

Denver's 2022 Ebike Incentive Program

Results and Recommendations



Contributors

- City and County of Denver
- PeopleForBikes
- Bicycle Colorado
- Ride Report
- Rocky Mountain Institute

Summary

In spring of 2022, the City and County of Denver launched a widely celebrated ebike incentive program. In just nine months, 4,734 Denver residents became new ebike owners. As cities around the world consider programs of their own, and look to model Denver's success, we offer context on the state of the ebike industry, how Denver funded and implemented their program, results, and recommendations.

At a Glance:

- Those surveyed rode their ebikes an average of 26 miles per week, replacing 3.4 round trip vehicle trips.
- 71% of respondents reported using their gas vehicles less often after purchasing their ebike.
- 29% of respondents indicated they were new bike riders.
- 67% of the funding went to income qualified residents.
- Income qualified residents were using their ebikes nearly 50% more than standard voucher recipients.
- 65% of redeemers using Ride App were riding their ebike at least once daily, and 90% were riding weekly.
- The average trip length of Ride App users was 3.3 miles, with 84% of trips less than 5 miles, and 65% of trips less than 3 miles.
- During this time period, shared bike and scooter trips in Denver reached the highest ridership since the launch of shared micromobility, demonstrating the complementary nature of the two city-supported programs.
- On a per-mile basis, ebikes cost 40% less to operate than EVs and nearly 75% less than ICEVs.
- RMI found that, in terms of operational emissions, ebikes emit 3% of the CO₂e emissions as EVs and 1% of the CO₂e as ICE vehicles.
- Denver's ebike incentive program saved 0.94 lb CO₂_e per dollar spent, for a total of 2,040 MT CO₂_e avoided emissions per year.

About The Contributors



Bicycle Colorado

Mission: lead a passionate and growing movement that champions the interests of everyone who rides or wants to ride a bicycle in the state of Colorado.



City and County Of Denver

Mission: oversee programs that mitigate the causes of climate change, adapt to its ongoing impacts, build resiliency, and improve equitable outcomes.



peopleforbikes

PeopleForBikes

Mission: get more people riding bikes more often. To make bike riding better for everyone.



Rocky Mountain Institute

Mission: transform the global energy system to secure a clean, prosperous, zero-carbon future for all.



Ride Report

Mission: accelerate the adoption of low carbon transportation by designing the data platform for the multimodal future.

Why Cities Want Electric Bicycle Incentives

By Ashley Seaward and Noa Banayan, PeopleForBikes

Electric bicycles reduce barriers to bicycling by helping people ride more often and for longer distances. They offer a more appropriate replacement for short car trips than non-electric bicycle trips. Electric bicycle incentive programs create low-cost, accessible, and efficient solutions for achieving our nation's climate, sustainability, health, and transportation goals. Another benefit? They're an absolute joy to ride.

In the United States, the transportation sector accounts for nearly a third of total carbon emissions.¹ Passenger vehicle trips are credited for nearly two thirds of overall transportation-based carbon emissions.² Federal surveys also show that the majority of passenger vehicle trips in the U.S. account for less than three miles, a distance that can be easily replaced by bicycles and electric bicycles with connected and protected infrastructure in place.³

Electric bicycle incentive programs target this specific segment of carbon emissions by making this emerging technology more available to Americans seeking affordable mobility solutions that reduce their emissions and better connect them with their communities.

Top Considerations For Designing Your Program

PeopleForBikes serves as a trade association for the U.S. bicycle industry and an advocacy organization for bike riding, representing more than 300 bicycle brands and 1.6 million people across the nation. PeopleForBikes advocates for electric bicycle incentive programs and closely tracks the implementation of new and continuing programs at the Federal, state, and local level.

¹ United States Environmental Protection Agency, (2020), [Sources of Greenhouse Gas Emissions](#)

² United States Environmental Protection Agency, (2020), [Sources of Greenhouse Gas Emissions](#)

³ United States Office of Energy Efficiency & Renewable Energy, (2021) [More than Half of all Daily Trips Were Less than Three Miles in 2021](#)

[Our electric bicycle incentive guide](#) details the top five components a program administrator should consider when designing a program, including:

- make the program voucher-based at point-of-sale
- include in-store retailers as well as online retailers
- prioritize dedicated outreach and incentives for low-income residents
- include all forms of electric bicycles within the three-class system
- partner with local nonprofits and bike retailers as you develop your program

Electric bicycle incentive programs like the City and County of Denver's met most of these criteria, which helped ensure its popularity and success in reaching residents and offering an affordable and accessible mobility solution to replace many of their short car trips. Denver's nationally recognized model serves as an inspiration for cities and states across the nation as they gather information and resources to design their own electric bicycle incentive programs.

Additionally, the AAA estimates the annual cost of car ownership in the U.S. reached more than \$10k per year in 2022.⁴ Electric bicycles range from \$1000-\$8000 in upfront purchasing costs, with relatively low costs of ownership and maintenance compared to a vehicle or even an electric vehicle. An electric bicycle incentive program like Denver's designed to support low-income individuals simultaneously addresses climate and equity goals by offering a low-cost and efficient transportation solution.

To find the most up-to-date information on electric bicycle incentive programs in North America, please visit Portland State University's Transportation Research and Education Center (TREC) [Electric Bicycle Incentive Program Tracker](#). In 2022 alone, six states either proposed or renewed funding for a statewide electric bicycle incentive program. These states include Colorado, Connecticut, Hawaii, Massachusetts, Rhode Island, and Vermont. This public investment in affordable, reliable, low-carbon transportation is unprecedented and expected to grow exponentially in 2023.

⁴ AAA, Brittany Moye, (2022), [Annual Cost of New Car Ownership Crosses \\$10K Mark](#)

How Denver Launched The Leading Ebike Program

By Piep van Heuven, Bicycle Colorado and Kelly Blynn, formerly of NRDC

Denver's program is the result of eager and ongoing collaboration between agency and advocacy staff across the state of Colorado. In 2019, Denver joined the [American Cities Climate Challenge](#), which provided the city with technical assistance support from the [Natural Resources Defence Council](#) (NRDC) and other partners to accelerate its climate change commitments.

Building upon insights from the American Cities Climate Challenge activities, the Mayor's Office formed a Denver Mayor's Climate Action Task Force that was charged with producing recommendations and a Final Report on actions the City could take to address climate change. Transportation recommendations included efforts to improve transit, reduce vehicle trips, reallocate public space, increase clean vehicle options, change travel behavior, and embrace micromobility options.

Bicycle-specific recommendations included expanding bike share options, prioritizing the buildout of the bike lane network, and establishing ebike and ecargo bike programs with an emphasis on accessibility for low-income residents. A primary recommendation of the Task Force was the creation of a dedicated sales tax effort to fund purchase incentive programs.

A Funding Mechanism Is Born

On November 3, 2020, Denver voters approved a .25 sales tax with 62% support to create the [Climate Protection Fund](#) and ensure dedicated funding for climate mitigation projects that improve climate equity outcomes across the county. The [Denver Office of Climate Action, Sustainability, and Resiliency](#) (CASR) was created to oversee, implement, and evaluate the work of the Climate Protection Fund.

Denver used the opportunity of support from the American Cities Climate Challenge, and the passage of the Climate Protection Fund, to build a network to research and build support for ebike incentives. The broader network was made up

of staff from NRDC, the [Colorado Energy Office](#) (CEO), [Bicycle Colorado](#), [Northeast Transportation Connections](#) (NETC), and the Colorado-based [National Renewable Energy Laboratory](#) (NREL). Collectively, they evaluated similar programs and findings, interviewed ebike program administrators from around the country, and talked to local shops around the region to understand the potential benefits and challenges of a city-wide ebike incentive..

Proof Is In The Pilot

Also in 2020, the Colorado Energy Office (CEO), in partnership with Bicycle Colorado, engaged Northeast Transportation Connections (NETC), and the Colorado-based National Renewable Energy Laboratory (NREL) to participate in planning and launching the [Can Do Colorado EBike Mini Pilot](#), a pilot program to support essential workers during the pandemic with ebikes.

The Fall 2020 Mini-Pilot, which Bicycle Colorado was tasked with creating and overseeing, provided 13 Denver area residents with an eBike and equipment needed to ensure safe, year-round riding at no cost. In addition to eBikes, the participants received helmets, locks, panniers, tubes, lights, and even bar mitts to support winter riding. Participants provided data and feedback about their bike usage through NREL's app, CanBikeCO, which captured trip data, including distance, mode, and trip purpose.

The findings by NREL demonstrated program success, in that the majority of participants used the ebikes for trips to work and as their primary mode of transportation. A full record of the planning and results of the pilot program were compiled by Bicycle Colorado and shared widely in a comprehensive [Final Report](#).

Denver used the opportunity of support from the American Cities Climate Challenge, the work and recommendations of the Denver Mayor's Climate Action Task Force and its report, the subsequent passage of the Climate Protection Fund, and the success of the Colorado Energy Office's pilot program to build a network to research and build support for ebike incentives.

Collectively, agency staff and non-profit partners evaluated similar programs and findings, interviewed ebike program administrators from around the country, and talked to local shops around the region to understand the potential benefits and challenges of a city-wide ebike incentives. Using learnings from the Pilot and interviews with ebike program administrators from around the country and local bike shops, the network began sketching out recommendations for a citywide ebike rebate program.

Key considerations that emerged included: offer a point of sale rebate, set incentives high enough to enable low and moderate income residents to participate, and weigh the pros and cons of only allowing participation by local bike shops versus allowing some online retailers to participate. Using these and other learnings, the Denver Office of Climate Action, Sustainability and Resiliency launched their groundbreaking ebike rebate program on Earth Day, April 22, 2022.

How Denver Funded, Structured, And Administered Their Program

By Mike Salisbury of Denver's Office of Climate Action, Sustainability, and Resiliency (CASR)

CASR is made up of approximately 40 staff who oversee programs that mitigate the causes of climate change, adapt to its ongoing impacts, build resiliency and improve equitable outcomes in our communities.

In early 2020, CASR worked with the city's Climate Action Task Force to identify priority projects, and through the 2020 Can Do Colorado pilot, saw the potential in ebikes to effectively and affordably replace vehicle travel across the region.

How We Structured The Program

CASR originally allocated \$250,000 from the Climate Protection Fund for their 2022 ebike voucher program. It launched on April 22nd with 9 participating bike shops, and a contractor, APTIM, to process applications and vouchers.

The program offered \$400 for any Denver resident, and up to \$1,200 for income qualified residents, with an additional \$500 for anyone purchasing an e-cargo bike.

To be eligible for the income qualified incentive, residents needed to show that they were either enrolled in an existing program meant to support lower income residents offered by the state, or Xcel Energy, or that they met household income thresholds such as being below 80% of Area Median Income.

To apply, residents filled out a simple online form providing their name, address and contact information and uploaded proof of residency and income qualification (if applicable) which the contractor then reviewed. Within 1-3 weeks of submission, if applicants were deemed eligible, they were emailed a 10-digit voucher code, which the resident then shared with the cashier when purchasing their bike at a participating shop.

Denver offers a point of sale rebate, so that the bike shop can easily deduct the rebate amount from the price of the new ebike. The bike shop then submits a form to Denver's rebate administrator for reimbursement. Denver believes that point of sale rebates are easier for people who may not have the capital to make the purchase and then wait for a tax credit or mail-in rebate. Pre-approval allows the opportunity to tier the rebate based on income, without requiring bike shops to verify residency or income qualification at the point of sale.

Eligible bike shops were any bricks and mortar stores located within five miles of the City of Denver that sold qualifying ebikes. This five-mile buffer provided more convenient access to shops for many Denver residents not well served by bike shops located in the City. Bike shops also were required to offer on site service and repair to ensure that voucher redeemers had convenient options if there was an issue with their ebike post purchase. Bike shops that provide on-site follow-up service and repair are thought of as a trusted subject matter expert resource for Denverites and are committed to the ongoing upkeep of the ebike they sold. By the end of 2022, more than 30 bike shops were participating in the program.

The program's popularity became its biggest pain-point with demand for the vouchers far exceeding the available funding. CASR allocated a set budget for rebates and set up monthly application windows. Over email, CASR communicated with residents about upcoming application dates. Denver residents flooded the application site, like Taylor Swift fans flooding Ticketmaster. Residents usually had only a narrow window of time to apply before the monthly application allotment was filled.

Recommendations To Anyone Building a Program

After nine months, the City had spent \$4.7 million to provide vouchers to 4,734 Denver residents. 49% of those vouchers and 67% of the funding went to income qualified residents, and almost 45% of all bikes were cargo bikes. CASR's top recommendations are:

- Budget accordingly
- Keep the resident application process simple and easy
- If e-cargo bikes receive a different level of incentive try to make the definition of e-cargo bike as objective as possible
- Make the incentive applicable at the time of purchase
- Build relationships and work with local bike shops
- Lead early and genuine outreach in lower income neighborhoods
- Make a plan for how to collect data from individuals once they have purchased the ebike
- Think holistically about inducing demand for biking in your region by prioritizing investment in safe infrastructure

Findings From Our Online Survey

At the end of 2022, CASR surveyed ebike voucher redeemers to better understand how they're using their ebikes and to quantify the program's impact. Surveyed redeemers are riding their ebikes an average of 26 miles and replacing 3.4 round trip vehicle trips per week. Across all voucher redeemers, CASR estimated that the new ebikes were replacing 100,000 vehicle miles each week. Income qualified residents are using their ebikes nearly 50% more than standard voucher recipients, 32 miles per week compared to 22 miles per week. 71% of respondents reported using their gas vehicles less often after purchasing their ebike and 29% of respondents indicated they were new bike riders.

Ridership Data And Insights From Ride App

By Brian Ellin, Michael Schwartz, and Nelle Pierson of Ride Report

For the last several years, Ride Report has worked closely with Denver and the surrounding region, through our partnership with the [Denver Regional Council Of Governments](#), to accelerate the adoption of shared scooter and ebike programs. These programs are generally referred to as shared micromobility. To date, the Denver region has over logged over [12.2 million trips on 3,000+ shared vehicles](#) managed by Bird, B-cycle, Lime, and Lyft. Based on utilization, [Denver is consistently one of the top US cities for shared micromobility](#).

When CASR announced its ambitious ebike rebate program, we knew immediately data would play an important role in determining its success, potential expansion, and replicability. As the global leader in shared micromobility data, Ride Report also understood the unique opportunity to understand travel behavior of new ebike riders and were curious to compare those patterns with shared micromobility riders.

Our first step was to meet with the CASR team to understand how they planned to measure the success of the program. The top question was obvious: will rebate recipients actually ride their new ebikes, or will they sit dormant in the garage collecting dust? Additionally, questions about how the bikes are used emerged: when are the bikes ridden and for what purpose (e.g. commuting, exercise, utility, etc)? Longer term: are ebike trips replacing personal car trips, and how are these trips reducing carbon emissions?

With that in mind, Ride Report created Ride App – a custom iOS app built for automatic ebike ride detection and logging. Denver riders installed the app, optionally indicated they were part of the rebate program, and simply went for bike rides. The app automatically detected and logged their ebike rides and provided them with trip summaries, weekly and monthly ride stats, and milestone rewards for ride streaks. It's super easy and fun to use! To spread the word, Ride Report partnered with the [Denver Bicycle Lobby](#), and promoted the app in local bike shops offering a \$30 gift card to those shops. This helped build interest, trust, and adoption among rebate recipients.

Ride App: The Big Picture

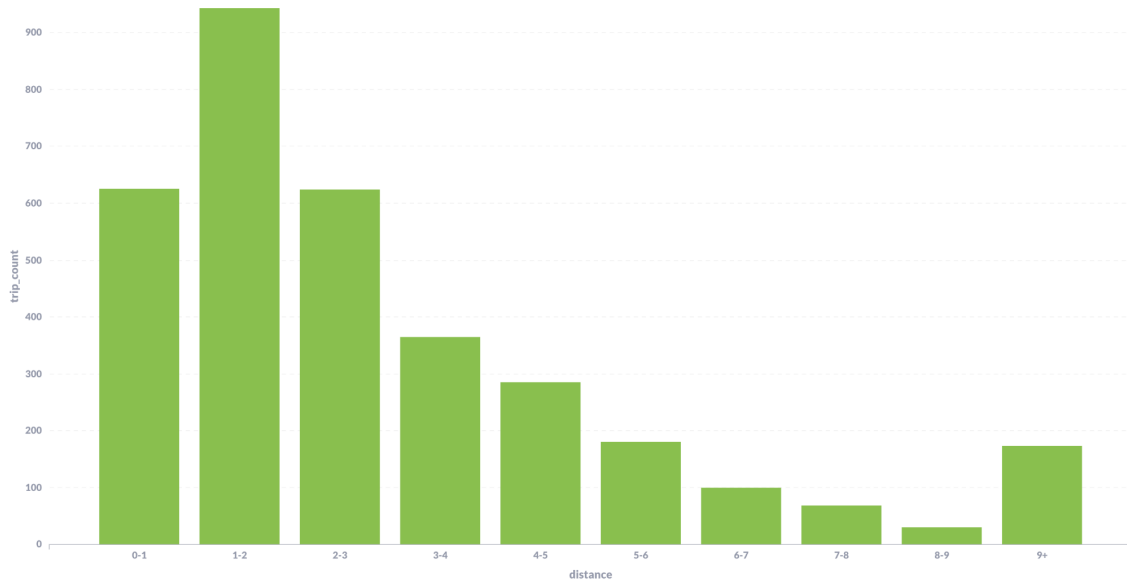
- The Denver Ride App pilot launched on June 1st and ran for 3 months
- Our sample size consisted of 70 riders across 12 of the 19 participating local bike shops
- Collectively, these riders logged over 3,500 ebike rides and over 15,000 miles during the pilot period

We recognize Ride App users represented a sample of the broader rebate recipients. These riders also represent iOS users only (an Android version of the Ride App wasn't available for the pilot), and results may be skewed towards behavior of iPhone owners and their demographics.

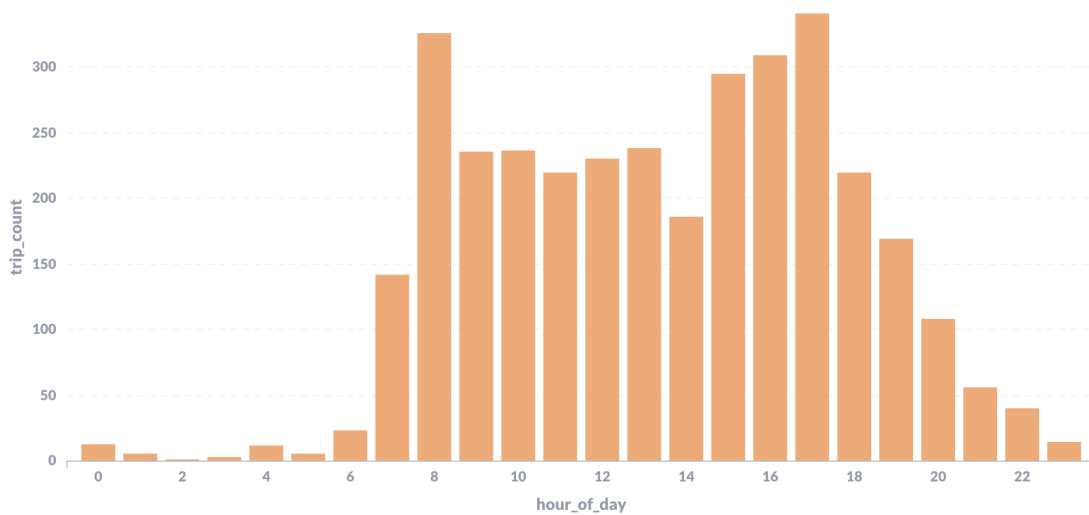
Additionally, what we learned during the pilot period should be considered early indicators of ebike usage, and don't necessarily mean observed behaviors will sustain over the long run or throughout seasonal weather trends. Longer term studies and rider surveys are recommended to understand sustained behavior change. You can [watch our webinar for a full discussion of our findings](#).

Summary Of Ride App Findings

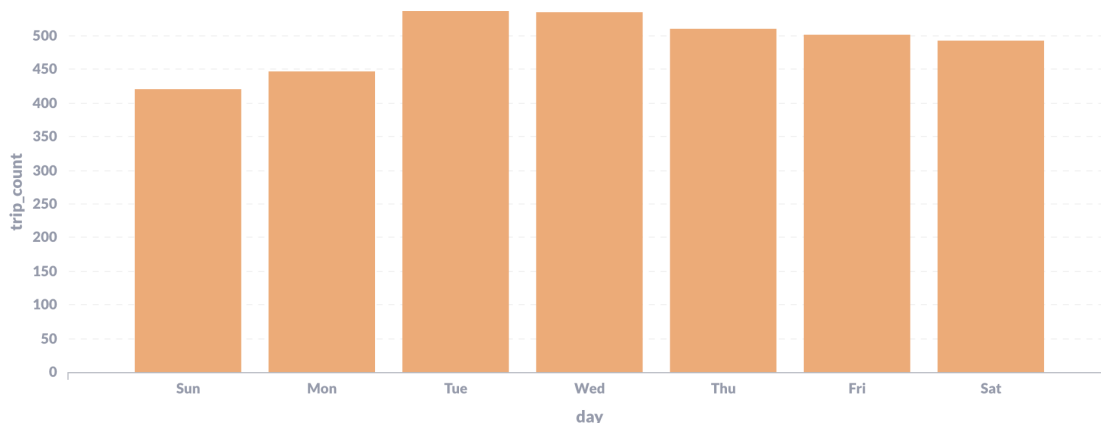
- Perhaps the most interesting finding from the pilot is around that of ebike utilization. We found that of recipients with the Ride App installed, **65% were riding their ebike at least once daily**, and that **90% were riding weekly**. This gets to the heart of CASR's key question: are people actually going to use their new ebikes? Our findings indicate that the overwhelming majority are riding them, and on a very regular basis.
- There was an **average trip length of 3.3 miles**, among rebate recipients, with 65% of trips less than 3 miles and 84% of trips less than 5 miles. The distribution of trip length indicates a wide range of usage, with 5% of trips being greater than 9 miles. Notably, trips from Denver's shared ebike program during the same time period averaged a distance of 1.6 miles, indicating that owned ebikes are solving for a different set of use cases than shared ebikes and scooters.



- The hours that ebike trips occurred begin to paint a meaningful picture of usage, with clear usage spikes around 9–5pm commute hours, between 8–9am and in the later afternoon around 6–7pm. Shared mobility usage tends to peak in the evening, with no clear pattern around commute time hours.



- Also of note are the days of the week when trips occurred most, and the observation that trips are relatively evenly distributed across days. In shared ebike usage, trips clearly peak the highest around the weekend (for non-work related purposes), while weekday usage is less pronounced. In contrast, Denver ebike rebate recipients are riding throughout the week:



How Do Trips Compare To Shared Bike And Scooter Trips?

Ride Report works with agency staff around the world to manage shared bike and scooter programs. City staff use our compliance dashboard to help oversee and advance their programs. Because we ingest and visualize granular, first-of-its-kind data from Denver’s program with Lyft and Lime, we can offer another perspective. Here we start to see the ways in which ebike incentives are a complimentary transportation policy to shared micromobility programs.

Denver has recorded more than 12M shared e-scooter and ebike trips since its first pilot in May 2021. From July through September 2022, during the ebike subsidy program, the program averaged more than 2,500 trips per day on shared ebikes with a maximum of 5,000 per day. This represents the highest ridership since the launch of shared ebikes, indicating that the rebates are a complement to the shared program and vice versa. One can imagine a Denver resident being more invested in ebike ownership after giving a shared ebike a try. Likewise, someone who regularly rides their personal ebike purchased with a subsidy is much more likely to use a shared ebike for short, spontaneous trips when their bike’s at home.

Shared ebikes are commonly used in a manner similar to public transit, taxis, Transportation Network Companies such as Uber and Lyft, and walking. They are often spontaneous in nature. Shared micromobility is a popular option for people who need to get somewhere quickly and they don’t have their vehicle (car or bike),

or don't want to worry about parking or theft, Maybe they want to go out for a fun night and get a taxi home. And maybe they just find it to be faster/easier/more fun to travel by ebike or scooter!

In Denver, shared micromobility trips peak between 3–6pm, with highest ridership Saturday evenings. Note that, compared to the trips taken with subsidized owned ebikes, there is not a large percentage of trips taken during weekday mornings, indicating that shared trips are less likely to be used to ride to work for jobs with 9–5 weekday hours.

Due to the nature of the shared ebike data, and the need to protect personally identifiable information, we don't know how frequently individual users ride shared micromobility. However, the data indicates that the owned ebikes purchased through the rebate program are for longer and more frequent trips, and during commuting type times compared to shared ebikes. This again is an indicator of the distinct and complementary nature of shared and owned ebikes, both of which are encouraged through public policies and programs from the City and County of Denver.

We also found it interesting to compare Ride App data, alongside [Denver's Public Dashboard](#), and [Strava Metro data](#). Without trip diaries, and with our current sample-size, we can't speculate on trip types or potential behavior change among residents who received ebike rebates. However, the difference in trip lengths and duration is striking. Shared ebike trips are shortest, with ebike subsidy participant trips more than twice the distance and nearly 50% longer. Strava trips, which tend to be more fitness focused, are much longer than the more utilitarian natured trips of shared and ebike subsidy related trips

Data Source	Ave Distance	Ave Duration
Shared Trips	1.59 miles	13.5 minutes
Ride App Trips	3.26 miles	19.6 minutes
Strava Denver	17.4 miles	1.7 hours

Strava Global	16.2 miles	1.18 hours
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A quick note about privacy: Ride App puts the privacy of the rider first, and while the app utilizes GPS and location data for ride detection, that sensitive information never leaves the device. Only summary trip information such as trip bike trip duration and distance are aggregated and sent to Ride Report's servers.

These observations represent the initial 3 months of usage across 70 riders in the Ride App pilot, and further study is required to better understand the following:

- **Long term behavior.** A sustained study across a longer period of time will help understand whether the initial honeymoon of usage stands the test of time.
- **Car trip replacement.** Ride App data can be joined with travel survey data around personal car trip replacement to develop a better understanding of how ebikes are replacing car trips, and the associated reduction in car VMT.
- **Avoided emissions.** With an understanding of car trips replaced, an estimate of carbon emissions avoided can be made and the investment of the rebate can be quantified in terms of tons of CO2 saved.

Economic And Emissions Benefits Of Denver's Ebike Program

By Bryn Grunwald, Jacob Korn, and Ben Holland of Rocky Mountain Institute

Background And The City-Scale Ebike Calculator

The Rocky Mountain Institute (RMI) is an independent, non-profit, non-partisan organization working to accelerate the clean energy transition and improve lives. Based out of Colorado, RMI has worked for forty years to transform the global energy supply and energy usage.

As part of this work, RMI has been working to quantify the benefits of shifting transportation in cities from more energy intensive modes, such as individual vehicle travel in internal combustion engine (ICE) cars, to electric vehicles (EV), public transit, and micromobility. To this end, RMI developed an Excel-based model to understand the impacts of shifting shorter car trips to ebikes. The model examines current short car trips within a city and shifts a proportion of trips to ebikes, depending on the city's policy or climate action goals. The model estimates the number of ebikes necessary for the shift, the impact on greenhouse gas emissions, and financial savings for city residents.

The calculator was inspired in part by Denver's successful ebike rebate program. While ebikes are very popular with users, their full economic and climate benefits are not fully understood. It can be difficult to assess the impact that shifting trips from ICE and electric vehicles to ebikes will have on transportation emissions, making it difficult for policymakers to incorporate them into climate policy. The calculator aims to give officials and advocates in cities like Denver a simple platform to understand the emissions reductions and economic benefits of shifting short vehicle trips to ebikes. The calculator also allows users to see how potential rebate programs could increase ebike adoption and subsequent climate and economic benefits.

Preliminary Results Of Denver’s Program

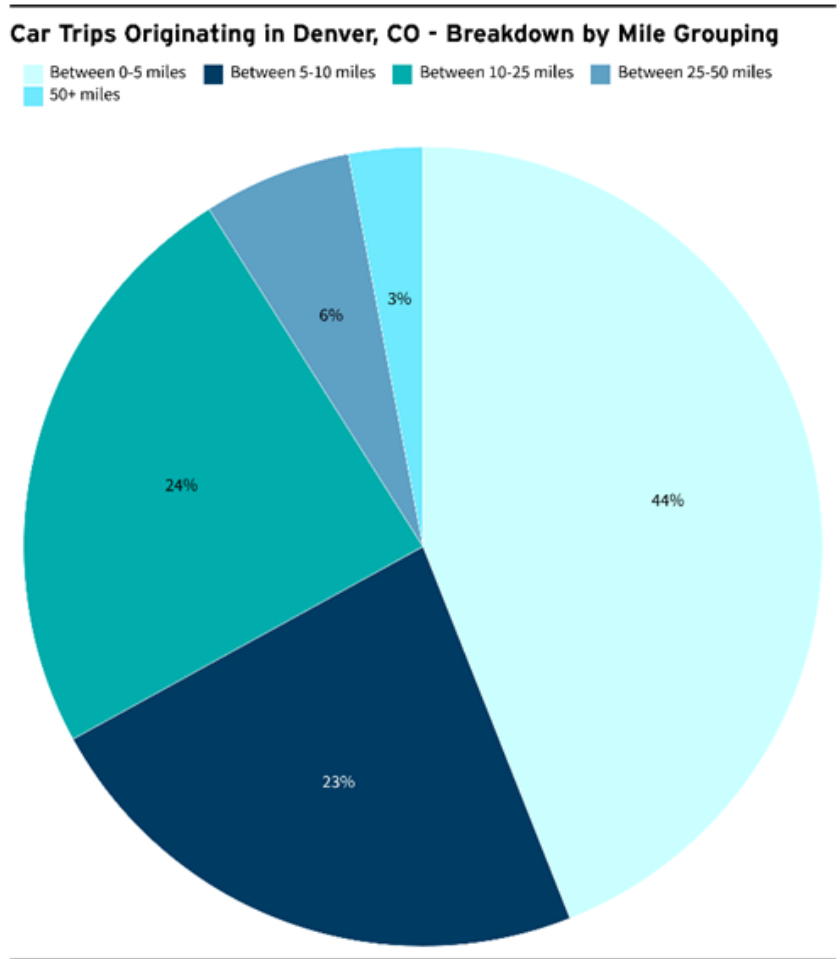
The calculator showed a reduction of 2,000 MT CO₂e from avoided fuel and electricity usage in Denver for the first year. In addition, the ebike trips reported in Denver’s survey could produce cumulative savings of nearly \$1 million from avoided fuel and electricity costs.

Presets in the calculator were adjusted to account for Denver’s current car population and the number of ebike vouchers redeemed in 2022.⁵ As of September 2022, [6.6% of vehicles registered to Denver](#) were EVs. The model applied a business-as-usual scenario for electric vehicle adoption in Colorado, and assumed electric vehicles would grow to be 16% of the fleet by 2031. The following table presents the estimated breakdown of vehicles by fuel type.

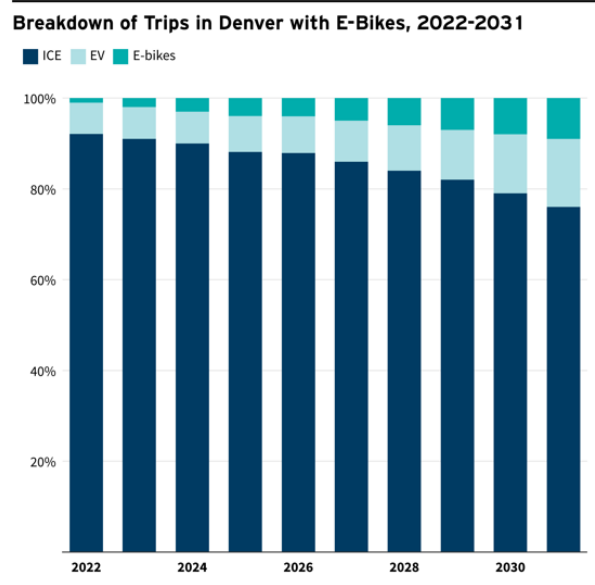
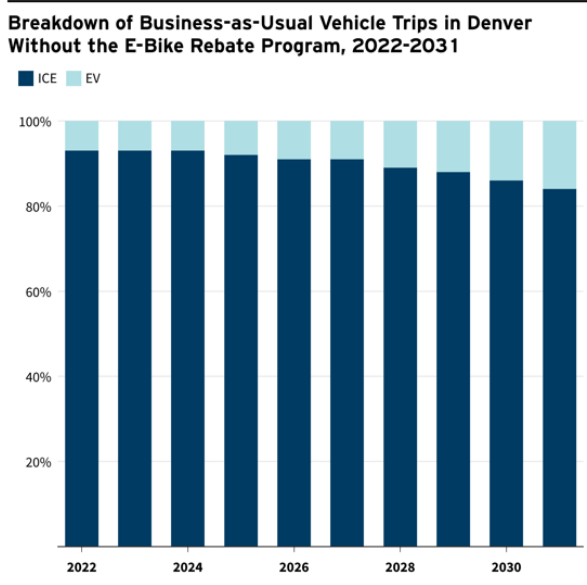
Year	ICE Vehicles	Electric Vehicles
2022	93%	7%
2023	93%	7%
2024	93%	7%
2025	92%	8%
2026	91%	9%
2027	91%	9%
2028	89%	11%
2029	88%	12%
2030	86%	14%
2031	84%	16%

⁵ RMI assumed an average efficiency for each vehicle type, and an overall vehicle efficiency improvement of 0.1 mpg per year through 2031 as older vehicles are retired from the fleet. To understand the emissions intensity of the electricity grid, the team used the National Renewable Energy Laboratory’s (NREL) [Cambium model. Replica](#) provided a breakdown of current vehicle trips under five miles within Denver. RMI assumed that the number of these trips would increase proportionally to the population through 2031, or a growth rate of [0.8% per year](#). For modeling purposes, RMI assumed that Denver will continue to see an additional 4,734 ebikes added per year, as that was the number of ebikes purchased through the rebate program.

Using the calculator and results from Denver’s survey, which was sent to the 2022 program participants, RMI analyzed the program’s implications on emissions and finances for vehicle owners from short trips under five miles. In Denver, nearly half of all vehicle trips originating in the city are under five miles, and over 60% are under ten miles as shown in the figure below. This is consistent with national trends, with the [National Household Travel Survey](#) finding that nearly 60% of all vehicle trips were less than six miles in 2017.



The calculator analyzes electric vehicle adoption alongside ebike adoption. Using the current estimated trip split between ICE vehicles and EVs, the ebike program is most likely reducing the use of ICE vehicles for short trips, even as EV adoption continues, as there are currently more ICE vehicles than EVs in Denver.



Average cost per mile is a useful metric to assess the economics behind distinct vehicle types. RMI considered average [statewide gas](#) and [electricity rates](#) in Colorado and utilized a [Department of Energy report](#) to estimate the maintenance cost per mile for ICE vehicles and EVs.⁶ The table below **highlights that on a per-mile basis, ebikes cost over 40% less to operate than EVs and nearly 75% less than ICEVs.** In addition, per vehicle, **ebikes produce 3% of the operational emissions as EVs and 1% the operational emissions as ICE vehicles.**

⁶ To identify the maintenance cost of ebikes, RMI estimated the cost of commonly replaced parts on bicycles, such as wheels, brake pads, and chains, and divided the total cost by the number of miles each component can be used before replacement. This is a conservative figure that will likely be higher than what most users will experience for ebike maintenance.

Category	ICE Vehicles	EVs	ebikes
Fuel (\$/mile)	\$0.15	\$0.05	\$0.001
Maintenance (\$/mile)	\$0.10	\$0.07	\$0.07
Total (\$/mile)	\$0.25	\$0.12	\$0.07
Total Emissions per Vehicle (MT CO _{2e}) ⁷	0.54	0.19	0.01

Denver’s program presents an opportunity to assess the efficacy of ebike incentive programs to reduce greenhouse gas emissions from avoided fuel and electricity consumption. The preliminary findings from the analysis, shown in the table below, reveal that the ebike incentive program saved 0.94 lb CO_{2e} per dollar spent.

	Estimated Funding	Avoided Emissions
Denver ebike Rebate	\$4.7 million	2,040 MT CO _{2e}

Implications Of The Calculator For Advocates And Cities

Establishing a program similar to Denver’s ebike rebate program would likely reduce GHG emissions from transportation in cities and save residents money; however, until this point, the exact impact of the program on cities’ climate goals has been hard to determine. The RMI City–Scale Ebike Emissions and Economics calculator leveraged Denver’s program to provide concrete data on the potential role for ebikes to cut transportation emissions and save resident’s money. This information can arm advocacy groups and cities with firm numbers to quantify impacts and help officials understand and assess the value of adopting a similar program. For more information on the calculator or interest in city–level analyses, please contact [Bryn Grunwald](#).

⁷ Total operating emissions, specifically for trips under 5 miles.