersections in the region contributing to overall signal optimization.

DRCOG staff made calculations for greenhouse gas emission reductions associated with this effort using the method described in Policy Directive 1610. Greenhouse gas emission reductions are calculated per 10,000 average annual daily traffic per signal optimized within five years prior to the evaluation year. The emission reduction value declines over time due to the increase of electric vehicles in the fleet, and the calculations include an induced demand factor. The investment assumes 250 signals (50 per year) optimized during the five years preceding the analysis year and with an average annual daily vehicle volume per signal of 45,000.

Table 15: Greenhouse gas reduction calculation for signal timing

Traffic operations	2030 signals	2030 reduction (tons)	2040 signals	2040 reduction (tons)
Retime/optimize arterial signals	250	56,250	250	37,125

Bicycle and pedestrian facilities and Complete Streets retrofits

DRCOG staff analyzed the agency's Active Transportation Plan, most recently updated in 2026, in terms of the plan's envisioned regional network buildout, including both the regional active transportation network and proposed on-street facilities. DRCOG staff also reviewed the agency's Complete Streets Toolkit and deployed its Complete Streets geographic information system prioritization tool developed under guidance from the federal Bipartisan Infrastructure Law to estimate the potential for Complete Streets retrofits throughout the region for each analysis year. Using Policy Directive 1610's methodology, staff multiplied the mileage associated with each investment by a factor to estimate the total points for each category.

Table 16: Greenhouse gas reduction calculation for bicycle and pedestrian facilities and Complete Streets retrofits

Area	Project type	2030 miles	2030 reduction (tons)	2040 total miles	2040 new miles	2040 reduction (tons)
Urban/ core urban	Bike lane/facility	65	1,870	140	75	2,420
	Sidewalk/pedestrian facility	95	1,528	170	75	1,423
	Shared-use path	15	998	35	20	1,440
	"Complete Streets" reconstruction	61	4,866	89	28	4,118
Suburban	Bike lane/facility	100	600	170	70	540
	Sidewalk/pedestrian facility	150	188	250	100	313
	Shared-use path	40	440	75	35	252
	"Complete Streets" reconstruction	90	2,400	154	64	1,588

Table 16: Greenhouse gas reduction calculation for bicycle and pedestrian facilities and Complete Streets retrofits (continued)

Area	Project type	2030 miles	2030 reduction (tons)	2040 total miles	2040 new miles	2040 reduction (tons)
Rural	Bike lane/facility	10	10	25	15	30
	Sidewalk/pedestrian facility	10	13	23	13	29
	Shared-use path	10	30	20	10	30
Total		**646**	**12,941**	**1,151**	**505**	**12,454**

Table 17: Total emission reductions from off-model calculations, million metric tons per year

Emission reductions origin	2030	2040	2050
Greenhouse gas emission reductions from signal timing	0.06	0.04	Not applicable
Greenhouse gas emission reductions from bicycle and pedestrian facilities and Complete Streets retrofits	0.01	0.01	Not applicable
Greenhouse gas reduction from off-model calculations	**0.07**	**0.05**	**Not applicable**

Progress made since 2022

Regional Bus Rapid Transit Partnership

In 2023, DRCOG and partner agencies formed the Regional Bus Rapid Transit Partnership to cooperatively plan, develop and implement multiple bus rapid transit corridors within the metro Denver area. The regional partnership is a unique voluntary collaboration of multiple agencies working together to implement various corridors at various planning and project development stages. The regional partnership's guiding principles are:

- Developing and implementing the regional bus rapid transit network is more than a single agency can lead or undertake alone.
- Different agencies may lead various individual bus rapid transit corridor planning and project development efforts, though all agencies will have the opportunity to participate.
- Regional bus rapid transit network implementation will also require a multiagency funding partnership of federal, state, local and other funding sources.

There are 12 designated bus rapid transit corridors in the updated 2050 Regional Transportation Plan. Two corridors are under construction (East Colfax and Colorado Highway 119), and two more (Federal Boulevard and Colorado Boulevard) are in development under the federal National Environmental Policy Act being led by the Colorado Department of Transportation. Additionally, in 2024, DRCOG completed a corridor vision study for the Alameda bus rapid transit corridor. DRCOG is completing a federally compliant alternatives analysis study for the East Colfax Extension bus rapid transit project in partnership with the City of Aurora and kicking off a study for the Speer Boulevard, Leetsdale Drive and Parker Road corridor. Finally, DRCOG won an almost

$1 million Innovative Finance and Asset Concession grant from the Unites States Department of Transportation to develop strategies to accelerate the implementation of the “next five” bus rapid transit corridors in the Regional Transportation Plan. The effort began in early 2026 and is anticipated for completion by mid-2027.

Complete Streets standards

DRCOG adopted a Regional Complete Streets Toolkit in 2021 and subsequently developed an interactive Complete Streets webmap and geographic information system-based location prioritization tool. In 2024, DRCOG staff began informally inventorying local governments’ efforts to develop, adopt and apply local Complete Streets standards.

- In late 2023, the City of Lafayette adopted its Multimodal Transportation Plan, which included several elements of DRCOG’s Regional Complete Streets Toolkit relating to street typology and design.
- In its informal inventory, DRCOG staff found that several jurisdictions have adopted Complete Streets plans or policies in the last few years, and over time have conducted Complete Streets-related planning or project activities.
- The City of Englewood has multiple Complete Streets projects underway.
- The City of Boulder and City of Edgewater have plans that call out the need to develop a street design guide or Complete Streets approach.
- The City of Littleton has a Safer Streets program, though it is not specifically a Complete Streets program.

- The City of Lakewood in 2024 adopted Lakewood Moves, which includes specific guidance that “Lakewood will continue to work towards the full implementation of a Complete Streets system.”
- Adams County is in the process of updating its functional classifications and standard roadway cross sections.

DRCOG learned that a “state of the practice” report would be helpful to local government staff and have begun researching what this report should include and plan to complete it in early 2027. Accordingly, DRCOG staff will continue to work with local governments over time to track not just the status of adopting Complete Streets standards, but their application to multimodal project design and implementation.

Local government outreach

DRCOG staff maintain relationships with local government planners to understand, anticipate and coordinate local and regional growth priorities. Staff routinely engage with local government staff as part of the agency’s transportation planning, program and project-based work. Highlights of the most recent engagement include:

- Advanced six projects through procurement and contracting for the Livable Centers Small-Area Planning Set-Aside, which focused on increasing housing, promoting mixed-use transit-oriented development and implementing Complete Streets.
- Initiated several Innovative Mobility Set-Aside projects with local government partners related to the mitigation measures, including two shared micromobility-related studies, one focused on mobility hubs.
- Engaged local governments and stakeholders in developing the Regional Housing Strategy (Housing-Transportation Coordination Plan) through focus groups, interviews and participation in a steering committee and advisory group. The

strategy promotes residential density, particularly in infill and transit-served areas. By prioritizing infill, co-locating housing and jobs, and improving location efficiency, the strategy promotes compact, walkable communities that reduce vehicle miles traveled, lower emissions, support transit-accessible housing and encourage efficient infrastructure use.

- Completed, initiated and continued several studies under the agency's new Corridor Planning Program and Community-Based Planning Program, including the Colfax BRT Next project in Aurora, which began in October 2024.

Cumulatively, DRCOG staff have undertaken multiple initiatives to implement the multimodal transportation investment priorities in the Regional Transportation Plan to assist in complying with the intent and the reduction targets of the transportation greenhouse gas rule.

Conclusion

DRCOG meets or exceeds the required greenhouse gas reduction levels in each staging year, demonstrating compliance with the Greenhouse Gas Transportation Planning Standard.

Emissions test results

Table 18 on the following page details the modeling results for the 2026 update to the Regional Transportation Plan with the greenhouse gas emission reductions from the baseline. Only in 2050 do the modeling results meet the greenhouse gas reduction levels on their own. Because the modeling of the 2026 update to the Regional Transportation Plan did not achieve the rule's reduction levels, DRCOG incorporated additional transportation investments evaluated using off-model calculations to achieve further emission reductions.

Table 18: Greenhouse gas emission results, million metric tons per year

Greenhouse gas reduction metric	2030	2040	2050
Regional Transportation Plan 2026 update modeling (Demographic, land use and network updates; program investments)	0.76	0.60	0.44
Off-model calculations (Active transportation, Complete Streets retrofits and signal timing)	0.07	0.05	Not applicable
Total greenhouse gas reductions	0.83	0.65	0.44
Reduction level requirement from Table 1 of the greenhouse gas rule (2 CCR 601-22, Section 8.02.6)	0.82	0.63	0.37
Reduction level achieved?	**Yes**	**Yes**	**Yes**

To review changes in regionwide travel measures between 2023 and 2050 using forecasts from DRCOG's Focus transportation model, refer to Appendix G.