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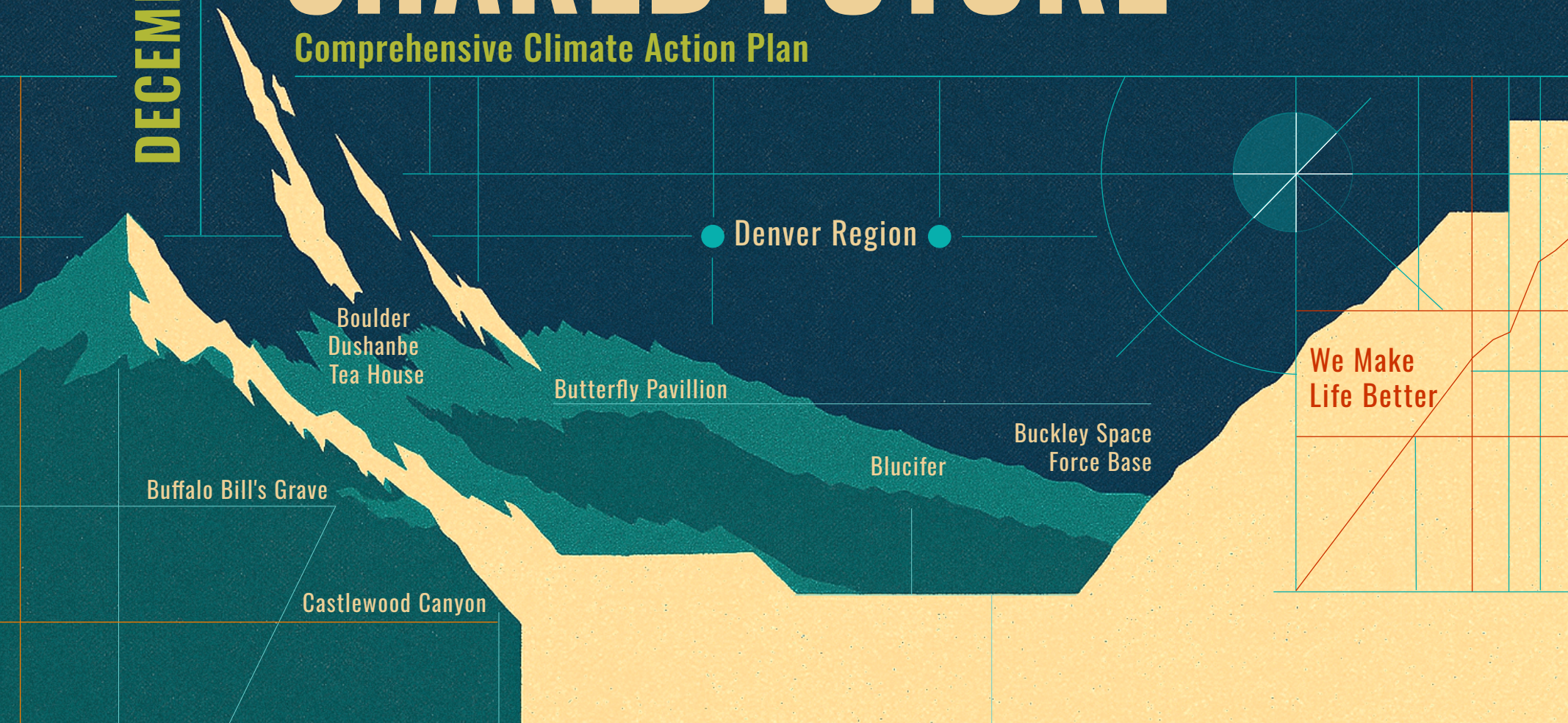
DENVER REGIONAL COUNCIL OF GOVERNMENTS

DECEMBER 2025

NAVIGATING OUR SHARED FUTURE

Comprehensive Climate Action Plan



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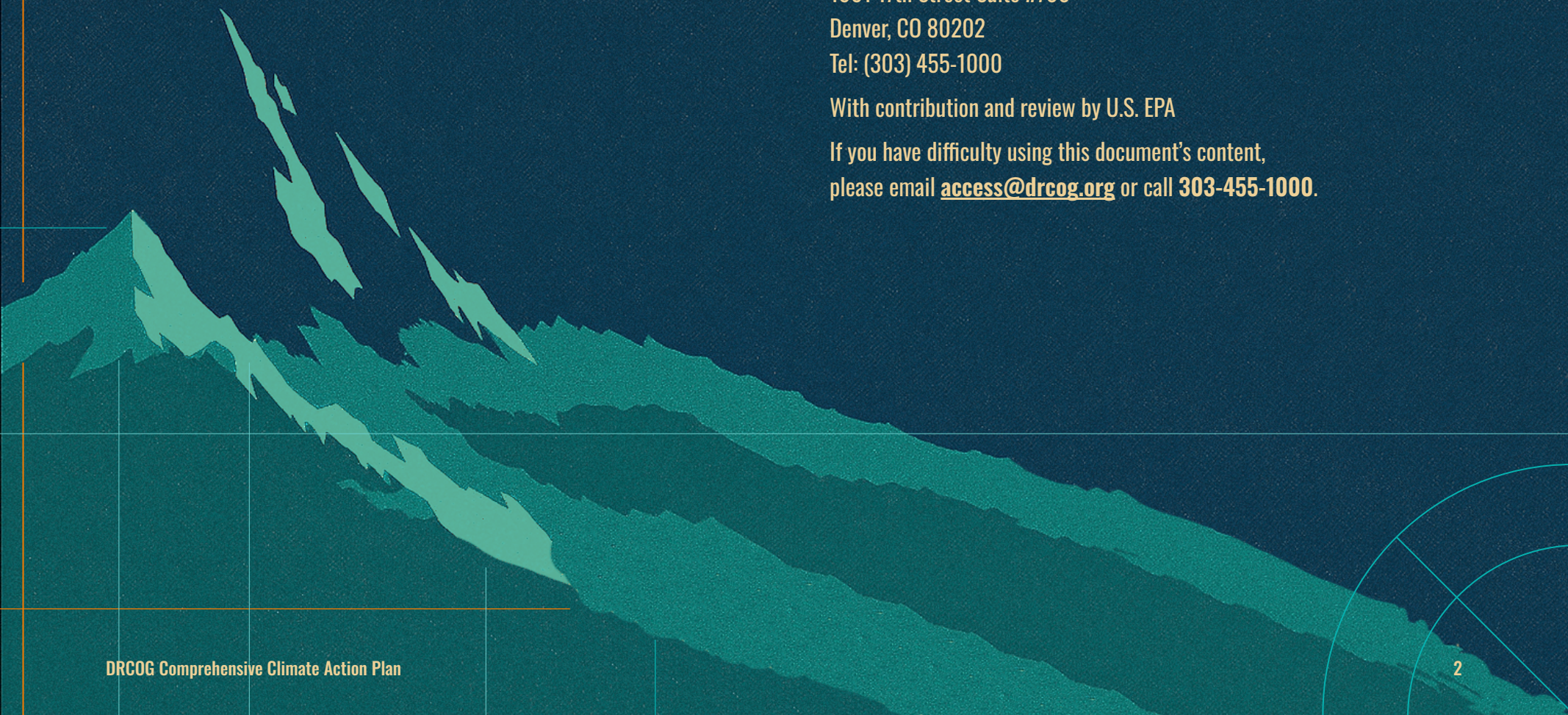

Prepared For:

The Climate Pollution Reduction Grant Program

State and Local Climate and Energy Program

U.S. Environmental Protection Agency

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With contribution and review by U.S. EPA

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Acknowledgements

The Denver Regional Council of Governments, known as DRCOG, would like to extend its deepest gratitude to all individuals and organizations who contributed to the development of the Comprehensive Climate Action Plan.

DRCOG staff are grateful to our community stakeholders for their active participation and feedback during the consultation process. Your voices have been crucial in ensuring that this plan reflects the diverse needs and aspirations of our communities. Furthermore, our 59 governmental partners and the state: your collaboration and resources have been essential in driving this initiative forward.

Special thanks to Lotus Sustainability and Engineering, our technical advisors and environmental experts, whose knowledge and guidance have been instrumental in formulating the effective strategies and solutions proposed in this plan.

Lastly, DRCOG expresses its appreciation to the dedicated staff members who have worked tirelessly behind the scenes to coordinate meetings, compile data and draft this document. Their hard work and dedication are deeply appreciated.

DRCOG is committed to creating a sustainable and resilient future for our communities. Thank you for your continued support and partnership.

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Thank you for your interest in the Comprehensive Climate Action Plan. The Denver Regional Council of Governments (also referred to as DRCOG) was awarded the U.S. Environmental Protection Agency's Climate Pollution Reduction Grant for the Denver Aurora-Lakewood Metropolitan Statistical Area and prepared this Comprehensive Climate Action Plan consistent with grant requirements. The plan sets a vision for the greater Denver region's climate goals and builds upon the Priority Climate Action Plan, describing near- and long-term, high-priority, implementation-ready measures to reduce climate pollution and improve air quality across the Front Range. The plan was prepared in partnership with staff and elected officials of local governments along with a robust public engagement process. The plan expands, accelerates and celebrates climate work across the Front Range. I appreciate the thoughtful contributions of the many residents of the region who shaped it through the various opportunities for public involvement.

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1 Introduction

1.1 Introduction

The Denver-Aurora-Lakewood Metropolitan Statistical Area received a $1 million planning grant to develop climate action plans to reduce climate pollution emissions as part of the Climate Pollution Reduction Grants program, an initiative of the U.S. Environmental Protection Agency. The Denver Regional Council of Governments (also known as DRCOG) is spearheading the climate action planning efforts for the planning area, which is referred to as the Climate Pollution Reduction Grant Planning Area (figure 1).

The Comprehensive Climate Action Plan is the second deliverable for the Climate Pollution Reduction Grants program, after the Priority Climate Action Plan. This plan includes a climate pollution inventory, a workforce planning analysis, and a set of quantified measures to reduce carbon pollution in buildings, transportation and waste. The plan also includes broader tactics to reduce carbon pollution in agriculture, energy, industry and natural working lands.

At its core, the Denver region's Comprehensive Climate Action Plan outlines an ambitious, interconnected set of voluntary strategies to mitigate climate change while addressing economic disparities. The plan prioritizes equitable access to benefits and ensuring that vulnerable communities receive a fair share of the opportunities arising from investment. The flexible strategies in the plan can be customized by the local communities to meet their specific needs and priorities, while encouraging local decision-makers to pursue initiatives that will benefit the entire planning area.

Through collective and collaborative efforts, DRCOG staff, member governments, and partner organizations strive to create a resilient and sustainable future for the Denver region.

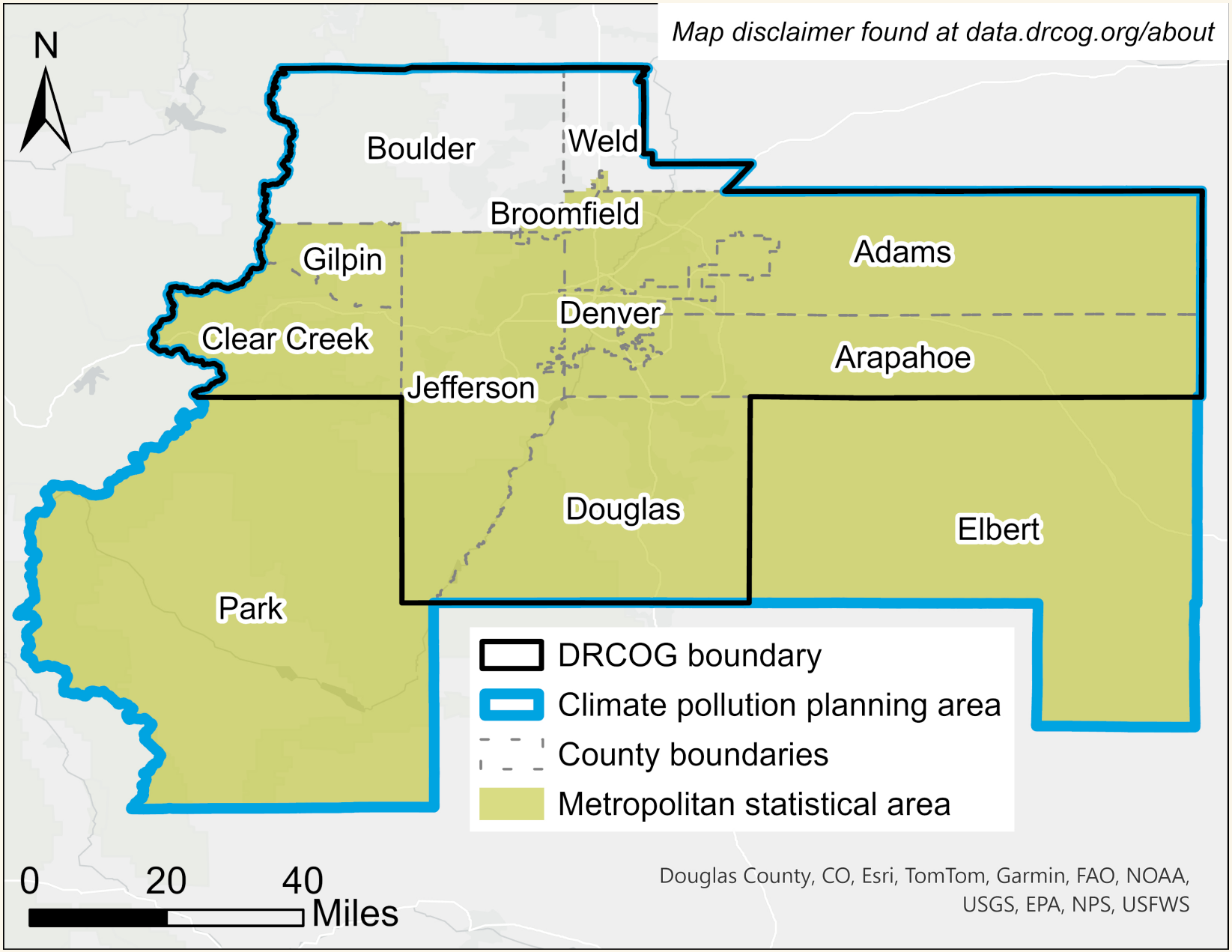
Image of the Boulder Flatirons.

What is DRCOG?

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.

Vision: Our region is a diverse network of vibrant, connected, lifelong communities with a broad spectrum of housing, transportation and employment, complemented by world-class natural and built environments.

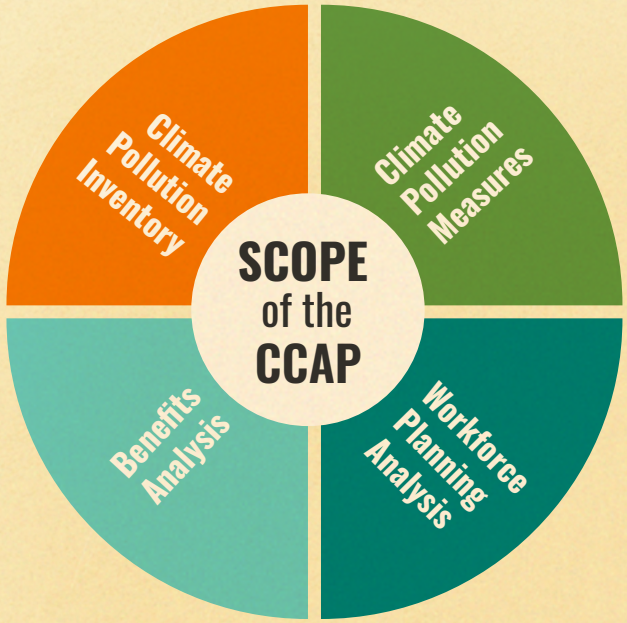
Figure 1: Map of the DRCOG Region.



1.2 Climate Pollution Reduction Grant overview

Authorized under Section 60114 of the Inflation Reduction Act and administered by the U.S. Environmental Protection Agency, the Climate Pollution Reduction Grants program provides $5 billion in grants to states, local governments, tribes and territories to develop and implement ambitious plans to reduce climate and other harmful air pollution. The first phase of the program provides $250 million in noncompetitive planning grants to every state and the largest census-designated metropolitan statistical areas. The second phase designates approximately $4.6 billion in funding for competitive implementation grants. Through the program, the U.S. Environmental Protection Agency seeks to achieve three broad objectives:

- Tackle climate pollution while supporting the creation of good jobs and lowering energy costs for families.
- Accelerate work to empower community-driven solutions in overburdened neighborhoods.
- Deliver cleaner air by reducing harmful air pollution in places where people live, work, play, and go to school.



The Denver-Aurora-Lakewood Metropolitan Statistical Area received a **$1 million** planning grant to develop climate action plans to reduce climate pollution emissions as part of the Climate Pollution Reduction Grants program, an initiative of the U.S. Environmental Protection Agency.

Through the Climate Pollution Reduction Grants program, the Denver-Aurora-Lakewood Metropolitan Statistical Area was allocated a $1 million planning grant to develop climate action plans in coordination with local stakeholders throughout the region. On April 19, 2023, with letters of support from several local government partners, the DRCOG Board of Directors voted unanimously to accept the role of lead agency for the region's Climate Pollution Reduction Grant. U.S. Environmental Protection Agency requirements dictate that the planning grant funds be designated for the completion of the following products:

- Priority Climate Action Plan, due March 1, 2024.
- Comprehensive Climate Action Plan, due December 1, 2025.
- Status Report, due at the close of the four-year grant period, August 1, 2027.

1.3 Climate change: what is it?

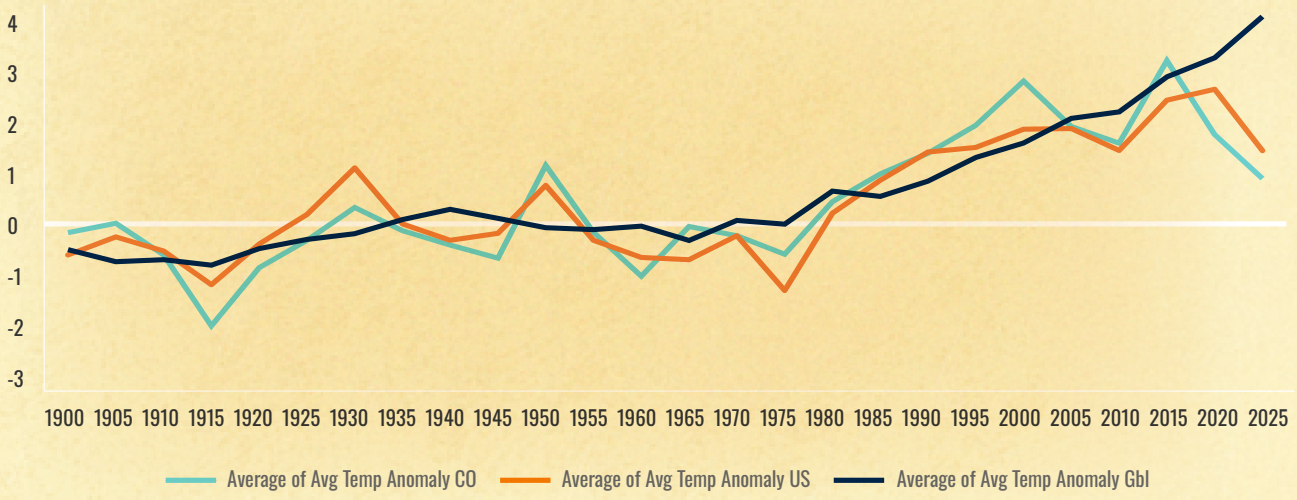
Climate change refers to long-term shifts in Earth's temperature, precipitation patterns, and other atmospheric conditions, largely driven by human activities such as the burning of fossil fuels, deforestation, and industrial processes.

Climate pollution traps heat in the atmosphere, leading to an increase in the Earth's average temperature. Different pollutants have varying effects on the planet's warming and the higher a pollutant's ability to absorb energy is, the more it's able to warm the atmosphere over time. Furthermore, the longer a pollutant remains in the atmosphere, the longer it can exert warming effects.

Large and increasing amounts of climate pollutants are creating an imbalance in the atmosphere, intensifying harmful changes to the Earth's climate. Climate change is a recurring aspect of our lives with impacts felt disproportionately in vulnerable communities. Simultaneously, the benefits of climate action are increasingly clear in

Welcome to colorful Colorado sign.

Figure 2: Observed 5-year running mean surface temperature departure from a 20th century baseline for Colorado (teal), the U.S. (orange), and the globe (navy blue). Data from NOAA National Centers for Environmental Information.



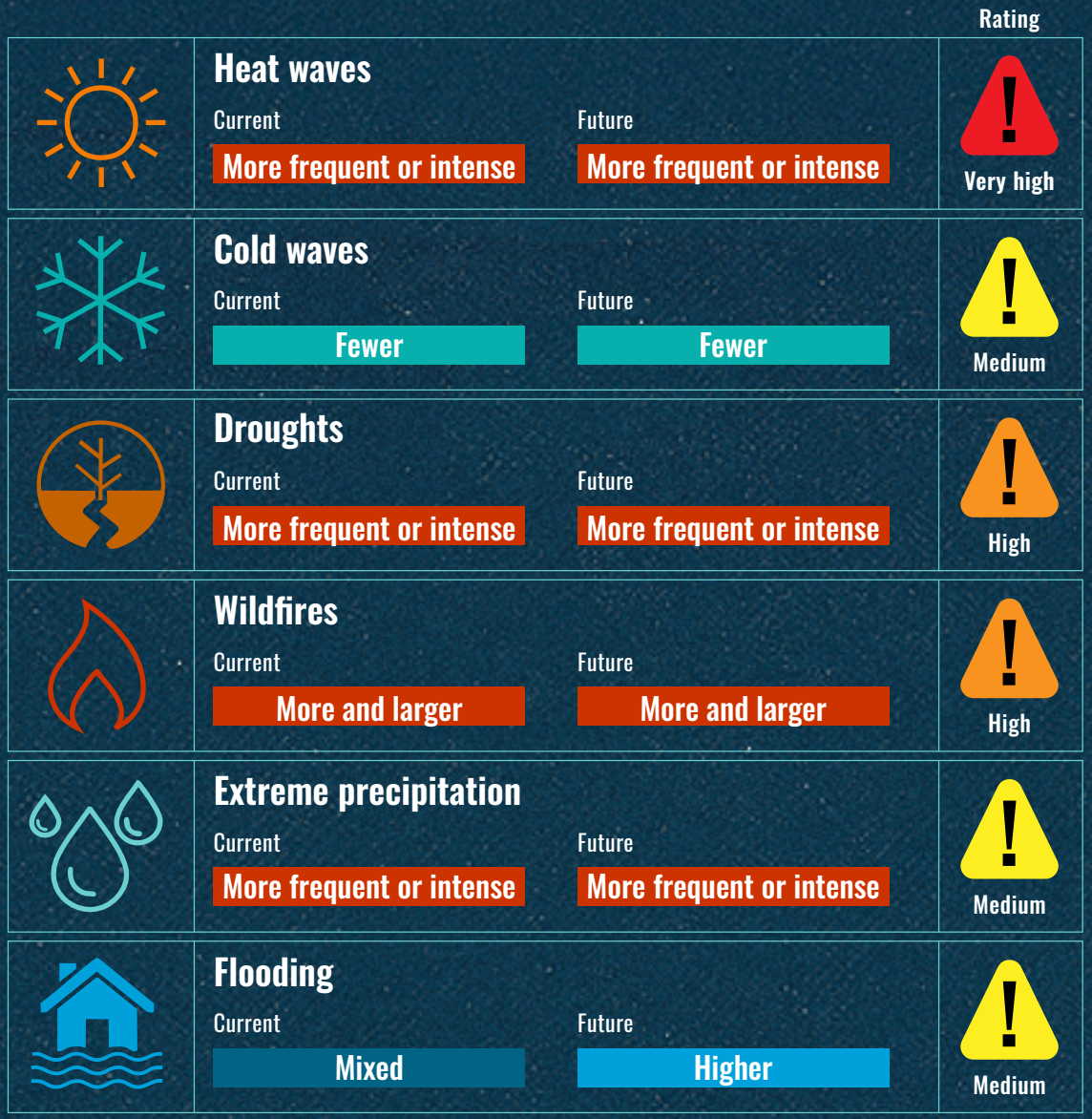
growing green jobs, cleaner air, safer homes and better mobility. Preparing for, and responding to, the risks of climate change means improvements to the daily lives of residents across the Front Range and a future that is resilient, equitable, and healthy.

1.3.1 Climate change in the Front Range

Climate change is significantly impacting Colorado's Front Range, with temperatures projected to increase by 2.5 degrees Fahrenheit to 5 degrees Fahrenheit by 2050. The 2024 report “Climate Change in Colorado” states that, in general, extremes and natural hazards that have strong physical linkages to warming temperatures will continue to increase further in the future. At the top of this list are heat waves, droughts, and wildfires, all of which are worsened in a warmer climate, and all three have shown clear recent upward trends in Colorado. Mimicking nearly every other part of the globe, Colorado has warmed substantially over the past century, and the overall trajectory of Colorado’s temperatures has closely followed those of the United States and global temperatures as illustrated in figure 2.

Climate extremes in Colorado:
Recent trends and future risks

Based on 2024 report: Climate Change Colorado



Summary of the observed and projected changes in climate extremes and hazards for Colorado. Source: Climate Change in Colorado, 2024, page 54

This warming trend is reducing snowpack and causing earlier snowmelt, leading to decreased water availability in summer, which in turn extends and amplifies wildfire risks. Cameron Peak, East Troublesome and Pine Gulch fires, the three largest fires in Colorado history by acreage burned, all occurred in 2020 and totaled 541,732 acres. The most destructive fire by homes lost, the Marshall fire, occurred in December 2021 and burned over 1,000 homes in three days — its negative impacts are still felt four years later, according to the Colorado Water Conservation Board.

Wildfire risk is not the only looming threat to Colorado's pristine landscape. Forest health is deteriorating due to increases in temperatures, water stress, wildfire frequency and pest outbreaks, according to Colorado River Resilience.

These changes threaten essential ecosystem services like water filtration and carbon storage. Additionally, the region is experiencing more frequent and severe weather events, including

droughts and heavy precipitation, which can lead to flooding and other hazards. Given the increased risks, adaptive strategies are crucial to mitigate these impacts and protect both natural and human communities.

1.4 Comprehensive Climate Action Plan purpose and scope

The Comprehensive Climate Action Plan is a list of near and long-term measures to reduce climate pollution, including an analysis of emissions reductions that would be achieved through implementation. The plan includes:

- **A climate pollution inventory** to quantify and track the amount of climate pollution sources (carbon dioxide, methane, nitrous oxide) released into the atmosphere from human activities in the planning area.
- A list of **quantified climate pollution reduction measures** that achieve significant climate pollution reductions while considering other relevant planning goals.
- **A benefits analysis** that assesses how the climate pollution reduction measures positively impact the region's communities, including, but not limited to, co-pollutant emissions reductions, increased climate resilience, improved access to services and amenities, increased number of jobs created, improved workforce development initiatives, and reduced costs from energy efficiency improvements.
- **Workforce planning analysis** that assesses anticipated workforce shortages and identifies possible solutions, including funding resources and programs that can support current and future workforce needs.

The Comprehensive Climate Action Plan builds on the Priority Climate Action Plan, which was a prerequisite for competing for implementation grants during the program's second phase. Implementation awards under the Climate Pollution

Reduction Grants program relied on a Priority Climate Action Plan to describe the programs, policies, measures, and projects the entity would carry out with the implementation grant funding. In July 2024, the Denver Regional Council of Governments was one of 25 awardees; the $199.7 million implementation grant is described in depth in the building measures section of this plan.

1.5 Metro Vision

DRCOG's Metro Vision is a future-focused, regionally oriented plan that is designed to preserve the region's best qualities for generations to come. It encourages residents to take an active role in shaping the region's future within **five key themes: place, mobility, environment, livability, and vitality.**

Metro Vision key themes

PLACE

An efficient and predicable development pattern

Each of the region's jurisdictions and counties contributes in different ways to the metro area's economy, resiliency, quality of life and sense of place. As the region grows, maintaining place-based distinctions will protect the ability of residents and businesses to choose the types of communities that meet their distinct needs and values.

MOBILITY

A connected, multimodal region

The needs of the region's transportation system must adapt to major trends affecting the region, such as significant population growth, a rapidly aging population, emerging technologies, a shifting economy, and changing patterns in how people live and work.

ENVIRONMENT

A safe and resilient natural and built environment

A foundation for regional cooperation will safeguard the region's natural resources for all residents and ensure access to those spaces remains inclusive to everyone regardless of cultural identities, genders and socioeconomic levels. Preservation includes, but is not limited to, provisions for clean water, air, and reduced climate pollution.

LIVABILITY

Healthy, inclusive and livable communities

Through a deliberate focus on the built environment's influence on physical activity, mobility choices, and access to healthy food, livable communities will thrive across the region. Support for a healthy natural environment simultaneously supports the opportunity to lead healthy and active lifestyles.

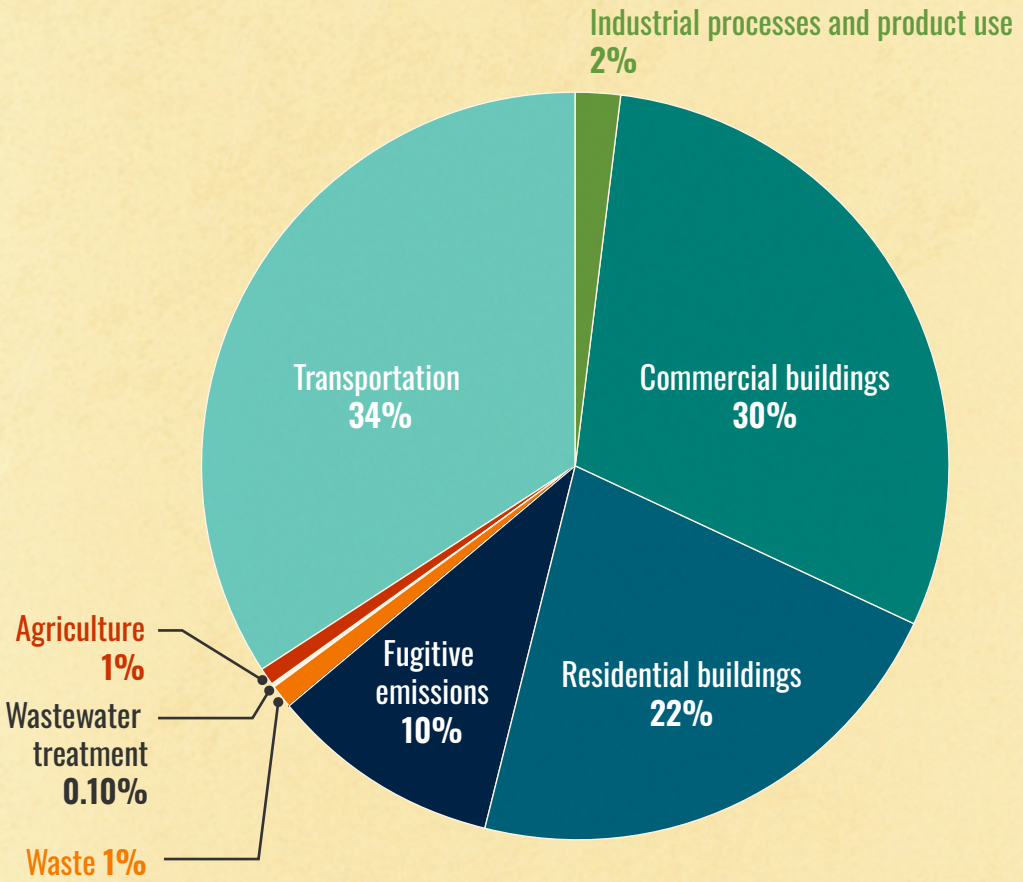
VITALITY

A vibrant regional economy

Everyone has access to a range of transportation, employment, commerce, housing, educational, cultural and recreational opportunities.

2 Inventory

Figure 3: Emissions by sector (units are in metric tons of carbon dioxide equivalent).



2.1 Climate pollution inventory

A climate pollution inventory is a historical accounting of carbon emissions and removals from the atmosphere over a specific time period, categorized by economic sector. The climate pollution inventory covered in this section complies with the Global Protocol for Community Greenhouse Gas Emission Inventories. The inventory includes a mix of measured and estimated activity data for the year 2022. Staff calculated emissions for stationary energy (sources associated with generating electricity, or energy generation as part of manufacturing and construction activities); transportation; fugitive emissions (unintentional and undesirable leakage or discharge of gases or vapors from pressure-containing equipment or facilities) and oil and gas activity; waste and wastewater; industrial processes and product use; and agriculture, forestry, and other land uses. The climate

pollutants included in the inventory cover carbon dioxide, methane, nitrous oxide and hydrofluorocarbons. This section of the plan includes an overview of sources, methodology and results from the inventory. Figure 4 lists the various sectors and all carbon pollution sources within each sector.

Figure 4: Denver regional 2022 greenhouse gas inventory sector descriptions.

Inventory Sector	Description
Agriculture, forestry and other land uses	This sector includes emissions from livestock, urea fertilization and manure, and soil fertilizers and chemicals. Carbon emissions and removals from forests and urban trees are also included in this sector.
Fugitive emissions and oil and gas activity	This sector includes fugitive emissions from natural gas leakage and process emissions from oil and natural gas activity in the region.
Industrial processes and product use	This sector includes refrigerant leakage and emissions from industrial facilities such as gas plants, refineries, and mining operations.
Stationary energy	This sector includes: • Electricity generation: Xcel Energy, CORE Electric Cooperative, United Power, Poudre Valley Rural Electrification Administration, Longmont Power and Communications. • Natural gas: Xcel Energy, Black Hills Energy, Colorado Natural Gas. • Staff also estimated usage data for stationary diesel and propane for this sector.
Transportation	This sector includes data for fossil fuel vehicles, electric vehicles, gas-powered and electric public transit buses, light and commuter rail, railway activity, jet fuel and aviation gas for airplanes, and fuel usage for off-road vehicles and equipment.
Waste and wastewater	This sector accounts for landfilled waste emissions, fugitive and process emissions from wastewater treatment, as well as emissions from septic tanks.

2.2 Inventory trends and analysis

The Denver region's carbon pollution emissions totaled 44,443,010 metric tons of carbon dioxide equivalent (MT CO_2e) per year in 2022. The total net carbon removed from the atmosphere by trees and forests, or "removals," totaled 854,036 MT CO_2e per year. Subtracting the removals from the total carbon emissions leaves 43,588,974 MT CO_2e per year, representing the Climate Pollution Reduction Grant planning area's net climate pollution emissions for 2022.

Breaking total emissions into sectors helped develop policies and strategies in this plan that would directly reduce the emissions-generating activity or source. For most counties in the planning area, the two largest emissions sectors are building energy use and transportation. Figure 6 divides emissions by county and sector.

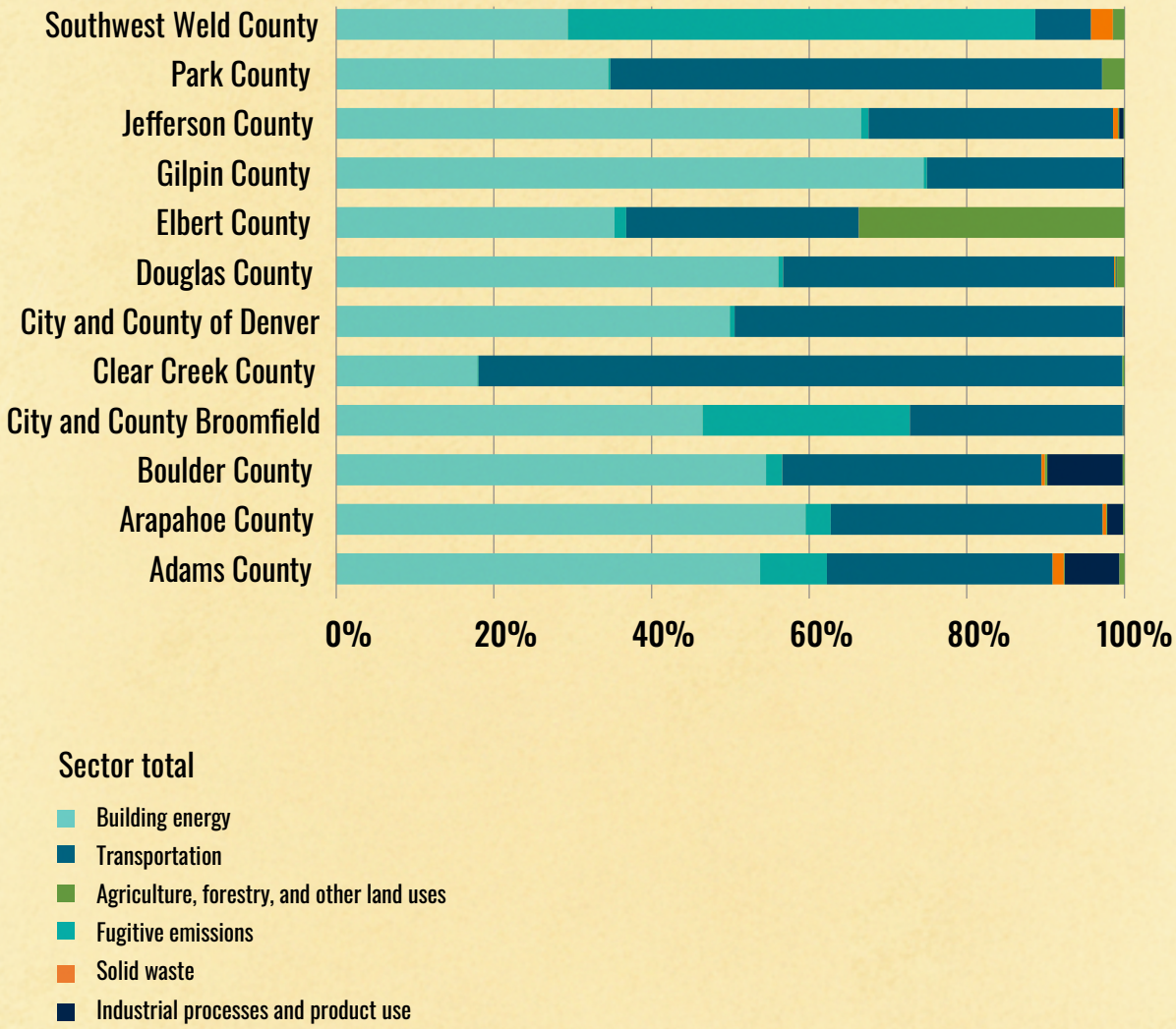
The emissions makeup for each county is depicted in figure 6.

In total across the planning area the largest emission sector is buildings at 52%, followed by transportation at 34% of total emissions and fugitive emissions at 10% of total emissions. The remaining sectors make up approximately 4% of total regional emissions.

Figure 5: Denver regional 2022 climate pollution inventory total emissions, removals and net emissions by county. Emission totals may differ from a county's publicly reported climate pollution emissions due to the regional methodology of this inventory.

County	Total emissions (metric tons of carbon dioxide equivalent)	Removals (metric tons of carbon dioxide equivalent)	Net emissions (metric tons of carbon dioxide equivalent)
Adams County	6,974,204	4,409	6,969,795
Arapahoe County	6,409,870	13,010	6,396,860
Boulder County	3,404,118	157,429	3,246,689
City and County of Broomfield	972,128	777	971,351
Clear Creek County	471,598	98,413	373,185
City and County of Denver	10,402,538	7,874	10,394,664
Douglas County	4,404,652	102,851	4,301,801
Elbert County	361,233	N/A	361,233
Gilpin County	131,778	56,893	74,885
Jefferson County	5,482,362	180,349	5,302,013
Park County	287,631	231,561	56,070
Southwest Weld County	5,140,899	470	5,140,428
Total	**44,443,010**	**854,036**	**43,588,974**

Figure 6: Proportional emissions by sector by county in 2022 in the DRCOG region.



2.2.1 Stationary energy sector

Within the stationary energy sector, building electricity use accounts for the largest share of emissions at 52%. Fossil gas use and associated fugitive emissions follow next at 34%. Propane emissions make up 11%, oil and gas activity make up 4%, and stationary diesel use makes up less than 1%.

2.2.2 Transportation sector

In the transportation sector, on-road vehicles with internal combustion engines result in the largest share of emissions at 69%. The next-largest sources of emissions are transboundary aviation (or flights that go into or out of the region's airports) at 15%, off-road vehicles and equipment like construction vehicles and lawn and garden equipment at 10%, and in-boundary aviation (or flights that take off and land at the same regional airport) at 4%. The remaining sources in this sector make up approximately 2% of transportation emissions. This includes emissions from electric vehicles and railways, which each generate 1%, and transit emissions, which account for less than 1%.

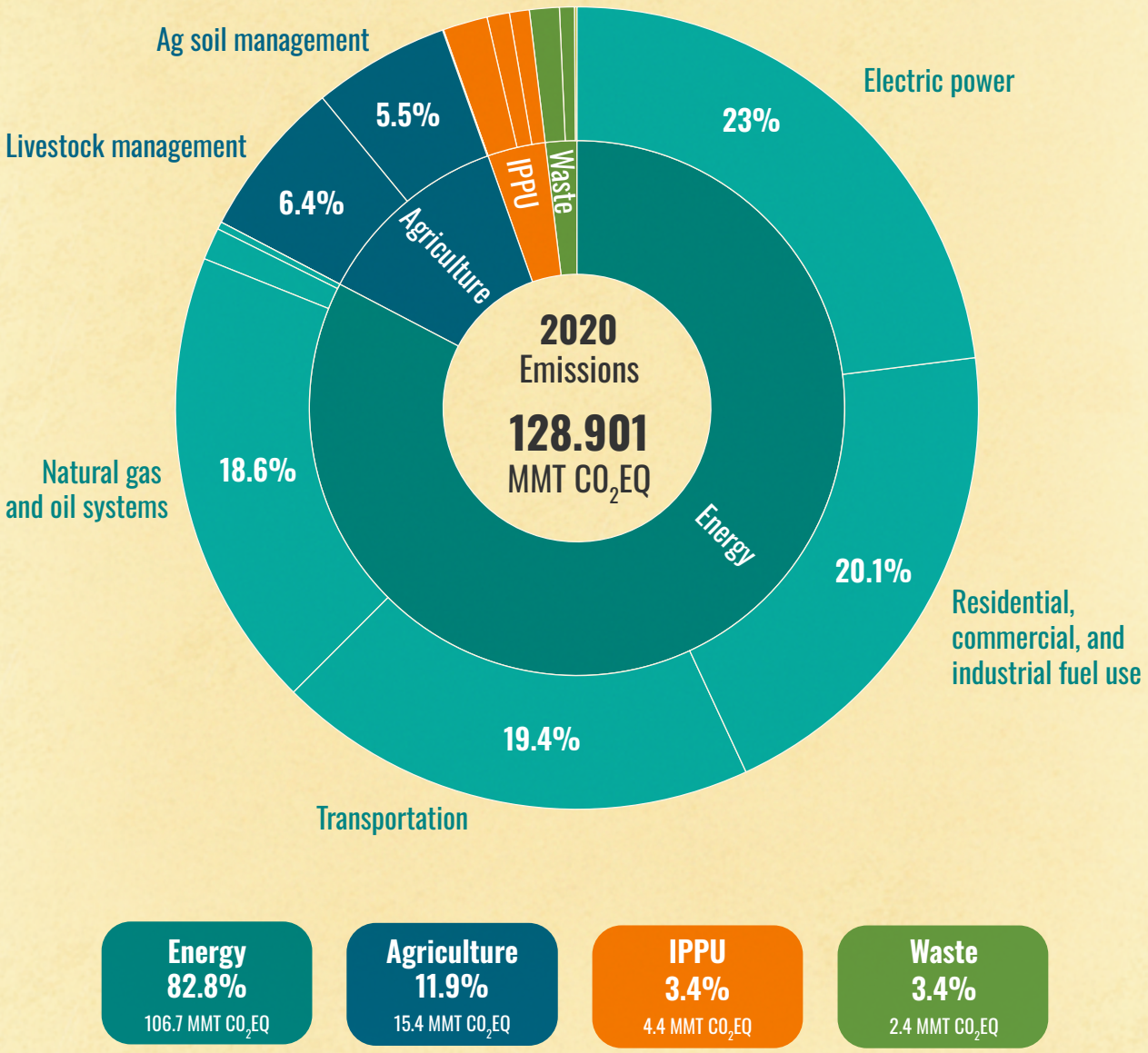
2.2.3 Remaining sectors

Waste and wastewater account for just over 1% of total regional emissions, with landfill emissions generating 87% of the sectors emissons and wastewater treatment emissions accounting for 13%. Industrial processes and product use account for 2% of total regional emissions, with industrial facilities making up 60% of the sector's emissions and refrigerant leakage emissions making up 40%. The agriculture, forestry and other land uses sector is composed almost entirely of emissions from agriculture practices; emissions from forestry and trees make up less than 1% of the sector. The sector also includes 854,036 metric tons of removed carbon from trees and forests.

2.2.4 State of Colorado climate pollution inventory

The state of Colorado's leading emission sectors differ from those in DRCOG's Climate Pollution Reduction Grant planning area. In 2020, statewide climate pollution emissions were 128.901 million MT CO_2e. The leading emissions in DRCOG's

Figure 7: Climate pollution emissions by sector and subsector for the State of Colorado in 2020.
Source: Colorado State Priority Climate Action Plan.



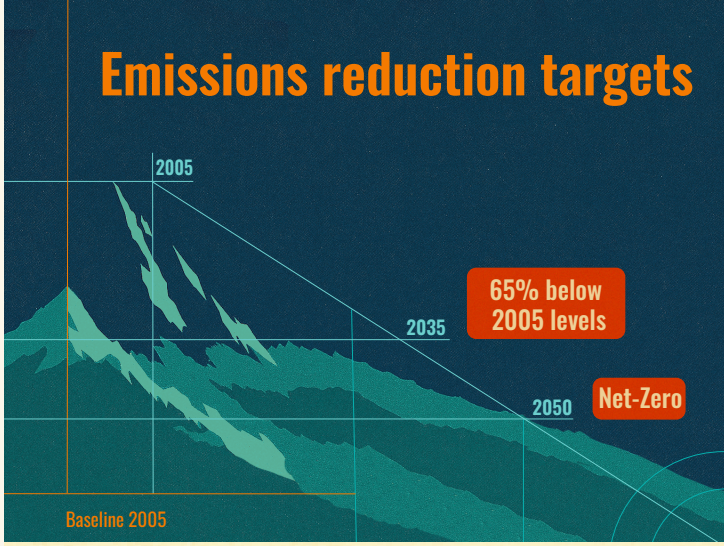
Climate Pollution Reduction Grant planning area are from building, transportation and fugitive emissions. Statewide, the energy sector (including transportation activities) contributed the majority of Colorado's emissions, with carbon dioxide being the most prominent pollution source. Agriculture is the second largest contributor to statewide emissions, and nitrous oxide and methane are the prominent pollutants in that sector. Fluorinated gases are only accounted for in the industrial processes and product uses sector, where they contributed over half of the sector's total emissions in 2020.

3 Targets and projections

3.1 Near-term and long-term GHG reduction targets

In 2019, the legislature adopted and Governor Polis signed House Bill 19-1261, which set economy-wide climate pollution reduction goals for Colorado: a reduction of 26% below 2005 levels by 2025, 50% by 2030 and 90% by 2050. In 2021, Colorado released the first Greenhouse Gas Pollution Reduction Roadmap, which is a science-based, ambitious and substantial plan for pollution reduction, a clean energy transition, and establishing climate leadership. In 2023, SB23-016 amended the targets set by HB19-1261 to include reductions of 65% by 2035, 75% by 2040 and 90% by 2045, while simultaneously revising the 2050 target to net-zero emissions, meaning removing an equal amount of CO_2 from the atmosphere as is released into it. These actions resulted in the Greenhouse Gas Pollution Reduction Roadmap 2.0, which is in line with the Intergovernmental Panel on Climate Change's targets to keep global warming under 1.5 degrees Celsius, which according to the United Nations' 1.5°C *" will significantly reduce the risks, adverse impacts, and related losses and damages from climate change."*

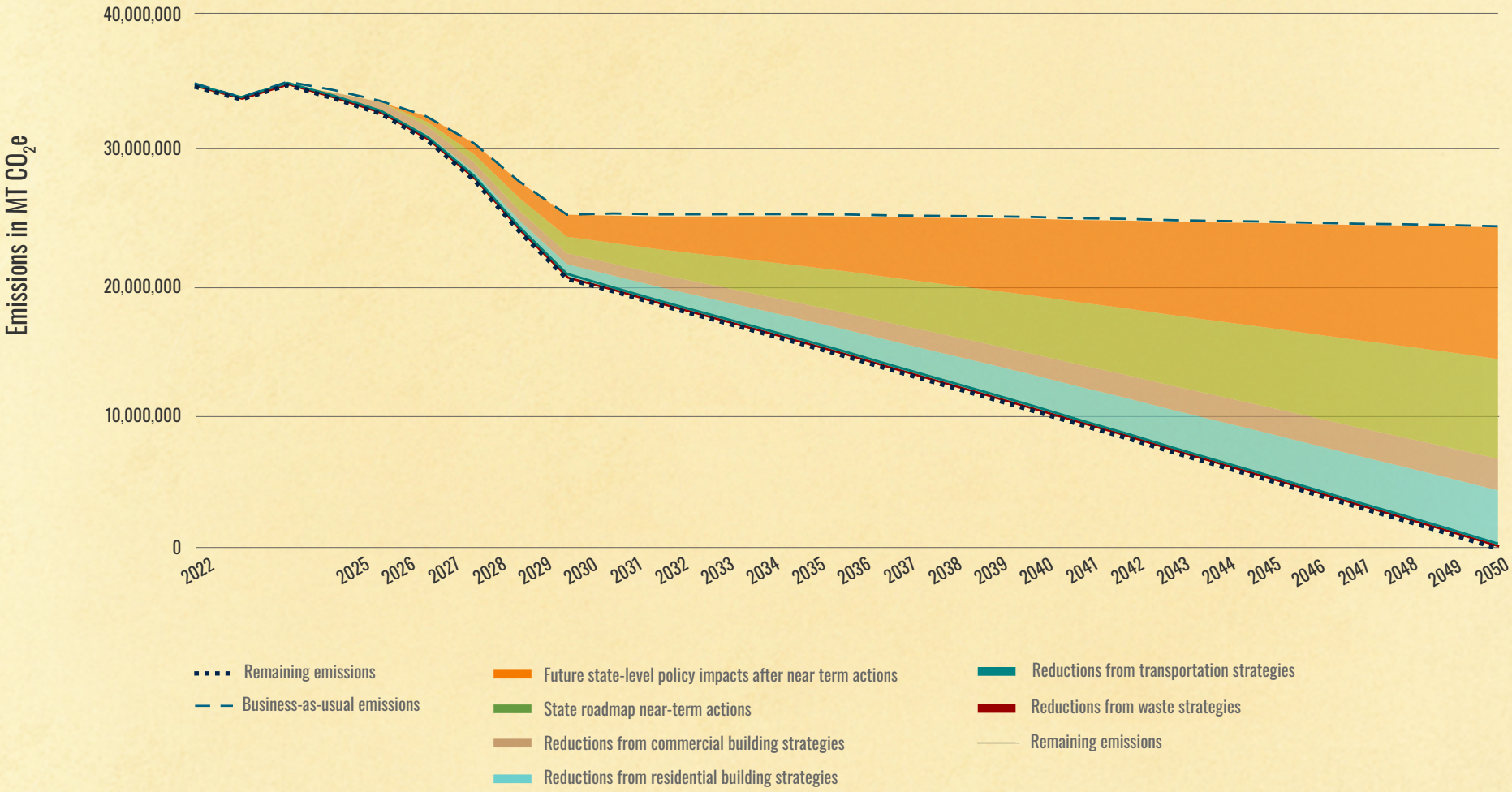
Given the state of Colorado's substantial committment to reducing emissions state-wide through 49 near-term actions, ***DRCOG's economy-wide near-term target of 50% climate pollution reduction by 2030 and long-term target of net-zero emissions by 2050, directly aligns with the state's goals.***



DRCOG's economy-wide near-term target of 50% climate pollution reduction by 2030 and long-term target of net-zero climate pollution emissions by 2050, directly aligns with the state's climate pollution reduction goals.

Figure 8: DRCOG's initiatives + state initiatives to reach net-zero by 2050.

The business-as-usual scenario assumes that by **2050**, **74.6%** of energy is renewable and **25.5%** of vehicles are electric.



3.2 Business-as-usual projections

The business-as-usual scenario (BAU) demonstrates what would happen if DRCOG's planning area did not make any major changes in policies and/or investment to reduce emissions. This is considered a worst-case scenario related to the amount of intentional intervention and illustrates the region's buildings, on-road transportation, and waste emissions in 2050 if no additional regional climate pollution reduction measures are implemented. In addition, the model demonstrates the overall potential of measures to reduce greenhouse gas emissions in each sector. The business-as-usual scenario assumes that by 2050, 74.6% of energy is renewable and 25.5% of vehicles are electric.

Figure 9: BAU projections by sector

Sector	Base year emissions ($MT CO_2e$)	Short-term BAU projection year (2030) ($MT CO_2e$)	Long-term BAU projection year (2050) ($MT CO_2e$)
Transportation	15,336,630	9,576,542	7,113,751
Commercial and residential buildings	27,427,783	15,698,104	17,157,751
Waste and materials management	372,986	349,175	399,550
Industry	992,879	992,879	992,879
Agriculture	311,814	311,814	311,814
Natural and working lands	-853,117	-853,117	-853,117
Electricity	N/A	N/A	N/A
Total emissions	**43,588,974**	**26,075,397**	**25,122,628**

3.3 Climate pollution reduction measures summary

DRCOG selected these measures through considerable community and partner engagement over the course of two years. Both measure one, regional bus rapid transit expansion, and measure two, funding active transportation projects through Transportation Improvement Program (TIP), are pulled directly from the Priority Climate Action Plan, along with measures five through eight. The waste measures were discussed at length through public forums, surveys, and discussion groups, along with our monthly stakeholder steering committee members.

Figure 10: Measure summary by sector.

Measure	Sector
M1. Regional bus rapid transit expansion	Transportation
M2. Provide funding for active transportation projects	Transportation
M3. Regional transportation demand management program	Transportation
M4. Coordination of EV charging locations and infrastructure purchases	Transportation
M5. Low-Income decarbonization	Buildings
M6. Energy advising	Buildings
M7. Rebates and incentives	Buildings
M8. Building Policy Collaborative	Buildings
M9. Collaborate to manage the regional “wasteshed”	Waste
M10. Develop local ordinances and policies to manage the regional “wasteshed”	Waste
M11. Expand public education in the region	Waste
M12. Support expansion of public-private partnerships to improve local circularity	Waste

3.4 Implementation scenario projections

DRCOG quantified the total estimated impact of the twelve measures on regional carbon pollution. Figure 11 illustrates the projected carbon pollution trajectory when meaures are implemented as compared to the business as usual emissions estimate. If all measures are implemented successfully, regional emission reduction goals are likely to be acheived. Figure 12 illustrates the emissions anticipated to be remaining within each sector if all short-term and long-term measures are implemented successfully.

Figure 11: Scenario impacts in the transportation, buildings, and waste sectors in 2030 and 2050.

Sector	Short-term implementation scenario year climate pollution reduction (e.g., 2030) ($MT CO_2e$)	Long-term implementation scenario year climate pollution reduction(e.g., 2050) ($MT CO_2e$)
Transportation	1,518,654	
Commercial and residential buildings	6,855,776	148,176,499
Waste and materials management	36,467	121,412
Total emissions	**8,410,897**	**149,816,565**

Denver's infamous "browm cloud" is a visible haze caused mainly by fine particulate matter (PM)—soot and other tiny particles—mixed with gases like nitrogen oxides and sulphur dioxide that react in the air. It's most noticeable during winter temperature inversions, when a warm layer aloft traps polluted air near the ground.

4 Measures

4.1 Climate pollution reduction measures

Denver Regional Council of Governments staff used extensive public and partner engagement efforts to select and refine the following climate pollution reduction measures. Along with considerable engagement, staff shaped the measures in the context of a metropolitan planning organization's purpose and abilities.

Other key factors influenced the selection of measures, including the climate pollution inventory, which demonstrates that over 52% of total emissions come from the building sector and over 34% from the transportation sector. In addition to these two sectors, the waste sector can also be greatly influenced by regional and local agencies, and was therefore a primary focus for the planning effort.

Each of the following measures is described in further detail in this chapter:

Transportation
implementation measures

Measure 1 (M1): Regional bus rapid transit expansion

Measure 2 (M2): Provide funding for active transportation projects

Measure 3 (M3): Regional transportation demand management program

Measure 4 (M4): Coordination of electric vehicle charging locations and infrastructure purchases

Building
implementation measures

Measure 5 (M5): Low-income decarbonization

Measure 6 (M6): Energy advising

Measure 7 (M7): Rebates and incentives

Measure 8 (M8): Building Policy Collaborative

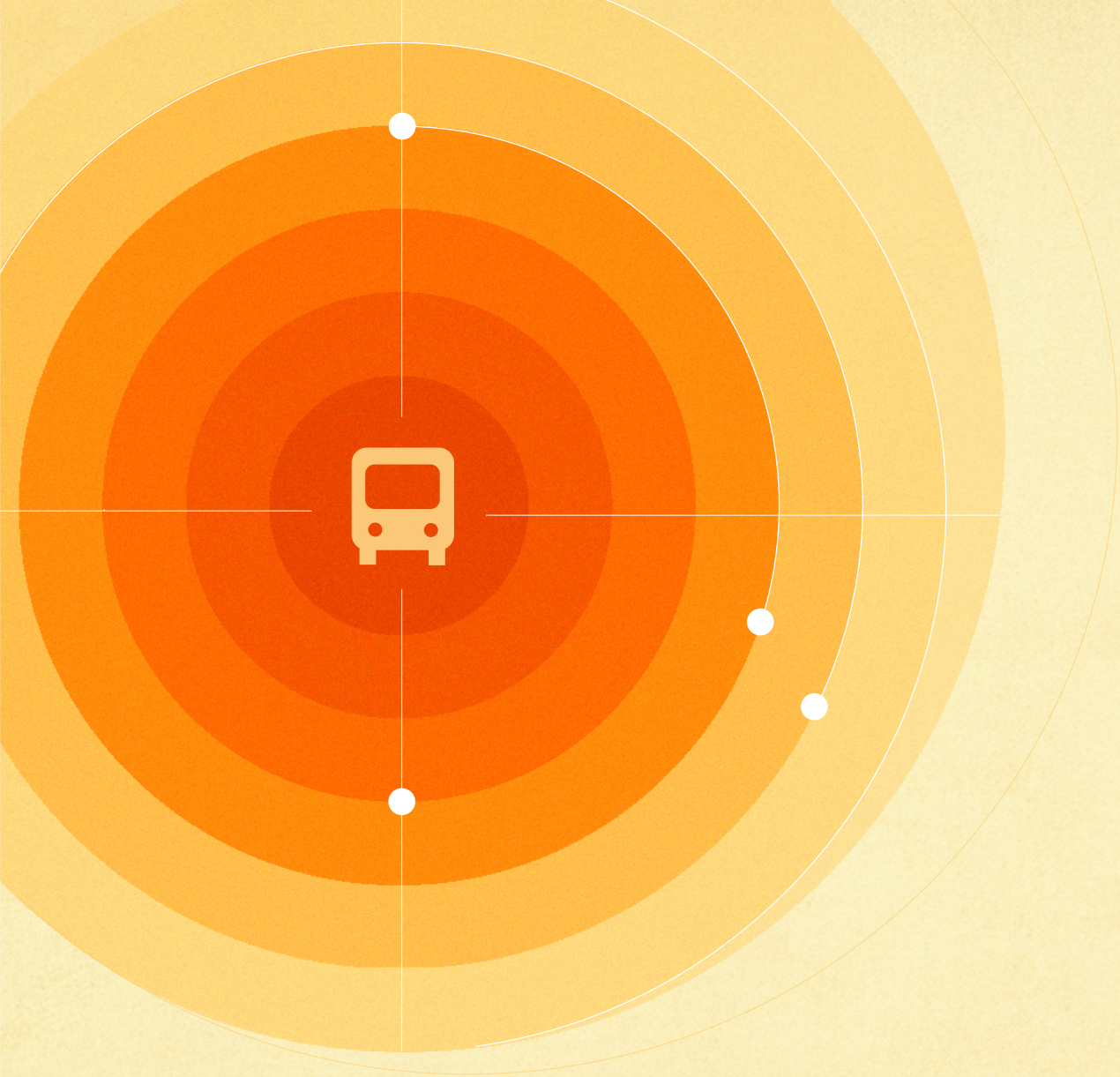
Waste
implementation measures

Measure 9 (M9): Collaborate to manage the regional "wasteshed"

Measure 10 (M10): Develop local ordinances and policies to manage the regional "wasteshed"

Measure 11 (M11): Expand public education in the region

Measure 12 (M12): Support expansion of public-private partnerships to improve local circularity



4.2 Transportation

M1: Regional bus rapid transit expansion

M2: Provide funding for active transportation projects

M3: Regional Transportation Demand Management program

M4: Coordination of electric vehicle charging locations and infrastructure purchases

4.2 Introduction

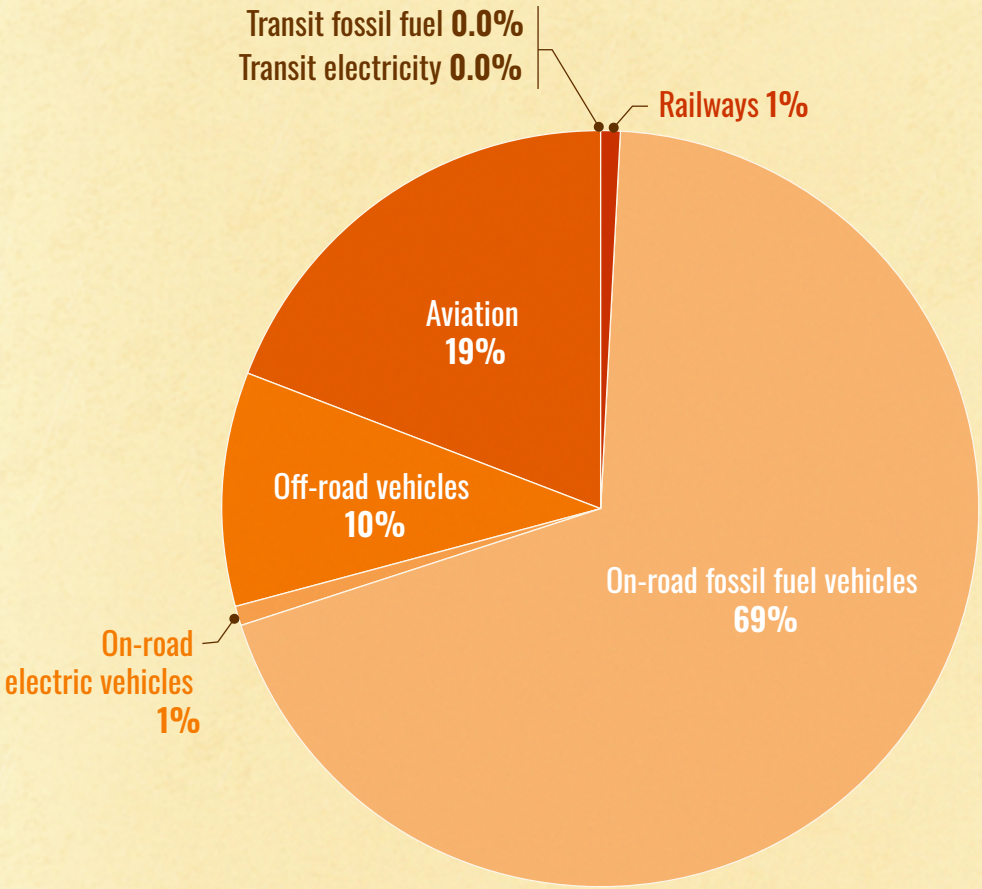
Transportation is a vital component of our daily lives, connecting people, goods and services across our region. It's also one of the largest contributors to climate pollution, comprising 34% of the region's emissions, while also significantly impacting our environment and public health. As we face the urgent challenge of climate change, it is imperative to transform our transportation systems to be more sustainable, efficient and equitable.

4.2.1 Transportation measures

The four measures in this sector aim to address these challenges by promoting multimodal, human-centered and more accessible transportation options. By investing in public transit, encouraging active transportation like walking and cycling, and supporting the adoption of electric and low-emission vehicles, we can reduce our carbon footprint and create a healthier, more resilient community.

These measures outline ways to reduce

Figure 13: Transportation sector emissions by emission source.



emissions from the transportation sector, improve air quality, and enhance the quality of life for all residents. Collectively, we can build a future where our transportation systems are not only efficient and reliable but also environmentally responsible and inclusive. The future rests on a safe, equitable and sustainable multimodal transportation network. As the region continues to grow, intentionality is essential in order to plan and address the region's changing mobility needs.

4.2.2 DRCOG's work

Through DRCOG, 59 local governments are represented in a continuing, cooperative and comprehensive transportation planning process that addresses all travel modes in the region. This work is done alongside the Colorado Department of Transportation, Regional Transportation District, Regional Air Quality Council and other partners. DRCOG's transportation planning process supports Metro

Dountown Denver Light Rail Source: RTD Flickr

Vision while adhering to state and federal practices and regulations. Ongoing planning addresses both the Regional Transportation Plan's long-term vision for the region, as well as short-term needs identified through the Transportation Improvement Program. The Unified Planning Work Program details the activities of the transportation planning partners. Read the Framework for Transportation Planning in the Denver Region to learn more.

4.2.3 Statewide transportation overview

Transportation contributed to approximately 18.5% of the state's climate pollution emissions. Transportation emissions are impacted by the travel options available to people, the type of fuel used to power vehicles, the efficiency of vehicles, and the total amount of vehicle miles traveled. Local governments have authority over the design and operation of local roads and streets. They also have policy options

available to encourage walking, biking and transit use, as well as electric vehicle and lower-emissions vehicle adoption.

Colorado is working to reduce transportation-related climate pollution emissions by 41%, or 12.7 million metric tons, by 2030 from 2005 levels. To meet this goal, the state is:

- Ensuring auto and truck manufacturers make a variety of zero-emission vehicle options available at Colorado dealerships.
- Investing in electric vehicle charging and offering incentives for electric vehicle purchases.
- Prioritizing emissions reduction opportunities when developing and approving plans for new transportation projects.
- Expanding public transportation and shared transportation options (e.g., electric car-shares).
- Enabling adoption of zero-emission trucks, buses and electric bikes.
- Mitigating emissions from facilities that generate significant amounts of traffic.

Colorado has also enacted different legislation to advance these goals:

- The state's Greenhouse Gas Pollution Reduction Roadmap establishes milestones for Colorado to reach net-zero emissions by 2050 across all sectors.
- Colorado Senate Bill 260 was approved in 2021 and provides financial incentive for the adoption of electric vehicles, requires the reduction of emissions in the regional transportation planning process, and prioritizes funding for active and public transportation projects.

Downtown Denver skyline at dusk with Amtrak and commuter rail lines in the foreground at Union Station.

- Colorado House Bill 1263 was approved in 2021 and aligns with California's standards for the emissions of new vehicles sold in Colorado.

Achieving net-zero in the transportation sector

The measures identified will lower climate pollution emissions by reducing vehicle miles traveled, promoting electric vehicle adoption, and fostering safety and reliability across all modes of transportation. The measures were selected as priorities due to their ability to be impacted by DRCOG's planning efforts.

RTD light rail train stopped at a Denver station platform.

Increased demand for transit

Population and employment growth in the Denver region will contribute to a significant increase in traffic congestion by 2040. Transportation agencies and communities can meet the needs of growing regional populations by implementing infrastructure approaches such as complete streets, which accommodate multiple modes of travel, and by prioritizing public transit to provide reliable travel choices to get around the region. Through its transportation demand management work, DRCOG and its partners help the region's residents and visitors travel to work, school, medical care, social and cultural activities, and their daily errands, all while aligning with the goals established in Metro Vision.

Figure 14: Summary of carbon pollution reductions compared to the business-as-usual scenario for the transportation sector.

Transportation measure summary		Emission reductions in 2030 compared to the BAU ($MT CO_2e$)	Emission reductions in 2050 compared to the BAU ($MT CO_2e$)
M1	Regional bus rapid transit expansion	350,400	1,518,600
M2	Provide funding for active transportation projects	4,900-233,000	21,400-1,010,000
M3	Regional Transportation Demand Management program	27-54	105-130
M4	Coordination of electric vehicle charging locations and infrastructure purchases	260-790 in reductions enabled per Level 2 charger and 2,600-10,500 MT per DCFC charger	1,400-4,200 in reductions enabled per Level 2 charger and 14,100-56,000 MT enabled per DCFC charger

M1: Regional bus rapid transit expansion

Goal summary:

Expand BRT access in the DRCOG region by completing routes in 5 corridors by 2030.

Investment:

$ $$ $$$

Carbon pollution impact:

Co-benefits:

- Economic vitality
- Placemaking

Stakeholders and DRCOG staff will coordinate with regional transportation agencies (such as, but not limited to, the Colorado Department of Transportation, the Regional Transportation District, and member government staff) to continue to implement the regional bus rapid transit network defined in the DRCOG metropolitan planning organization's 2050 Metro Vision Regional Transportation Plan. This plan aims to better serve low-income and disadvantaged communities while supporting regional transit connectivity. This measure will use frameworks established by the cooperating agencies, and will prioritize the development and implementation of the following corridors by 2030:

- **East Colfax Bus Rapid Transit:** Colfax Avenue from Union Station to Interstate 225 (currently under construction).
- **East Colfax Bus Rapid Transit Extension:** Colfax Avenue from Interstate 225 to E-470 (DRCOG is leading an Alternatives Analysis study).
- **Colorado State Highway 119 Bus Rapid Transit:** Downtown Boulder to Longmont (currently under construction).
- **Federal Boulevard Bus Rapid Transit:** Federal Boulevard from Dartmouth Avenue to 120th Avenue (CDOT is leading a National Environmental Policy Act study).
- **Colorado Boulevard Bus Rapid Transit:** Colorado Boulevard from Interstate 25 to Interstate 70 (CDOT is leading a National Environmental Policy Act study).

As DRCOG is currently updating its 2050 Regional Transportation Plan, implementation timelines for these and other BRT corridors may change over time.

What is bus rapid transit?

Bus rapid transit is a bus-based system that delivers efficient, fast, and reliable service that may include traffic signal priority, elevated platforms, enhanced stations, dedicated lanes and increased frequency. Bus rapid transit contains features similar to light rail transit and is often considered more convenient and faster than standard bus services.

Figure 15: Key features of bus rapid transit services.
Source: https://www.rtd-denver.com/bus-rapid-transit-brt

Implementation timelines and milestones

DRCOG staff are currently working with jurisdictions in the region to identify priorities and set goals and timelines to achieve bus rapid transit objectives. The first five bus rapid transit corridors outlined in this strategy are planned for implementation by 2030.

Quantified emission reduction

This measure includes the conversion of several existing transit routes into bus rapid transit routes. DRCOG staff provided total one-way miles and the expected frequency of each route for the analysis. Using the frequency and one-way distance, staff estimated the total annual miles driven along all bus rapid transit routes. Staff did not directly calculate emissions from mileage; rather, they based emissions on the Colorado Department of Transportation's Greenhouse Gas Mitigation Measures Policy Directive which includes avoided metric tons of carbon dioxide equivalent per mile of bus rapid transit driven during various timeframes. Staff applied resulting values to the estimated bus rapid transit mileage to estimate total avoided emissions. The Colorado Department of Transportation's Policy Directive estimates are based on a high electric vehicle adoption scenario. Emission reductions for years closer to 2050 may vary from those included in the directive if electric vehicle adoption does not meet projected scenarios.

Co-pollutant impacts

Increases in transit infrastructure are correlated with increased ridership, and additional ridership is correlated with a reduction in particulate matter and ozone precursor emissions. Ozone precursors include volatile organic compounds and nitrogen oxides. As specific ridership estimates were unavailable for the development of the plan, DRCOG staff were unable to calculate specific estimates of co-pollutant reductions.

Figure 16: Total bus rapid transit miles added, with upfront and ongoing costs per mile and cumulative from 2025-2050.

Bus rapid transit route miles added	6,729,632
Upfront cost per mile	$115
Ongoing costs per mile	$1.64
Upfront costs (2025)	$763 million
Ongoing costs cumulative (2026-2050)	$290 million

Did you know?

Colfax began as a major thoroughfare during the Gold Rush and then transformed into U.S. 40, which ran 3,157 miles from Atlantic City to San Francisco, seamlessly traversing the entire state of Colorado before the interstate system was built. Originally called “Golden Road” as well as “Grand Avenue,” Colfax Avenue changed its name in honor of Schuyler Colfax, a powerful Indiana congressman and Speaker of the House of Representatives at that time.

Source: colfaxave.com/history

East Colfax Avenue bus rapid transit

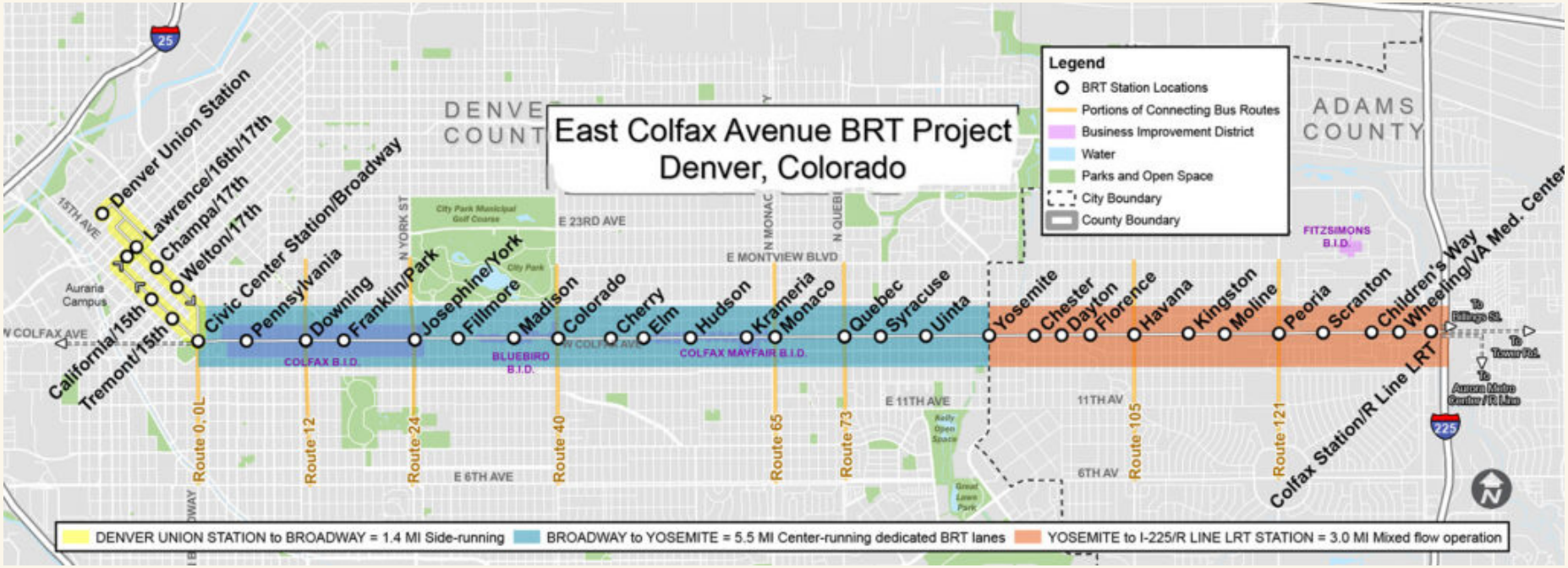
Project overview

Colfax Avenue, one of the area’s most historic streets and the longest continuous road (non-highway) in the United States, is a key east-west transportation route and the backbone of a thriving and diverse community. With significant population and business growth expected in the coming years, the time came to reimagine the Colfax experience with a focus on moving people more efficiently, safely and sustainably along the corridor.

In 2008, the City and County of Denver’s Strategic Transportation Plan identified the need to improve traffic flow and rider and pedestrian safety. Because demand for RTD’s 15/15L bus service along Colfax is higher than all other RTD routes, the city selected the East Colfax Corridor to explore new transit approaches.

A Streetcar Feasibility Study was conducted in 2010, followed by a more detailed 2012 analysis of current and future needs along the Colfax corridor. In 2018, following six years of outreach and community input, 75% of the participating public recommended center-running bus rapid transit as the favored design alternative. The design process and environmental review began in late 2020 and was completed in 2024. Construction on the project began in October 2024 and is slated to be completed in 2027.

Figure 17: Map and construction photo of East Colfax Avenue BRT Project



M2: Provide funding for active transportation projects

Goal summary:

Collaborate on and support the full build out of the active transportation network in the DRCOG region by 2050 (446 total miles).

Investment:

$ $$ $$$

Carbon pollution impact:

Co-benefits:

- Healthier communities
- Placemaking
- Safety

The Denver region is highly mobile, and as in many places around the country, driving alone is the most common way people get to work in the region. Beginning in the early planning stages of the Priority Climate Action Plan, stakeholders strongly encouraged additional investment in active transportation projects across the region. In order to achieve this goal, partners and DRCOG staff will coordinate with regional stakeholders (such as, but not limited to, the Colorado Department of Transportation, the Regional Transportation District, and member government staff) to expand active transportation infrastructure in the region. Facilities will include bike lanes and shared-use paths that align with transportation safety best practices, all while prioritizing low-income communities and key corridors using frameworks established by participating agencies. Infrastructure projects will align with adopted plans for respective project areas, with a focus on first- and last-mile connectivity and the completion of missing links in the regional network.

DRCOG's Transportation Improvement Program

DRCOG supports active transportation regionwide through the Transportation Improvement Program. The DRCOG Board of Directors establishes the Transportation Improvement Plan policy, which outlines how projects in the region will be funded using existing resources over which DRCOG has allocation authority. This occurs through calls for projects, all of which must meet current air quality standards. Projects in the Transportation Improvement Program are regularly updated through administrative modification and amendments, and the program identifies all current federal- and state-funded transportation projects with funding in the Denver region over a four-year period.

What is active transportation?

Active transportation refers to pedestrian modes such as walking and wheelchairs, bicycling, and other forms of self-propelled transportation. It comprises trips made for any purpose including commuting, utility, school, recreation or casual trips. While emerging modes like e-bikes and e-scooters do not exclusively rely on human power, people riding them typically use shared-use paths, bike lanes and sidewalks. These methods offer a viable alternative to the use of motor vehicles and contribute to many of the same goals as walking and bicycling.

Example from DRCOG's Active Transportation Plan (ATP) indicating public support for various active transportation improvements

No bicycle facility on a four-lane roadway.

Bicycle lane on a two-lane roadway.

Bicycle lane on a four-lane roadway.

Buffered bicycle lane on a four-lane roadway.

Separated bike lane on a four-lane roadway.

Bi-directional separated bike lane on a four-lane roadway.

Sidepath adjacent to a four-lane roadway.

Bicycling and Walking Trail.

Goal summary:

Implement the Transportation Demand Management Strategic Plan and encourage transportation demand management for Transportation Improvement Program projects.

Investment:

$ $$ $$$

Carbon pollution impact:

Co-benefits:

- Economic vitality
- Healthier communities

What does Way to Go do?

Way to Go helps employers — at no cost — find the right commute options for their employees, improving morale while reducing traffic congestion and air pollution. Fewer car trips help lead to essential climate pollution reduction benefits.

M3: Regional transportation demand management

Transportation demand management refers to a suite of strategies to help travelers use transportation systems in a more efficient and sustainable way. The strategies include education and outreach campaigns, commute consultations, technology for planning and tracking trips, some transportation infrastructure, zoning regulations, employer programs, and parking management. The primary purpose of transportation demand management is to decrease the number of people driving alone on the roadway system to reduce traffic congestion and climate and air pollution. Staff from DRCOG will continue work to expand its existing program, Way to Go (a partnership between DRCOG and eight transportation management associations), support DRCOG's Transportation Demand Management Strategic Plan, and integrate transportation demand management — and further, the reduction of climate pollution — as a requirement for certain projects in the Transportation Improvement Program.

Did you know?

Over 34,000 people from August 2023-September 2024 applied to the the State of Colorado's e-bike rebate program, resulting in 7,985 Coloradans purchasing an e-bike through the program. While this program has since closed, the state provides a $450 e-bike tax credit from purchasing retailers.

Source: https://energyoffice.colorado.gov/ebike-rebates

City and County of Denver's e-bike program

Electric bicycles (e-bikes) are a safe and reliable method of transportation that can reduce the need for short vehicle trips by helping the rider reach destinations with speed and ease. An e-bike is a bicycle that is equipped with an electric motor that assists the rider with pedaling. E-bikes also support individuals with medical conditions or mobility issues. The City and County of Denver's Climate Action, Sustainability and Resiliency Office, which hosts a popular e-bike program, noted that a *"full year's usage of e-bikes purchased with rebates will displace over 3,300 tons of...emissions while eliminating nearly 170,000 miles of vehicle travel weekly,"* helping the city reach ambitious climate goals.

The program began in 2022 and since its inception, 9,565 e-bike vouchers have been redeemed as of April 2025. The program is first-come, first serve, and interested applicants can apply for the vouchers a few times a year. In February 2024, all vouchers were claimed within eight minutes of their release, and within two and a half minutes in April 2024. Voucher amounts vary depending on what requirements interested parties fall into as seen in figure 18.

Contraflow lane, Edgewater

Figure 18: City and County of Denver's e-bike program rebate requirements.

Low-income	
Household income is below 60% of Colorado or Denver median income or below 200% of the relevant federal poverty line qualify.	**E-bike:** $1,200 **E-cargo bike:** $1,400
Moderate-income	
Participants must make below 100% of Colorado's median income, below 200% of the relevant federal poverty line or between 60% and 100% of Denver's median income.	**E-bike:** $700 **E-cargo bike:** $900
Standard	
Any City and County of Denver resident who is 16 or older.	**E-bike:** $300 **E-cargo bike:** $500

Goal summary:

Facilitate and support the completion of the regional EV charging network.

Investment:

$ $$ $$$

Carbon pollution impact:

Co-benefits:

- Economic vitality
- Placemaking

With no tailpipe emissions, more efficient energy usage, and lower maintenance costs, electric vehicles are associated with positive health, economic and environmental benefits for all people in the Denver region. Charging infrastructure is essential to help drivers choose to transition away from their gas vehicles.

M4: Regional electric vehicle charging infrastructure

The automobile is cemented in American culture — emissions from cars and trucks must be reduced to reach regional climate goals. Charging infrastructure plays a critical role in encouraging the transition from gas-powered vehicles to cleaner electric ones. Several factors impact charging infrastructure for electric vehicles: local government zoning, energy grid capacity and funding, as examples.

As a regional agency, DRCOG is best equipped to convene stakeholders and encourage collective action. DRCOG staff will assess charging infrastructure in the region and identify areas of need, provide technical support to local governments to update zoning regulations and encourage charging infrastructure, coordinate with utility companies to ensure energy grid capacity sufficiently exists for additional charging, and organize a bulk purchasing effort for charging infrastructure if needs require it.

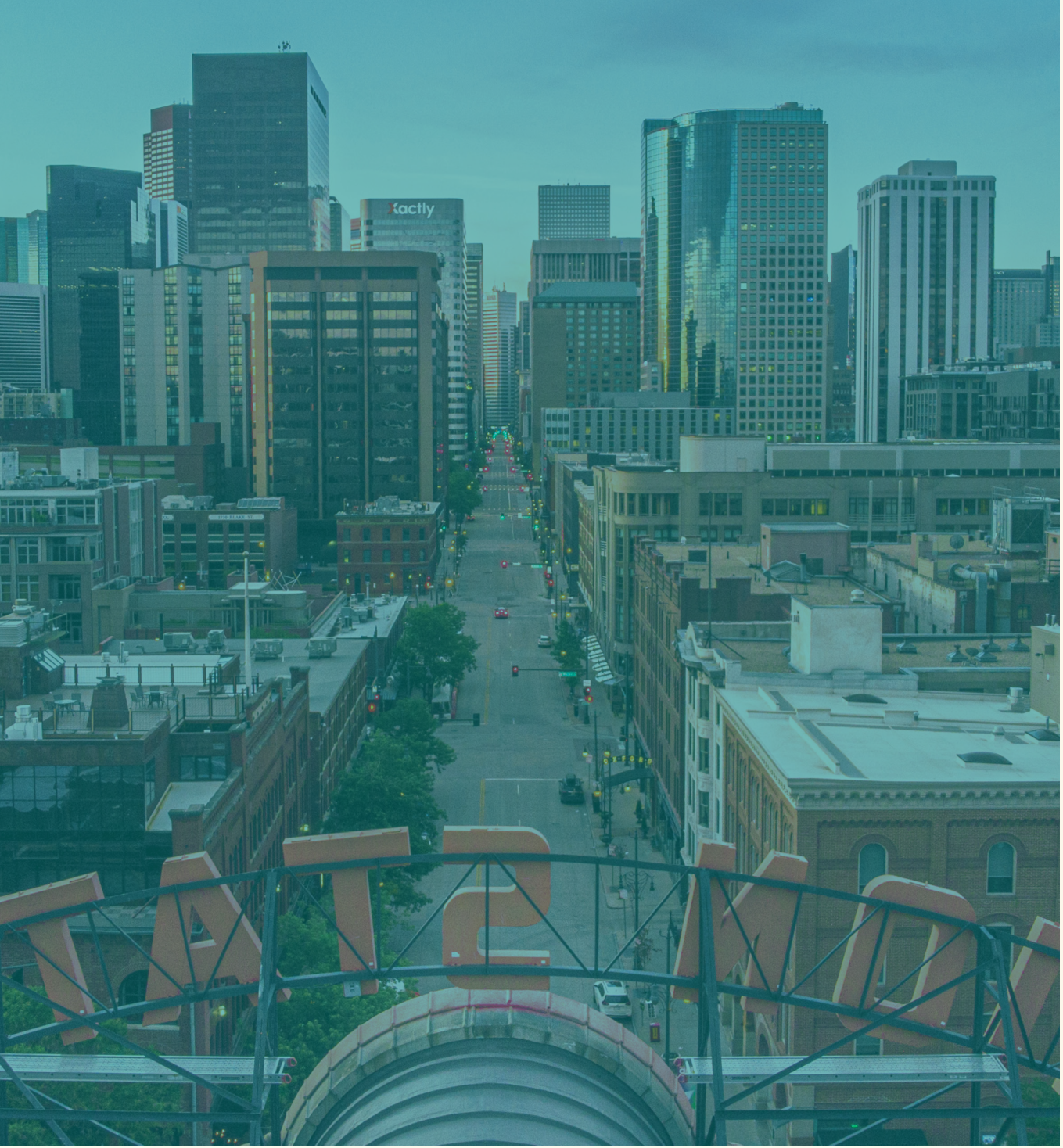
4.3 Buildings

M5: Low-income decarbonization

M6: Energy advising program

M7: Rebates and incentives

M8: Building Policy Collaborative

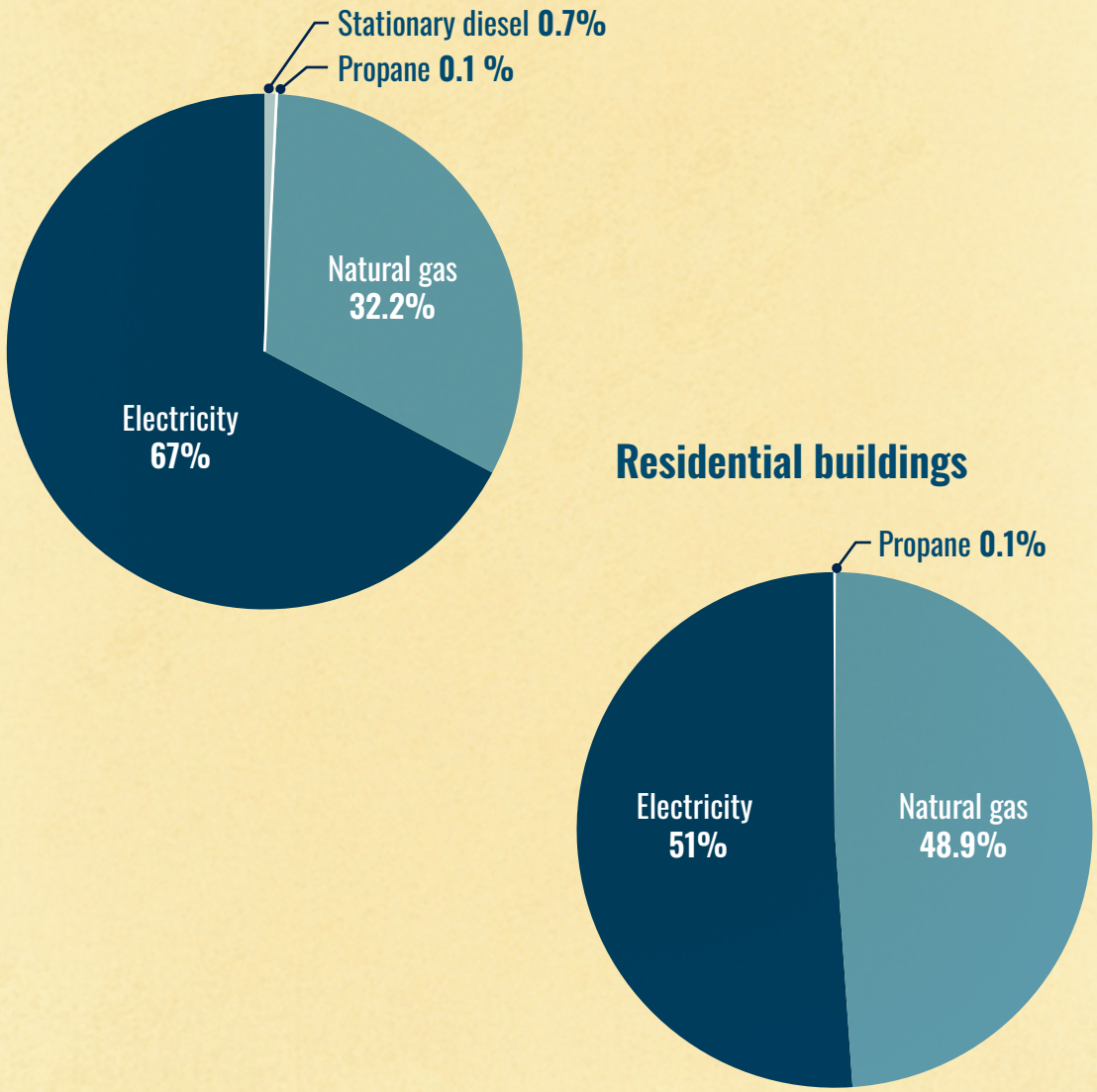


4.3 Introduction

The DRCOG region's robust built environment generates 52% of the region’s climate pollution emissions. Basic energy conservation measures like efficient windows, insulation, lighting, and heating/cooling systems cut back on emissions from energy usage. However, a more holistic whole-building approach that evaluates broader building systems, facilities, and how they interact with the grid can lead to deeper savings.

While new construction can take advantage of more efficient design and construction standards, modifying existing buildings has the greatest potential for energy savings and related emissions reductions. Retrofitting aging buildings enables businesses, institutions, and residents to reduce energy use, shrink their carbon footprint, and cut costs while also extending the life of the building and raising property values. Residents bear some of the highest financial burdens in the country

Figure 19: Buildings sector emissions by emission source



related to utility bills. This highlights the importance of government and utility weatherization programs and performance standards that address issues of affordability, health and safety for the region's most vulnerable populations. State and local policy is particularly important in providing necessary programs, regulations and cost-saving measures.

The following measures take a holistic approach to tackling the challenge of decarbonizing the building sector through advocating for policy reform, assisting vulnerable populations, and upskilling and training the growing workforce.

Overhead view of the University of Colorado Boulder and the Flatirons.

4.3.1 State of Colorado buildings overview

The building sector across Colorado is a significant contributor to climate pollution, primarily through energy use for heating, cooling, lighting and appliances. Following the publication of the Greenhouse Gas Reduction Roadmap, the state adopted several laws to help the sector reach emission reduction goals by 2050.

New construction

- **(2019) Building Energy Codes (HB19-1260):** This law requires local jurisdictions in Colorado to adopt and enforce one of the three most recent versions of the International Energy Conservation Code upon adopting or updating any other building code.
- **(2022) Building Greenhouse Gas Emissions (HB22-1362):** Building upon HB19-1260, this law requires the state to appoint an Energy Code Board that will develop two sets of model codes, including a model electric and solar ready code on or before June 1, 2023, and a model low energy and carbon code on or before July 1, 2025, for adoption by counties, municipalities and state agencies.

Green financing for building retrofits

- **(2021) Transfer to Colorado Energy Office Energy Fund (SB 21-230):** Provides funding to capitalize the Colorado Clean Energy Fund and Colorado's new energy improvement district to initiate a transition to a sustainable funding pathway for Colorado's Commercial Property Assessed Clean Energy Program. Since January 2021, the program has mobilized $167 million in private financing.

Pearl Street, Boulder

Existing buildings

- **(2021) Energy Performance for Buildings (HB21-1286):** This law requires large buildings (50,000 square feet and larger) to reduce greenhouse gas emissions by 7% by 2026 and 20% by 2030, compared to 2021 levels. Building owners must report their energy use annually and eventually comply with building performance standards to improve energy efficiency or switch to cleaner energy sources.
- **(2023) Building Performance Standards Rule (5 CCR 1001-32):** Approved by the Air Quality Control Commission, this rule set performance targets for all buildings covered by HB21-1286. This rule provides pathways for covered buildings to comply with 2026 and 2030 deadlines, which will require building owners to reduce their energy usage and emissions.
- **(2025) Building Decarbonization Measures (HB25-1269):** The law provided updates to HB21-1286 by adding requirements to meet 2040 performance standards as adopted by the Air Quality Control Commission, updating civil penalties and adding alternative compliance mechanism for 2026 targets. It also created a building decarbonization enterprise to provide financial and technical assistance, and other programmatic assistance, to covered building owners.

The Colorado Energy Office received $129 million in EPA Climate Pollution Reduction Grant implementation funds in July 2024. The funds are obligated for three different areas. The first is used for large building decarbonization and offers subawards to fund projects for buildings covered by the state Benchmarking and Building Performance Standards programs that aim to reduce emissions before or beyond regulatory requirements. The second is for the Local Government Climate Action Accelerator, through which the state will offer subawards to local governments for measures that have significant emissions reduction potential. These subawards are

best suited for local government implementation, and adopting energy codes and performance standards that exceed state requirements is one of the many options in the building sector category. Finally, the funds also support the creation of a program to monitor and reduce methane emissions from landfills and coal mines.

4.3.2 Building measures

DRCOG's five-year, grant funded Building Decarbonization Program supports several coordinated initiatives to reduce carbon pollution from buildings, foster workforce development, and offer financial incentives for home services. Each initiative, formed out of DRCOG's Priority Climate Action Plan, addresses specific environmental and industry challenges and improves air quality, sustainability and public health in the Denver region. The program directly impacts 56% of Coloradans (over 3.3 million people) with the goal of achieving a region-wide zero operational emission building sector by 2050.

The program focuses on four measures:

M5: Low-income full-service household program

Free home retrofits and upgrade services from start to finish, designed to meet low-income resident needs.

M6: Energy advising

Free, data-driven, client-focused, and vendor-neutral advising to help residential, multifamily and commercial building owners through decarbonization.

M7: Rebates and incentives

Funds to mitigate costs, accelerate adoption and spur market growth.

M8: Building Policy Collaborative

Facilitated support for accelerating and coordinating zero-emissions building policy implementation region-wide, including funds to grow municipal capacity.

Figure 20: Summary of carbon pollution reductions compared to the business-as-usual scenario for the buildings sector.

Building measures summary		Emissions reductions ($MT CO_2e$) 2025-2030	Emissions reductions ($MT CO_2e$) 2025-2050
M5	Low-income full-service household program decarbonization	12,204	94,955
M6	Energy advising	367,025	3,202,381
M7	Rebates and incentives	246,141	1,935,956
M8	Building Policy Collaborative	3,811,623	106,614,244

M5: Full-service decarbonization for low-income populations

Goal summary:

Provide free home weatherization and energy efficiency services to nearly 2,000 low-income households in the DRCOG region by 2030.

Investment:

Carbon pollution impact:

Co-benefits:

- Attainable housing
- Economic vitality
- Healthier communities
- Resource conservation

This measure intends to make healthy, energy-efficient homes more accessible to low-income households by offering holistic energy efficiency and electrification measures. At no cost to the participant, the program will facilitate building retrofit measures together with supporting services to mitigate risks to residents, such as bill assistance, community solar subscriptions, and long-term no-cost maintenance contracts. Program services will be income qualified and designed to address participant energy, resilience, and other needs. DRCOG intends to utilize Colorado's Enviroscreen 2.0 and other relevant datasets to inform outreach and neighborhood scale pilots in areas of high potential social and environmental impact.

Services and equipment upgrades will be allocated based on household assessment and participant needs and may include weatherization, insulation, air sealing, window alterations, induction cooktops/cookware, cold climate heat pumps and heat pump water heaters. These upgrades will reduce emissions, improve indoor air quality, and increase resilience to extreme heat and poor outdoor air quality. Based on need, participants may receive pre-weatherization health and safety repairs to enable effective efficiency and electrification upgrade implementation. The program will provide dedicated energy coaches for each participant to guide household members, set expectations, listen, and provide education around new home upgrades and technologies. The program will initially focus on deed-restricted affordable housing and income qualified homeowners with significant vulnerabilities such as aging household members or small children, household members with powered medical equipment, etc. The program will also link to DRCOG's workforce development programs and resources, and endeavors to recruit new entrants to the workforce through program outreach and the pipeline of work created through the implementation of the program.

M6: Energy advising program

Goal summary:

Provide energy advising services to nearly 40,000 homes, apartments, and businesses by 2030.

Investment:

Carbon pollution impact:

Co-benefits:

- Economic vitality
- Healthier communities
- Resource conservation

Currently, no unified resource guides residents through the complexities of building upgrade projects. Even highly motivated customers and commercial building owners struggle to navigate the process. Local government staff routinely hear from homeowners whose contractors discouraged heat pump installation or provided highly variable proposals. Commercial building owners, both buildings covered by state or local building performance policies and buildings not covered by these policies, face complex system upgrades without a clear explanation of the potential risks and benefits, and available incentives for different building system replacement or updates.

Essentially, home and building owners must become their own general contractor to navigate complex and unfamiliar energy efficiency and electrification topics. DRCOG's Energy Advising Program will provide a one-stop shop that helps residents and businesses understand and access available upgrades and associated incentives. Advisors will help support projects via email, phone and virtual meetings, focusing first on customer needs and concerns rather than solely on technical outcomes. To mitigate costs and maximize residents served, DRCOG will also offer a self-service website with a variety of tools and educational resources for all audiences.

Services will be tailored to residents and building owners ranging from small single-family homeowners to larger commercial or multifamily property holders, whether they are owner-occupied, landlord-operated, or governed by condominium/homeowner associations. The advising program will be integrated with DRCOG's Low-Income Household Program to ensure that customers understand all available offerings and access the right services for their needs. Advising and other resources will be multilingual, with offerings in languages such as Spanish, Vietnamese, Arabic, Somali, and Amharic, and will comply with federal language access plan requirements.

M7: Rebates and incentives

Goal summary:

Provide incentives to install heat pumps in nearly 25,000 homes and apartments. Electrify more than 7 million square feet of commercial building space.

Investment:

Carbon pollution impact:

Co-benefits:

- Economic vitality
- Healthier communities
- Resource conservation

Upfront cost and the high differential cost between traditional equipment and highly efficient, all-electric equipment is a major barrier to electrification. DRCOG's Incentive Program will build on incentive programs from local jurisdictions, utilities, and state tax credits to further reduce upfront costs for more efficient equipment choices. Incentives will be designed to both affect the transformation of the marketplace and to serve as an asset for contractors providing quality installation and service for highly efficient equipment.

Incentives will be available for residential, multifamily, and commercial properties, and will be accessible, timely, and impactful. Audits, weatherization, electrification and related necessary upgrades may be covered by the program and several modes of incentivization will be explored, including upstream offerings through equipment distributors, midstream incentives offered to contractors, and custom and downstream offerings for individual customers. Incentive levels will be based on community engagement and best practice research, setting sufficiently high rebate amounts while still achieving maximum emission reduction returns per dollar, as well as equitable income-based distribution and market stability for the workforce. Depending on community engagement outcomes, industry incentives (e.g., contractor installation or distributor stocking bonuses), or incentives for meeting certain green building standards (e.g., LEED and PassiveHouse) may also be considered. Incentives will be reviewed and adjusted at least annually and will align with technical requirements for other incentive programs in the region.

Three DRCOG communities (City and County of Denver, City of Boulder, and Boulder County) currently provide incentives on top of utility, state and federal programs. Each locality, however, has distinct rebates and qualifying criteria, leaving

contractors, homeowners and businesses to face a complicated landscape, and leaving two-thirds of DRCOG's population with no municipal decarbonization support. These three communities have committed to end their separate rebate programs and instead direct funding to supplement DRCOG's program. This reorganization will not increase rebate amounts allocated per recipient, but rather will serve more units, eliminating confusion and equalizing rebates across the region and simplifying systems for contractors working across jurisdiction and utility boundaries. Other DRCOG communities have provisionally expressed interest in contributing additional local funding.

M8: Building Policy Collaborative

Goal summary:

Guide municipalities in the DRCOG region to adopt net zero building energy codes by 2030.

Investment:

Carbon pollution impact:

Co-benefits:

- Economic vitality
- Healthier communities
- Resource conservation

Colorado constitutionally grants municipalities the authority to self-govern building codes. The Building Policy Collaborative (BPC) will provide member jurisdictions with support in adopting, implementing and enforcing building decarbonization policies. The BPC will provide support and technical assistance using three primary approaches:

- **A peer network**, which will create a regional roadmap to help guide DRCOG's region towards a zero-emission built environment by 2050, as well as to create model policies for new construction and existing buildings. The peer network will also work together to assess what each jurisdiction needs to advance ambitious building policies and work to find collaborative solutions to policy concerns.
- **A Jurisdictional Subaward Program**, which will provide DRCOG jurisdictions with a total of $35 million in awards to help jurisdictions build capacity, update their software and permitting systems, and increase technical assistance in their region, ultimately increasing the adoption and enforcement of building decarbonization polices.
- **Research** to track and evaluate data across the region and publish reports that jurisdictions can use to inform and advocate for improved policy.

Why is it important to advance local high-performance building policies now?

Colorado has experienced a rise in extreme weather events, particularly wildfires, that pose significant risks to buildings and air quality. Building policies are one of the primary tools local governments have in order to protect residents from pollution and energy cost burdens, and to ensure safe and healthy indoor and outdoor environments for future generations. Additionally, consistent building policies are easier for builders and equipment suppliers to follow. The Building Policy Collaborative will not only support member jurisdictions in complying with state requirements, but will also help them exceed the state's minimum standards for existing and new construction, while advancing regional sustainability goals. The resulting goal of the Building Policy Collaborative will be that by 2030, most of the region will have near zero emission building policy for new construction, and communities representing 33% of regional population will have advanced energy efficiency requirements for existing buildings of 10,000 to 50,000 square feet.

South Platte river running through downtown Denver.

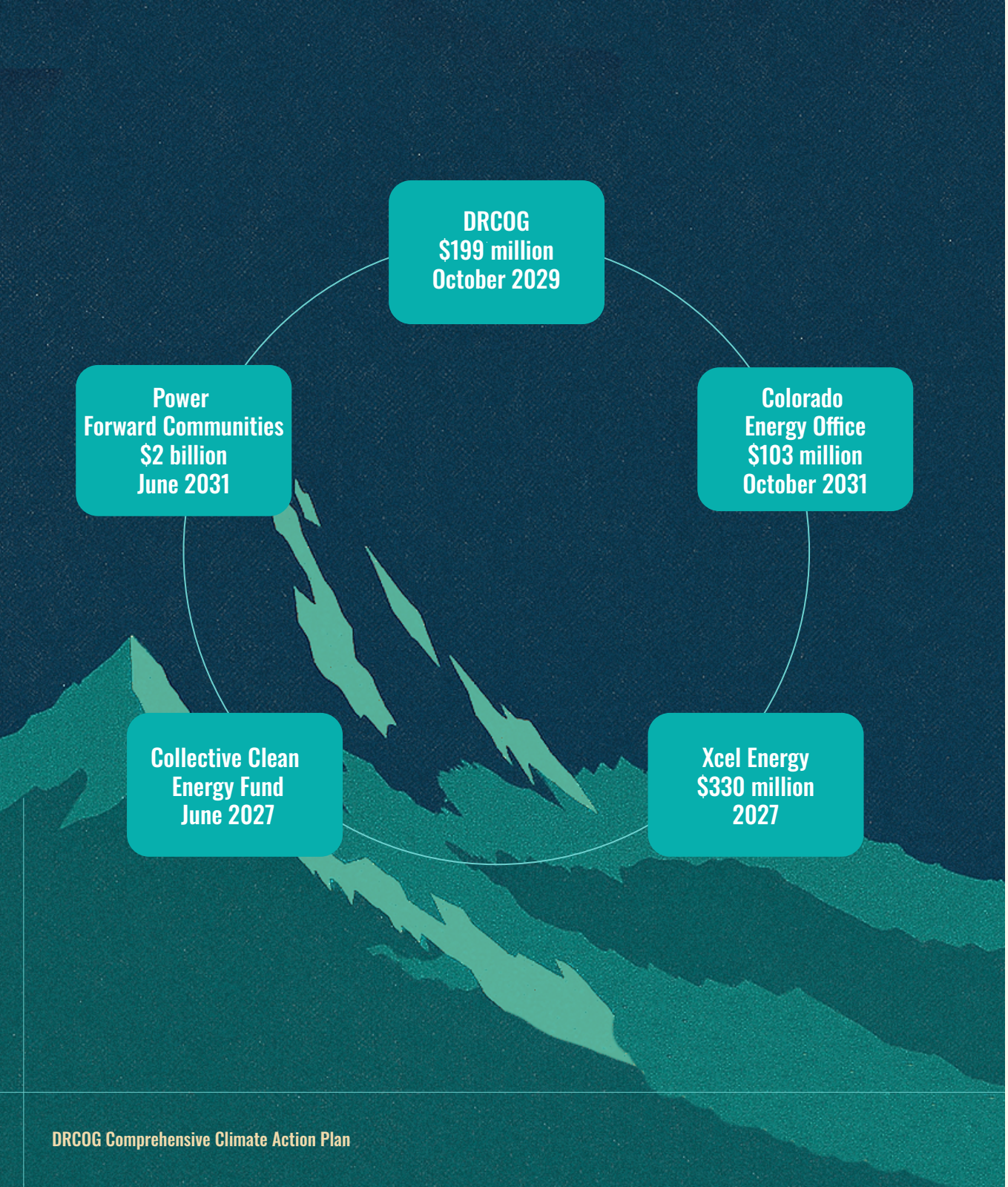
4.3.3 Energize Denver Building Performance Policy

The Energize Denver Building Performance Policy is a cornerstone of the city's strategy to eliminate building-related emissions by 2040. Originally passed in 2021 and most recently updated in 2025, the policy sets performance standards for energy efficiency across two categories of commercial and multifamily buildings: those between 5,000 and 24,999 square feet, and those 25,000 square feet and larger. By targeting these building sizes, the policy aims to drive widespread improvements in energy use and support Denver's broader climate goals. The program requires owners to track energy use, meet performance goals, and consider upgrades like heat pumps and renewable energy systems. The policy is expected to bring long-term cost savings, support local job creation and energy independence, and reduce pollution, leading to cleaner air and better health.

To help building owners make the switch, the City and County of Denver launched the Building Electrification Retrofit Pilot Program, which helps cover the cost of replacing gas-powered systems with electric ones. It offers up to 100% of the cost difference, with additional incentives for buildings serving low-income residents. The program is fully booked for 2025, indicating strong demand.

These efforts align closely with Colorado's statewide climate strategy. The state's Building Performance Colorado program sets similar energy benchmarking and performance standards for large buildings, aiming to cut emissions by 20% by 2030. Additionally, Colorado's statewide building energy code supports the transition to all-electric buildings by requiring new construction to be electric vehicle- and solar-ready, and to accommodate efficient electric appliances like heat pumps.

Together, these initiatives are transforming how Denver and Colorado power their buildings, making them cleaner, healthier and more resilient for the future.



Building Decarbonization Network

Program overview

Five organizations — DRCOG, Colorado Energy Office, Power Forward Communities, Collective Clean Energy Fund and Xcel Energy — were awarded funding to implement building decarbonization solutions across Colorado. In October 2024, these organizations formed the Building Decarbonization Network to collaborate on workforce development, align on messaging, and develop program mechanics to streamline application processes and ensure smooth and cohesive program experiences for customers.

4.4 Waste

M9: Collaborate to manage the regional “wasteshed”

M10: Develop local ordinances and policies to manage the regional “wasteshed”

M11: Expand public education in the region

M12: Support expansion of public-private partnerships to improve local circularity

4.4 Introduction

The waste and water treatment sectors contributed approximately 1% of DRCOG's total emissions in 2022, amounting to 372,986 MT CO_2e. Emissions within this sector were calculated for each county based on the landfilled and composted waste inside the county as well as wastewater generated and treated inside the county in wastewater facilities and septic tanks. It should be noted that waste emissions can be analyzed through the lens of consumption, or life cycle emissions. This lens estimates emissions based on the creation, use and disposal of waste collectively. For this inventory, only emissions from end of life, or landfilling, were analyzed. The majority of emissions in the DRCOG service area in this sector are from landfilled waste emissions.

Bags of trash ready for the landfill.

Colorado's current waste diversion rate, the portion of waste not sent to the landfill, is 16%, which is considerably lower than the national average of 32%, according to a 2024 report by the Colorado Public Interest Research Group. Although waste contributes only 1% to DRCOG's regional emissions, boosting recycling and composting participation remains critical to a sustainable future for Colorado. A systemic shift in how waste is managed is crucial to reduce emissions, improve efficiency, and foster fairness within the state's waste management systems. DRCOG will provide support for these efforts as available.

The basis of the measures in this chapter is the U.S. EPA's Wasted Food Hierarchy and the Zero Waste Hierarchy. These help to provide guidance on actions and efforts to undertake in order to promote a circular economy. A circular economy is one "that uses a systems-focused approach and involves industrial processes and economic activities that are restorative or regenerative by design, enables resources used in such processes and activities to maintain their highest value for as long as possible, and aims for the elimination of waste through the superior design of materials, products and systems (including business models) according to the EPA.

The following measures outline strategies to reduce emissions from the waste sector, help create a circular economy, design recyclable and less wasteful packaging, and increase and expand existing recycling and composting programs. The implementation of these measures will help create and maintain sustainable waste management systems that are not only efficient but environmentally responsible.

Trash, recycling, and compost collection bins.

4.4.1 Waste emissions and measures

Climate-polluting emissions associated with the waste sector are primarily methane, nitrous oxide and carbon dioxide from waste management and treatment processes. Co-pollutant emissions in this sector stem from volatile organic compounds, which contribute to air quality issues along the Front Range. Methane is released from municipal and industrial landfills, and both methane and nitrous oxide are released from composting, anaerobic digestion, and municipal and industrial wastewater treatment operations. Additionally, the combustion of solid waste contributes to carbon dioxide and nitrous oxide emissions.

4.4.2 DRCOG's work

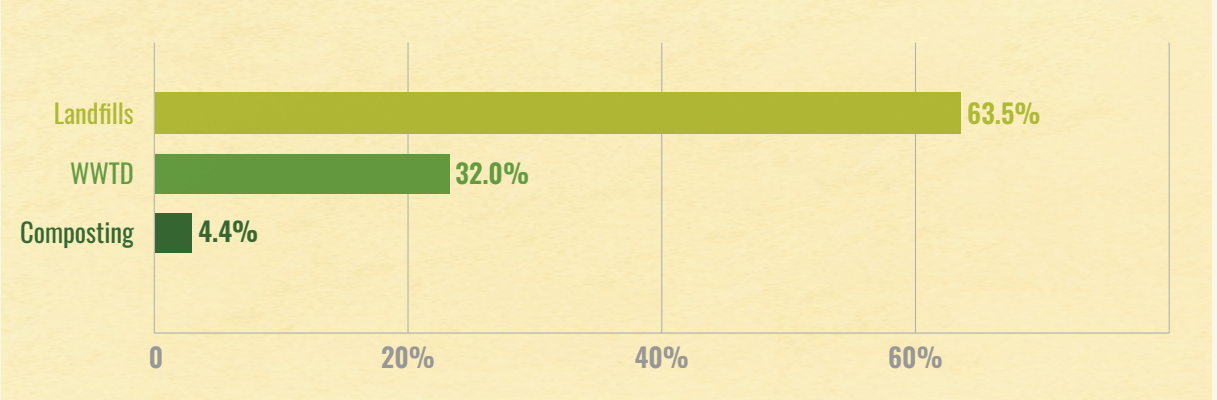
While DRCOG does not currently work directly in the waste space, it is supportive of efforts to reduce waste emissions in the DRCOG service area. DRCOG can serve as a resource for data, mapping and information for its 59 member jurisdictions. Additionally, DRCOG will work to implement the following measures outlined in this CCAP. DRCOG perceives its role as primarily a convener and a conduit to foster conversations to improve the "wasteshed." The term "wasteshed" was used in early engagement (likely developed in concurrent regional discussions) with subject matter experts to describe the need to think collectively and regionally on how waste moves. A wasteshed is similar to a watershed; a wasteshed includes the creation of materials, how they are used and moved throughout a region, and how they are reused, recycled or disposed of.

Truck depositing waste in a landfill.

4.4.3 Statewide waste overview

The waste sector contributed approximately 1.7% of the state's climate pollution in 2020. Waste sector emissions resulted from waste management and treatment activities. This sector includes landfills; wastewater treatment and discharge; composting; and anaerobic digestion, a process through which bacteria break down organic matter — such as animal manure, wastewater biosolids, and food wastes — in the absence of oxygen. It is important to note that commercial waste incineration activities are not present in Colorado, though some agricultural waste burning may occur, according to the Colorado Statewide Inventory of Greenhouse Gases.

Figure 21: Chart of the percentage share of Colorado's 2020 waste sector emissions.



The state of Colorado's waste goal is to have diversion rates of 35% by 2026 and 45% by 2036. To meet this goal, the state is:

- Helping to create a circular economy.
- Supporting packaging design for less waste and outlawing hard to recycle items like Styrofoam and single use plastics.
- Enhancing recycling and composting infrastructure.

Colorado has enacted various legislation, programs and grants to advance these goals:

- The state's Greenhouse Gas Pollution Reduction Roadmap establishes milestones for Colorado to reach net-zero emissions across all sectors, including waste.
- The Colorado Circular Communities Enterprise, formerly Recycling Resources Economic Opportunity and Front Range Waste Diversion Enterprise programs.

4.4.4 Plastic Pollution Reduction Act

- House Bill 21-1162 creates a fee on single-use checkout bags, bans single-use plastic bags and Styrofoam food containers, and lifts the local preemption on plastic bans.

4.4.5 Producer responsibility for recycling packaging and paper.

- House Bill 22-1355 will provide free, convenient recycling access to all Coloradans with no added cost to consumers or local governments.
- Producer Responsibility Program requires companies that sell products in packaging and paper products to fund a statewide recycling system to recycle those materials by early 2026.

4.4.6 The Circular Economy Development Center.

- House Bill 22-1159 provides support and technical assistance to businesses using recycled materials in manufacturing.

4.4.7 Battery Stewardship Programs.

- Senate Bill 25-163 requires producers to manage the end-of-life of their products and create statewide battery recycling access.

A home compost bin with food scraps.

4.4.8 Landfill Methane Rulemaking.

- The state's Air Pollution Control Division is currently working on draft rules to regulate the amount of methane that is released into the air from landfills. Within the regulation, Regulation 31, proposed actions to limit methane include landfill gas capture systems, enclosed flares for methane destruction, emissions monitoring and landfill covering requirements.

4.4.9 Achieving net-zero in the waste sector

In the waste sector, reducing emissions means reducing the amount of organic waste that ends up in the landfill and avoiding using virgin products as much as possible. The final measures included below will work to divert more organic waste from the landfill, expand on public education efforts, and improve waste circularity in the region.

Figure 22: Summary of carbon pollution reductions compared to the business-as-usual scenario for the waste sector.

Waste measures summary		Emissions reductions in 2030 compared to the BAU ($MT CO_2e$)	Emissions reductions in 2050 compared to the BAU ($MT CO_2e$)
M9:	Collaborate to manage the regional "wasteshed".	6,862	67,777
M10:	Develop local ordinances and policies to manage the regional "wasteshed".	57,264	871,992
M11:	Expand public education in the region.	45,321	988,423
M12:	Support expansion of public-private partnerships to improve local circularity.	N/A	N/A

Goal summary:

Create a regional Waste Planning Collaborative and develop a regional wasteshed plan.

Investment:

Carbon pollution impact:

Co-benefits:

- Economic vitality
- Resource conservation

M9: Establish a Regional Planning Collaborative that works on policies, programs and incentives to manage the "wasteshed" in the DRCOG service area.

The DRCOG service area includes many jurisdictions with different waste policies, ordinances, waste collection structures and waste facility types. A Regional Planning Collaborative would bring representatives together from DRCOG's 59 jurisdictions to create a more cohesive waste landscape in order to better manage the regional wasteshed.

Actions

The following actions should be taken to accomplish Measure 9:

- Convene local governments, nonprofit organizations, waste haulers and businesses to create a Regional Planning Collaborative that meets regularly to discuss the waste network and create plans.
- Collaborate with Colorado Circular Communities to create a Regional Wasteshed Plan.
- Partner with Recycle Colorado to increase memberships in the region and communicate efforts, projects and decisions between organizations.
- Improve standardization of data and reporting requirements for haulers and end-facilities.
- Support the assessment of organic waste processing, benefits, availability, and opportunities for expansion (including other types of emerging technologies). Also, assess the opportunities for better infrastructure, regional partnerships and available land for organics processing.

- Encourage and support the completion of a regional Consumption-Based Emissions Inventory (CBEI).
- Utilize the CBEI to yield a Regional Circularity Plan to guide member governments toward a circular economy.

Implementation timeline and milestones

The creation of a Regional Waste Planning Collaborative, referred to in this report as the Collaborative, would begin in 2026. Upon establishment, this Collaborative will begin working to gather data, standardize terminology, complete the CBEI and standardize reporting requirements where possible through 2028. With these elements as a foundation, jurisdictions can begin collaborating on future policy and planning opportunities and unification of the regional waste network. The Collaborative is meant to be a long-standing group that will continuously work together to improve circularity and waste reduction efforts throughout the DRCOG service area.

Measures for tracking progress

Milestones

- Establishing a Regional Waste Planning Collaborative with regularly scheduled meetings.
- The completing and publishing of a regional CBEI.
- The completing and publishing of a Regional Circularity Plan.
- Establishing a baseline of regional waste data to provide a point for future comparison.

Quantified emissions reductions

This strategy is modeled as utilizing construction and demolition waste policies and/or incentives to increase the amount of waste that is repurposed, or using embodied carbon as a tax incentive. This action is modeled as an increase in the diversion of wood, metal and concrete construction and demolition waste from landfills, assuming a ramp up to 90% diversion from 2026-2030. All waste diverted is assumed to be reused or recycled. The recycling contamination rate from the Circular Action Alliance's Needs Assessment is applied to all waste being diverted, assuming that it is too contaminated to be recycled or reused and is therefore landfilled. It is assumed that Colorado's Extended Producer Responsibility Act has no significant impact on construction and demolition waste. The proportion and composition of construction and demolition waste disposed in landfills were determined using waste studies and characterizations from Larimer, Boulder, and Denver counties. A weighted average composition was calculated using building permit data from each of the three counties.

Co-pollutant impacts

The decomposition of waste does not directly create co-pollutant emissions. When waste is deposited in a landfill that has gas collection and flaring, co-pollutant emissions can be created from the flaring of the collected gas. Depending on the materials decomposed in the landfill, this may include co-pollutants such as carbon dioxide, nitrogen oxides, sulfur dioxide, carbon monoxide and various volatile organic compounds. As with emissions reductions, the direct impact of this measure on co-pollutants is difficult to quantify. However, it is known that many forms of packaging contain toxic chemicals that can leach out if disposed of improperly. The work included in this measure will support more efficient and effective regional waste

management practices in the future, which may reduce co–pollutants from activities like landfill flaring. Additional support for reducing co-pollutants can come from future statewide legislation.

Measure costs

The creation of a Regional Waste Planning Collaborative does not have a direct cost associated with it. However, the time and labor of DRCOG team members and representatives from the 59 member governments should be taken into consideration. It will require time, planning and collaboration to bring this Collaborative together.

In addition, gathering data and producing studies is a task that also requires time, labor and money. Assuming that the Collaborative uses expert support, such as hired consultant expertise, to produce these studies, the cost per study would likely be tens of thousands dollars depending upon the comprehensiveness of the study. DRCOG and member jurisdiction staff time will also be required to manage these projects, consult with contractors, and review findings. Costs associated with the studies could be taken on by member governments or could be offset by pursuing future grant opportunities.

Goal summary:

Develop a hub for local governments to collect information on funding opportunities and to collaborate on new public-private partnerships to increase local circularity.

Investment:

Carbon pollution impact:

Co-benefits:

- Economic vitality
- Resource conservation

M10: Establish "wasteshed" recommendations for ordinances and policies for consideration by DRCOG municipalities.

There are many differing policies and ordinances on waste throughout DRCOG's 59 jurisdictions, sometimes causing confusion and inefficiencies. Providing region-wide policy recommendations would lighten the workload on municipalities and enable a helpful 'blueprint' of waste legislation for local governments to adopt if they wish. A good place to start is by referencing the Colorado Circular Communities' STEPS program and resource library, which is currently being developed. Widespread adoption of these policies would also create a more cohesive waste landscape and could save time and money by reducing inefficiencies.

Actions

The following actions should be taken to accomplish Measure 10:

- Utilize previously successful ordinances, policies, and/or studies as a model for continual waste policy development and recommendations to DRCOG jurisdictions. This may include, but is not limited to the following:
  - » Explore collective purchasing opportunities to reduce costs and waste.
  - » Recommend a ban on yard waste, cardboard and other organics going to the landfill.
  - » Explore incentives or requirements for impact resistant roofing.
  - » Recommend hauler licensing requirements such as single-hauler ordinances.
  - » Propose an equal space ordinance for trash and recycling receptacles.

    - » Prioritize which construction and demolition materials can be reused and are in demand to avoid pile-up of unwanted materials.
    - » Support a universal recycling ordinance, including multifamily and commercial buildings, similar to Denver's Waste No More.
    - » Recommend that usable construction and demolition materials must be either recycled, reuse incentivized, or both by giving rebates or embodied carbon tax credits after usable materials are recovered.
    - » Recommend expansion of disposal options and cost reduction for household hazardous waste.
    - » Recommend expansion of services and free or low-cost residential drop-off of hard-to-recycle items.
- Recommend necessary waste-related studies and data collection for municipalities to consider.

Implementation timeline and milestones

After the assembly of a Regional Waste Planning Collaborative throughout 2026 and 2027, policy recommendations can start to be issued during the second half of 2027. These policy measures will have to be discussed and vetted by the Collaborative to ensure that member jurisdictions are willing and able to implement them. After making recommendations, DRCOG does not have the authority to pass any policies on behalf of member jurisdictions, but can provide support in ongoing local policy discussions. Decisions on policy adoption will be left up to individual local governments, so the implementation timeline is dependent upon the actions of individual jurisdictions. Generally, DRCOG aims to see these policy recommendations widely implemented across the region by 2030.

Measures for tracking progress

- Implementation of recommended policies and the number of jurisdictions that adopt these across the region.
- Percent reduction in waste being sent to landfills, particularly in communities where policy recommendations have been implemented.
- Tracking of certain waste types, such as construction and demolition.
- Increased availability of proper disposal options for Household Hazardous Waste and hard-to-recycle items.
- Establishing universal recycling for commercial and multifamily residential units that are currently exempted.

Quantified emissions reduction

This strategy is modeled as two main actions: a ban on yard waste and cardboard at landfills and supporting an increase in food waste composting. For banning yard waste and cardboard, this action is modeled as a ban on yard and cardboard waste in landfills for both municipal solid waste and construction and demolition waste. This model assumes 100% diversion is reached by 2050, with an interim target of 50% by 2030. Existing diversion was applied based on analysis of 2023 CDPHE data and the waste characterization. The Circular Action Alliance's Needs Assessment average compost contamination rate was applied to yard waste, and the average recycling contamination rate was applied to cardboard. Contaminated diverted materials are assumed to be landfilled.

For supporting an increase in food waste composting, this action is modeled as diverting previously landfilled food waste to composting for all communities in the DRCOG service area. This model assumes 50% diversion is reached by 2050, with an interim target of 25% by 2030. Existing diversion was applied based on analysis of 2023 CDPHE data and the waste characterization. The Circular Action Alliance's Needs Assessment average compost contamination rate was applied to food waste. Contaminated compost is assumed to be landfilled.

Co-pollutant impacts

These measures are unlikely to have significant effects on co-pollutants. At some landfills, methane gas is collected and burned, which can create co-pollutants such as carbon dioxide, nitrogen oxides, sulfur dioxide, carbon monoxide and various volatile organic compounds. A reduction in organics being sent to landfills would reduce the amount of methane gas being burned, reducing these co-pollutants. It is difficult to quantify how much this reduction may be. However, it is known that many forms of packaging contain toxic chemicals that can leach out if disposed of improperly. The work included in this measure will support more efficient and effective regional waste management practices in the future, which may reduce co–pollutants from activities like landfill flaring. Additional support for reducing co-pollutants can come from future statewide legislation.

Measure costs

These measures do not come at a direct cost to DRCOG or its member governments. Regardless, there will be costs associated with the time and labor spent developing, writing and reaching consensus on recommended policies. It should be noted that a collaborative effort on waste policies is likely to save money overall across the region by consolidating the work rather than requiring each member government to handle policy-writing individually.

Example of a successful project/program

Colorado's House Bill 22-1355, the Producer Responsibility for Recycling Act, signed in May 2022 aims to reduce waste management costs and incentivize producers to create more efficient recycling systems through improved product design, collection, processing and market development.

The Colorado Circular Communities Enterprise, also known as C3, is a statewide program that supports Colorado's communities, businesses, nonprofits, schools, institutions and tribes in their transition to a circular economy. C3 provides financial and technical assistance to enhance circularity throughout the state and helps organizations achieve their waste reduction and diversion goals.

By working with organizations like C3, ordinances and policies can be adopted to support residents' access to benefits provided by the Producer Responsibility for Recycling Act, in hopes of furthering the DRCOG service area on its waste management strategies.

Goal summary:

Support municipalities in adopting model ordinances and policies to increase diversion and circularity.

Investment:

Carbon pollution impact:

Co-benefits:

Resource conservation

M11: Expand regional public education initiative on "wasteshed" awareness and waste reduction through enhanced community engagement/awareness and partnerships.

It's not always clear what items can or cannot be recycled or composted, and these guidelines can change significantly across different communities and waste haulers. Alongside the work of previous measures to better align regional wasteshed approaches, public outreach and education campaigns would help to inform residents of proper waste disposal methods and the importance of waste diversion.

Actions

The following actions should be taken to accomplish Measure 11:

- Promote the Producer Responsibility Program and inform producers, businesses, local governments, and residents on how this policy will affect them.
- Use Eco-Cycle's Green Star Schools as a case study and promote implementation of successful programming to other schools more widely.
- Promote opportunities and education around jobs in waste reduction, diversion and circularity.
- Share and promote success stories of innovative circular business models.
- Create a regional "waste mascot" as a recognizable icon for public education efforts.
- Promote the Denver Reuse Business Directory as a free resource for residents and businesses.

- Build an online database for downloading waste signage in alignment with standardized regional messaging.
- Create an outreach contact list of local schools, nonprofits, government entities and other organizations to help distribute waste-related information and materials.
- Use well-attended litter cleanups as a marketing channel to promote other waste-related events, services and educational content.
- Invest in social-based marketing and peer to peer training, waste reduction and circularity throughout the region.
- Use a peer trainer to catalyze change at social gathering places and events.
- Create a Master Composter program, similar to a Master Gardener program, to train interested parties into composting experts. This could build from or expand on the model created by Denver Urban Gardens.
- Collaborate with green businesses on combined marketing and waste education efforts.

Implementation timeline and milestones

Waste education and outreach efforts can begin in the near-term alongside the Producer Responsibility Program, which includes dedicated efforts to inform the public about local waste systems and how they are changing. Educational campaigns such as these often span years, and it can take decades to see tangible results. Coordinated efforts will begin as soon as 2026, spanning the full timeline of this plan and continuing through 2050. Ultimately, the goal is for every resident of the Denver region to understand proper waste sorting techniques, how to reduce waste, and why it's important.

Measures for tracking progress

- Publishing of an online database for universal waste signage and infographics.
- Increasing the number of Eco-Cycle Green Star Schools and school waste reduction programs in the region.
- Creating quality waste-related jobs, particularly in disadvantaged communities.
- Launching a Master Composter program, training people to become expert composters.
- Creating and continuously building out the waste outreach contact list.

Quantified emissions reduction

This strategy is modeled as creating a robust regional education plan around Producer Responsibility and effectively promoting the plan. It is modeled as increased recycling based on the estimated impact of Colorado's Extended Producer Responsibility Act. Colorado's Extended Producer Responsibility Act, House Bill 22-1355, became law in 2022 and requires producers of packaging and paper products to fund and implement a program for statewide recycling. The Circular Action Alliance's Needs Assessment was used as a primary source to estimate the expected impacts from this law. This assessment models an increase in recycling rates of 15% by 2030, and an additional 15% increase by 2035, for a total increase of 30% from baseline levels in 2022 in a medium scenario of implementation. This report also provided the default recycling contamination rate applied to all recycling in this analysis. Contaminated recycling is assumed to be landfilled. Note that the modeling of this law includes providing residential households with recycling services equivalent to trash, recycling services offered to all non-residential covered entities by 2030. The modeling of this act is limited to municipal solid waste and assumes that the act has no significant impact on construction and demolition waste.

Co-pollutant impacts

These measures are unlikely to have significant effects on co-pollutants. At some landfills, methane gas is collected and burned, which can create co-pollutants such as carbon dioxide, nitrogen oxides, sulfur dioxide, carbon monoxide and various volatile organic compounds. A reduction in organics being sent to landfills would reduce the amount of methane gas being burned, reducing these co-pollutants. It is difficult to quantify how much this reduction may be. However, it is known that many forms of packaging contain toxic chemicals that can leach out if disposed of improperly. The work included in this measure will support more efficient and effective regional waste management practices in the future, which may reduce co–pollutants from activities like landfill flaring. Additional support for reducing co-pollutants can come from future statewide legislation.

Measure costs

The main costs of these campaigns will be producing and distributing informational content and creating a dedicated webpage or database to house it. Compensation for employees creating and sharing these materials will be necessary, though some of the social-based and peer marketing can be done with the help of volunteers. If desired, a dedicated branding and marketing firm may be engaged to create high-quality and compelling branding and outreach materials; the cost of this will depend on the depth of the scope of work. Much of these costs could be covered as part of the Producer Responsibility Program being rolled out across 2025 and 2026.

Example of a successful project or program

Starting in 2024, The Denver Reuse Business Directory was launched through the City and County of Denver's Climate Action, Sustainability and Resiliency Office, to educate the public on how to waste and use less through local reuse-friendly businesses. This features businesses that enable the buying, renting or repairing of various items, including antiques, appliances, arts and crafts supplies, bikes and sporting goods, books, media, games, building materials, and cameras. In 2023, these reuse businesses generated over $500 million and employed more than 3,000 individuals.

Along with the Reuse Business Directory, there is also Denver's Compost, Recycling, and Trash Waste Directory. This directory provides several features to assist residents with waste management, including a pickup calendar where users can enter their address to view personalized trash and compost schedules, a waste directory that informs users how to properly dispose of materials, and an interactive waste sorting game covering backyard composting, Denver recycling, Denver composting, and landfill disposal.

Implementing diverse public directories and increasing public knowledge of these resources can significantly raise awareness about waste and waste reduction within the DRCOG service area. DRCOG can also utilize workshops and educational campaigns to highlight the directories' benefits and encourage their use. Additionally, strategic partnerships can amplify outreach efforts and promote responsible consumption habits.

Goal summary:

Increase waste diversion annually through public education and awareness campaigns.

Investment:

Carbon pollution impact:

Co-benefits:

- Placemaking
- Resource conservation

M12: Create a resource hub for the region, specifically for economic incentives that apply to the waste sector, and support expansion of public-private partnerships to improve local circularity.

In order to create the most sustainable, efficient and cost-effective regional waste network, public and private entities must work together and understand what support is available to them. DRCOG can leverage its regional leadership and public visibility to facilitate collaboration and compile waste-related incentives and resources for businesses.

Actions

The following actions should be taken to accomplish Measure 12:

- Pursue and facilitate public-private industry partnerships, fostering collaboration between local businesses, governments, nonprofits and other organizations.
- Explore opportunities to scale up successful circular business models.
- Gather and share information on waste-related funding opportunities, such as grants, tax incentives, private foundations, etc.
- Coordinate member government funding and infrastructure for shared washing facilities that provide a place for the cleaning and reuse of service ware and other items.
- Regulate the cost of wash hubs for use by local restaurants, bars, and coffee shops.
- Leverage the free-market structure to drive larger culture change around circularity and waste reduction.

- Encourage the creation of a reuse hub that houses unused materials to be claimed by others that want them, including optional cleaning and/or repair services for usable materials.
- Promote opportunities to create more quality waste diversion jobs in vulnerable and low-income and disadvantaged communities.
- Develop business plans and private sector investments through estimates of volume materials.

Implementation timeline and milestones

Opportunities to form public-private partnerships can take place as soon as 2026, during and after the formation of the Regional Waste Planning Collaborative. Other measures, such as the construction of a wash hub and creation of new waste-related jobs are likely to take years and may not happen until 2030 or later.

Measures for tracking progress

- Establishing more public-private sector waste partnerships.
- Creating more quality, waste-related job opportunities in vulnerable communities.
- Building a reuse hub to store unused materials and clean or repair them. This could be modeled from the hub currently being developed by the City of Boulder.
- Building a shared regional washing facility for cleaning and reusing service ware and other items.
- Creating a webpage or other resource to share information about funding opportunities.

Quantified emissions reduction

The possible emissions reductions from implementation of these measures would come from less creation of waste on the producer's end, as well as fewer transportation emissions from haulers. Greater efficiencies and collaboration on these measures could create GHG reductions for the region, though it is unlikely that these will be significant. Precise emission reductions from this measure are difficult to quantify.

Co-pollutant impacts

These measures are unlikely to have significant effects on co-pollutants. At some landfills, methane gas is collected and burned, which can create co-pollutants such as carbon dioxide, nitrogen oxides, sulfur dioxide, carbon monoxide and various volatile organic compounds. A reduction in organics being sent to landfills would reduce the amount of methane gas being burned, reducing these co-pollutants. It is difficult to quantify how much this reduction may be. However, it is known that many forms of packaging contain toxic chemicals that can leach out if disposed of improperly. The work included in this measure will support more efficient and effective regional waste management practices in the future, which may reduce co–pollutants from activities like landfill flaring. Additional support for reducing co-pollutants can come from future statewide legislation.

Measure costs

Construction of a reuse hub and washing infrastructure are the largest costs associated with this measure, potentially costing in the range of several hundred thousand dollars to a few million dollars. Most of the other measures would not incur significant costs unless funding is needed to help with scaling of circular business

models or job creation. The cost of these measures could be offset by pursuing further government and/or private grants, private investment, and shared investment from member governments.

Example of a successful project or program

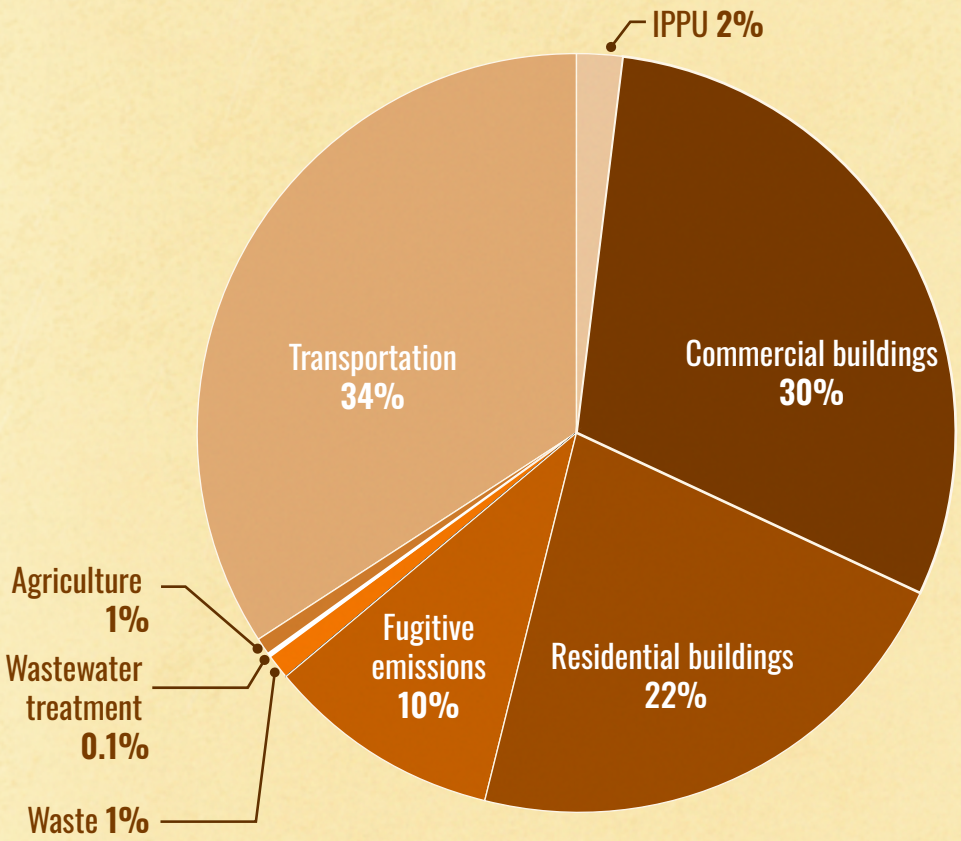
Too Good to Go, a certified B Corp, is an app launched in Denmark in 2016 to battle food waste. It partners with different food service sectors, including gas stations, restaurants, grocery stores and markets, to offer "surprise bags" of surplus food items at a discounted cost. This initiative has saved over 400 million meals and involved 175,000 business partners globally, preventing the equivalent of 1.1 MT CO_2e emissions avoided. Too Good to Go launched in Denver in March of 2024.

C40 Cities are committed to a circular economic approach. They aim to work with cities to significantly reduce waste and enhance resource recovery through global ambition and local action. They have a sustainable waste system network and a waste to resources network, led by San Francisco, where the network supports cities that have signed or plan to sign the Zero Waste Accelerator. According to the International Labor Organization, through a circular waste economy, 45 million waste management jobs could be created by 2030.

Achieving a circular economy in the DRCOG service area requires strong public-private partnerships. This can be accomplished by empowering private entities to serve as resource hubs and support public goals through innovative solutions, like Too Good to Go. Similarly, C40 Cities facilitate knowledge sharing and collaboration among cities, fosters waste sector partnerships and provide resources for sustainable waste management. These organizations offer practical tools, connections, guidance, and data, serving as vital resource hubs for partnership building.

4.5 Colorado Landscape

Figure 23: Breakdown of carbon pollution emissions by sector in the DRCOG region in 2022.



4.5 Introduction

DRCOG is a planning organization in which 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 Environmental Protection Agency's Climate Pollution Reduction Grant Program requires grantees to cover six measures to reduce greenhouse gas emissions from electricity generation, industry, transportation, buildings, agriculture/ natural and working lands, and waste management. The 12 measures in the 3 main sectors detail how DRCOG can work in the buildings, transportation and waste sectors to reduce climate emissions through various initiatives. The remaining four sectors are described in this chapter and outline how DRCOG can work with local jurisdictions and the state to reduce emissions to reach net-zero by 2050.

Farmlands looking west towards the Rocky Mountains.

4.5.1 Agriculture

Agriculture plays a fundamental role in almost every Colorado county, connecting urban and rural communities across the state. Despite being in one of the leading agricultural states, only 1% of the DRCOG region's emissions are produced from agricultural activities (figure 23). Lowering emissions and enhancing efficiency and equity within Colorado's agricultural systems are key components to ensuring a sustainable future for the state. DRCOG will support these efforts where available.

The following measures, supported by the State of Colorado, aim to reduce emissions through incentive-based programs and more efficient and productive agriculture, while reducing the impact of farming on the natural environment. Though local action is important, DRCOG is limited in its ability to create policies that impact emissions in this sector. For this reason, many of the actions put forth in this chapter would require state-level policies and programs, which DRCOG cannot directly create.

The measures outline ways to decrease emissions from the agriculture sector by reducing methane and nitrous oxide emissions from agricultural operations, securing permanent funding for soil health programs, and augmenting funding for renewable energy and energy efficiency projects for agricultural operations. The implementation of these measures will help create and maintain sustainable agricultural management systems that are efficient and environmentally responsible.

Irrigated farmland and rural homes at the base of Colorado's snow-capped Front Range.

Agricultural emissions and measures

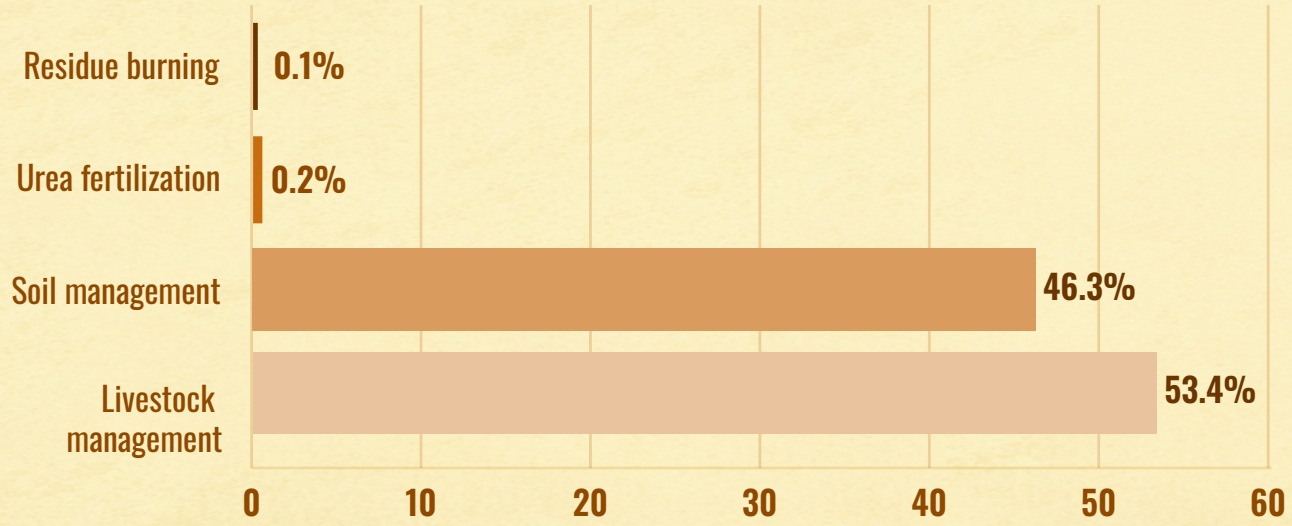
The State of Colorado and DRCOG recognize the importance of safe, equitable and sustainable farm management practices. As the region grows, DRCOG is committed to supporting the state in addressing agricultural needs. Climate smart agriculture enhances biodiversity, food security and rural economies, while also reducing climate pollution and increasing climate resilience for all Coloradans.

Emissions from the agriculture sector are primarily from methane and nitrous oxide, with very minimal carbon dioxide emissions. Agricultural emissions come from two main activities: managing livestock and managing crops and land. Livestock, namely cattle, naturally produce methane throughout their digestion process. Methane and nitrous oxide emissions continue to occur when manure is applied to fields. Nitrous oxide emissions are released when the land is treated with fertilizers (natural and synthetic) and those products interact with the soil and break down.

Statewide agricultural overview

The agriculture sector contributed approximately 11.4% of the state's climate pollution in 2020. Agricultural emissions are impacted by livestock management, agricultural soil management, urea fertilization (use of fertilizers on the land), and the burning of crop remnants, with livestock management and agricultural soil management producing many of the emissions. Colorado's agricultural sector, spanning nearly 30 million acres of farmland and over 36,000 farms, is a vital contributor to the state's economy and food supply.

Figure 24: Chart of the percentage share of Colorado's 2020 agricultural sector emissions.
Source: December 2023 Colorado Greenhouse Gas Inventory Report.



The state of Colorado's goal is to store 1 million metric tons of carbon dioxide on natural and working lands by 2030. To meet this goal, the state is:

- Helping farmers and ranchers use climate-smart soil health practices that keep carbon in the soil and enhance their ability to store additional emissions in the ground.
- Ensuring agricultural lands continue to be used for growing crops and supporting the people and communities that rely on this sector.
- Increasing on-farm renewable energy and energy efficiency.
- Providing scientific and technical support to help ranchers and farmers adopt climate-smart practices, and develop market opportunities for climate-smart agricultural products.
- Supporting new technologies that capture and reuse methane and other emissions from agriculture.

Colorado has enacted various legislation to advance these goals:

- The state's Greenhouse Gas Pollution Reduction Roadmap establishes milestones for Colorado to reach net-zero emissions across all sectors, including agriculture.
- In June 2023, the Polis administration released Colorado's first Strategic Plan for Climate-Smart Natural and Working Lands.
- Governor Polis announced the grantees for Colorado Department of Agriculture's new Agrivoltaics Research and Demonstration program. This program will focus on economic research, expanding demonstration projects, testing new technology, and understanding the soil and water benefits of agrivoltaics.
- The Colorado Department of Agriculture's Soil Health Program assists farmers and ranchers in implementing sustainable soil practices. These practices increase agricultural productivity, lessen environmental impact and reduce climate pollution. Additionally, they may provide farmers with opportunities to participate in carbon credit markets, promoting both sustainability and competitiveness in Colorado's agricultural sector.
- The Regenerative Agriculture Tax Credit, established by Colorado Senate Bill 24-152 in 2024, provides an income tax credit for qualifying food and beverage retailers that source ingredients from local producers practicing regenerative agriculture.
- The Consumer Right to Repair Agricultural Equipment Act, signed into law by Governor Polis, outlines that agricultural manufacturers are required to supply independent repair providers and equipment owners with the resources needed to repair their machinery.

- The Electric-Powered Lawn Equipment Tax Credit gives a credit to qualified retailers for all retail sales of new, electric-powered lawn equipment sold in Colorado during the income tax year.

Co-pollutant emissions impacts

Statewide legislation and measures will not only impact local climate pollution, but will work to reduce associated co-pollutants. Co-pollutant emissions reductions will be seen from the following policies/programs:

Agrivoltaics Research and Demonstration Program

- This program supports the development of renewable energies on agricultural lands. Renewable energy can reduce the need for more pollution-heavy energy sources such as natural gas and coal. Reduced reliance on coal and natural gas will reduce the amount of nitrous oxides, particulate matter and sulphur dioxide emissions.

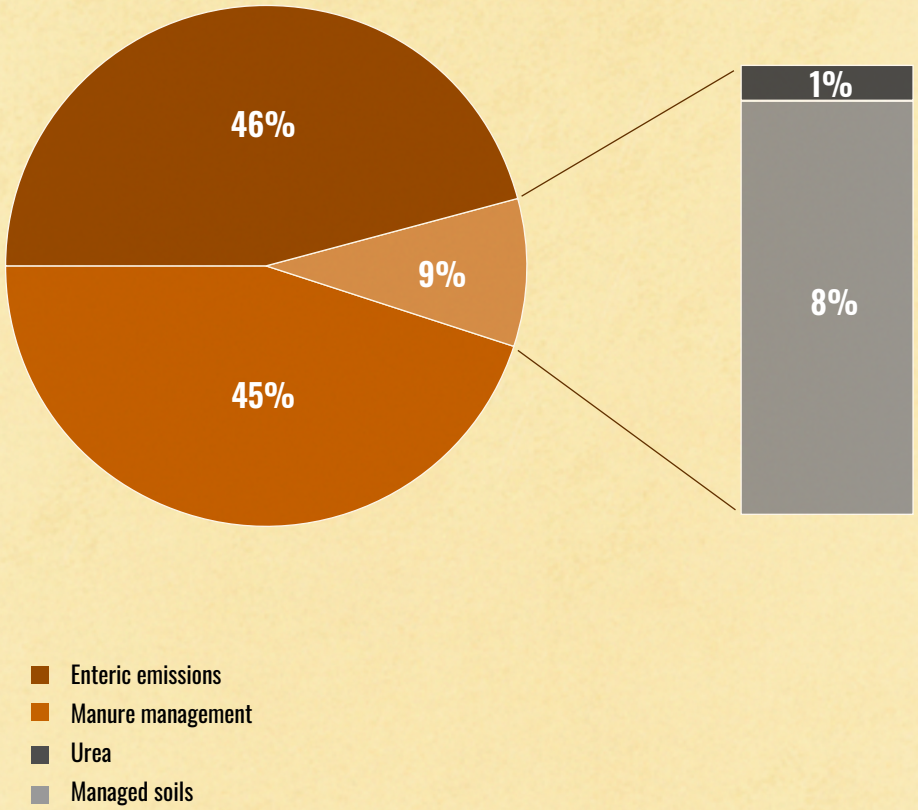
Electric Lawn Equipment Tax Credit Program

- Gas-powered lawn equipment is a notable source of co-pollutant emissions. Converting from fossil-fuel powered lawn, garden and agricultural equipment to electric-powered equipment will reduce emissions from all co-pollutants, and especially volatile organic compounds, carbon monoxide and particulate matter emissions.

CDA Soil Health Program

- One way to improve soil health is to switch from synthetic fertilizers to alternatives like compost. Reducing the quantity of nitrogen-based fertilizer emissions will lessen the amount of ammonia emissions locally.

Figure 25: Breakdown of agricultural carbon pollution emissions by source in the DRCOG region in 2022.



DRCOG agricultural overview

The agriculture sector contributed approximately 1% of DRCOG's total emissions in 2022, amounting to 311,814 (MT CO_2e). Emissions within this sector were calculated for each county based on the number of acres treated with fertilizers and chemicals as well as the quantity of a variety of different livestock. Counties within the DRCOG planning area support a variety of livestock, including dairy and beef cattle, pigs, sheep, poultry, goats, horses and more.

Jack's Solar Garden in Boulder County, Colorado.
Source: https://www.coagrivoltaic.org/

Jack's Solar Garden

In Boulder County, Jack's Solar Garden is pioneering agrivoltaics in the state. This innovative approach involves combining agriculture, such as crop or livestock production or pollinator habitats, with solar energy generation. Their 1.2 megawatt community solar garden generates enough electricity to power over 300 homes and serves as a national guide for governments, solar developers and farmers seeking to integrate renewable energy with continued agricultural output through agrivoltaics. Through its nonprofit, the Colorado Agrivoltaic Learning Center, Jack's Solar Garden fosters community engagement with clean energy, local food systems and responsible land management practices.

DRCOG agricultural measures

Measures mentioned in this chapter not only address climate pollution but provide wide-ranging co-benefits for those who work in the agricultural sector. The measures aim to create a more climate resilient agricultural sector by improving soil health, which can help increase the resilience of surrounding crops and plants. Healthier plants also sequester and store more carbon from the atmosphere. Developing solar and other renewable energies in tandem with agriculture, such as the practice of agrivoltaics, can help reduce emissions from the electricity sector and can generate income for farmers who lease their land for this purpose. Additionally, reducing the use of fertilizers will help improve local water quality, as there is less fertilizer and nutrients that can run off into local streams and lakes.

Figure 26: Co-benefits from DRCOG-supported agricultural sector measures.

Measures	Improved public health outcomes	Job creation	Improved climate resilience	Improved access to services	Decreased energy costs
Climate-smart soil health practices		●	●		●
Avoided conversion of agricultural lands			●		
Renewable energy and energy efficiency	◗	●	◗		●
Scientific and technical support	◗	●	●		
New technologies	◗	●	●		

Note: Example measures with potential direct benefits are denoted in ●; measures with potential indirect benefits are denoted in ◗. This summary table is just a visual representation of benefits

Electricity transmission lines.

4.5.2 Electric power generation

Electricity generation is a significant contributor to Colorado's emissions, ranking within the top five emitters. Despite this, the state's utility costs remain below the national average, according to Colorado Climate Action. The power generation sector contributes 52% of DRCOG's regional emissions and lowering emissions and enhancing efficiency within Colorado's energy systems are key to ensuring a sustainable future for the state. DRCOG will support these efforts where available.

The subsequent measures, supported by the State of Colorado, aim to reduce emissions through incentive-based programs, and add efficient and productive electricity generation, while reducing the impact on the natural environment. While local action is important, DRCOG is limited in its ability to create policies that impact emissions in this sector. Therefore, actions in this chapter reference state-level policies and programs.

The measures outline ways to reduce emissions from the electricity generation sector, reduce emissions from electrical operations, promote energy grants and technologies, strengthen energy sector careers, and augment funding for renewable energy and energy efficiency projects. The implementation of these measures will help create and maintain sustainable electrical management systems that are not only efficient, but environmentally responsible.

Image of wind turbines.

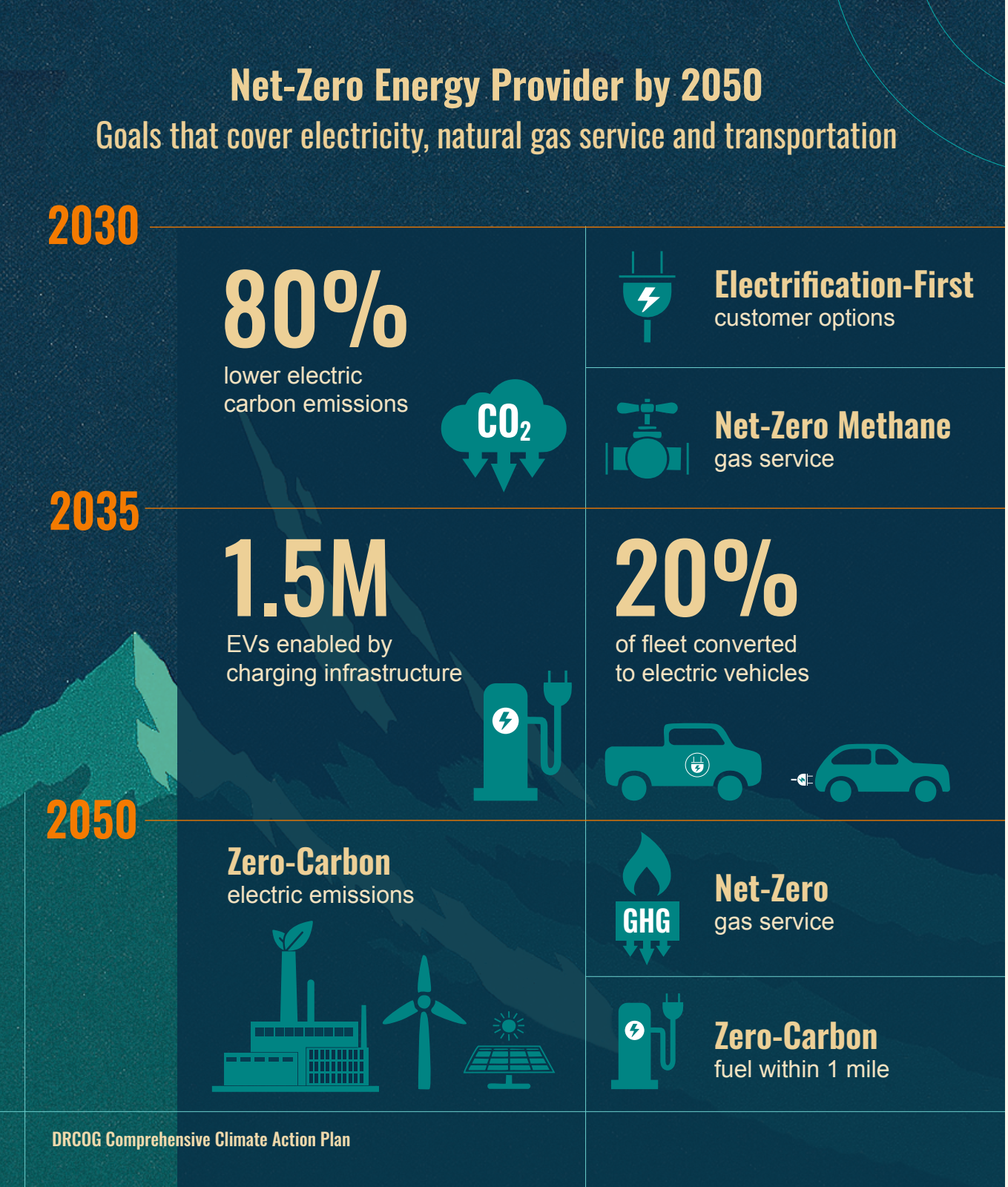
Electric power generation emissions and measures

The State of Colorado and the DRCOG service area recognize the importance of safe, equitable and sustainable energy management practices. As the region grows, DRCOG is committed to supporting the state in addressing electricity needs. Transitioning to clean electrical energy protects the health of Colorado's natural environment, protects its communities, provides access to lower-cost energy resources, increases investment and economic opportunities and expands jobs, according to the Colorado Energy Office.

Emissions from the electric power subsector are primarily from carbon dioxide and methane, with very minimal nitrous oxide emissions. The emissions come from both regulated utilities and non-utilities, such as small power producers, independent producers, etc. In some cases, commercial and industrial facilities produce their own electricity on-site, but their primary business is different than such production. The emissions associated with electricity generation for on-site use at these facilities are reported in association with the primary purpose of their business, according to the December 2023 Colorado Greenhouse Gas Inventory Report.

Statewide electric power generation overview

Electric power contributed approximately 21.9% of the state's climate pollution in 2020. The emissions consist of electric utilities and independent power producers whose primary business is the production of electricity as defined by North American Industry Classification System 2022 code 22111157.



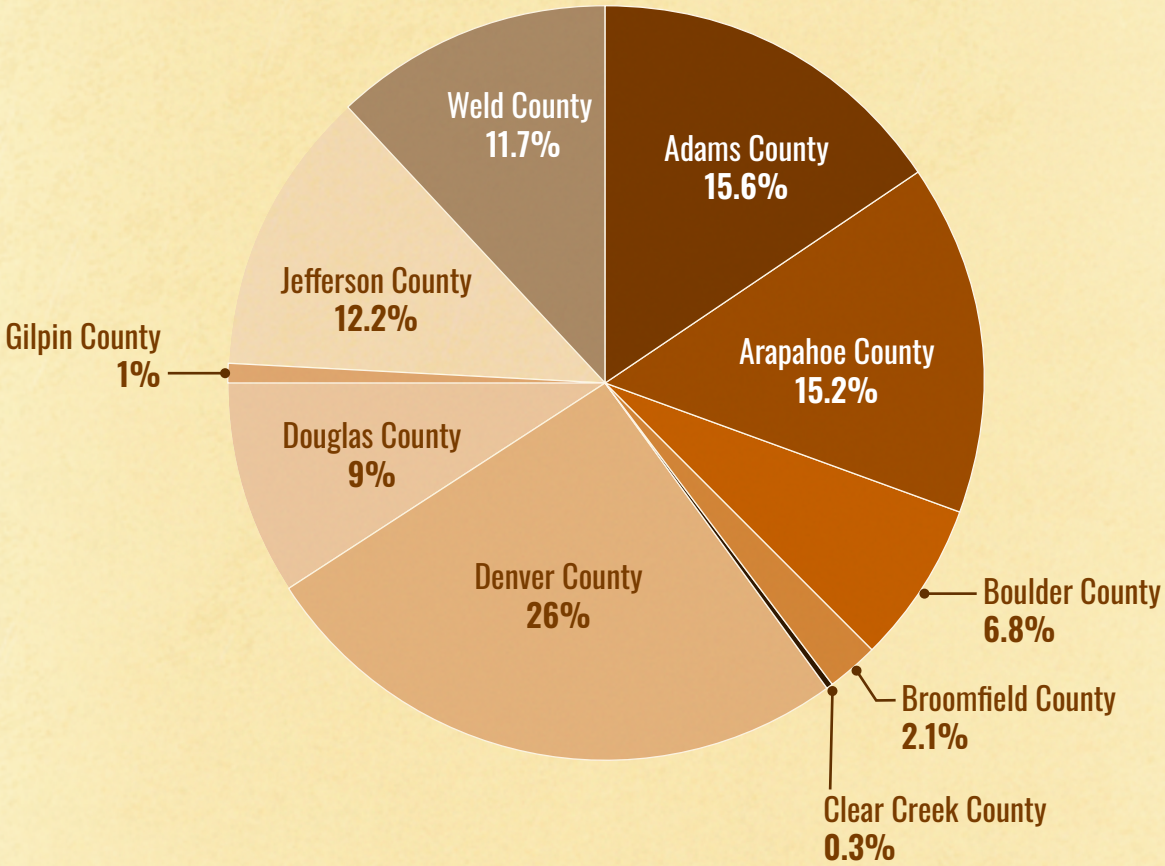
The state of Colorado's goal is to transition to 100% clean electricity by 2040.To meet this, the state is:

- Transitioning Utilities to Clean Energy: Close all of Colorado's coal-fired power plants by no later than January 1, 2031.
- Encouraging Local Energy Sources, Microgrids, Community Solar Gardens: Add thousands of megawatts of new wind/solar generation and battery storage.
- Modernizing and Enhancing Electrical Grid Planning: Expand and upgrade the existing transmission grid to help bring new clean energy technologies to Colorado homes and businesses.
- Adopting Advanced Energy Technologies

Colorado has enacted various legislation and developed incentives to advance these goals:

- The state's Greenhouse Gas Pollution Reduction Roadmap establishes milestones for Colorado to reach net-zero emissions across all sectors, including energy generation.
- Senate Bill 24-218 (The Modernize Energy Distribution Systems Act) aims to modernize Colorado's electric grid and helps support the transition to clean energy technologies.
- Senate Bill 18-064 (Require 100% Renewable Energy by 2035) updates the renewable energy standard to require all electric utilities derive their energy from 100% renewable sources by 2035.
- Clean Energy Career Program: Support Xcel Energy's Clean Heat Plan that focuses on developing workforce education and training, including grant opportunities.
- Strengthening Photovoltaic and Renewable Careers: Supports the creation of career pathways and workforce development in energy, with the goal of reaching 100% renewable energy for the grid.
- Weatherization Assistance Program: Offers training and apprenticeship opportunities for energy efficiency technicians, preparing individuals to become residential energy efficiency experts.
- Public Electric Utility Services Authorization: Public electric utilities may provide electricity to charge electric vehicles as unregulated or regulated services and may recover the costs of distribution system and infrastructure investments to accommodate EV charging.

Figure 27: Commercial, industrial, and residential emissions through grid-supplied energy by county in the DRCOG region in 2022.



Co-pollutant emissions impact

The primary co-pollutant that will be impacted by measures in the Electric Power Generation sector is sulfur hexafluoride. This is the primary co-pollutant from the generation of electricity. Sulfur hexafluoride is emitted from the burning of coal and other fossil fuels to produce electricity. Transitioning from fossil fuels and utilizing cleaner sources for electricity like solar, wind and hydroelectric power, will make great impacts on the quantity of sulfur hexafluoride emissions in the state.

DRCOG electric power generation overview

The grid-supplied electricity contributed approximately 57% of DRCOG's energy emissions in 2022, amounting to 13,267,048 MT CO_2e. Emissions within this sector were calculated for each county based on the activity of kilowatt hours from commercial, industrial and residential usage. Denver County was the largest contributor for commercial and industrial usage, while Arapahoe County was the largest contributor for residential usage.

DRCOG electric power sector measures

As DRCOG does not regulate or create policies to influence electric utilities, DRCOG, where appropriate, will aim to support the state's efforts to decarbonize the electric power generation sector. DRCOG will also support local government renewable energy projects and the development of local renewable energy resources.

Figure 28: Co-benefits from DRCOG-supported electric power generation sector measures.

Measures	Improved public health outcomes	Job creation	Improved climate resilience	Improved access to services	Decreased energy costs
Municipal renewable energy adoption	◗	●	◗		●
Local renewable energy projects	◗	●	◗		●

Note: Example measures with potential direct benefits are denoted in ●; measures with potential indirect benefits are denoted in ◗. This summary table is just a visual representation of benefits

Image of industrial refinery

4.5.3 Industry

Colorado's diverse economic base consists of three key industries: advanced industries, lifestyle industries, and access-to-market industries. Advanced industries include diverse facilities and activities in the oil and gas and electrical transmission and distribution industries, as well as plants producing electronics and semiconductors, cement, iron, steel and others. Lifestyle industries include outdoor recreation and tourism, among others. Access-to-market industries include financial services and transportation and logistics. Despite industrial processes and product use being one of the top five sources of Colorado's climate pollution emissions, it contributes just 2% of DRCOG's regional emissions. By lowering Colorado's industrial systems emissions and enhancing its efficiency, Coloradoans can ensure a sustainable future for the state. DRCOG will support these efforts where available and appropriate.

The following measures, supported by the State of Colorado, aim to reduce emissions through incentive-based programs as well as more efficient and productive industrial processes, while reducing the impact of industry on the natural environment. While local action is important, DRCOG is limited in its ability to create policies that impact emissions in this sector. Therefore, actions in this chapter reference state-level policies and programs.

The measures outline ways to reduce emissions from the industrial and manufacturing sectors, phase out hydrofluorocarbons in favor of more climate-friendly alternatives, and support innovative carbon dioxide removal technologies. The implementation of these measures will help create and maintain sustainable industrial and manufacturing processes and systems that are not only efficient but environmentally responsible.

Image of a refinery.

Industrial emissions and measures

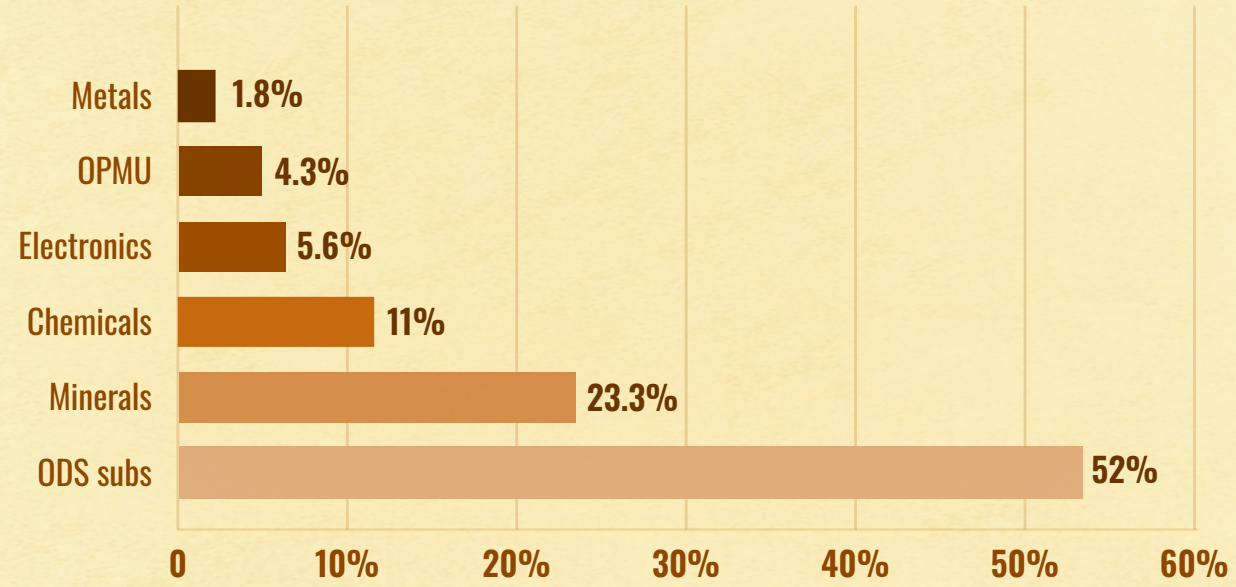
The State of Colorado and the DRCOG service area recognize the importance of safe, equitable and sustainable industrial practices. As the region grows, DRCOG is committed to supporting the state's implementation of its industrial and manufacturing goals and actions when appropriate. A climate smart industry enhances economic growth and technology and job creation while reducing climate pollution and increasing
climate resilience for all Coloradans.

Emissions from industrial activities are referred to as industrial/manufacturing or IPPU emissions. These emissions are not generated from the energy used in the processes, but rather the chemical reactions or the transformation of raw materials. Emissions from the sector are primarily in the form of carbon dioxide, methane, nitrous oxide and fluorinated gases like hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride.

Statewide industrial overview

The Industrial Processes and Product Uses sector includes climate pollution emissions occurring from industrial processes and usage, and contributed an approximate 3.4% share of the state's climate pollution in 2020. The emissions are broken down by subsectors; including minerals; chemicals; metals; electronics manufacturing; uses of substitutes for ozone depleting substances (uses of ODS substitutes); and other product manufacturing and use, according to the

Figure 29: Chart of the percentage share of Colorado's 2020 IPPU Sector Emissions.



2023 Colorado Statewide Inventory of Greenhouse Gas Emissions and Sinks.

In 2021, Colorado passed the Colorado Environmental Justice Act which requires the industrial and manufacturing sector to reduce its emissions by 20% by 2030. The decrease is driven by multiple rules and regulations that have been adopted by the state's Air Quality Control Commission. To meet this goal, the state is:

- Regulating industrial facilities: 1) Lowering emissions across industrial and manufacturing sectors, and 2) phasing out hydrofluorocarbons and potent gases, in favor of climate-friendlier alternatives (including ammonia and hydrocarbons).
- Removing carbon from the atmosphere: Support innovative technologies, such as carbon capture and storage and direct air capture, that remove carbon dioxide from the air.
    - » Creating legal and regulatory pathways to develop carbon capture and storage

and direct air capture.

Colorado has enacted or introduced various legislation to advance these goals:

- The state's Greenhouse Gas Pollution Reduction Roadmap establishes milestones for Colorado to reach net-zero emissions by 2050 across all sectors, including industry.
- HB25-1157 (Reauthorize Advanced Industries Tax Credit) states that the "credit is available to a qualified investor that makes a qualified investment in a qualified small business that is in an advanced industry."
- Environmental Justice Act: The Polis Administration signed the act that requires the industrial and manufacturing sector to cut climate-warming emissions 20% by 2030 relative to 2015 emissions levels.
- HB 24-1339 (Disproportionately Impact Community Air Pollution) was introduced concerning measures to be taken by the air quality control commission to reduce air pollution in the state.

Co-pollutant emissions impact

Primary impacts to co-pollutant emissions in the industrial sector will be apparent with hydrofluorocarbons and volatile organic compound emissions. Hydrofluorocarbons emissions come from the usage of refrigerants in buildings and vehicles. Reducing the use of these chemicals and shifting to low-global warming potential options will lessen emissions from hydrofluorocarbons. Volatile organic compound emissions are primarily borne from oil and gas system operations. Reducing the production of oil and gas in the DRCOG region will produce fewer volatile organic compound emissions, reducing the extent of ground-level ozone development, another harmful air pollutant.

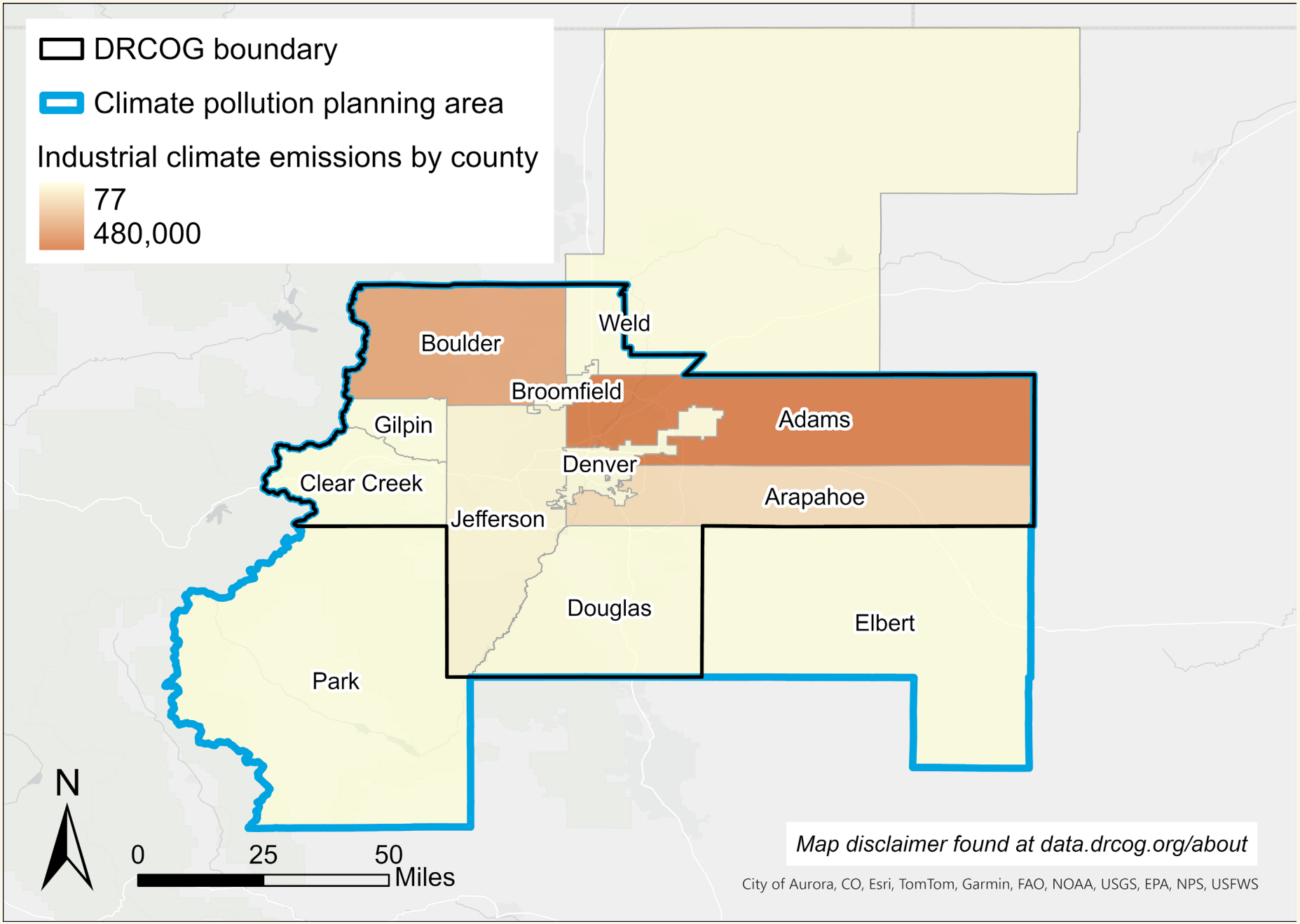
DRCOG industrial overview

The IPPU sector contributed approximately 2% of DRCOG's total climate pollution emissions in 2022, amounting to 5,326,702 MT CO_2e. Emissions within this sector were calculated for each county based on the number of industrial processes, their subpart and their associated emissions. Adams County was the largest contributor for oil and gas emissions, responsible for 544,710 MT CO_2e of these emissions. Weld County was the largest contributor of fugitive emissions, responsible for 3,048,846 MT CO_2e of these emissions. Fugitive emissions include emissions from lost natural gas in the distribution system as well as the production of oil and gas.

Prometheus Materials

In Louisville, Prometheus Materials created ProZERO™, the first carbon negative or low embodied carbon supply-blend concrete. This cutting-edge concrete blend can be used as a ready mix or through their manufactured material goods. The formula was inspired by the formation of seashells and coral reefs, incorporating microalgae. This innovative material indefinitely removes and stores carbon within the final building project. ProZERO™ has been used in many projects across the DRCOG service area, from the pavers at the Denver Premium Outlet Mall to a hotel and conference center in Boulder. Prometheus Materials is contributing to a more sustainable industrial sector by manufacturing carbon-negative products.

Figure 30: Industrial sector carbon pollution emissions by County in the DRCOG region in 2022.



DRCOG industrial measures

DRCOG, where appropriate, will aim to support the state of Colorado's main measures for reducing Industrial climate pollution emissions: regulating industrial facilities and removing carbon dioxide from the air.

Figure 31: Co-benefits from DRCOG-supported industry sector measures.

Measures	Improved public health outcomes	Job creation	Improved climate resilience	Improved access to services	Decreased energy costs
Support the regulation of industrial facilities	●	●	●		
Support the removal of carbon dioxide from the air	●	●	●		

Note: Example measures with potential direct benefits are denoted in ●; measures with potential indirect benefits are denoted in ◗. This summary table is just a visual representation of benefits

Plains east of Denver with bison.

4.5.4 Natural and working lands

Natural and working lands include farmlands, rangelands, grasslands, shrublands, forests, urban green spaces, wetlands and riparian zones. These all offer numerous advantages: providing food and fiber, open space for recreation, wildlife habitat, supporting biodiversity, enhancing water and air quality, creating jobs, and offering solutions for climate change mitigation and adaptation.

There are over 24 million acres of forest throughout Colorado, a portion of which falls in the western part of the DRCOG service area. Natural and working lands served as a net carbon sink in DRCOG's regional emissions for 2022. Preserving, restoring and expanding land area and enhancing efficiency and equity within Colorado's natural and working lands systems are key to ensuring a sustainable future for the state. DRCOG will support these efforts where possible.

The following measures, supported by the State of Colorado, aim to reduce emissions through incentive-based programs and more efficient and productive natural and working lands, while reducing the impact of recreation on the natural environment. Though local action is important, DRCOG is limited in its ability to create policies that impact emissions in this sector. Therefore, actions in this chapter reference state-level policies and programs.

The measures outline ways to reduce emissions, increase carbon storage and enhance the health and resilience of forests by improving management, expanding native plant cultivation, advancing monitoring and research, and collaborating with landowners. These efforts simultaneously boost job and educational opportunities in related sectors. Implementing these strategies for natural and working lands will foster sustainable management systems that are both productive and environmentally sound.

Image of the Boulder Flatirons.

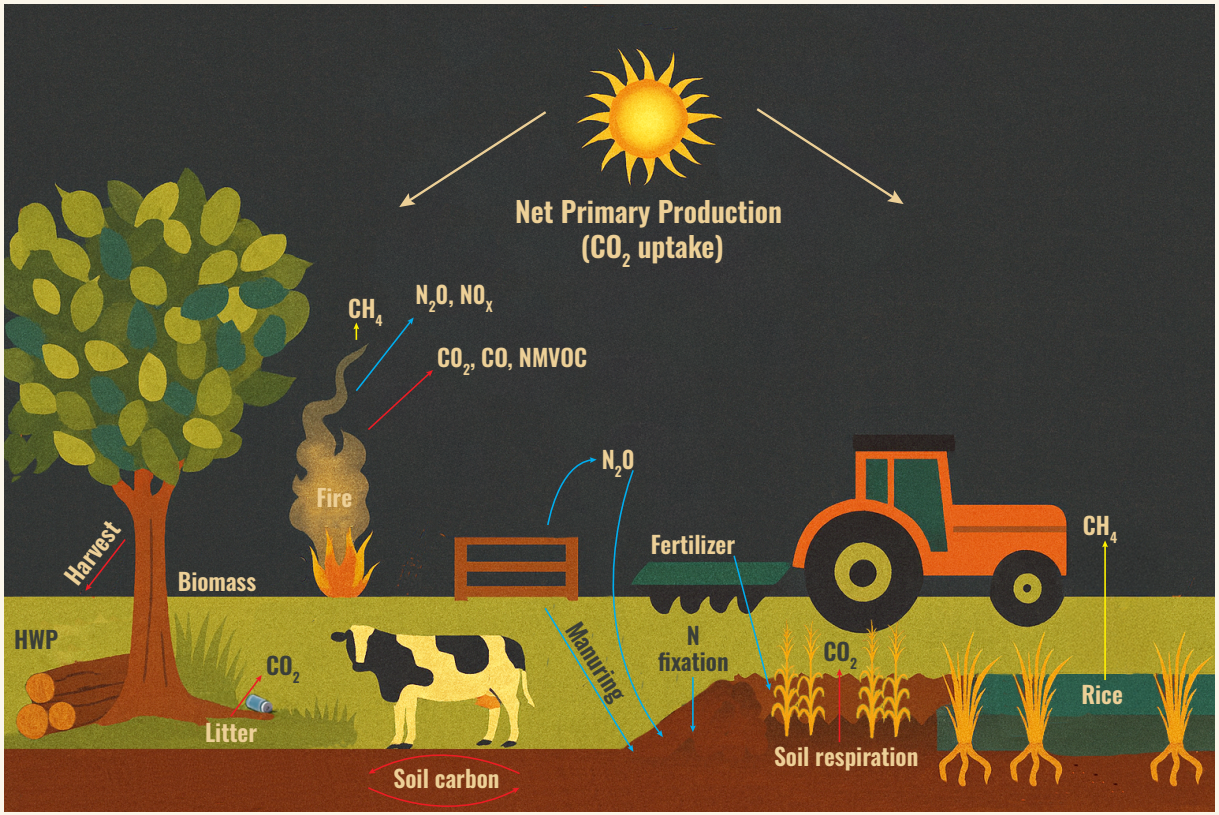
Natural and working lands emissions and measures

The State of Colorado and DRCOG recognize the importance of safe, equitable and sustainable natural and working lands. As the region grows, DRCOG is committed to supporting the state in addressing its needs. Climate smart natural and working lands provide open space, recreation, wildlife habitat and biodiversity, while also reducing climate pollution and increasing climate resilience. Natural and working lands naturally capture, store or release different gases such as carbon dioxide and nitrogen. For example, plants take in carbon dioxide and release it when they decompose or burn. Other gases like nitrous oxide and methane are released from soil, animal waste, and burning. These processes also release other compounds that can contribute to climate warming such as nitrogen oxides, ammonia, carbon monoxide and volatile organic compounds. Forests and trees can remove carbon dioxide from the atmosphere to build branches, roots, trunks and foliage while also delivering a portion of the carbon to the surrounding soil. Understanding these diverse storage and uptake pathways is crucial for managing emissions and removals in Colorado's natural and working lands.

Statewide natural and working lands overview

The natural and working lands sector is part of the land use, land-use change, and forestry sector Colorado Statewide Inventory of Greenhouse Gas Emissions. In the 2020 inventory, the net land use, land-use change, and forestry emissions totaled to 12.234 MT CO_2e, a 34% increase since 2005. The rise can be attributed to the changes in forest carbon stocks and reduced carbon dioxide removal from grasslands. Carbon dioxide is the dominant gas emitted in the sector, contributing up to 84% of net emissions, according to the Colorado Statewide Inventory of Greenhouse Gas Emissions and Sinks.

Figure 32: Natural working lands climate pollution emissions and removal pathway.



The State of Colorado's goal is to store one million metric tons of carbon dioxide in natural and working lands by 2030. To meet this goal, the state is:

- Effectively managing the state's 24 million acres of forest.
- Expanding the capacity to grow native trees, shrubs and plants.
- Improving forest monitoring and research techniques to help keep forests healthy and resilient.
- Encouraging private, state and federal landowners to work together to protect forests from natural disaster impacts, including drought stress, insects, disease and wildfires.
- Making the management and use of both the forest biomass and products easier, more affordable and less carbon intensive.
- Increasing employment opportunities, internships and work-study programs in tree-planting, forest management and forest products industries.

- Helping members of underserved communities and youth with on-the-ground experience and other learning opportunities.

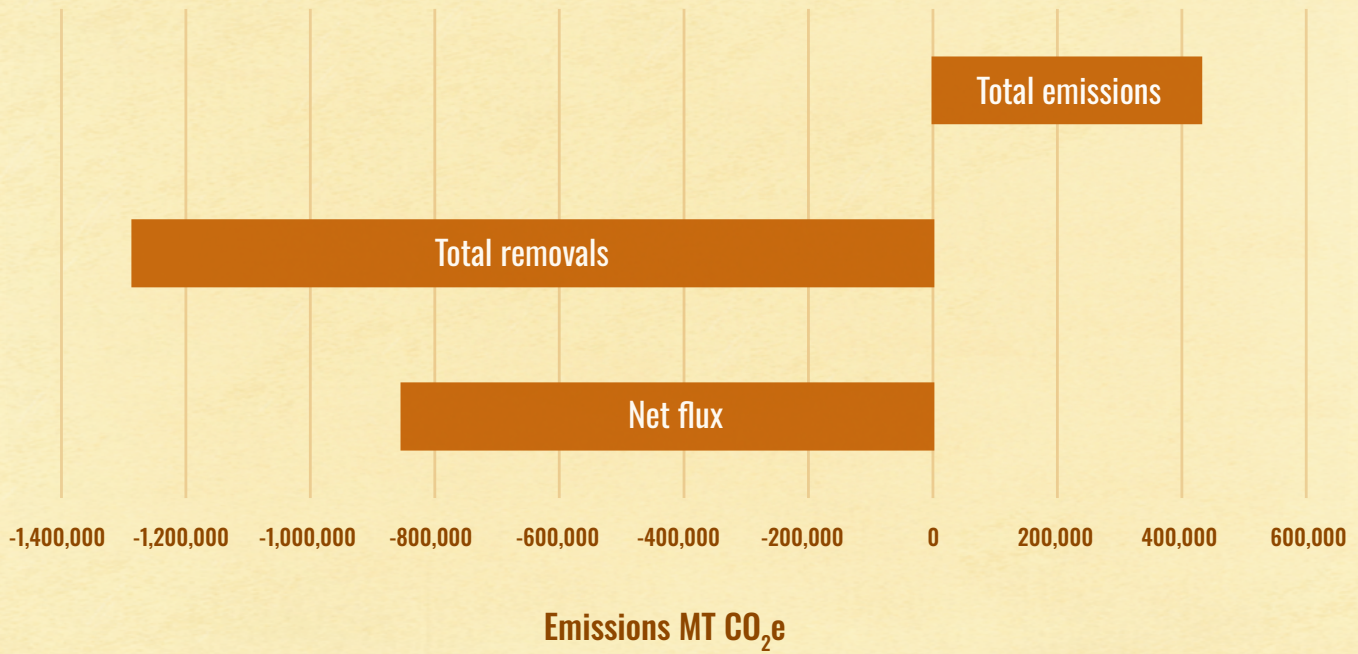
Colorado has enacted various legislation to advance these goals:

- The state's Greenhouse Gas Pollution Reduction Roadmap establishes milestones for Colorado to reach net-zero emissions across all sectors by 2050, including Natural and Working Lands.
- In June 2023, the Polis administration released the 2023 Strategic Plan for Climate-Smart Natural and Working Lands for forests, farms, ranches grasslands, wetlands, riparian areas and urban green spaces.
- The Colorado Outdoor Recreation and Economy Act was reintroduced to the Senate in 2025 and proposes to protect approximately 420,000 acres of Colorado public land by establishing new wilderness areas and safeguard outdoor recreation.
- The Colorado Legislature passed the Senate Joint Resolution 25-009, Protection of Colorado's Public Lands.
- The Colorado Department of Agriculture's Soil Health Program assists farmers and ranchers in implementing sustainable soil practices. These practices increase agricultural productivity, lessen environmental impact and reduce climate pollution.

Co-pollutant emissions impact

Natural and working lands have a positive impact on local air quality and remove large quantities of air pollutants annually. By maintaining and expanding natural and working lands in the DRCOG service area, the area can expect to see reductions in co-pollutants, including particulate matter, nitrogen oxides, sulfur dioxide and carbon monoxide.

Figure 33: Carbon emissions and removals from natural and working lands in the DRCOG region in 2022.



DRCOG natural and working lands overview

The natural and working lands sector serves as a net sink for climate pollution in the DRCOG service area. In 2022, natural and working lands in the DRCOG service area reduced to a total of 853,117 MT CO_2e. Emissions within this sector were calculated for each county based on the net removals of carbon and resultant carbon dioxide from forest change (land use change), conservation of forests, trees outside of the forest (urban trees), and harvested wood products (lumber, etc.). Park County had the largest intake of carbon into its natural and working lands, emitting 243,591 MT CO_2e and removing roughly 475,152 MT CO_2e, resulting in a net climate pollution flux of approximately -231,561 MT CO_2e.

Figure 34: Carbon emissions, removals, and the net carbon flux from natural and working lands by County in the DRCOG region in 2022.

The Reforestation Hub

Hosted by The Nature Conservancy and American Forest, the Reforestation Hub is an interactive web-based tool that highlights feasible low-cost options to restore forests throughout the United States. The hub identifies up to 148 million acres of total reforestation opportunity in the United States. In Colorado, there is opportunity to restore forest cover for approximately 2.66 million acres. By reforesting Colorado with over 795 million trees, this hub estimates that they could capture 3.64 million tons of carbon dioxide per year. The hub provides summaries of potential opportunities in various land types: corridors, floodplains, marginal cropland, grassy areas, pasture, shrubs, streamside buffers and urban open space. It also includes a breakdown of landownership. The online tool identifies reforestation options to help mitigate climate change, restore ecosystems and provide other environmental benefits to wildlife.

DRCOG natural and working lands measures overview

Measures mentioned in this chapter not only address climate pollution but provide wide-ranging co-benefits for those who work in the natural and working lands sector. DRCOG may have a limited ability to influence the climate pollution impact directly in this sector; however, there are measures that DRCOG member governments can undertake with DRCOG's background support. These measures are outlined in the following table.

Figure 35: Co-benefits from DRCOG-supported natural and working lands sector measures.

Measures	Improved public health outcomes	Job creation	Improved climate resilience	Improved access to services	Decreased energy costs
Support reforestation efforts and research	●	◗	●		
House research and information related to increasing carbon sequestration			●		
Support urban tree planting efforts in the DRCOG region	●	◗	●		●
Support land use policies that prioritize densification and reduces the amount of urban sprawl and natural lands changing to development			●		

Note: Example measures with potential direct benefits are denoted in ●; measures with potential indirect benefits are denoted in ◗. This summary table is just a visual representation of benefits

5 Benefits

5.1 Benefits analysis

DRCOG's partner agencies and stakeholders recognize the importance of reducing not only climate pollution but other air pollutants that negatively impact public health. Co-pollutants, such as nitrogen oxides, sulfur dioxide, particulate matter and volatile organic compounds, pose serious risks across economic, social and environmental dimensions, especially in vulnerable communities. Environmentally, these pollutants contribute to air and water contamination, acid rain, smog formation and ecosystem degradation and can lead to the reduction of local biodiversity. Socially, co-pollutant exposure disproportionately affects low-income and marginalized groups due to systemic inequalities such as housing and health care access which can lead to elevated rates of asthma, heart disease and other chronic illnesses. This in turn strains local healthcare systems and deepens disparities. Heavily polluted areas often suffer from diminished property values and deterred business investments, while residents face rising healthcare costs and lost productivity due to illnesses. Collectively, these interconnected impacts create a cycle of environmental injustice that reinforces poverty and limits opportunities for community resilience. By implementing the measures in this plan, and reducing emissions across sectors, the Front Range can see a decrease in emissions co-pollutants and an increase in co-benefits in the environmental, social and economic categories.

Figure 36: Cumulative co-pollutant estimated emissions reductions in metric tons by 2030 and 2050.

Measure		2030					2050				
		Particulate Matter (PM2.5)	Nitrogen Oxides (NO_x)	Sulfur Dioxide (SO_2)	Volatile Organic Compounds (VOC)	Carbon Monoxide (CO)	Particulate Matter (PM2.5)	Nitrogen Oxides (NO_x)	Sulfur Dioxide (SO_2)	Volatile Organic Compounds (VOC)	Carbon Monoxide (CO)
M1	Regional bus rapid transit expansion*	1	20	3	47	2,645	6	91	12	222	12,373
M2	Provide funding for active transportation projects	0.8	12	1.6	28	1,588	3	39	5	95	5,289
M3	Regional Transportation Demand Management program	<0.1	<0.1	<0.1	<0.1	27-54	<0.1	<0.1	<0.1	<0.1	105-130
M4	Coordination of Electric Vehicle charging locations and infrastructure purchases	<0.1	<0.1	<0.1	0.1	11	<0.1	0.1	<0.1	0.4	53.5
M5	Low-Income Decarbonization	<0.1	7	0.2	0.4	8,645	284	2,031	248	89	68,786
M6	Energy Advising**	0.3	65	<0.1	4	729,214	2	538	2	31	6,044,365

*Increases in transit infrastructure are correlated with increased ridership – additional ridership is correlated with a reduction in particulate matter and ozone precursor emissions. Ozone precursors include volatile organic compounds and nitrogen oxides. As specific ridership estimates were unavailable for the development of the plan, DRCOG staff were unable to calculate specific estimates of co-pollutant reductions. ** This measure will support the buildings implementation measures, but it does not have a direct, associated co-pollutant reduction. *** Emission reductions from measure implementation as compared to BAU.

Figure 36 (continued): Cumulative co-pollutant estimated emissions reductions in metric tons by 2030 and 2050.

Measure		2030 Particulate Matter (PM2.5)	2030 Nitrogen Oxides (NO_x)	2030 Sulfur Dioxide (SO_2)	2030 Volatile Organic Compounds (VOC)	2030 Carbon Monoxide (CO)	2050 Particulate Matter (PM2.5)	2050 Nitrogen Oxides (NO_x)	2050 Sulfur Dioxide (SO_2)	2050 Volatile Organic Compounds (VOC)	2050 Carbon Monoxide (CO)
M7	Rebates and Incentives	0.5	143	<0.1	8	191,726	4	1,095	<0.1	63	1,469,902
M8	Building Policy Collaborative	212	3,814	844	114	1,741	6,155	102,228	17,652	3,639	55,576
M9	Collaborate to manage the regional "wasteshed."	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
M10	Develop local ordinances and policies to manage the regional "wasteshed."	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
M11	Expand public education in the region.	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
M12	Support expansion of public-private partnerships to improve local circularity.	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

*Increases in transit infrastructure are correlated with increased ridership – additional ridership is correlated with a reduction in particulate matter and ozone precursor emissions. Ozone precursors include volatile organic compounds and nitrogen oxides. As specific ridership estimates were unavailable for the development of the plan, DRCOG staff were unable to calculate specific estimates of co-pollutant reductions. ** This measure will support the buildings implementation measures, but it does not have a direct, associated co-pollutant reduction. *** Emission reductions from measure implementation as compared to BAU.

The benefits summary table (figure 37) identifies the potential direct benefits which are denoted with a ●; measures with potential indirect benefits are denoted with a ◗.

Figure 37: Co-benefits of pollution reduction measures.

Benefits		M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
Economic	Promote green economy	●	●	●	●		●	●	●	●	●		●
	Create job growth & creation		●		◗	●	●		●		●		●
	Cost savings	◗				●	◗	●	●				
Social	Enhance quality of place	●	●	●	◗	●	◗	●	●			●	●
	Improve transportation access	●	●	●	●								
	Enhance regional collaboration	●	●	●	●	◗			●	●	●	●	●
Environmental	Improve air and public health outcomes	●	●	●	◗	●	◗	●	●		●		●
	Shift to more sustainable behavior	●	●	●	◗	●	●	●	●	●	●	●	●
	Improve climate resilience	●	●	●	●	●	◗	◗	●	●	●	●	●

*Note: This table does not include all possible co-benefits but highlights key areas of economic, social and environmental benefits.

5.2 Low-income communities benefits analysis

The Denver Regional Council of Governments staff recognize their role in building and maintaining an equitable region where all residents and communities thrive. The adoption of DRCOG's 2017 regional plan, Metro Vision, exemplifies this and focuses on the region's social and economic health alongside its physical growth plan. Metro Vision ensures the commitment that the region remains a diverse network of vibrant, connected and lifelong communities — particularly in light of a global climate crisis. This plan builds on Metro Vision's commitment, and DRCOG staff acknowledge the importance of including and elevating the voices of marginalized groups in the creation of this plan, building off Metro Vision and continuing to propel the region forward. The Climate Pollution Reduction Grants program and DRCOG's corresponding plans present an opportunity to support marginalized communities while addressing nuanced challenges associated with climate pollution. For example, when stakeholders developed the Priority Climate Action Plan, they paid special attention to opportunities to provide health, social and economic benefits to residents in low-income areas, which coincides with this plan. The Priority Climate Action Plan heavily influenced the awarding of $199.7 million in funding for the building decarbonization program that has provided $39 million to these communities for home retrofits.

The 12 measures in this plan will not only provide reductions in climate pollution, but will also provide benefits to local communities, including marginalized communities in the region. The measures described in this plan contain co-benefits that will be realized by local communities near where the measures are implemented. Examples of these co-benefits include benefits from reductions in emissions of criteria air pollutants such as fine particulate matter and ground level ozone concentration, which contributes to a wide variety of adverse health effects. These adverse

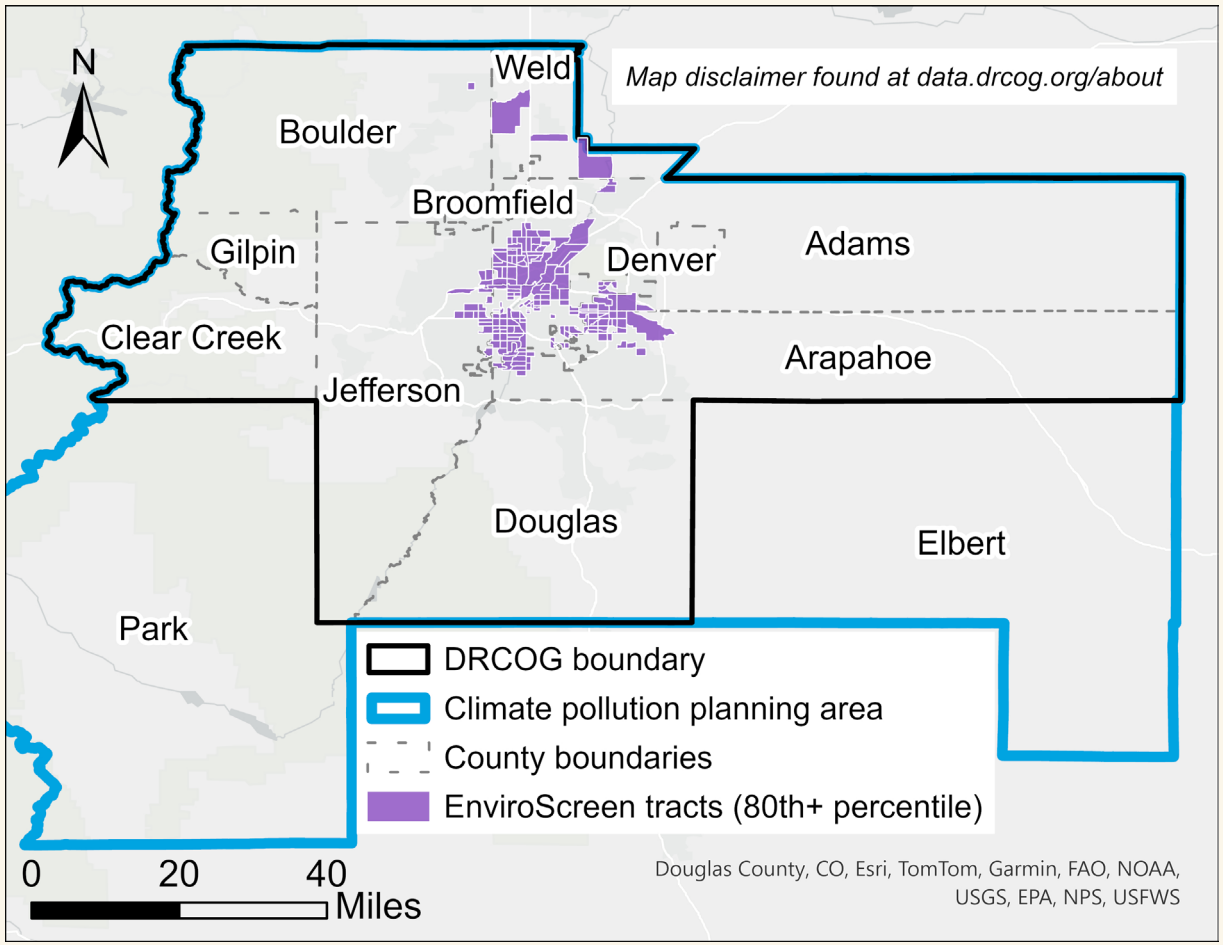
health effects include, but are not limited to, increases in frequency of asthma attacks, premature death in people with lung or heart disease, and nonfatal heart attacks. The DRCOG service area currently contains areas designated by the EPA as nonattainment under the National Ambient Air Quality Standards for Ozone. Reductions in criteria air pollutant emissions will have the additional benefit of assisting the region attain the National Ambient Air Quality Standards which have both public health and economic benefits for the region. Co-benefits of the emission reduction measures are listed in figure 37.

5.2.1 Marginalized communities identification

To identify marginalized geographies, DRCOG used the Colorado Enviroscreen tool, which reflects Colorado's definition of disproportionately impacted communities and includes nuanced considerations such as the inclusion of mobile home communities.

Colorado Enviroscreen was developed through a partnership between the Colorado Department of Public Health and Environment and teams from Colorado State University and the Colorado School of Public Health. The tool includes 35 indicators to calculate a score that provides a quantifiable measurement of combined environmental stressors.

Figure 38: Identified disproportionately impacted Census tracts. Source: The state of Colorado's Colorado Enviroscreen.



The map (figure 38) depicts the location of the Colorado Enviroscreen tracts identified within the planning region. After analyzing demographic data for identified tracts, DRCOG staff found that the planning area's marginalized communities comprise nearly 934,000 people, representing approximately 28% of DRCOG's entire population and 42% of DRCOG's people of color population (per the U.S. Census 2022 5-year estimates).

DRCOG staff worked to equitably address the needs of every community in the region in the Priority Climate Action Plan and continued to engage with and amplify the perspectives of these communities throughout the Comprehensive Climate Action planning processes via monthly stakeholder steering committee meetings that span DRCOG's 59 jurisdictions.

5.2.2 Benefits of measures to marginalized communities

In addition to resulting in emission reductions, countless financial, environmental, social and public health benefits will be promoted through the aspiring completion of this plan's measures. Four benefit categories were identified: public health, jobs and workforce development, transportation access and energy cost burden and security. These benefits and their risks are listed below in figure 39, and how they apply to each measure can be seen in figure 37 (co-benefits of pollution reduction measures).

Figure 39: Benefits are identified for marginalized communities along with their risks and associated metrics.

Benefit category	Benefits/disbenefits	Metrics
Public health	**Benefits** • Reduce public health issues related to air pollution (example: asthma) • Improved air quality (reducing volatile organic compounds and criteria air pollutants)	• Number of people from marginalized communities with chronic respiratory illness • Number of marginalized community members with other illnesses, including cancer and cardiovascular diseases
	Disbenefits Not applicable.	
Jobs and workforce development	**Benefits** • Increased employment opportunities • Increase in upskilling and training existing workforce	• Number of new participants in the green workforce • Number of participants who obtained continuing education and or certifications
	Disbenefits Not applicable.	

Figure 39 (continued): Benefits are identified for marginalized communities along with their risks and associated metrics.

Benefit category	Benefits/disbenefits	Metrics
Transportation access and costs	**Benefits** • Improved access and reliability of various transit options • Lowered transportation burden	• Percent of new public bus lines or increased bus service that will impact marginalized communities identified by CO Enviroscreen • Change in transit costs upon implementation of transportation measures • Reductions in travel time for non-vehicular mobility alternatives
	Disbenefits • Potential increase in cost of ridership	
Energy cost burden and security	**Benefits** • More reliable energy access • Potential to decrease energy bill	• Change in annual energy consumption per square foot • Change in annual energy costs (rent/owning)
	Disbenefits • Potential for energy bill to increase	

6 Engagement

6.1 Overview

Denver Regional Council of Governments staff know that public and stakeholder engagement is fundamental to the development of the region's Priority and Comprehensive Climate Action Plans. The Priority Climate Action Plan engagement laid the foundation for the Comprehensive Climate Action Plan, and the input and feedback received from the four distinct groups (the stakeholder steering committee, equity subcommittee, project management team and the public) carried over to this plan. Over the two-year process of developing both plans, staff wove diverse and intentional engagement into interactions with group members. Each team or committee's purposes complemented the others.

6.2 Climate Pollution Reduction Grant stakeholder steering committee

From May 2023 through November 2025, there were a total of 15 Climate Pollution Reduction Grant stakeholder steering committee meetings. These monthly, hour-long meetings consisted of roughly 60 municipal staff from the planning area with expertise across various environmental sectors. During these meetings, DRCOG staff gathered insight into the creation of the Priority Climate Action Plan, Comprehensive Climate Action Plan and the implementation grant. Half a dozen of these meetings were dedicated to the Comprehensive Climate Action Plan, where staff provided invaluable insight into building, transportation and waste measures.

6.2.1 Building sector

In June 2024, the Climate Pollution Reduction Grant Stakeholder Steering Committee selected their top building measure priorities using Mentimeter, an online engagement tool, and open discussion. The following six measures were selected as a top priority for the building measures:

1. Convening industry partners (real estate developers, property managers, local NPOs and governments) to discuss efficiency and electrification.
2. Coordination with Xcel and Colorado Energy Office to create certified heat pump contractor list/certification program.
3. Transit Oriented Development and Transit Demand Management support for new developments.
4. Support for local adoption of ICOs (International Code Council).
5. Heat pump group-buy and contractor education to so enhance local knowledge of electrification.
6. Work with Rewiring America on easily digestible campaign on electrification.

These six measures aligned with DRCOG's $200 million building decarbonization implementation grant, which was awarded in July 2024, and are identified in the buildings sector of this plan.

6.2.2 Transportation sector

The four transportation measures were identified as priorities for reducing climate pollution through DRCOG's planning efforts. Measure 1: Regional bus rapid transit expansion, and Measure 2: Provide funding for active transportation projects, were identified through the Priority Climate Action Plan engagement activities. Measure 3: Regional transportation demand management, and Measure 4: regional electric vehicle charging infrastructure, were identified in June 2024 by the Climate Pollution Reduction Grant Stakeholder Steering Committee as ideal areas for DRCOG to lead. Given DRCOG's work in the transportation space, staff leaned on internal experts to review the four transportation measures to adhere closely to DRCOG's work and capabilities.

6.2.3 Waste sector

The four measures selected for waste were identified through four meetings of the waste working group, which were composed of governmental staff and local waste experts. DRCOG also held two public meetings to discuss how DRCOG could best serve its jurisdictional members and the public via various waste measures.

7 Workforce planning analysis

A skilled and adaptable workforce is essential to drive progress toward a clean energy economy. As communities consider adopting strategies in this plan or pulling inspiration to form their own unique climate action measures, demand for public sector collaboration and private sector solutions is likely to increase. This will concurrently address environmental concerns and present an economic opportunity to create high-paying jobs and foster innovation in the renewable energy and sustainability sectors.

This chapter builds upon DRCOG's Priority Climate Action Plan's workforce planning analysis and explores the evaluation of existing and potential workforce needs to implement the plan's identified measures. It also provides a holistic outline for current green job workforce trends, challenges and opportunities within the state's clean energy industry.

7.1 Overview

Every energy sector in the state of Colorado grew from 2021 to 2022, with fuels and energy efficiency growing the most, and energy efficiency making up the largest portion of clean energy jobs in the state. Fuels employment includes jobs in agriculture and forestry, mining and extraction, construction, manufacturing, trade and professional services sectors, and includes coal, oil and other petroleum, natural gas, corn ethanol, other ethanol/non-woody biomass and woody biomass. In 2022, the largest trades within the energy efficiency sector in Colorado were Energy Star certified construction; efficient lighting; and heating, ventilation and air conditioning (HVAC).

7.2 DRCOG'S commitment to workforce and industry development

DRCOG launched a comprehensive Workforce and Industry Development Initiative under its Building Decarbonization program to address labor shortages in the building decarbonization sector and expand access to high-quality, clean energy jobs. This initiative comprises three strategic programs:

Green Workforce Hubs: The Green Workforce Hubs are located at five sites across the DRCOG service area and are overseen by Arapahoe/Douglas Works!, a publicly supported workforce center guided by the Workforce Development Board, which is composed of Colorado community members. These hubs provide paid training, career navigation and vital wraparound services such as childcare, transportation and other provisions to help participants overcome barriers to employment. With a strong focus on serving underserved and underrepresented populations, the hubs are designed to address the region's critical labor shortages in the building decarbonization trades. Each hub offers clear career pathway tracks in high-demand fields such as energy efficiency, cold-climate heat pump installation and service, electrical work, plumbing, pipefitting, sheet metal and building controls management. The program intends to register 3,800 participants across the five hubs between 2026 and 2029, each of which will be staffed by a dedicated Green Career Navigator who will provide individualized guidance, coaching and support to help participants successfully launch and advance in their careers, ultimately strengthening the local workforce and driving economic development across the DRCOG service area.

Contractor Navigation Hub: The Contractor Navigation Hub (CNH), managed by the Building Decarbonization Coalition, will be essential in advancing DRCOG's market transformation efforts. This dynamic one-stop shop will offer business

coaching, hands-on technical support and streamlined access to critical resources for both established and aspiring contractors, with a strong focus on mechanical, electrical and plumbing trades. Designed to assist at least 1,000 contractors in navigating the expanding network of regional decarbonization programs like DRCOG's, the CNH will play a key role in driving the widespread adoption of cold-climate heat pump technologies. By equipping contractors with the knowledge, skills and resources they need, the CNH will accelerate the region's transition to a greener, more energy-efficient future.

Growth Access Programs: The Growth Access Programs are a bold, transformative effort poised to make a tangible impact in just two years. The program consists of three dynamic training programs designed for underrepresented communities — including justice-involved individuals, non-native English speakers and young adults (ages 18–24). The curriculum for these training programs is focused on hands-on HVAC/heat pump training. Additionally, vendors offer job placement support and vital wraparound services like childcare and transportation so that participants can gain the skills and confidence to thrive in the booming green economy. Participants also have access to mentorship, work-based learning and essential soft skills development that sets them up for long-term success in building decarbonization trades.

Figure 40: Growth in each energy sector, as reported in the E2: Clean Jobs Colorado 2023.

Sector	Number	Percent increase from 2022	Career with largest representation in sector
Fuels	3,519	12%	Mining and extraction
Energy efficiency	1,642	5%	Professional services and construction
Motor vehicles and component parts (including electric vehicles)	241	4%	Repair and maintenance
Transmission, distribution and storage	324	1%	Utilities
Electric power generation	259	1%	Professional services

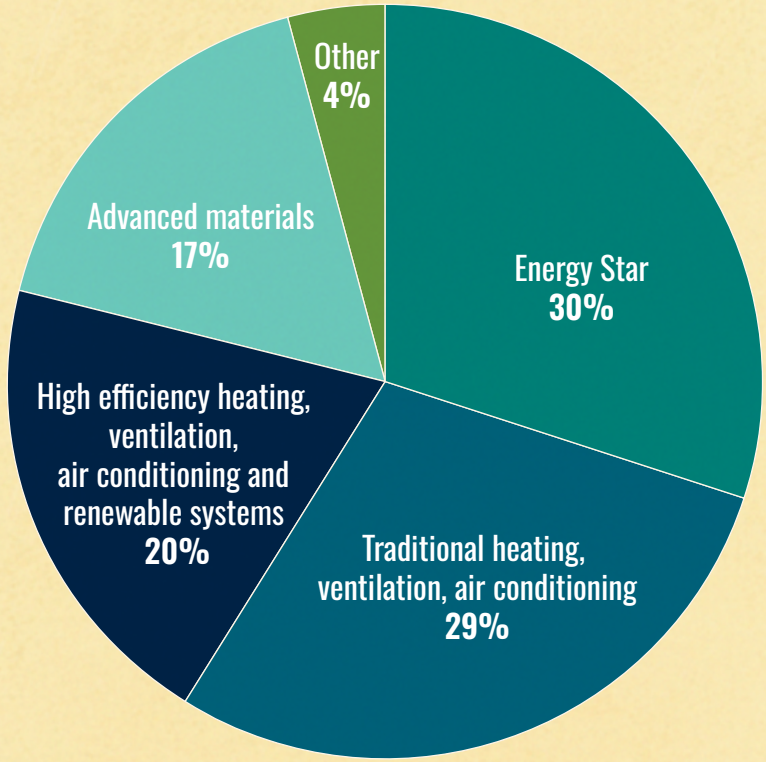
7.2.1 Summary of workforce data

According to the U.S. Energy and Employment Report 2023, from 2021 to 2022, the number of jobs in the energy sector in Colorado increased by 5%. Specifically, clean electric power jobs depicted in figure 40 increased by 4%.

New technologies include:

- Renewable electric power generation technologies.
- Nuclear electric power generation and fuel.
- Microgrids and grid modernization.
- Non-fossil fuel energy storage.
- All biofuels.
- Plug-in hybrid vehicles.
- Battery electric vehicles.
- Hydrogen fuel cell vehicles.
- All energy efficiency.
- Traditional transmission and distribution (including that which is associated with fossil fuels).

Figure 41: Breakdown of employment in the Colorado energy efficiency sector in 2022. Source: Environmental Entrepreneurs, 2023.



In 2022, the energy efficiency sector made up the largest portion of clean energy jobs in Colorado, with just under 36,000 jobs, the majority being contractors and trades focused on Energy Star construction, efficient lighting, heating, ventilation, air conditioning and other building and efficiency-related trades (Environmental Entrepreneurs, 2023). Figure 40 illustrates clean energy employment by sector, and figure 41 illustrates employment within the energy efficiency sector in Colorado.

Finally, a 2022 report by Center for the New Energy Economy at Colorado State University found that Colorado had over 140,000 energy workers in 2021, which included over 34,000 workers employed in energy efficiency. About 24% of Colorado's clean energy jobs were in rural areas of the state. These reports detail that Colorado experienced job growth within the energy efficiency trades and growth was the highest in energy-related jobs.

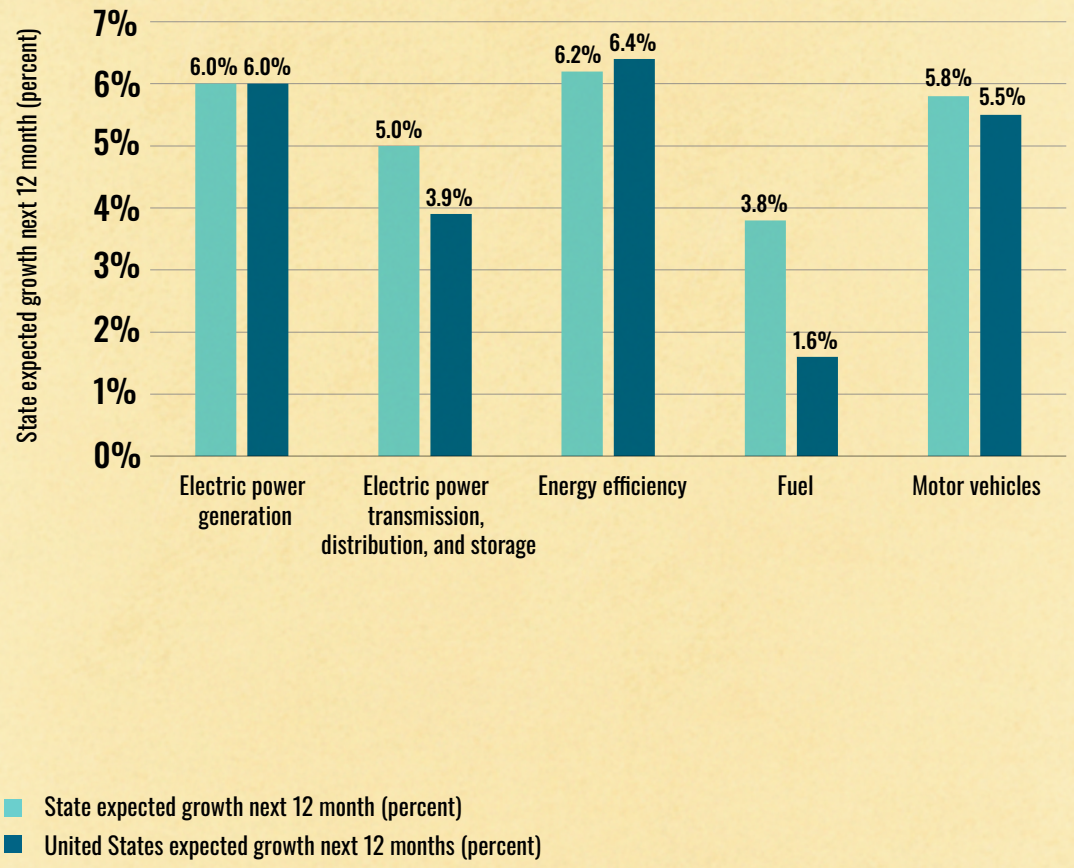
7.3 Expected growth in the energy industry in Colorado

DRCOG staff used data analysis related to the expected growth of the clean energy workforce to inform its key takeaways for this section. Staff used data provided by the Political Economy Research Institute at the University of Massachusetts Amherst, the U.S. Energy and Employment Report 2023, and the 2023 Beneficial Electrification Workforce Development Ecosystem (Beneficial Electrification Workforce Development) Report developed for the City and County of Denver by the Brendle Group and Collaborative Climate.

7.3.1 Key takeaways

Colorado is expected to experience, at minimum, a 5% growth in 2024 in key new technology sectors, with energy efficiency and motor vehicles expected to experience the highest growth. The key new technology sectors do not include the fuels sector, which grew 3.8% from 2021 to 2022. In addition, to meet the state's climate goals, Colorado's government and public and private sectors would need to invest significantly in the clean energy industry, with potential to generate around 100,000 new jobs by 2030.

Figure 42: Expected near-term job growth by major technology application. Source: U.S. Energy and Employment Report 2023.



7.3.2 Summary of workforce data

A study conducted by the Political Economy Research Institute estimates that significant investment would be required for Colorado to meet its goal of reducing carbon dioxide emissions 50% by 2030 and 90% by 2050. Total investments in energy efficiency and renewable energy alone would need to average about $14.5 billion per year from 2021 through 2030. Ultimately, this would generate approximately 100,000 jobs per year in Colorado.

According to the U.S. Energy and Employment Report 2023, Colorado is expected to experience major growth in many areas of new technology, several of which relate directly to clean energy. Figure 42 highlights the expected growth in Colorado by major technology applications. According to the study, energy efficiency technology is expected to have the greatest jobs increase at over 6%.

The Beneficial Electrification Workforce Development Report provides workforce data related to residential building electrification, particularly heating, ventilation and air conditioning and heat pumps within the Denver metropolitan area and throughout the state. The report indicates three growth scenarios for new or newly trained residential heat pump installers relative to the total heating, ventilation and air conditioning workforce in the Denver region. One of the scenarios shows that the metropolitan area must reach an annual 23% increase for new or newly trained heat pump installers to ensure that 100% of heating, ventilation and air conditioning installers are able to install heat pumps for customers by 2035. The report illustrates the importance of nurturing and training the existing workforce on heat pump technologies and installation at a rapid rate that can be scaled across the state.

For Colorado to meet its robust climate goals, it's apparent that significant growth must happen in the clean energy sectors.

7.4 Current challenges and opportunities in Colorado's clean energy workforce

This section provides an overview of current gaps in Colorado's clean energy workforce and details the barriers stunting the state's workforce expansion. In its analysis, DRCOG staff used data from the 2023 U.S. Energy and Employment Report 2023, E4TheFuture's 2023 Energy Efficiency Jobs in America-Colorado Report, the Beneficial Electrification Workforce Development Report, and insights from reports and discussions with The Common Thread, a Denver-based consulting firm focused on reducing labor turnover in the construction industry.

Figure 43: Strengths, weaknesses, opportunities and threats to Colorado's clean energy workforce.

SWOT analysis to Colorado's clean energy workforce

Strengths

- Job demand continues to increase.
- Wide range of jobs with varying levels of education required.
- Diverse career paths with innovation and technology advancements.

Weaknesses

- Lack of diversity in workforce (gender, race, age).
- Training and certification programs can be expensive.
- Geographical limitations — many trainings are concentrated in urban areas, limiting access.

Opportunities

- Upskilling current workforce through DRCOG and other programs.
- Increasing diversity through stakeholder engagement.
- Collaboration opportunities with public-private partners.

Threats

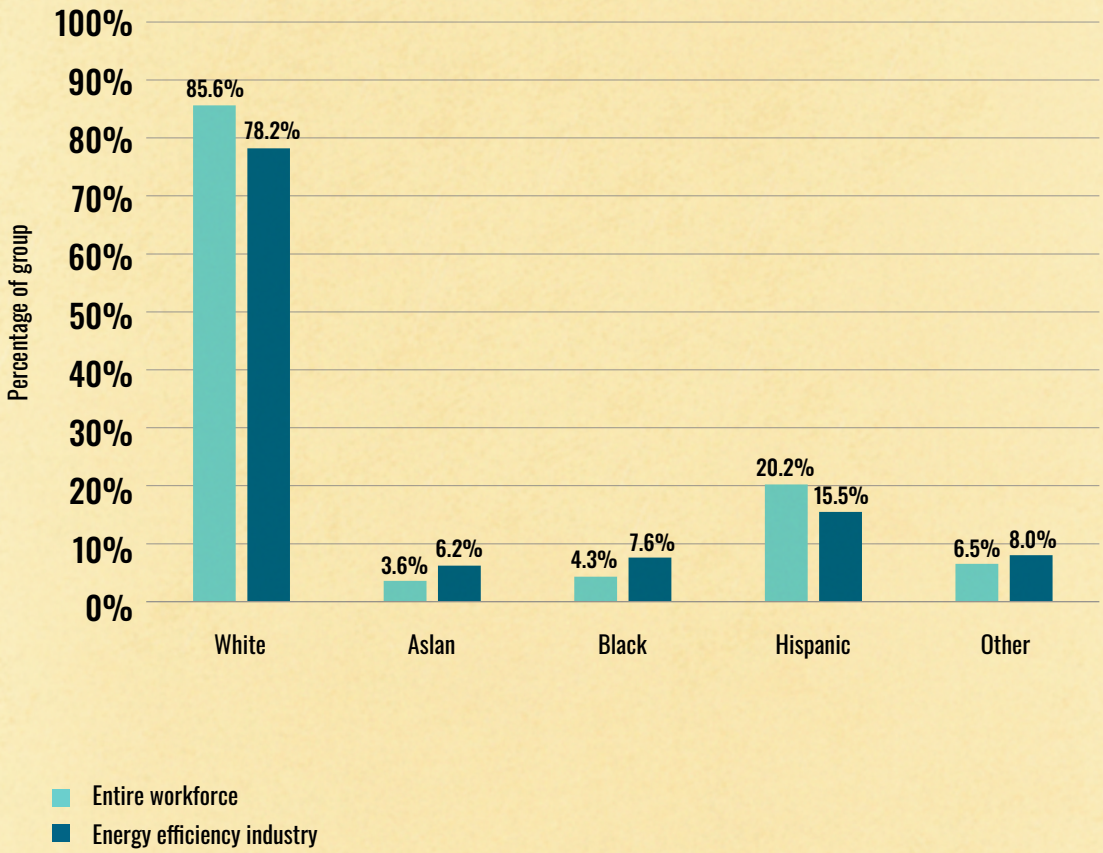
- High turnover rates across industries.
- Economic volatility could result in federal and state funding cuts.
- Inadequate grid modernization and supply chain disruptions can slow down progress.

7.4.1 Overview

Colorado's clean energy workforce faces several challenges to meeting the increasing demands for workers in electrification, energy efficiency and other clean energy trades. The lack of diverse racial, ethnic and gender representation with the workforce creates barriers to widespread recruitment and access to opportunities in these industries, such as cultural differences, which can lead to higher turnover rates.

With rapid advances in clean energy technology, the state’s current energy industry employees don’t have the knowledge, skills and training to provide the most innovative solutions. Stakeholders indicated that DRCOG staff should encourage industry leaders to pursue robust, targeted recruitment, training and education programs to reskill and upskill their workers.

Figure 44: Race and ethnicity in the Colorado energy efficiency industry in 2022. Source: E4TheFuture, 2023.*



*"White" includes both non-Hispanic and Hispanic white people.

7.4.2 Gaps in Colorado's clean energy workforce demographics

The clean energy industry is made up of predominantly male workers, many of whom are 40 or older according to 2023 research by Brendle Group and Collaborative Climate. The lack of diversity and representation of Black, Indigenous and people of color in the clean energy industry can present cultural and generational challenges within the workplace and can lead to high turnover rates. Promoting diversity and inclusive practices within trades and clean energy companies can help create a larger and more resilient workforce.

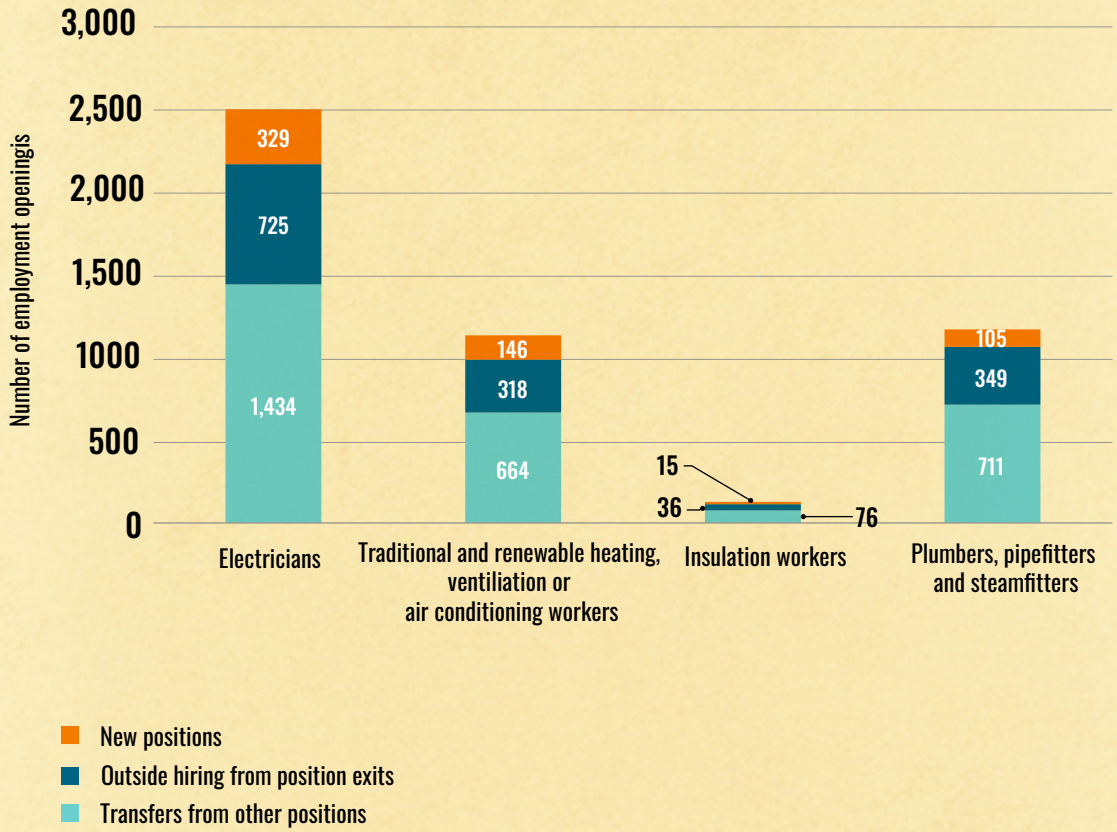
The 2023 U.S. Energy and Employment Report found that nationally in 2022, the energy workforce was primarily male, with men making up 73% of the workforce. Participation in the energy workforce by women increased by 8% in 2022, meaning that over half of the net new energy jobs added in 2022 were held by women. Gender nonconforming workers made up less than 1% of the energy workforce.

The report also found that non-white workers made up about 24% of the energy workforce in 2022. Hispanic or Latino workers represented about 18% of the energy workforce, and Asian Americans accounted for about 7%.

DRCOG staff analysts discovered similar data in the E4TheFuture report, which noted that in 2022 about 78% of the energy efficiency industry in Colorado was white, and women only made up about 28% of the energy efficiency workforce.

In 2019, the Energy Efficiency Business Coalition, a statewide trade association to increase the business potential of the energy efficiency industry, surveyed its trade members. It asked member companies to identify their most important business needs. Half of respondents indicated their most important need was to attract younger workers and identify a broader labor pool (The Common Thread). Additionally, the 2023 U.S. Energy and Employment Report found that 47% of the state's energy industry employers reported hiring difficulty. According to the Beneficial Electrification Workforce Development Report, probable causes of hiring issues in the clean energy industry also include language barriers among potential hires, lack of awareness of quality job opportunities for potential employees which makes it difficult for contractors to meet hiring needs.

Figure 45: Projected Colorado statewide annual workforce openings for key building electrification-related occupations from 2022 to 2032. Source: Brendle Group and Collaborative Climate, 2023.



7.4.3 Gaps in Colorado's recruitment and retention of the clean energy workforce

Studies indicate that growing the current energy workforce must be accompanied by robust recruitment and retention programs. The Beneficial Electrification Workforce Development Report highlighted the large number of workers in the building electrification trade transferring out of their occupation or exiting the industry altogether, as conveyed in figure 45. Industry attrition could be attributed to an aging workforce, lack of training and upskilling opportunities, language barriers and lack of access to job opportunities, and limited hiring efforts (Brendle Group and Collaborative Climate, 2023).

Figure 45 details Colorado's projected annual workforce openings between 2022 and 2032 for key building electrification-related occupations. The data in figure 45 demonstrates challenges with the current workforce and the anticipated openings, also

accounting for a small amount of growth in the sector overall from 2022 to 2032. These metrics include the workforce serving both residential and nonresidential properties. In order for Colorado to maintain an adequate clean energy and building electrification workforce, plan stakeholders recommend that industry leaders improve recruitment and retention within the building electrification.

A study conducted by The Common Thread examining labor turnover challenges among three of the largest insulation and air sealing corporations nationwide found that for every 10 newly hired technicians, the contractor would lose six new hires within a few months. The study also found that for every four retiring construction employees, only one younger worker would enter the industry to replace them. Such nationwide statistics point to systemic issues for the energy workforce, including an aging population and high turnover rates and suggest the potential value of programs to recruit and retain new workers.

7.4.4 Gaps in Colorado's clean energy workforce skills and training programs

Nationwide trends reveal building electrification and its associated technologies, such as heat pumps, are key to transitioning Colorado's buildings into cleaner heating and cooling solutions. Workforce data reveals barriers to adequate enrollment in training and certification programs, exacerbating workforce gaps in the clean energy industry.

The Beneficial Electrification Workforce Development Report found that only 10% of Colorado's heating, ventilation and air conditioning contractors serving residential properties are participating in heat pump utility incentive programs, corresponding to just 491 individuals trained in heat pump technology and installation. The report also found that 52% of the heating, ventilation and air conditioning workforce services residential projects, and of that 52%, only 9.6% participated in heat pump incentive

programs. The report also noted the need for 23% annual growth in heating, ventilation and air conditioning contractors (serving residential properties) trained in heat pump technologies.

Within the construction industry, The Common Thread reported that Colorado will need around 220,000 construction workers by 2027, which means the state must attract 8,000 workers to the construction workforce annually between 2024 and 2029. Similarly, the projected growth of new technology sectors and clean energy workforce needs (reported in the previous sections on energy industry growth in Colorado) indicate the need for a highly skilled workforce to meet these demands.

The Beneficial Electrification Workforce Development Report found that while training programs exist across the state, widespread enrollment is lacking due to financial constraints, inadequate marketing and awareness of programs by potential employees, lack of uptake on heating, ventilation, and air conditioning heat pump technologies residentially and commercially, and lack of emphasis on equity and inclusion in upskilling efforts by contractors.

In the fall of 2023, Xcel Energy staff surveyed 23 heating, ventilation and air conditioning contractors to better understand their opinions around air-source heat pumps and future training. The report found that over 50% of respondents indicated “difficulty finding heat pump trained workforce” as the number one barrier, with current lack of training and difficulty acquiring heat pumps (supply chain issues) as other key issues as identified by Brendle Group and Collaborative Climate.

Such findings underscore the need to provide the workforce with access to training and education programs to acquire the necessary skills to keep pace with technological advancements in heat pumps, energy efficiency upgrades and other clean energy trades.

Figure 46: Estimated annual enrollments for DRCOG's green workforce hubs.

Year	Percentage of Total	Estimated Enrollments	Rationale
2026	15%	570	Ramp up period: hiring staff, process refinement, launching outreach efforts, early referrals
2027	25%	950	Systems and pipelines are in place, outreach expands, partner engagement increases
2028	35%	1,330	Peak implementations: full momentum, strong referral and training pipelines, increased awareness
2029	25%	950	Continued enrollments, focused on retention, outcomes and sustainability

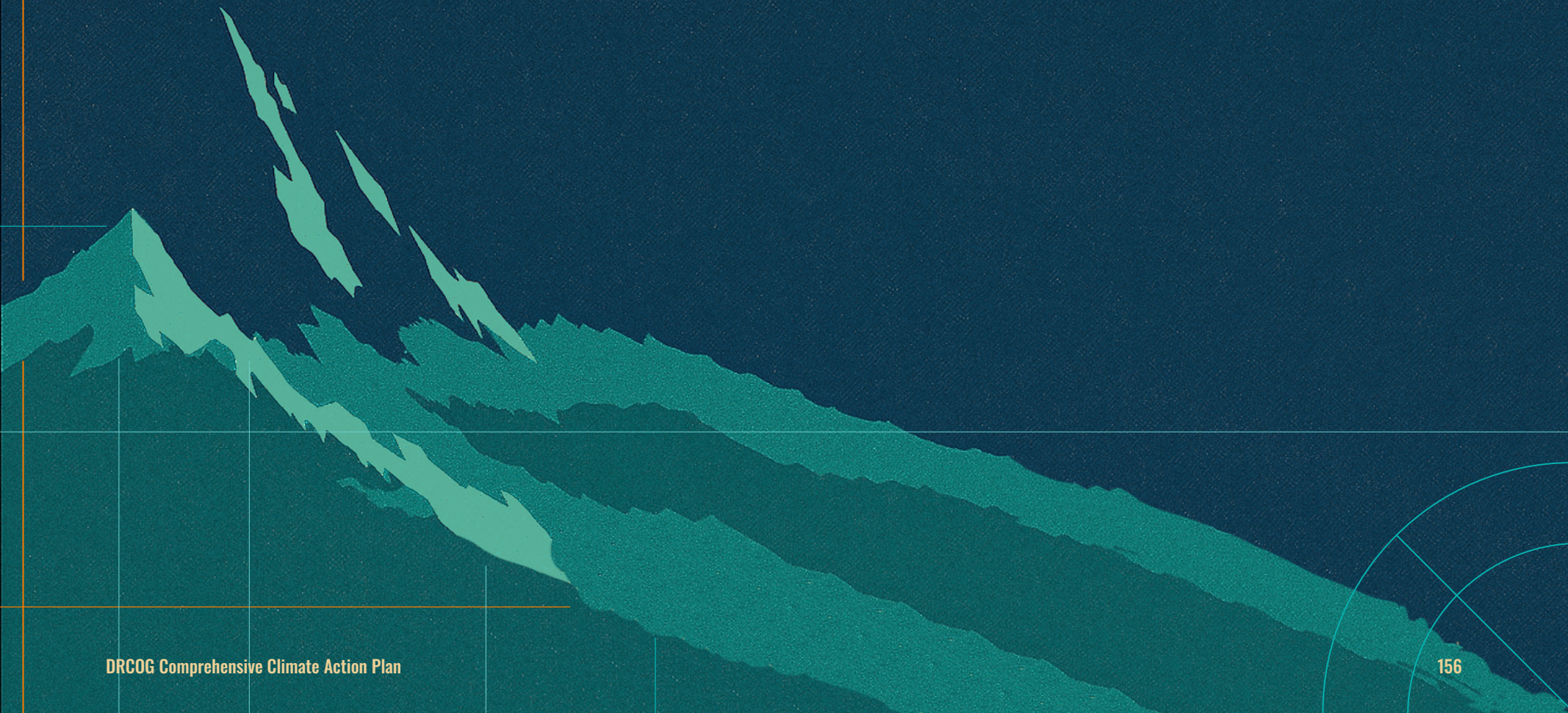
Data reveals that Colorado's clean energy industry is rapidly growing, particularly in the energy efficiency sector, but the workforce needed to support the state's decarbonization efforts must overcome several barriers. Stakeholders recommend targeted and equitable recruitment and retention efforts be leveraged to expand the prospective workforce and connect them with training programs across the state to help meet the demand for heating, ventilation, air conditioning and other trades in the clean energy industry.

7.4.5 Key takeaways

Colorado's clean energy workforce is rapidly growing and driven by the state's industry shift toward a greener economy and commitment to sustainability. However, the state's current workforce has not met the demand for the skilled workers needed to support the building electrification, energy efficiency and other clean energy trades. Many challenges are thwarting the growth of Colorado's clean energy workforce, but lack of opportunity and access to training and education, inadequate recruitment and retention efforts, and lack of inclusion are among the most challenging. DRCOG's workforce and industry development programs will assist in closing these gaps through the five Green Workforce Hubs which will provide vital wraparound services to help participants overcome barriers to employment. The Contractor Navigation Hub will help contractors by equipping them with knowledge surrounding heat pump technologies, and the Grow Access Programs will create tangible impacts for underrepresented communities by providing hands-on HVAC heat pump training. Addressing workforce challenges is among the most essential elements to stakeholders to ensure demand in the clean energy space is met rapidly, sustainably and equitably.

Next steps

The Comprehensive Climate Action Plan is the second major deliverable under the EPA's Climate Pollution Reduction Grant planning grant and builds upon the foundation established by the Priority Climate Action Plan. DRCOG and its partners will continue planning, engagement and implementation efforts to reduce emissions, enhance quality of life across the region and promote best practices in the buildings, transportation and waste sectors. These measures, along with the other programs highlighted in this plan, align with the state of Colorado's broader climate goals as laid out in the Greenhouse Gas Roadmap 2.0. In 2027, DRCOG will publish a status report that details implementation progress for measures included in the Priority Climate Action Plan and the Comprehensive Climate Action Plan, relevant updates to analyses and next steps.



Appendices

A. Inventory methodology

DRCOG staff prepared the regional inventory for the entire Climate Pollution Reduction Grant planning area by combining data from the following 12 counties in the Denver region and its surrounding area: Adams, Arapahoe, Boulder, Broomfield, Clear Creek, Douglas, Denver, Elbert, Gilpin, Jefferson, Park and the southwest portion of Weld. This portion of Weld County, referred to as "Southwest Weld County," includes the municipalities of Dacono, Firestone, Frederick, Lochbuie, Mead, Platteville, half of Fort Lupton, as well as the Weld County portions of Erie and Longmont.

The Global Protocol for Community Greenhouse Gas Emission Inventories provides a transparent and consistent emissions accounting methodology for reporting community climate pollution emissions from carbon dioxide, methane, nitrous oxide, hydrofluorocarbons and other gases. This report's inventory was developed in compliance with the Greenhouse Gas Protocol's BASIC reporting level, using relevant BASIC+ emissions reports.

Agriculture, forestry and other land uses

DRCOG staff used the Environmental Protection Agency's State Inventory Tool Agricultural Module and the U.S. Department of Agriculture 2017 Agricultural Census to calculate emissions from agriculture and land use. Staff used the Land Emissions and Removals Navigator to calculate carbon emissions and removals from forests and urban trees.

Fugitive emissions and oil and gas activity

Fugitive emissions data is calculated based on the activity data provided by natural gas utilities. Staff used activity data from the Colorado Oil and Gas Commission to calculate emissions from oil and gas operations.

Industrial processes and product use

Staff used commercial square footage data from each county's assessor's offices and the Intergovernmental Panel on Climate Change's 2019 Guidance for Greenhouse Gas Inventories to estimate refrigerant leakage. Staff used industrial facility data from the Environmental Protection Agency's Facility Level Information on Greenhouse Gases Tool.

Stationary energy

Stationary energy is energy consumed within unmoving objects and buildings such as homes and offices. It primarily includes electricity and heating fuel but can also include other fuels like diesel or propane. Utilities provided the electricity and natural gas activity data necessary to calculate stationary energy emissions. In most cases, activity data from the utilities was derived from the site of the consumption, for example, the customer or premise. Staff calculated transmission and

distribution losses using state-specific data from the U.S. Energy Information Administration. Additional activity data was provided for propane and stationary diesel by FerrellGas and the Colorado Department of Public Health and Environment, respectively.

Transportation

Staff calculated emissions for gasoline, diesel and ethanol vehicles using vehicle-miles-traveled (the amount of travel for all vehicles in a geographic region over an annual period) data from Google Environmental Insight Explorer; vehicle type breakdowns from the Colorado Department for Health and Environment; and vehicle registration data from the Colorado Department of Revenue. Staff used the EValuateCO Dashboard for electric vehicle data.

Fuel usage, electricity usage and route data from the Regional Transportation District is provided for public transit, light rail and commuter rail calculations. The Environmental Protection Agency provided emissions data for freight railway activity. Staff collected data from the National Emissions Inventory for off-road vehicles and equipment. All regional airports directly provided airport fuel use data.

Waste and wastewater

The Environmental Protection Agency's Facility Level Information on Greenhouse Gases Tool provides landfill emissions data. When preparing the inventory, staff accounted for all major landfills in the Denver region. Staff used a population-based approach to calculate fugitive and process emissions for wastewater. Various county public health departments provided septic tank data.

B. BAU modeling methodologies

Business-as-usual forecast

Assumptions

1. Activity and emissions data were projected from a baseline year of 2022. All activity and emissions data for 2022 were obtained from the 2022 PCAP Greenhouse Gas Inventory for the DRCOG region.
2. All emissions factors, outside of grid emissions, were assumed to remain constant over time.
3. Carbon dioxide emissions from ethanol were considered biogenic emissions and were not included in emission totals.

4. In building energy consumption forecasting, stationary diesel consumption was held constant as it is unknown how stationary diesel usage will increase over time. As it is often a backup fuel or used in industrial processes, population is not a directly appropriate factor to apply. Similarly, commercial propane consumption was also held constant over time due to uncertainty in future consumption in these markets.
5. Waste is forecasted based on expected service population growth. Service population is the sum of resident population and employment for the MSA region.

Description

A Business-As-Usual (BAU) model was developed to forecast baseline mobile transportation, transit, and building energy climate pollution emissions in the Denver Regional Council of Governments (DRCOG) region from 2022 through 2050. The BAU models a baseline for climate pollution emissions assuming operations continue as they exist today, no additional policies are implemented, and no technological breakthroughs are achieved in the future. The results from the BAU model are used to compare emission impacts from the proposed strategies.

The BAU model was limited to the sectors of the proposed emissions reduction strategies: mobile transportation, transit, building energy consumption, and waste. For each sector, activity and emissions data were collected, calculated, and forecasted based on the 2022 PCAP Climate Pollution Inventory for the DRCOG region.

1. Establish key forecasting parameters.

a. Forecast population growth in the DRCOG region.

i. Population forecasts for each county within the DRCOG region were obtained from the Colorado Demography Office[1]. It was assumed that 25% of Weld county's population is located within the DRCOG region.

b. Forecast emissions from the grid.

i. Statewide carbon intensity of electricity generation for Colorado was pulled from the Energy Policy Simulator Business as Usual case from 2021-2050 [2].

c. Forecast changes in temperature over time.

i. Heating and cooling degree days were used as an indicator for assessing the impacts of changes in temperature on energy consumption.

ii. Heating and cooling degree day projections were obtained from the National Renewable Energy Laboratory's (NREL) State and Local Planning for Energy (SLOPE) tool [3].

iii. The Representative concentration Pathway (RCP) 8.5 scenario was used to obtain degree day projections for Colorado in SLOPE. RCP 8.5 represents a conservative business as usual scenario of emissions changes over time.

2. Forecast baseline emissions from mobile transportation.

a. Forecast total Vehicle Miles Traveled (VMT)

i. Total VMT is expected to grow proportionally with population growth in the DRCOG region [1].

b. Forecast the vehicle stock in the region.

i. Electric vehicle usage is expected to grow even without any direct action taken by DRCOG. Electric vehicle adoption was forecasted based on Colorado Energy Office's Electrification Roadmap, which estimates electric vehicles will account for 14% of all light-duty vehicles in the DRCOG region by 2050 in a baseline scenario [4].

   It is assumed that all electric vehicle adoption starts at zero in 2020. The baseline scenario follows annual zero-emission vehicle sales projections from the Energy Information Administration Annual Energy Outlook in 2021 and represents electric vehicle sales if the state were not undertaking any adoption policies.

ii. Increased electric vehicle usage will displace the use of gasoline, ethanol, and diesel vehicles over time. This displacement was modeled by decreasing the vehicle miles traveled of each vehicle type based on the percent of total passenger vehicle miles traveled of each fuel type.

iii. Vehicle stock shares for all vehicle types except passenger and light-duty trucks are kept constant after 2022. Due to uncertainty in how electric vehicles will displace heavy-duty trucks, motorcycles, and paratransit buses.

c. Forecast fuel economy changes for each vehicle type.

i. Fuel economy improvements for light-duty internal combustion engine vehicles over time were estimated from the U.S. Energy Information Administration's (EIA) Annual Energy Outlook fror 2023 [5]. The yearly percent change in fuel economy for the average vehicle stock in the reference case was used to estimate changes in fuel economy over time.

ii. Electric vehicle fuel efficiency projections were obtained from the National Renewable Energy Laboratory (NREL)'s Annual Transportation Baseline data. NREL fuel efficiency values were provided in 5-year intervals starting in 2020 through 2050 [6]. Fuel efficiencies were linearly interpolated between the NREL reported values for intermediate years.

   The mid-case scenario was used for forecasting fuel efficiencies for light-duty medium-sized battery electric vehicles. These projected values were used for both passenger and truck vehicles. The mid-case models expected manufacturer improvements over time and business as usual regulations.

d. Calculate emissions from mobile transportation.

i. Emissions from mobile transportation sources were calculated annually using VMT, fuel economy, and emission factors based on fuel type.

3. Forecast baseline emissions from transit services.

a. Transit services were expected to grow linearly and proportionally with population growth in the DRCOG region [1]. No additional parameters were utilized in forecasting the demand for transit services.

4. Forecast baseline emissions from building energy consumption.

a. Determine the breakdown of energy consumption by end-use.

i. Energy consumption was forecasted by climate dependent and non-climate dependent end-use. Water heating, space heating, and air conditioning end-uses were considered to be climate dependent. All other end-uses were considered to not change significantly with changes to temperature over time.

ii. EIA data was used to determine the share of energy used for heating, cooling, and other end-uses for residential and commercial buildings.

iii. Table CE 4.10 “Annual Household Site End-Use Consumption by Fuel in the West - Averages” from the Residential Energy Consumption Survey (RECS) for 2020 was used to determine the energy consumption for electricity, natural gas, and propane for residential homes in the Mountain North census region [7].

iv. Tables E3 “Electricity Consumption by end use” and E7 “Natural Gas Consumption and Intensities by End Use” from the Commercial Building Energy Consumption Survey (CBECS) for 2020 was used to determine the energy consumption for electricity and natural gas for commercial buildings in the Mountain North census region [8].

b. Forecast energy demands from climate dependent end-uses.

i. The energy used for heating and cooling is expected to change linearly and proportionally with projected changes in heating and cooling degree days over time. Statewide degree day projections were obtained from NREL’s SLOPE tool [3].

ii. The share of energy used for heating and cooling obtained from RECS and CBECS data was used to determine the amount of energy used for climate-dependent end-uses.

iii. Energy consumption required for heating or cooling was divided by heating or cooling degree day projections to create a ratio of energy consumption and degree days.

iv. This ratio was then multiplied by the change in degree days from the previous year to determine the change in energy consumption. This change in energy consumption is added to the previous year's energy consumption and then increased by the year's population growth rate.

c. Forecast energy demands from non-climate dependent end-uses.

i. Energy demands from non-climate dependent end-uses were expected to grow linearly and proportionally with population growth in the DRCOG region [1].

d. Calculate forecasted emissions from building energy consumption.

i. Emissions were calculated annually using total energy consumption and emission factors based on fuel type.

C. Implementation authority, responsibilities, timelines and milestones

Measure 1: Regional bus rapid transit implementation

Implementation authorities:

Government organizations

- Local governments adopt zoning incentives or requirements for active transportation such as sidewalk repair, bus stop improvements, bike storage and parking reductions.
- Colorado Department of Transportation
- The Regional Transportation District is working on a technology program to help older adults and people who don't speak English as a first language navigate transit applications more easily.
- Denver Regional Council of Governments (DRCOG)

Community organizations and commissions

- Commerce City Transportation Commission
- Commerce City Environmental Policy Advisory Committee
- Denver Streets Partnership
- Local advocacy organizations

Housing Organizations

- The Colorado Housing Finance Authority works with developers to ensure communities aren't displaced as infrastructure improvements and connectivity improvements occur, and ensures affordable housing is built around transit centers.

Timelines and milestones

- DRCOG staff are currently working with jurisdictions in the region to identify priorities, set goals and aggressive timelines to achieve bus rapid transit objectives. The first five bus rapid transit corridors outlined in this strategy are set to be completed by 2030. As DRCOG is currently updating its 2050 Regional Transportation Plan, implementation timelines for these and other BRT corridors may change over time.

Measure 2: Provide funding for active transportation projects

Government organizations

- Local governments adopt zoning incentives or requirements for active transportation such as sidewalk repair, bus stop improvements, bike storage and parking reductions.
- The Colorado Department of Transportation
- The Regional Transportation District's technology program to help older adults and people who don't speak English as a first language navigate transit applications more easily.
- Denver Regional Council of Governments (DRCOG)

Community organizations and commissions

- Commerce City's Environmental Policy Advisory Committee, which promotes the environmental effects of public transit and active transportation.
- Denver Streets Partnership
- Local advocacy organizations

Housing organizations

- The Colorado Housing Finance Authority works with developers to ensure communities aren't displaced as infrastructure improvements and connectivity improvements occur, and ensures affordable housing is built around transit centers.

Timelines and milestones

- DRCOG staff are currently working with jurisdictions in the region to identify priorities, set goals, and set aggressive timelines to achieve active transportation network expansion goals.

Measure 3: Regional transportation demand management program

Government organizations

- Local governments adopt zoning regulations that impact density and walkability of communities, impacting mode choice.
- DRCOG administers its Way to Go program which helps employers find commute options for employees, alternative to driving alone.
- The State of Colorado enacts legislation impacting transportation – recent notable laws include HB24-1304 and HB24-1313 which limit parking minimums for certain developments and require local zoning to allow a certain amount of housing within a certain distance of frequent transit, respectively.

Community organizations and commissions

- Transportation management associations are organizations that implement transportation demand management services. Transportation management associations in the DRCOG service area (as of 2025) include:

- Boulder Transportation Connections
- Commuting Solutions
- Denver South
- Downtown Denver Partnership
- Northeast Transportation Connections
- Smart Commute
- Transportation Solutions
- West Corridor TMA

Housing organizations

- The Colorado Housing Finance Authority works with developers to ensure communities aren't displaced as infrastructure improvements and connectivity improvements occur, and ensures affordable housing is built around transit centers.

Timelines & Milestones

- Fully implement the Transportation Demand Management Strategic Plan by 2050.
- DRCOG will continue its Way to Go program as established and discuss improvements to it with stakeholders by 2027.

Measure 4: Regional electric vehicle charging infrastructure

- DRCOG's Regional Transportation Plan considers electric vehicle charging. Working with local, state, and federal partners, DRCOG is well-positioned to guide the efforts outlined as part of this measure.

Timelines & Milestones

- Support the full build out of the regional EV Charging Network by 2050.
- DRCOG will work immediately to establish a methodology to identify gaps in charging infrastructure and explore bulk purchasing in the near term.

Measure 5: Low-Income Full-Service Household Program

- The Denver Regional Council of Governments has authority to implement this program through their EPA funded Building Decarbonization Program.

Timelines and milestones

- 436 Single family homes upgraded by 2030
- 1,165 multifamily homes upgraded by 2030

Measure 6: Energy advising

- The Denver Regional Council of Governments has authority to implement this program through their EPA funded Building Decarbonization Program.

Timelines and milestones

- 1,109 single family homes advised by 2030
- 33,891 multifamily units advised by 2030
- 5,800 businesses advised by 2030

Measure 7: Rebates and incentives

- The Denver Regional Council of Governments has authority to implement this program through their EPA funded Building Decarbonization Program.

Timelines and milestones

- 10,000 single family homes upgraded by 2030
- 16,000 multifamily units upgraded by 2030
- 4,150,000 square feet of commercial space upgraded by 2030

Measure 8: Building Policy Collaborative

- The Denver Regional Council of Governments has authority to implement this program through their EPA funded Building Decarbonization Program.

Timelines and milestones

- End of 2025 - Participating jurisdictions have co-developed a region-wide roadmap towards zero emission building policies; individual jurisdictions have identified their policy priorities through 2030; have awarded first two rounds of jurisdiction support funds (continued semi-annually).
- End of 2026 - Participating jurisdictions are implementing state low carbon and energy code.
- End of 2027 - Communities representing 65% of the regional population implement zero emission building policy for new construction.
- 2030 Goal - Entire region is operating under zero or near zero emission building policy for new construction; communities representing 65% of the regional population are implementing enhanced appliance requirements; communities representing 33% of DRCOG population have advanced energy efficiency requirements for buildings 10,000 to 50,000 sq ft.
- 2050 Goal - Nearly 100% of buildings in region are operating at zero emissions by 2050.

Measure 9: Collaborate to manage the regional “wasteshed”

Government Organizations

- Local governments
- Denver Regional Council of Governments (DRCOG)
- Colorado Department of Public Health and Environment

Community organizations and commissions

- Recycle Colorado
- Colorado Circular Communities
- Eco-Cycle

- Local haulers
- Businesses focused on waste management or recycling and composting.
- Non-profits focused on waste management or recycling and composting.

Timelines & Milestones

- The creation of a Regional Waste Planning Collaborative ("Collaborative") would begin in 2026, with the goal of having regular meetings established by Summer of 2026.
- Upon establishment, this Collaborative will begin working to gather data, standardize terminology, complete the CBEI, and standardize reporting requirements where possible through 2028.
- With these elements as a foundation, jurisdictions can begin collaborating on future policy and planning opportunities and unification of the regional waste network in late 2028 and into the future.

Measure 10: Develop local ordinances and policies to manage the regional "wasteshed."

Government Organizations

- Local governments who will adopt the local ordinances and policies developed by the Regional Waste Collaborative.
- Colorado Department of Public Health and Environment

Community organizations and commissions

- Colorado Circular Communities

Timelines & Milestones

- After the assembly of a Regional Waste Planning Collaborative throughout 2026 and 2027, policy recommendations can start to be issued during the second half of 2027.
- Generally, DRCOG aims to see these policy recommendations widely implemented across the region by 2030.

Measure 11: Expand public education in the region.

Government Organizations

- Local governments who will help promote public education campaigns.
- Denver Regional Council of Governments
- Colorado Department of Public Health and the Environment

Community organizations and commissions

- Recycle Colorado
- Colorado Circular Communities
- Eco-Cycle
- Local non-profits in the waste management space

Timelines & Milestones

- Waste education and outreach efforts can begin in the near-term alongside the Producer Responsibility Program, which includes dedicated efforts to inform the public about local waste systems and how they are changing.
- Cultural shifts and educational campaigns such as these often span years, and it can take decades to see tangible results. Coordinated efforts will begin as soon as 2026, spanning the full timeline of this plan and continuing through 2050.

Measure 12: Support expansion of public-private partnerships to improve local circularity.

Government Organizations

- Local governments
- Denver Regional Council of Governments (DRCOG)
- Colorado Department of Public Health and Environment

Community Organizations and commissions

- Compost facilities
- Recycling facilities
- Waste haulers
- Eco-Cycle
- Recycle Colorado
- Colorado Circular Communities
- Libraries, who loan out tools and other items aside from books.
- Small businesses who operate in the circular economy space (example: Zero Market).

Timelines & Milestones

- Opportunities to form public-private partnerships can take place as soon as 2026, during and after the formation of the Regional Waste Planning Collaborative.
- Other measures, such as the construction of a wash hub and creation of new waste-related jobs are likely to take years and may not happen until 2030 or later.

D. Intersection with other funding availability

Measure 1: Regional bus rapid transit implementation

Government organizations

- The Federal Emergency Management Agency and the U.S. Environmental Protection Agency could be sources of grant funding.
- The Federal Emergency Management Agency Transit Security Grant Program provides funding to public transportation systems (intra-city bus, ferries and all forms of passenger rail) to protect critical transportation infrastructure and the traveling public from terrorism, and to increase transportation infrastructure resilience.

- State and regional agencies such as the Colorado Department of Local Affairs, Denver Council of Regional Governments, Colorado Department of Transportation, the Regional Transportation District, and the Colorado Department of Public Health and the Environment could also provide funding through grants and other programs.
- The Regional Transportation District could support writing and applying for grant opportunities.
- The Denver Regional Council of Governments Transportation Improvement Program provides funding for transportation projects in the region.
- Local governments can also be grant recipients or administrators of state and federal rebate and incentive programs. Downtown authorities and urban renewable agencies could also provide funding.

Private sector

- Drive Clean Colorado could help secure funding for the purchase of electric vehicles and charging infrastructure.
- Automobile companies could also support the transition to electric vehicles by obtaining funding through grants, rebates and incentives, and lowering consumer costs.

Funding mechanisms

- Grants, rebates and incentive programs
- Tax increment financing

Measure 2: Provide funding for active transportation projects

Government organizations

- Federal government entities such as the Federal Emergency Management Agency and the Environmental Protection Agency could be sources of grant funding.
- The Federal Emergency Management Agency Transit Security Grant Program provides funding to public transportation systems (intra-city bus, ferries and all forms of passenger rail) to protect critical transportation infrastructure and the traveling public from terrorism, and to increase transportation infrastructure resilience.
- State and regional agencies such as the Colorado Department of Local Affairs, Denver Regional Council of Governments, Colorado Department of Transportation, the Regional Transportation District, and the Colorado Department of Public Health and the Environment, could also provide funding through grants and other programs.
- The Regional Transportation District could support writing and applying for grant opportunities.
- Denver Regional Council of Governments Transportation Improvement Program provides funding for transportation projects in the region.

- Local governments can also be grant recipients or administrators of state and federal rebate and incentive programs. Downtown authorities and urban renewable agencies could also provide funding.

Private sector

- Drive Clean Colorado
- Automobile companies

Funding mechanisms

- Grants, rebates and incentive programs
- Tax increment financing

Measure 3: Regional transportation demand management program

Government organizations

- DRCOG, CDOT, RTD

Private sector

- Drive Clean Colorado,
  Transportation Management Associations

Funding mechanisms

- Transportation Demand Management Set-Aside

Measure 4: Regional electric vehicle charging infrastructure

Government organizations

- DRCOG, CDOT, municipal transportation and/or public works departments

Private sector

- Drive Clean Colorado, EV manufacturers, EV charging station manufacturers (ChargePoint, Tesla, blink, etc.)

Funding mechanisms

- Charge Ahead CO grants, CEO's Fleet Zero grant funding

Measure 5: Low-income full-service household program

Government organizations and funding mechanisms

- The Denver Regional Council of Governments has authority to implement this program through their EPA funded Building Decarbonization Program.

Measure 6: Energy advising

Government organizations and funding mechanisms

- The Denver Regional Council of Governments has authority to implement this program through their EPA funded Building Decarbonization Program.

Measure 7: Rebates and incentives

Government organizations and funding mechanisms

- The Denver Regional Council of Governments has authority to implement this program through their EPA funded Building Decarbonization Program.

Measure 8: Building Policy Collaborative

Government organizations and funding mechanisms

- The Denver Regional Council of Governments has authority to implement this program through their EPA funded Building Decarbonization Program.

Measure 9: Collaborate to manage the regional "wasteshed"

- Extended Producer Responsibility Act funds
- Colorado Energy Office Local IMPACT Accelerator funds
- Colorado Circular Communities funding
- Future grant funding opportunities
- Pooled local government funds to pay for the CBEI.

Measure 10: Develop local ordinances and policies to manage the regional "wasteshed"

- Extended Producer Responsibility Act funds
- Colorado Energy Office Local IMPACT Accelerator funds
- Colorado Circular Communities funding
- Future grant funding opportunities

Measure 11: Expand public education in the region

- Extended Producer Responsibility Act funds
- Colorado Energy Office Local IMPACT Accelerator funds
- Colorado Circular Communities funding
- Future grant funding opportunities

Measure 12: Support expansion of public-private partnerships to improve local circularity.

- Extended Producer Responsibility Act funds
- Colorado Energy Office Local IMPACT Accelerator funds
- Colorado Circular Communities funding
- Future grant funding opportunities

E. Metrics for tracking progress

The following examples evaluate measure indicators that can be used to assess how well the project/program/ initiative is progressing overtime. While DRCOG staff has provided extensive lists, these indicators are not intended to be exhaustive.

Measure 1: Regional bus rapid transit implementation

Metrics for tracking program progress and success include the following:

- Miles of bus rapid transit route developed

- Ridership increase/decrease: daily, monthly annual and year over year
- Transit on-time performance
- Housing density and affordability adjacent to bus rapid transit stops
- Vehicle miles traveled
- Avoided emissions from cars

Measure 2: Provide funding for active transportation projects

Metrics for tracking program progress and success include the following:

- Ridership growth: Increase in daily, monthly, and annual ridership.
- First-last mile connectivity: integration with sidewalks and bike lanes.
- On-time performance: Percent of buses arriving within scheduled window.
- Travel time savings: Compared to pre-expansion or parallel routes in alternative modes of transport such as single-occupancy vehicles, biking, scooters, etc.
- Fleet utilization: percentage of vehicles in service vs. total available.
- Coverage in underserved areas: Percentage of low-income populations served.
- Job creation: Direct and indirect employment from the expansion.

Measure 3: Regional transportation demand management program

Metrics for tracking program progress and success include the following:

- Vehicle miles traveled reduced
- Greenhouse gas emissions reduced from approved Transportation Improvement Program projects (Carbon Dioxide, Nitrous Oxides, Particulate Matter 2.5, etc.)
- Number of transit, walk, and bike trips daily, monthly and annually
- Percentage of workforce participating in telework
- Percentage of planning area served by transportation demand management initiatives
- Performance alignment with regional and statewide goals (such as climate, equity, congestion)

Measure 4: Regional electric vehicle charging infrastructure

Metrics for tracking progress and success include the following:

- Number of electric vehicle charging stations added in the region by type

- Share of electric vehicles out of total vehicles in the region
- Local zoning policy approvals that make easier the development of charging infrastructure
- Cities that adopting building energy codes that require EV ready for new buildings
- Percentage of planned sites completed on schedule
- Percentage of time charters are operational (station uptime) and maintenance cost per station

Measure 5: Low-income full-service household program

Metrics for tracking program progress and success include the following:

- Number of low-income members served
- Quantified building energy savings
- Average cost per home installation project
- Amount and type of upgrades installed
- Energy burden reduction (percentage decrease or increase of household income spent on energy)
- Cost effectiveness (U.S. dollar per ton of carbon dioxide avoided)
- Number of homes deferred due to safety issues (mold, asbestos, ventilation, up to code, etc.)
- Rate of follow-up referrals and return to service rate

Measure 6: Energy advising

Metrics for tracking program progress and success include the following:

- Number of single-family home clients, multi-family and businesses contacted vs. advised
- Quantified building energy savings
- Average time of advising session (from first contact to account close-out)
- Tracking of types of upgrades completed (heat pumps vs weatherization)
- Participation by income level
- Amount of carbon emissions avoided

Measure 7: Rebates and incentives

Metrics for tracking program progress and success include the following:

- Number of residents and business served
- Tracking of types of upgrades completed (heat pumps vs weatherization)
- Average rebate amount issued (single-family vs. multi-family, etc.)
- Energy savings per client

- Financing access: number of clients using rebates, plus loans or on-bill financing
- Rebate processing time (average number of days from application to disbursement)

Measure 8: Building Policy Collaborative

Metrics for tracking program progress and success include the following:

- Number of jurisdictions participating in the Building Policy Collaborative
- Breakdown of new policies passed
- Percentage of jurisdictions meeting milestones on schedule
- Number of technical assistance hours provided to jurisdictions
- Energy savings estimates from policy-driven upgrades
- Cost-effectiveness: amount in United States Dollars per ton of carbon dioxide avoided or per building electrified
- Amount of funds disbursed vs. spent
- Program goals vs. performance year over year

Measure 9: Collaborate to manage the regional "wasteshed".

- Establishing a Regional Waste Planning Collaborative with regularly scheduled meetings.
- The completion and publication of a regional CBEI.
- The completion and publication of a Regional Circularity Plan.
- Establishing a baseline of regional waste data to provide a point for future comparison.

Measure 10: Develop local ordinances and policies to manage the regional "wasteshed."

- Implementation of recommended policies, and the number of jurisdictions that adopt these across the region.
- Percent reduction in waste being sent to landfills, particularly in communities where policy recommendations have been implemented.
- In particular, it may be beneficial to track certain waste types, such as C&D.
- Increased availability of proper disposal options for Household Hazardous Waste and hard-to-recycle items.
- Establishment of universal recycling for commercial and multifamily residential units that are currently exempted.

Measure 11: Expand public education in the region.

- Publication of an online database for universal waste signage and infographics.
- Increasing the number of Eco-Cycle Green Star Schools and school waste reduction programs in the region.

- Creation of quality waste-related jobs, particularly in disadvantaged communities.
- Launching a Master Composter program, training people to become expert composters.
- Create and continue building out the waste outreach contact list.

Measure 12: Support expansion of public-private partnerships to improve local circularity.

- Establishing more public-private sector waste partnerships.
- Creating more quality, waste-related job opportunities in vulnerable communities.
- Building a reuse hub to store unused materials and clean or repair them. This could be modeled off of the hub currently being developed by the City of Boulder.
- Building a shared regional washing facility for cleaning and reusing service ware and other items.
- Creating a webpage or other resource to share information about funding opportunities.

F. Co-pollutant impacts

Measure 1: Regional bus rapid transit implementation and Measure 2: Provide funding for active transportation projects

Expanding a regional Bus Rapid Transit system can reduce co-pollutant emission s such as nitrogen oxides, particulate matter, and volatile organic compounds by shifting commuters from single occupancy vehicles to high-capacity transit options. Also, reduction in vehicle miles traveled and improved traffic flow, as well as dedicated bus lanes which minimizes stop-and-go-traffic assist in curbing emissions.

Measure 3: Regional transportation demand management program

Transportation Demand Management strategies like promoting public transit, carpooling, walking, cycling, and telecommuting lead to fewer vehicles on the road, resulting in lower emissions of pollutants like nitrogen oxides (NOx), particulate matter (PM), and volatile organic compounds (VOCs) leading to improved air quality, public health and reduced noise pollution.

Measure 4: Regional electric vehicle charging infrastructure

Electric vehicles seecreate fewer ozone precursor emissions than gas-powered vehicles. Lower levels of Nitrogen Oxides and Volatile Organic Compounds will reduce ozone levels and help the region conform with the Environmental Protection Agency's nonattainment area standards.

Measure 5: Low-Income Full-Service Household Program, Measure 6: Energy advising, and Measure 7: Rebates and incentives

Replacing fossil-fuel based appliances with high-efficiency electric appliances (such as heat pumps) improves indoor air quality and reduces exposure to ambient pollution and reduces co-pollutants such as nitrogen oxides, particulate matter and volatile organic compounds.

Measure 8: Building Policy Collaborative

By incentivizing local jurisdictions to update their building codes and standards to follow stricter electrification rules, the end result means less ambient pollution and healthier indoor and outdoor air quality with the reduction of, potentially, new buildings being required to be all electric.

Measure 9: Collaborate to manage the regional "wasteshed", Measure 10: Develop local ordinances and policies to manage the regional "wasteshed", Measure 11: Expand public education in the region, and Measure 12: Support expansion of public-private partnerships to improve local circularity.

The decomposition of waste does not directly create co-pollutant emissions. When waste is deposited in a landfill that has gas collection and flaring, co-pollutant emissions can be created from the flaring of the collected gas. Depending on the materials decomposed in the landfill, this may include co-pollutants such as carbon dioxide, nitrogen oxides, sulfur dioxide, carbon monoxide, and various volatile organic compounds. As with emissions reductions, the direct impact of this measure on co-pollutants is difficult to quantify. However, it is known that many forms of packaging contain toxic chemicals that can leach out if disposed of improperly. The work included in this measure will support more efficient and effective regional waste management practices in the future, which may reduce co–pollutants from activities like landfill flaring. Additional support for reducing co-pollutants can come from future statewide legislation.

G. Measure costs

Measure 1: Regional bus rapid transit implementation

To model costs for this measure, DRCOG staff relied heavily on estimates previously provided for five bus rapid transit expansion projects. Staff incorporated previous estimates into the model as upfront costs in 2025, though those costs are likely to be spread out over many years. Based on individual project scope, staff used total miles added to the network (route miles multiplied by the number of scheduled trips) to develop the upfront cost. Staff estimated ongoing maintenance costs using transit agency or federal studies.

Figure 47: Total bus rapid transit miles added, with upfront and ongoing costs per mile and cumulative from 2025-2050.

Bus rapid transit route miles added	6,729,632
Upfront costs per mile	$115
Ongoing costs per mile	$1.64
Upfront costs (2025)	$763 million
Ongoing costs cumulative (2026-2050)	$290 million

Measure 2: Provide funding for active transportation projects

DRCOG staff modeled costs for a regional active transportation network expansion using existing estimates from a Denver Moves study of sidewalk expansion and cost estimates from The University of North Carolina Safety Research Center. Staff collected additional bike lane cost estimates from a Denverite interview with staff of Denver's Department of Transportation and Infrastructure. Costs for sidewalks and bike lanes are highly variable depending on the type and placement, so average costs are estimates.

Figure 48: Cumulative costs and costs per mile of active transportation infrastructure added from this measure.

Miles added 2025 through 2050	1,414
Cost per unit (miles)	295,485
Total costs 2025 through 2050	$417.9 billion

Measure 3: Regional transportation demand management program

DRCOG staff modeled costs for three scenarios related to the Way to Go program and its funding moving into the future. The low scenario holds funding where it's presently at and continues the program through to 2030 and 2050. The medium and high scenarios increase the program's funding by 50% and 100%, respectively, to the same horizon.

Figure 49: Low, medium, and high cost scenarios

	Low	Medium	High
Total costs 2025 through 2030	$8,960,000	$12,790,000	$16,630,000
Total costs 2025 through 2050	$40,450,000	$56,190,000	$71,940,000

Measure 4: Regional electric vehicle charging infrastructure

- Approximately $10,000 per Level 2 charging station or $50,000 per Level 3 fast-charging station
- One full-time staff person

Measure 5: Low-income full-service household program

This program has an allocated funding amount of $48,106,535, targeting full decarbonization for specific low-income households. Upgrades include heat pumps, heat pump water heaters, insulation and air sealing, induction stoves, heat pump dryers, and—in some indicated cases—pre-weatherization measures, health and safety remediation, and radon mitigation systems. This measure assumes average costs at $30,000 per single family low-income household and $22,500 per low-income multifamily unit, after including incentives available through Colorado's Affordable Residential Energy program and Weatherization Assistance Program.

Costs for heat pumps are estimated using publicly available datasets including Massachusetts Residential Air-Source Heat Pump Program, Massachusetts Whole Home Pilot, TECH Clean California, Lawrence Berkeley National Laboratory (LBNL), and data from local implementers. Heat pump water heaters are estimated using median data from the TECH Clean California dataset. The upfront costs of insulation are determined by matching the measures included in the NREL ResStock insulation packages with measures reported in an LBNL report on the costs of decarbonization. Stoves and dryers are estimated through local retailers. Modeling the upfront costs for multi-family households are based on analysis from Denver's Renewable Heating and Cooling Plan. Costs per square foot for electrification are taken from a study completed for the City of Denver that estimated electrification costs for a variety of building types, systems, and replacement technology combinations. Costs per square foot are provided for each stage of electrification: old system removal, new system installation, wiring, controls, and panel or utility service upgrades. While these assumptions provided a detailed data set, the numbers were compared to real case study examples of implementation through Denver's Healthy Homes program, which includes building electrification health and safety improvements. Based on this comparison, numbers were rounded up to ensure the costs accurately reflect local case study data and averages account for potential additional upgrades beyond building electrification where appropriate.

Measure 6: Energy advising

DRCOG's contractor was awarded the $17 million contract and provides the regional energy advising service for residential and commercial buildings. The contractor assists in project needs, review assessments, and oversee project completion. Costs cover program administration, including website development and virtual tools and support advising programs serving an estimated 34,000 residential units at $225/unit and 5,800 commercial buildings at $1,300/building over five years. More information can be found in the technical appendix.

Measure 7: Rebates and incentives

This measure builds on Inflation Reduction Act, state, and utility rebates/incentives, and offers expanded rebates for residential and commercial customers–increasing both the amount of rebates offered and types of decarbonization technologies that qualify for rebates. Rebates would be available for residential, multifamily, and commercial properties. A total of $40,000,000 will be distributed as follows: 10,000 single family rebates at $1,600 each; 16,000 multifamily unit rebates at $1,000 each; and $8,000,000 for commercial properties.

Measure 8: Building Policy Collaborative

This program has an allocated funding amount of $39,209,385 and provides subawards ranging from $50,000-$2,000,000 for each of DRCOG's 59 member governments. Jurisdictions can apply for subawards to support: direct staff capacity (internal or contracted), permitting process and applicant support, inspection and enforcement, systems administration, new data tracking capabilities, certification and training, software licenses, legal counsel and support, community engagement, peer-to-peer and elected coordination, strategic policy advancement and collaborative work, data collection for coordination, and/or evaluation and studies.

Measure 9: Collaborate to manage the regional "wasteshed"

The creation of a Regional Waste Planning Collaborative does not have a direct cost associated with it. However, the time and labor of DRCOG team members and representatives from the 59 member governments should be taken into consideration. It will require time, planning, and collaboration to bring this Collaborative together, which is a cost of its own.

In addition, gathering data and producing studies is a task that also requires time, labor, and money. Assuming that the Collaborative uses expert support (i.e., hired consultant expertise) to produce these studies, the cost per study would likely be tens of thousands dollars depending upon the comprehensiveness of the study. DRCOG and member jurisdiction staff time will also be required to manage these projects, consult with contractors, and review findings. Costs associated with the studies could be taken on by member governments or could be offset by pursuing future grant opportunities.

Measure 10: Develop local ordinances and policies to manage the regional "wasteshed"

These measures do not come at a direct cost to DRCOG or its member governments because there is not a specific cost to pass legislation. Regardless, there will be costs associated with the time and labor spent developing, writing, editing, and passing the recommended policies. It should be noted that a collaborative effort on waste policies is likely to save money overall across the region by consolidating the work rather than requiring each member government to handle policy-writing individually.

Measure 11: Expand public education in the region

The main costs of these campaigns will be producing and distributing informational content and creating a dedicated webpage or database to house it. Compensation for employee labor creating and sharing these materials will be necessary, though some of the social-based and peer marketing can be done with the help of volunteers. If desired, a dedicated branding and marketing firm may be engaged to create high-quality and compelling branding and outreach materials; the cost of this is likely to be in the tens of thousands of dollars, depending upon the depth of the scope of work. Much of these costs could be covered by packaging producers as part of the Producer Responsibility Program being rolled out across 2025 and 2026.

Measure 12: Support expansion of public-private partnerships to improve local circularity.

Construction of a reuse hub and washing infrastructure are the largest costs associated with this measure, potentially costing in the range of several hundred thousand dollars to a few million dollars. Most of the other measures would not incur significant costs unless funding is needed to help with scaling of circular business models or job creation. The cost of these measures could be offset by pursuing further government and/or private grants, private investment, and shared investment from member governments.

H. DRCOG CCAP engagement synthesis

Purpose

This engagement synthesis is provided as a capstone document summarizing the engagement conducted during the Comprehensive Climate Action Plan (CCAP) process from April through August 2025. Since the Priority Climate Action Plan (PCAP) did not touch deeply on the waste sector, DRCOG wanted a greater emphasis on the waste sector for the CCAP process; therefore, engagement for this project was solely focused on the waste sector and developing waste strategies.

Executive summary

The project team's main priority was ensuring that the voices and priorities of community members most vulnerable to the impacts of climate pollution were at the forefront of the project team's engagement approach. The CCAP engagement approach focused on developing waste measures that aligned with the Climate Pollution Reduction Grant (CPRG) Planning Area needs and the grant requirements.

The goal of engagement was to build upon the existing waste sector initiatives in the region and generate buy-in with key actors. This goal ultimately equipped DRCOG with clear, defensible measures for the waste sector chapter of the CCAP. For engagement, the project team completed the following tasks:

1. Presented to the existing Steering Committee established during the PCAP.
2. Convened a working group of subject matter experts.
3. Conducted informational interviews with key municipalities and experts.
4. Disseminated a community-wide rapid survey.
5. Hosted two public listening sessions.

As engagements were being planned and executed, it was top of mind that the information and feedback collected would be limited as the project had to be completed in a condensed timeline. Nevertheless, the project team was able to compile input on current barriers and challenges and solutions and opportunities. The main barriers and challenges identified were: confusing and uncertain messaging, increasing costs, lack of collaboration, and lack of a clear leader. The main solutions and opportunities identified were: advocating for regional alignment, increasing collaboration, and leveraging the Producer Responsibility Program.

Introduction

In April 2023, DRCOG became the lead agency for the Denver region's Climate Pollution Reduction Grant, which supports regional climate action planning. The first deliverable, the Priority Climate Action Plan, submitted to the US EPA on March 1, 2024, outlined key climate priorities and strategies and laid the foundation for the second deliverable, the Comprehensive Climate Action Plan (CCAP). The CCAP details climate pollution sources, reduction measures, and short- and long-term emissions goals to address the region's emissions. Leveraging the engagement conducted for the PCAP, the project team aimed to build on that foundation and expand on the findings, specifically for the waste sector.

Engagement approach

The project team prioritized amplifying the voices and addressing the priorities of community members most vulnerable to the impacts of climate pollution throughout its engagement approach and strategy development process.

Background

To support a meaningful engagement process for the PCAP, DRCOG convened three groups: a project management team, a steering committee, and an equity subcommittee. Sectors discussed during this process were: energy, workforce development, buildings, and transportation.

The project management team included five volunteer members from communities across the DRCOG region. They met regularly with DRCOG and joined two in-depth strategy sessions with the steering and equity committees to assess strengths, challenges, and opportunities related to the PCAP. The steering committee included 60 municipal staff from across the planning area who met monthly to provide input on engagement priorities, strategies, and implementation grant planning. The equity subcommittee, made up of six individuals representing sectors such as affordable housing, conservation, youth, and more, ensured equity was embedded throughout the plan's strategies and implementation plan.

Comprehensive Climate Action Plan (CCAP) process

The CCAP engagement approach focused on developing a plan that aligned with the CPRG Planning Area and the grant requirements. The goal of engagement was to equip DRCOG with all the necessary tools to develop measures with clear, defensible strategies targeting the waste sector. While the PCAP did not touch greatly on the waste sector, the CCAP process looked to build out strategies for this sector and align with state efforts. Below is a list of the different engagement methods for the CCAP process.

Steering committee

As part of the PCAP process, DRCOG convened a steering committee composed of sustainability representatives from the region's jurisdictions to gather input on climate pollution reduction strategies. The steering committee convened again for the CCAP and met four times between January and June of 2025 to provide insight on measures, local examples for the waste sector, and the final design.

Working group

Between May and July, DRCOG hosted and Lotus facilitated four working group meetings with technical experts, including community members, business representatives, local and state government staff, and nonprofits with expertise, interest, or lived experience in the waste sector, to assist and guide the strategy development process.

To baseline the arc of conversation for the meetings, the group first outlined current challenges and opportunities in the region's waste sector. Using the feedback from that exercise, the project team conducted research to identify potential strategy examples being implemented in other regions and presented their findings to the group. The findings from this research, alongside group members' industry expertise, served as the basis of the strategy development conversations.

Recruitment

The project team developed two strategies for recruitment: targeted outreach and the distribution of an interest form. Targeted recruitment involved identifying key regional and local leaders in the waste sector through research, while the interest form was shared through the steering committee. Ultimately, the working group comprised seven members representing six different regional organizations.

Figure 50: Working group composition.

Working Group Participants
Adams County, Environmental Programs
Denver's Department of Transportation and Infrastructure (DOTI)
Denver's Office of Climate Action, Sustainability, and Resiliency (CASR)
Eco-Cycle
Scraps
We Don't Waste

Informational interviews

Lotus facilitated informational interviews with local and state government staff and non-profit organizations with expertise, interest, or lived experience in the waste sector, to identify challenges and potential solutions to better inform strategies DRCOG can pursue or support within the waste sector. The informational interviews provided an avenue for those who could not join the working group to provide feedback.

Recruitment

Recruitment for the informational interviews included reaching out to those who couldn't commit to the working group and getting recommendations from other interviewees, steering committee members, and working group members.

Figure 51: Organizations and jurisdictions interviewed.

Informational Interviewees
City of Brighton
City of Commerce City
City of Lakewood
Colorado Department of Public Health and the Environment
GreenLatinos
Recycle Colorado
Total Informational Interviews: 6

Listening sessions

Between June and August, Lotus hosted two listening sessions open to the public to gather insight on what regional strategies the public has a high appetite for and gather input regarding waste issues and solutions.

Recruitment

Recruitment for the listening sessions included enlisting DRCOG, the steering committee, working group, and local organizations to advertise the meetings, and sending out email blasts.

Figure 52: Listening session attendance.

Listening Session Attendance
Listening Session #1 18
Listening Session #2 15
Total Attendance 33

Figure 53: Groups and organizations represented at the listening sessions.

Listening Session Attendees
Adams County
BSI
City and County of Denver
City of Boulder
City of Brighton
City of Centennial
City of Golden
City of Lakewood
City of Littleton
City of Longmont
Colorado Department of Public Health and the Environment (CDPHE)
Denver International Airport (DIA)
Downtown Denver Partnership
Eco-Products
GreenLatinos
PaintCare
Pretred Inc.
Recycle Colorado
Residents
Sustainable Golden
Water Research Foundation
YIMBY Denver
Total Groups and Organizations Represented: 22

Rapid survey

Between June and July, an online rapid survey was released to gather input from the public at large. A rapid survey differs from a normal survey in that it is intended to take no more than five minutes to complete to maximize participation. For this purpose, questions are kept short and simple, largely focusing on multiple-choice options to gather more quantitative data and less anecdotal evidence. The purpose of the rapid survey was to evaluate the current knowledge and attitudes related to regional waste systems, what waste management practices people are already participating in, what waste management practices people are willing to implement, and what barriers to waste reduction exist. The survey garnered 88 responses.

Promotion

The rapid survey was promoted in several ways. The survey was shared during DRCOG's Public Listening Session on June 12th, posted to DRCOG's Facebook and LinkedIn profiles, on Lotus' LinkedIn page, and in the Facebook group "Women in Sustainability in Colorado." Additionally, the working group and informational interview participants were informed of the survey and encouraged to distribute it to their respective networks.

Engagement results

The engagement process generated valuable insights. Although engagement efforts had limitations, feedback collected helped identify regional needs, concerns, and opportunities in the waste sector, as well as shape the CCAP strategies.

Limitations and considerations

When planning and executing any form of engagement, it's essential to take into account limitations and considerations. This means recognizing barriers and understanding the context in which engagement will take place. Understanding these factors informs engagement strategies while also enabling a more accurate interpretation of outcomes and results. Below is a discussion of the main limitations and considerations for this project.

Timeline

The entire CCAP development process followed a condensed timeline, requiring engagement to be done within three to four months. The timeline was both a limitation and a key consideration in planning and carrying out engagement efforts. A shortened timeline can restrict the ability to conduct extensive and inclusive engagement, limiting the type, quality, and quantity of feedback gathered, as well as limiting the opportunities for relationship building. At the same time, it calls for a more strategic approach from the outset. Understanding and planning around these time constraints was essential to ensure the engagement remained effective and impactful, despite the limited schedule.

Participation

The condensed timeline of the CCAP development process also had implications for participation. With only three to four months for engagement, opportunities for broad public involvement were limited. This presented a challenge when it came to ensuring that a diverse range of voices were contributing and participating in the engagement process. The time constraint made it more difficult to reach underrepresented groups and create multiple, accessible avenues for participation. Despite these limitations, efforts were made to prioritize inclusivity by using targeted outreach and leveraging existing community networks.

Engagement findings

The following section details the key themes identified throughout the engagement process.

Barriers and challenges

Engagement shed light and nuance as to what barriers and challenges different jurisdictions and organizations are facing regarding the waste sector. For this document's purpose, only the major themes captured across all engagements will be shared.

Lack of alignment and confusing messaging

Messaging around proper waste management and diversion is often unclear, creating significant confusion for the public and impacting willingness to participate. For many, it is unclear what materials haulers do or do not accept. There is public interest in receiving more information about proper waste practices and local waste diversion events, but many don't know how to access or engage with the information or opportunities. Additionally, there isn't cohesive, regional messaging, education, or operating procedures around proper waste management practices, creating further confusion as jurisdictions have different standards, requirements, and approaches. The inconsistent messaging and lack of regional alignment make it challenging for the public to understand what's expected of them. Without regional alignment or consistent messaging, efforts to educate and engage communities might remain confusing for the public, limiting the overall effectiveness of waste diversion strategies.

Costs

Hauling and recycling costs can be expensive, but in some cases, the cost to transport materials surpasses the cost of recycling them, limiting hauler participation. There is a need to build out stronger end markets in the Denver area to make local waste disposal (especially recycling and reuse) more viable. Expanding access to information and support could help create more local solutions and reduce reliance on hauling.

Programmatic

Programmatic costs remain a key challenge for scaling waste diversion efforts. Communities and businesses often struggle to maintain programs when costs rise, which can result in programs getting cut as they're not seen as essential. How and when this can be done is still unclear, but the goal should be to generate buy-in and promote engagement, rather than impose mandates that may face pushback.

Collaboration

Jurisdictions have limited time and capacity to collaborate and lead coordinated efforts. While there is interest in supporting regional solutions, local governments don't have the oversight to implement programs outside of their jurisdictions. Clear regional guidelines can help with regional alignment and move efforts forward. Recycle Colorado is currently a major player in convening those in the waste sector, but the majority of the participation is from local jurisdictions, with little involvement from private sector partners.

Leadership

There's ongoing uncertainty about what waste programs should be managed at the city level and what should be managed at a regional level. Many recognize that some services, like composting, could benefit from a regional approach, but there is no clear guidance as to who would do that or how it would be done. Given jurisdictions' limited capacity, they're looking to other organizations like Recycle Colorado to take this work on to support alignment and streamlining of efforts.

Lack of Spanish-speaking and priority pommunity representatives

Representation from Spanish-speaking or priority community waste organizations and individuals is currently lacking. This gap presents a significant barrier for inclusive engagement, as well as limits the understanding of the unique nuances these groups face in relation to waste.

Solutions and opportunities

Through the engagement process, engaged parties were able to share their desired solutions and potential opportunities to address the barriers and challenges in the waste sector. For this document's purpose, only the major themes captured across all engagements will be shared.

Regional alignment and consistency

Regionally aligned education and messaging efforts could help strengthen and streamline waste diversion efforts, especially if they leverage proven success stories. Highlighting what's already working inspires communities to take action. A separate organization, like Recycle Colorado, could work to develop materials and resources for the region that jurisdictions could distribute. This approach would allow for cohesive outreach and a shared vision for regional progress in the waste sector.

Similarly, engaged parties want requirements and funding to be approached and administered from a regional level. This approach would streamline processes, promote regional alignment, and relieve jurisdictions from bearing the full cost or administrative load.

Collaboration

To advance these waste diversion efforts and to ensure their progress and success, collaboration will be key. Part of this includes leveraging existing work and organizations in this space. Many of these organizations have blueprints and policy options for others to replicate and work off of. Collaborating with economic councils, local businesses, and others will help mitigate challenges, develop opportunities for innovation in waste and circularity, and alleviate burdens through resource and knowledge sharing.

Leverage the Producer Responsibility Program

Engaged parties believed that the onus should not be solely on jurisdictions and regional governments, but also on producers that are contributing to the waste generated. By leveraging Colorado's Producer Responsibility Program for Statewide Recycling Act, which requires companies to help fund a recycling system to process those materials, some of the responsibility can shift away from governments. This provides a stronger support structure when most jurisdictions have limited funding and capacity to tackle these issues.

Spanish-speaking and priority community representation

Increasing representation from Spanish-speaking communities and priority community waste organizations is a key solution for strengthening inclusive engagement and improving the results of the measures identified. Engaged parties emphasized that involving voices from Spanish-speaking and priority communities is essential to ensuring that waste and sustainability strategies reflect diverse perspectives, build trust, and are informed by those most impacted.

Recommendations for future engagement

This process allowed the project team to identify areas in which engagement efforts could be built or improved upon. While DRCOG does not have the jurisdiction to drive waste reduction work at a regional scale, its leadership and collaboration with other organizations could help move the needle of progress. A key recommendation is to involve a more diverse pool of parties in the process. Participants emphasized the importance of encouraging more local jurisdictions and private sector organizations to participate, noting that collaboration and representation are essential to keeping these efforts on track. To support this, DRCOG could consider working with other organizations to convene an ongoing waste working group with regional waste sector leaders to discuss and develop strategies and track their progress. Additionally, DRCOG could partner with others to host regular convenings,

discussions, and workshops aimed at informing the public, exploring funding collaboration, and supporting regional waste reduction efforts. By fostering collaboration and facilitating an ongoing dialogue, DRCOG can play a significant role in supporting and strengthening regional waste reduction efforts, even within its limited jurisdiction.

Data sources

1. Colorado Demography Office population forecasts by county: https://demography.dola.colorado.gov/assets/html/county.html
2. Energy Policy Simulator: https://energypolicy.solutions/simulator/colorado/en
3. NREL SLOPE Data Viewer for Degree Day Projections in Colorado: https://maps.nrel.gov/slope/data-viewer?filters=%5B%5D&layer=sfa.degree-days&geoId=G08&year=2020&res=state
4. Colorado Light-Duty Vehicle Electrification Roadmap: https://energyoffice.colorado.gov/sites/energyoffice/files/documents/100-Percent_LD_Electrification_Roadmap_Final_Report%20%281%29%20%281%29.pdf.
5. EIA Annual Energy Outlook 2023: https://www.eia.gov/outlooks/aeo/data/browser/#/?id=50-AEO2023&cases=ref2023&sourcekey=0
6. NREL Annual Transportation Baseline data: https://atb.nrel.gov/transportation/2020/data
7. RECS Table CE4.10: https://www.eia.gov/consumption/residential/data/2020/c&e/pdf/ce4.10.pdf
8. CBECS Data Tables: https://www.eia.gov/consumption/commercial/data/2018/index.php?view=consumption#e1-e11