

GREENHOUSE GAS EMISSIONS REDUCTION PLAN



April 2022

Department of
Strategic Initiatives

Acknowledgements

The City and County of Broomfield's (CCOB) Department of Strategic Initiatives (which encompasses the Sustainability team) would like to extend its deep appreciation for the valuable contributions to this report from members of ACES, listed below:

Aaron Heun (ACES Chair), Brianna Harp (ACES Vice Chair), Bob Pearson (Energy Subcommittee Chair), Casey Martin (Transportation Subcommittee Chair), Taylor Reiman (Zero Waste Subcommittee Chair), Max Kulbida (Youth Member), Brandon Mauch, Ryan Harp, Lois Vanderkooi, Darla Arians and Tony Raeker. It is thanks to them that these important sustainability initiatives are moving forward in our community.

Of critical importance to the advancement of this report was the hard work and research of the graduate consultant team from the University of Colorado at Boulder's Masters of the Environment Program: Lucy Ehrenclou, Hannah Miller, Janelle Gibbons, and Caroline Hamlin.

In addition, special thanks are due to the dozens of municipal staff members who provided input and feedback on the plan. Your dedication and professionalism are what make Broomfield such a special place.

Additional acknowledgements go to ICLEI, Local Governments for Sustainability for their critical technical assistance throughout the planning process, and to the Colorado Energy Office (CEO) for their ongoing support.

Lastly, none of these efforts would have been launched without the vision and leadership of the City Council, whose members prioritize sustainability as a vital part of Broomfield's thriving future.

*City and County of Broomfield
Dept. of Strategic Initiatives
Sustainability Team:*

- *Andrew Valdez*
- *Camille Pollan*
- *Mindy Olkjer*
- *Garrett McDaniel*



Sustainability IN BROOMFIELD

Table of Contents

Introduction	4
Greenhouse Gas Emissions	6
Colorado’s Climate Risks	7
GHG Inventory	10
GHG Reduction Goals	12
Community Benefits	12
Public Health	14
Diversity, Equity, Access & Inclusion	17
Workforce Development	21
Climate Resilience	24
Stakeholder Engagement	27
Interdepartmental Collaboration	28
Partnerships	29
Community Outreach	31
Methodology	34
Related Policies & Strategies	36
Impact Analyses	37
ClearPath Calculations	38
Recommended Policies & Programs	39
Energy	44
Energy Efficiency	46
CASE STUDY: Energy Efficiency in the Adams 12 Five-Star School District	47
Renewable Energy	48
CASE STUDY: Broomfield United Methodist Church Solar Projects	50
Electrification	51
Recommended Energy Policies and Programs	53
Transportation	61
Electric Vehicles	64
CASE STUDY: City of Madison, Wisconsin’s Fleet Electrification	67
Multimodality	68
CASE STUDY: Fort Collins e-bikes and e-scooters	69
Recommended Transportation Policies and Programs	71
Looking Ahead	77
Appendices	78
Acronyms / Definitions	79
Links to Impact Analyses	80

TRANSPORTATION • ENERGY • ZERO WASTE



Sustainability

IN BROOMFIELD

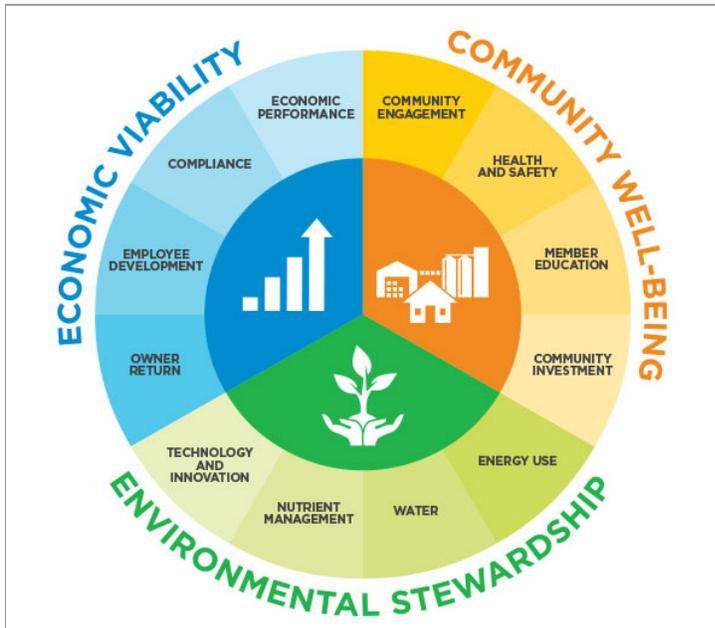
EDUCATE • ENGAGE • EFFECT CHANGE

Introduction

Sustainability is a focal point of social, economic, and environmental health in the CCOB, and aims to replenish resources so future generations can thrive. Focusing on energy and transportation, the Greenhouse Gas (GHG) Reduction Plan delivers strategies that enable Broomfield to take effective action towards mitigating harmful climate impacts.

Broomfield's [ACES](#) provides a forum for resident comment on environmental stewardship issues. This ongoing committee provides comments and recommendations for improvements

on Broomfield's current environmental stewardship policies, specifically related to Transportation, Energy, and Zero Waste.



Ambitious GHG reduction targets were laid out in [Resolution No. 2020-169](#), which the Broomfield City Council adopted on September 22, 2020. The goal is to reduce community-wide (i.e., residential, municipal, and commercial sectors) GHG emissions by 90% by 2050, and reduce municipal GHG emissions by 100% by 2050. In addition, the City Council passed [Resolution 2020-65](#), laying out Zero Waste goals, which aim to divert 50% of waste from the landfill by 2025 and 100% by 2035.

ACES and staff embarked upon an extensive [Community Outreach](#) effort as part of the GHG Reduction and Zero Waste Planning Process. The team spent the summer of 2021 asking residents for their feedback on sustainability. Residents were asked how they envisioned a sustainable future for Broomfield in order to help guide the sustainability strategy. Broomfield hosted online workshops, surveys, talked to Broomfield’s largest institutions, tabled at community events, hosted in-person workshops, and spoke at HOAs (homeowner associations).

Residents gave great feedback on Energy, Transportation, and Zero Waste, saying how important they thought the planning and engagement process was and how much they appreciated Broomfield’s leadership.

Because Diversity, Equity, Access, and Inclusion (DEAI) is a key priority, staff and ACES strategized on incorporating equity considerations into sustainability planning and implementation. Targeting hard-to-reach and vulnerable populations is an underlying principle for the community outreach, planning and implementation phases, as the goal is to build programs and policies that are accessible to and address the needs of all community members.

This GHG Emissions Reduction Plan represents ACES’ recommendations to the City Council for how to achieve Broomfield’s long-term sustainability goals in the Energy and Transportation sectors, to be followed by proposed program and policy development and implementation frameworks.

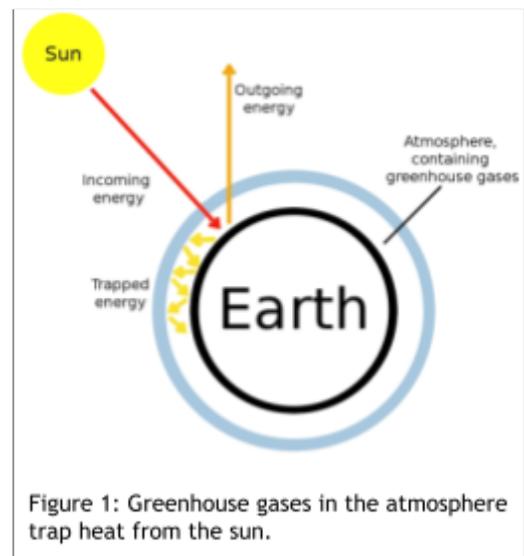


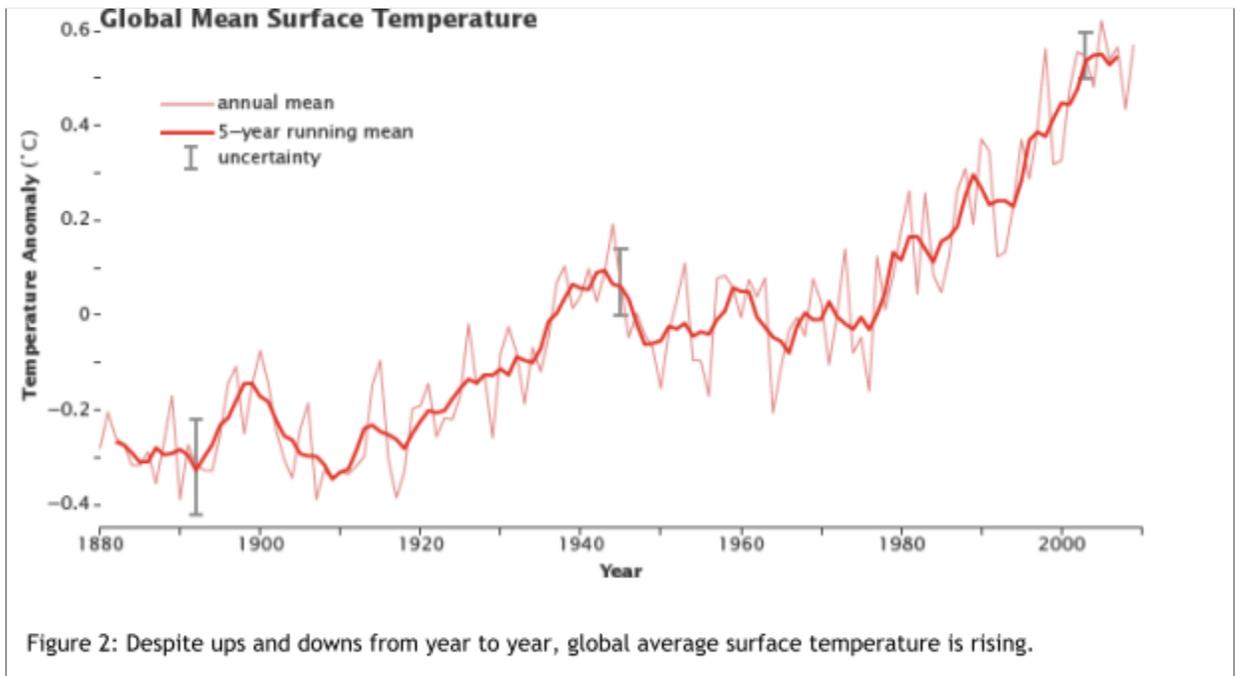
*“We don’t have a day to lose - climate change is here and accelerating.”
- Broomfield resident*



Greenhouse Gas Emissions

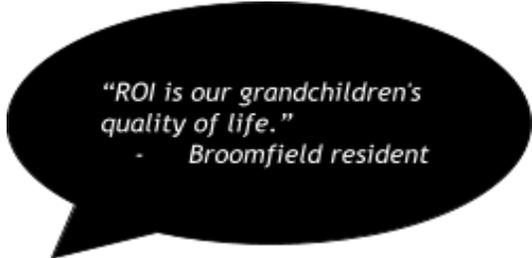
Solar radiation enters the earth's atmosphere where some radiation is reflected by the atmosphere and earth's surface, while other radiation is absorbed by the surface. A GHG is any gas that absorbs radiation emitted by the earth's surface and emits radiation of its own back to the surface. This process reduces the amount of radiation escaping the atmosphere and increases planetary temperature (Figure 1). GHGs are naturally occurring, but human activities are rapidly increasing the amount of carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (NO₂) gasses in the atmosphere, among others. CO₂ can stay in the atmosphere for thousands of years. Methane and nitrous oxide are more efficient at warming the atmosphere than carbon dioxide. Although they are less prevalent and have a short lifetime than carbon dioxide, they will have a large effect in upcoming





decades in terms of warming and ozone production.

[GHGs](#) are primarily emitted into the atmosphere through the burning of fossil fuels, such as coal, oil, and natural gas. Other lesser-known emission sources include land-use changes like deforestation, agricultural sources such as methane from cattle and nitrous oxide from fertilizers, as well as the creation of building materials like concrete and steel. Rapid industrialization and population growth over the past 150 years have driven dramatic increases in GHG concentrations, and will continue to do so unless drastic action is taken.



Increasing GHG concentrations raise the global surface temperature and cause a variety of [climate impacts](#) (Figure 2). These impacts include more intense and numerous heat waves, increases in both heavy precipitation and drought, more extreme weather such as intense wildfires, snow, and rainstorms, all of which can contribute to increased flooding.

Local, state, and national governments—alongside private sector and utility partners—are taking action to reduce GHGs through targeted programs and policies that address energy, transportation, and waste challenges. These collective interventions—if aggressive and quick enough—have the potential to reduce the effects of climate change.

Colorado’s Climate Risks

According to a January 2021 resident survey, 90% of Broomfield residents report that they have noticed a change in Colorado's climate. Most Coloradans have witnessed the impacts of

climate change within their lifetimes, observations that are supported by data in a wide variety of fields. Although the local climate is part of what makes the state such an enjoyable place to live, Colorado's population, economy, and environment are vulnerable to several impacts related to increasing levels of GHG emissions in our atmosphere, including:

Extreme heat - Colorado's average temperature has increased by [two degrees Fahrenheit](#) in the past 30 years. In addition, [the Denver area](#) and the Front Range now experience [longer streaks of days with 90 degrees and above temperatures](#) (Figure 3). In the future, climate models project a warmer environment for Colorado, with an [average temperature up to five-degrees Fahrenheit higher by 2050](#).

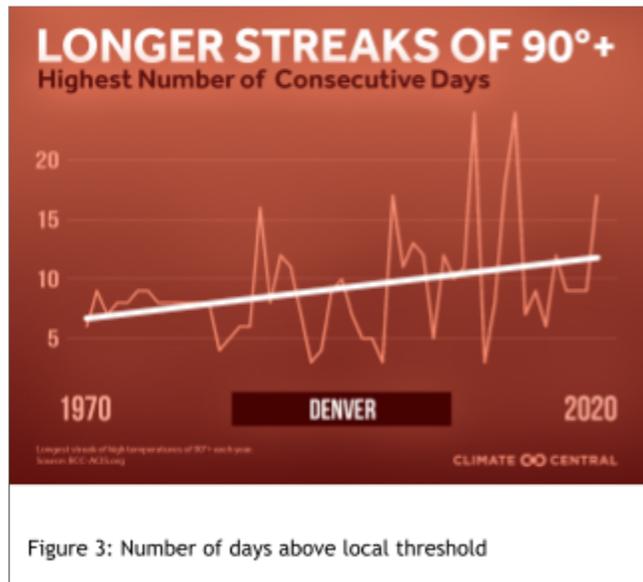


Figure 3: Number of days above local threshold

According to the [National Oceanic and Atmospheric Administration](#), a 2-degree increase would make the City of Denver's temperature in 2050 more like the City of Pueblo today. This would potentially accelerate the likelihood of other dangerous consequences, including frequent wildfires, increased drought, and other severe threats to life and safety, as well as the economy.

Wildfires - Wildfires have increased since 1984, and according to the [National Climate Assessment](#), the frequency of fires could increase by 25% and large fires could triple in frequency in the Southwest US. [Fire seasons throughout the West are getting longer and the burn areas are getting larger](#) (Figure 4). As Colorado's temperature has increased, so have the [number of annual fires over 1,000 acres](#). In 2016, Colorado was estimated to have [two million people](#) living in the wildland-urban interface at risk for wildfires, a figure that is only increasing with the state's population

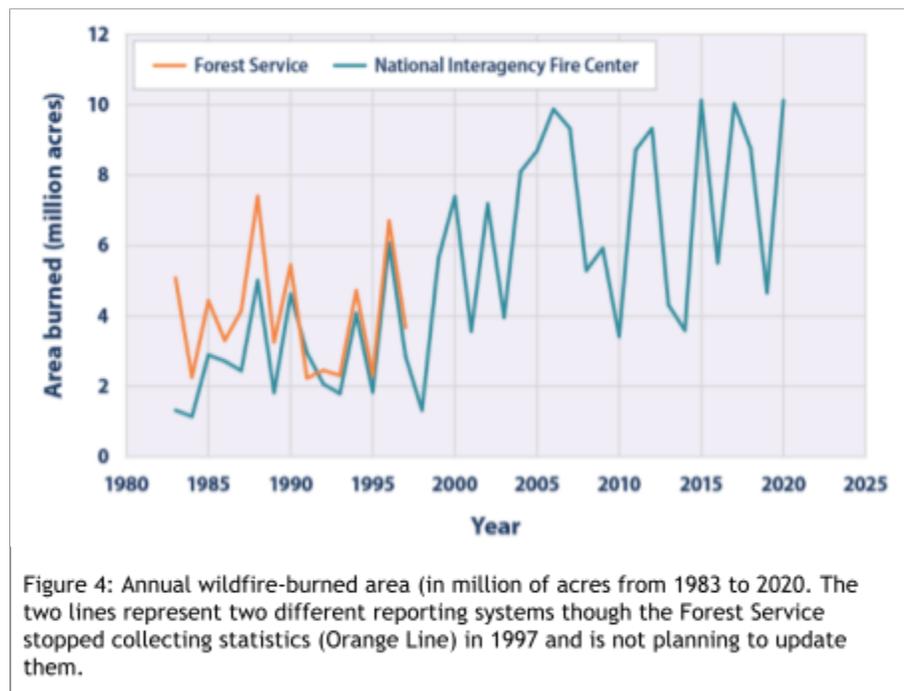


Figure 4: Annual wildfire-burned area (in million of acres from 1983 to 2020. The two lines represent two different reporting systems though the Forest Service stopped collecting statistics (Orange Line) in 1997 and is not planning to update them.

growth. The most recent wildfire, the [Marshall Fire](#), destroyed more than 1,000 structures in neighboring Boulder County, showcasing the vulnerability of urban environments to wildfires.

Mudslides - Wildfires result in less vegetation to help hold the soil together, especially on steep terrain in mountainous regions. They also reduce the amount of time that rainfall needs to flow downstream, causing higher peak flows that can erode hillsides and streams, wash out bridges and lead to mudslides like the one Colorado experienced in [Glenwood Canyon in 2021](#) that shut down I-70, leaving travelers stranded and disrupting a major trucking route.

Drought - The Southwestern United States is suffering through the [worst drought](#) seen in at least 1,200 years (often referred to as a “megadrought”), with reduced rainfall across multiple states, including Colorado. The lack of rainfall and increased evaporation result in reduced [reservoir levels](#).



Reduced snowpack - [Snow represents 70% of the surface water in Colorado](#) and increasing temperatures diminish these resources. Snowpack is melting earlier and more rapidly in the spring, with measurements showing [declines](#) at most April monitoring sites. In addition, as snow drains from the mountain snowpacks earlier in the spring, less water becomes available later in the year to nourish ecosystems and meet agricultural and human needs.

Agriculture losses - Rising temperatures and reduced snowpacks will also increase challenges within the agricultural industry and decrease water availability. The projected [unseasonably warm temperatures](#) create risks

	Potential Impacts	Key Vulnerabilities
Forests	<ul style="list-style-type: none"> • Longer and more severe droughts • More frequent and severe fires • Conditions more suitable to insect outbreaks and spread of non-native plant species 	<ul style="list-style-type: none"> • Individual trees and forested landscapes will likely become more vulnerable to insect and pathogen invasions • Landscapes are vulnerable to changes in connectivity, shifts from carbon sinks to carbon sources, and vegetation cover shifts (forests to grasslands, for example) if wildfires become more frequent and severe
Alpine Ecosystems	<ul style="list-style-type: none"> • Increased temperatures • Earlier onset of snowmelt 	<ul style="list-style-type: none"> • Alpine plants are vulnerable to phenology shifts caused by rising spring temperatures. As a result, flowering and leaf-out can occur earlier, potentially leading to a mid-summer decline.
Grasslands	<ul style="list-style-type: none"> • Increased frequency and severity of drought 	<ul style="list-style-type: none"> • Grass types that fare better in drought conditions are likely to become more dominant; less drought-tolerant species are therefore vulnerable to future warming
Wildlife	<ul style="list-style-type: none"> • More frequent and severe fires • Forest fragmentation and other changes in habitats 	<ul style="list-style-type: none"> • Aquatic species are vulnerable to decline due to reductions in habitat suitability, especially connected to rising water temperatures

Figure 5: Table outlining the impacts and vulnerability to different eco-systems

to food production and the ecosystems that sustain them. These changes threaten the [\\$24B farming, ranching, and agriculture industry](#), including more than 44,000 jobs.

Tourism losses - Reduced snowpack and higher summer temperatures have major implications for the recreation and tourism economies, which are heavily dependent upon predictable weather patterns and comfortable temperatures. Colorado has an estimated [43,000 jobs](#) that are supported by the winter tourism industry, adding approximately [\\$4.8B](#) to the state's economy. A projected reduction of up to [30% in snowpack](#) by 2080 and the related decline in winter tourism would have cascading effects on the economy.

Ecosystem impacts - Colorado is blessed with a varied topography with diverse flora and fauna, which have evolved to survive in a temperate climate. Climate change and extreme variations from historical weather patterns threaten the health of the state's ecosystem, in ways that can be partially [summarized](#) below.

Despite these dangerous consequences and dire predictions related to climate change, the good news is there are proactive steps policymakers can take to prevent additional warming of our planet, especially when acting in concert with one another as a region. GHG emissions do not respect borders, and within each jurisdiction, governments and residents have the power to accelerate programs and policies to reduce the negative risks from a changing climate.

GHG Inventory

GHG emissions can be quantified in two ways:

- Measurement-based methodologies refer to the direct measurement of GHG emissions (from a monitoring system) emitted from a flue of a power plant, wastewater treatment plant, landfill, or industrial facility.
- Calculation-based methodologies calculate emissions using activity data and emission factors. To calculate emissions accordingly, the basic equation below is used:
Activity Data x Emission Factor = Emissions

Most emissions sources in this inventory are quantified using calculation-based methodologies. Activity data refer to the relevant measurement of energy use or other GHG-generating processes such as fuel consumption by fuel type, metered annual electricity consumption, and annual vehicle miles traveled (VMTs).

In 2017, the University of Colorado Denver conducted an inventory of [Broomfield GHG emissions](#), including community-wide and government emissions. That analysis provided ACES with a reference point from which to develop goals.

The inventory was reviewed and updated to comply with the [US Community Protocol for GHG Inventories](#), incorporating the utilization of [Google Environmental Insights Explorer data](#) to provide improved transportation data.

Known emission factors are used to convert energy usage or other activity data into associated quantities of emissions. Emissions factors are usually expressed in terms of emissions per unit of activity data (e.g. lbs CO₂/kWh of electricity). More detailed inventory

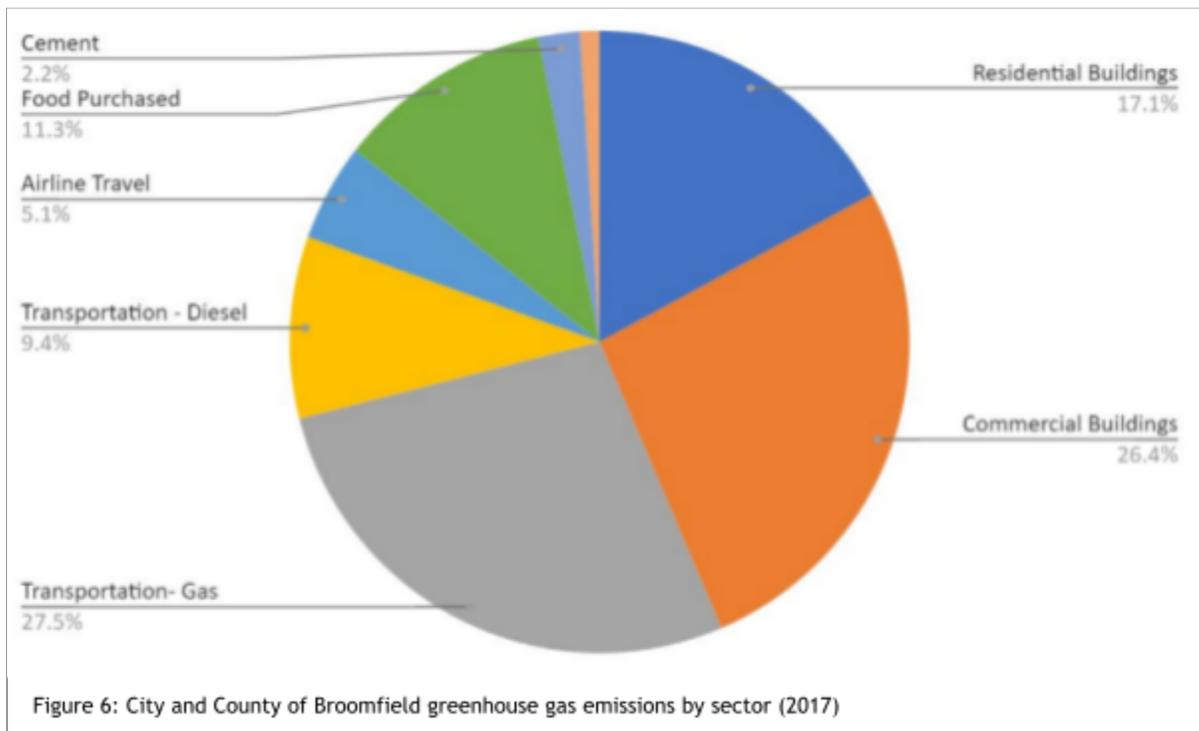
calculations were made using ICLEI's ClearPath tool.

The data (Figure 6) showed that the largest source of emissions comes from the transportation sector (42%), mostly due to single-occupancy vehicle (SOV) travel. Reducing emissions from this sector will be a focus area of our GHG Emissions Reductions plan.



The second-largest category is commercial and institutional buildings (26%), with residential buildings following in third (17%). When the two building types are combined (43%), we can see that reducing energy use in the overall building sector represents the greatest opportunity for GHG reductions (Figure 6).

Because Broomfield residents spend approximately 53% of their household income to cover the cost of housing and transportation, sustainability programs and policies have the potential to create significant cost savings for local families.



GHG Reduction Goals

Broomfield’s [Advisory Committee on Environmental Sustainability \(ACES\)](#) provides a forum for resident comments on environmental sustainability issues. This committee provides comments and recommendations for improvements on Broomfield’s current sustainability policies.

The City Council and ACES directed the Department of Strategic Initiatives to develop the following:

- GHG Emissions Reduction Plan, encompassing energy and transportation,
- and Zero Waste Plan

Staff and ACES worked together to identify GHG reduction goals that were specific, measurable, attainable, relevant, and time-based (SMART). These ambitious targets were laid out in [Resolution No. 2020-169](#), which the Broomfield City Council adopted on September 22, 2020. The goal is to reduce community-wide (i.e., residential, commercial, and municipal sector) GHGs by 90% by 2050, and reduce municipal GHGs by 100% by 2050.

Broomfield’s GHG reduction targets are aligned with the [State of Colorado’s](#) goals of “reducing 2025 GHG emissions by at least 26%, 2030 GHG emissions by at least 50%, and 2050 GHG emissions by at least 90% of the levels of statewide GHG emissions that existing in 2005”.

The stair-stepped reduction schedule allows for gradual adoption and implementation of the policies and programs that will eventually reach full compliance. Targets for municipal operations are more aggressive than community-wide targets, since local government can more easily exert control over the levers impacting those actions, and to position the CCOB to lead by example.

This document represents ACES’ summation to the City Council on Broomfield’s recommended path to achieve these GHG reduction goals. ([The Draft Zero Waste Plan is laid out in a separate document](#) and will be executed concurrently and in concert with these plans.)



Community Benefits

[Sustainability](#) can be broadly defined as “meeting the needs of the present, without compromising the ability of future generations to meet their own needs.” In Broomfield, the

path towards 90% reduction in GHG emissions by 2050 creates a host of related community benefits related to Transportation, Energy, and Zero Waste actions.

In the business world, sustainability projects are those that seek to achieve a “triple bottom line” effect, meaning that economic, environmental, and social benefits accrue as a result (also known as “people, planet, profit”). In the broader community context, thoughtful sustainability interventions have the potential to accrue a multitude of community benefits:



- positive and quantifiable impacts on human health, safety, and welfare
- new industries that create well-paying green jobs
- materials and cost savings to maximize resources
- greater access and opportunities for historically disenfranchised members of the population
- hardening of the infrastructure in the face of increasingly frequent extreme weather events
- drawing more desirable business in many sectors to Broomfield
- respect for Broomfield as a regional contributor to sustainability interventions
- Support for biological resources including wildlife

To create a Broomfield where everyone can thrive tomorrow and for generations to come, it’s necessary to invest today in the community’s sustainable future. Not all GHG reduction measures will be financially cost-effective, making it important to understand the qualitative benefits of an overarching carbon reduction strategy. The long-term impacts of reaching these goals far [outweigh the cost of doing nothing](#). The following sections will detail the health, workforce, equity, and resilience benefits a community can achieve through sustainability.



Public Health

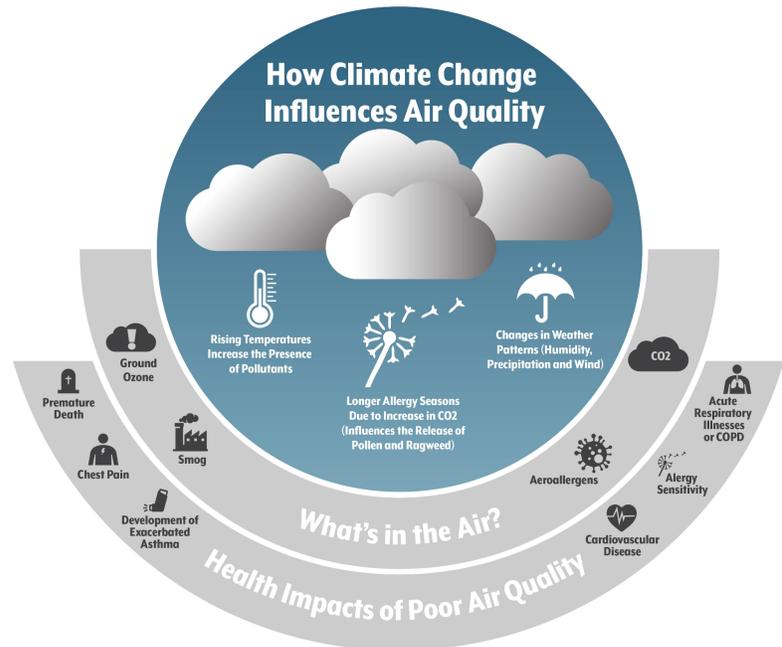
A warming climate, due to the greenhouse effect, increases the formation of smog and other air pollutants which is detrimental to human health and the planet as a whole. In conjunction with regional partners, such as Metro Denver Public Health, CCOB aims to increase public health by focusing on strategies that reduce our GHG emissions.

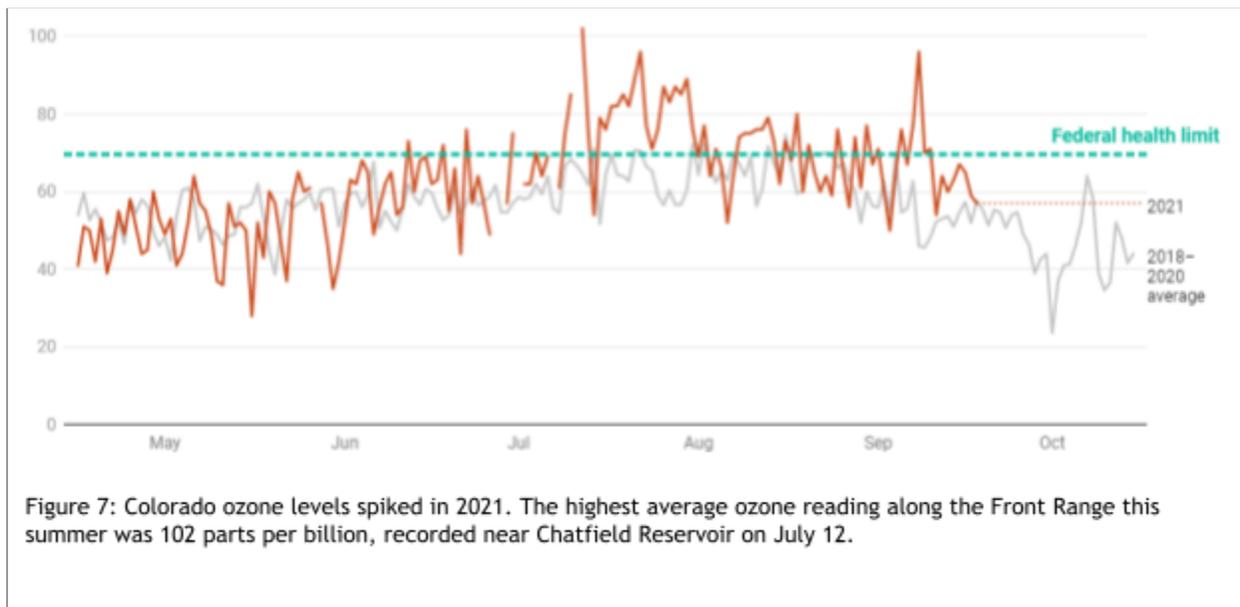
For a few unforgettable days in the summer of 2021, the Denver metro area's Air Quality Index (AQI) recorded the worst [air pollution in the world](#), due to a combination of smoke from western wildfires and pre-existing high ozone levels.

The Front Range has been designated by the United States Environmental Protection Agency (EPA) as a [serious nonattainment zone for ozone](#) due to its ongoing inability to meet air quality standards under the Clean Air Act.

Ozone is caused by chemical reactions between oxides of nitrogen (NO_x) and volatile organic compounds (VOCs). These ozone precursors are caused by emissions related to traffic, other industry sources like oil and gas, and natural sources. The unique topography on the Front Range coupled with hot, sunny days can escalate ozone conditions to unhealthy levels. [Ozone](#), along with five other air pollutants, is considered to be harmful to human health and the environment. The Clean Air Act requires the US EPA to set national ambient air quality standards to provide adequate protection of public health; however, Front Range monitors [often surpass](#) the [US EPA's ozone level of 70 ppb](#).

Parents in Broomfield that sign up to receive air quality alerts from the [Colorado Department of Public Health and Environment](#) (CDPHE) routinely receive alerts of high ozone conditions in the summer and are recommended to limit their children's playtime outside. Older residents and those who experience respiratory challenges are advised to stay indoors. In 2021, the Denver region experienced [65 ozone action](#) alert days (Figure 7). [Exposure](#) to high ozone is linked to coughing, lung and throat irritation, and trouble breathing during exercise. Many Front Range counties have been given [failing grades](#) for ozone by the American Lung Association, which tracks the relationship between unhealthy air pollutants and their related health problems such as lung irritants and [other respiratory challenges](#). CDPHE encourages Colorado residents to bike, or walk when possible, and reduce vehicle and lawnmower usage on high ozone days.

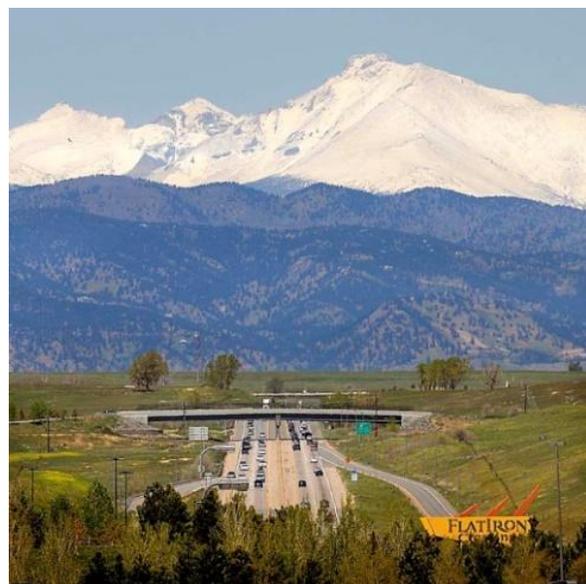


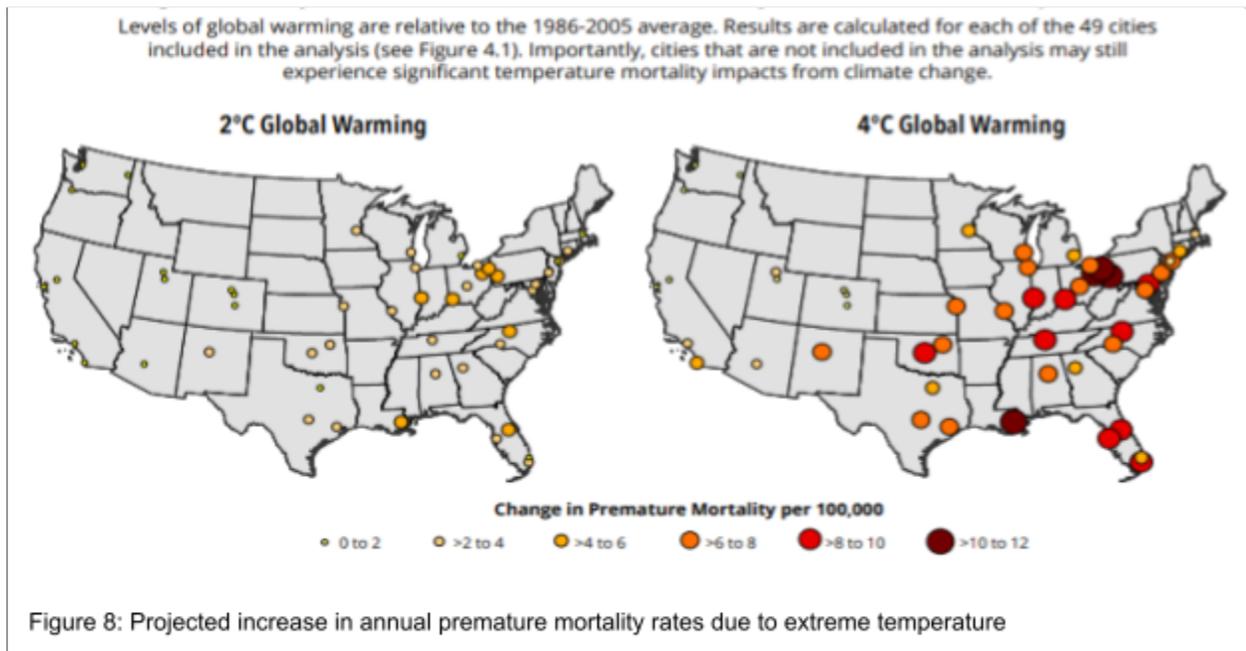


Increasingly, our changing climate is negatively affecting human health, in ways that can not only be cataloged and quantified but also personally experienced by Colorado residents. For example, there is a [link](#) between wildfire-related smoke and ICU admissions. The main risk from wildfires is smoke and small particulate matter, known as PM 2.5, can cause serious health problems affecting the heart and lungs, even with short-term exposure. Exposure to these fine particles can also [impact healthy people](#), causing respiratory symptoms, transient reductions in lung function, and pulmonary inflammation, among other serious health conditions.

According to [Broomfield’s Q4 Air Quality Monitoring Report](#), the air quality during the Marshall Fire showed significant increases in benzene, a known carcinogen.

Extreme heat is another climate risk factor in western states. A study from the US EPA modeled the [lethal impacts of increasing temperatures on vulnerable populations](#) and calculated a 3-4% increase in annual premature mortality rates in several Colorado cities due to a potential 2°C increase in global temperatures (Figure 8). In addition, “minorities and those with low income are more likely than non-minorities and those with higher income to currently live in areas with the highest projected increases in temperature mortality from climate-driven changes in



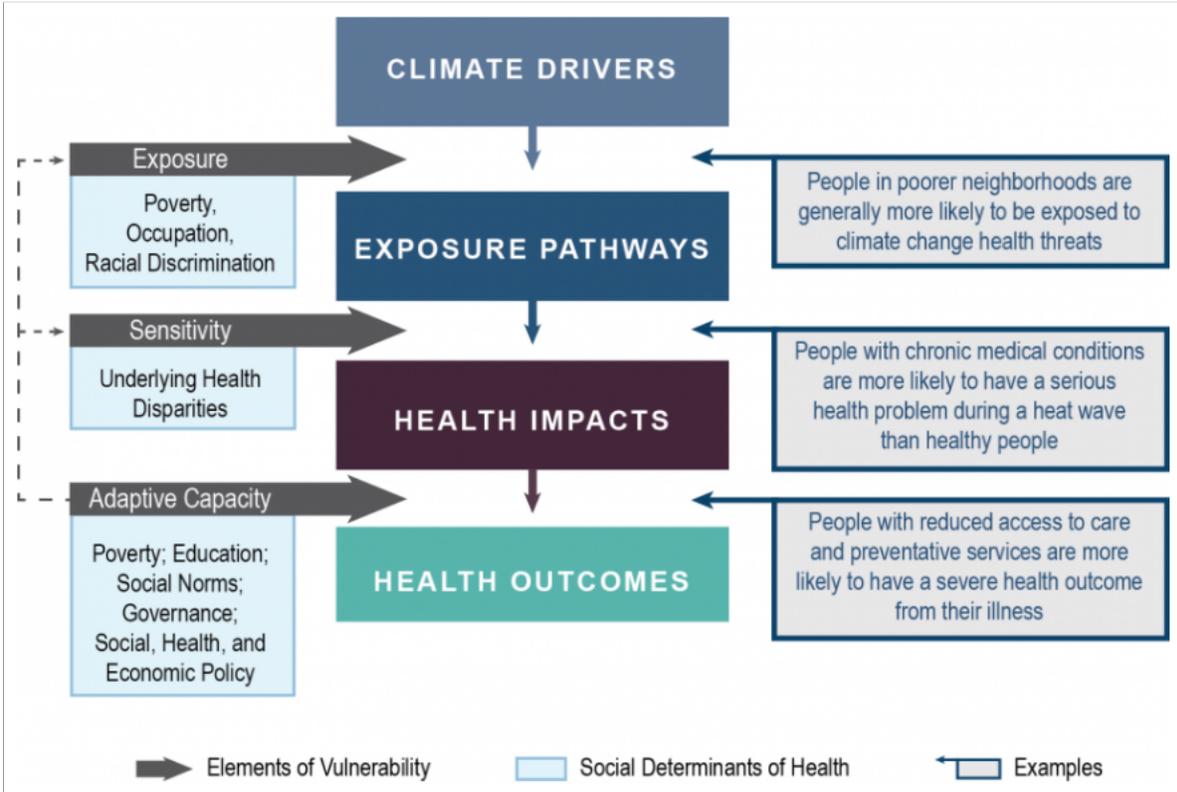


extreme temperatures.” Extreme heat can impact daily life and activities in younger populations, too.

[Scientists project an increase](#) in the number of extreme heat days which will likely lead to changes in outdoor sporting events, which are profoundly impacted by heat. Heat illnesses during practice and competition are a [leading cause of death and disability among high school athletes](#).

Many determinants of health and vulnerability are [exacerbated](#) by climate risks. Marginalized populations are often not only [more exposed](#) to the impacts of climate change, but also more sensitive to its negative effects. This leads to disproportionately severe health outcomes amongst historically marginalized groups such as communities of color, immigrants, the elderly, low-income, people with disabilities, and pregnant individuals.

The impacts of indoor air quality are disproportionately borne by low-income and minority populations, who are statistically more likely to live in [substandard housing](#). [Indoor air pollutants](#) - such as VOCs, carbon monoxide from cooking, lead, asbestos, mold, and radon - can directly lead to [health effects](#) such as asthma and other cardiovascular issues, as well as irritation of the eyes, nose and throat, and headaches, dizziness, and fatigue. Thus, suggestions to remain indoors to protect against the health impacts of high ozone, wildfire smoke, and extreme heat have other potential health burdens based on one’s socioeconomic status.



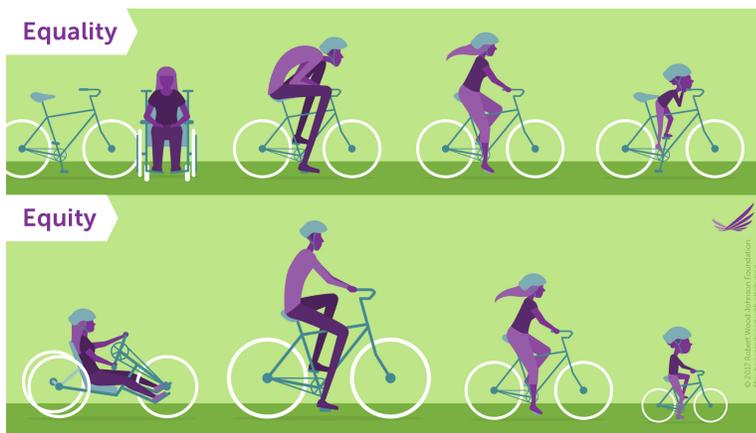
Other potential climate-related health impacts [include](#) mental health consequences (due to disaster-related stress), vector-borne diseases (due to changes in seasonal weather patterns), food-related infections (due to contamination from changes in precipitation and runoffs), water-related infections (due to temperature increases), and drowning (due to floods).

Due to the [detrimental health effects](#) of air pollution, extreme heat, and other environmental factors, local and regional [governments](#) are working together to reduce the factors that cause air pollution and to reduce GHG emissions, which - if left unchecked - would continue to pose a multitude of health threats to residents. Most of the strategies outlined in this document have direct beneficial health impacts on the population of Broomfield.

Diversity, Equity, Access & Inclusion

In communities across the world, low-income and minority populations are suffering disproportionately from the impacts of climate change. There can be no sustainable communities without equitable access to sustainable solutions. For example, higher heating and cooling costs due to severe weather are exacerbated by poor insulation and substandard housing. These cascading impacts mean that vulnerable population are often burdened with higher energy costs, greater health challenges, and reduced economic resilience. In addition, these same

Equity can be [defined](#) as when everyone, regardless of who they are or where they come from, has the opportunity to thrive. This requires eliminating barriers like poverty and repairing injustices in systems such as education, health, criminal justice and transportation.



families are often more likely to rely on public transportation, which limits job access when transit services are inadequate.

Several overarching concepts illustrate the interaction between Sustainability and Diversity, Equity, Access, and Inclusion (DEAI). It is estimated that [10% of Earth's population generates more than 50% of global emissions](#), while large proportions of the urban population are more prone to climate hazards. Those who are

least responsible for the climate crisis and have the [least resources to adapt](#) are being [hit first and worst](#): indigenous communities, communities of color, people in poverty, elderly people, women, youth, immigrants, people with disabilities, and other marginalized populations.

[Climate Justice](#) is acknowledgement that communities of color and low-income neighborhoods are disproportionately impacted by the climate crisis as a result of systemic racism and class discrimination both here and abroad. For example, low-income communities and minority populations are [50% more likely](#) to live near busy roads, increasing their exposure to dangerous air pollution. Communities that have historically borne the brunt of public health and environmental harms from pollutants, also often have [disproportionately high energy burdens](#).

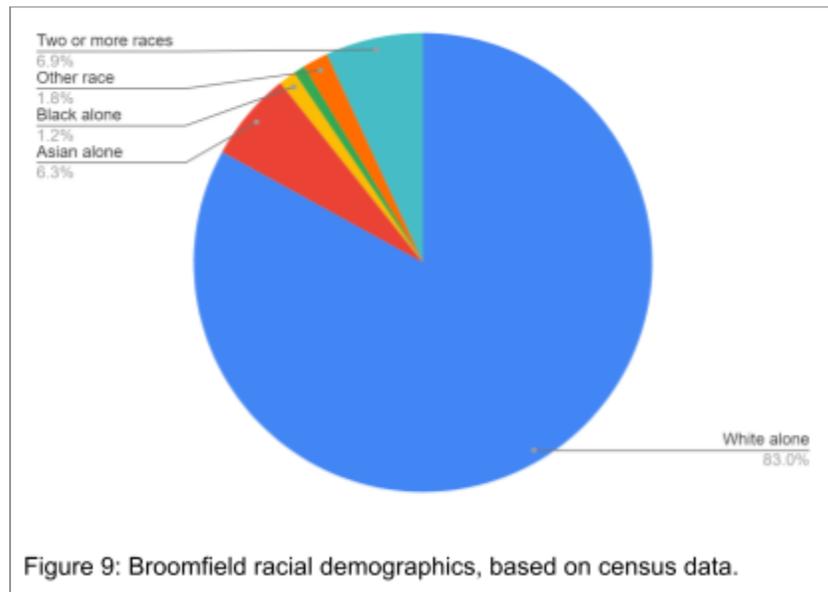


According to [Robert Bullard](#) (known as the father of the Environmental Justice movement), “Environmental Justice is the principle that all people are entitled to equal environmental protection regardless of race, color or national origin. It’s the right to live and work and play in a clean environment.”

The CCOB considers DEAI to be a central priority, and of vital importance in the development and implementation of the GHG Reduction Roadmap. Although the average income of a Broomfield resident is [\\$53,042 a year](#) (compared to the US average of \$28,555), and the [Median household income of a Broomfield resident is \\$96,416](#) a year (compared to the US average of \$62,483), between [3 - 4%](#) of Broomfield population live at or below the federal

poverty level (roughly 3,000 individuals).

Further exacerbating the problem, the income that families need to pay basic expenses in Broomfield County, such as housing, child care, and food, is much higher than the government's official federal poverty level. A Broomfield County family with one adult and one preschooler, for example, needs an annual income of \$58,139 to make ends meet, which is more than three times the federal benchmark of \$16,460 for a family of two. In Broomfield County, a total of [22.2%](#) of households fall under that level.



Making use of available data to target low-income, minority ([Figure 9](#)), and rental households, the Sustainability team can improve quality of life through lower energy costs, improved health, access to green jobs, and expanded affordable multimodal transportation options. The community outreach process has already provided opportunities to engage this demographic in the planning process (especially through community nonprofit partners and in-person events), as well as deliver education on the sustainability resources available.

For example, reviewing the census tracts and maps of the housing stock reveal zones within Broomfield that have older homes, higher concentrations of immigrants, poorer health outcomes, etc., and overlaying this data reveals concurrent concentrations in the same areas of the city ([Figures 10, 11 & 12](#)). It is urgent to engage these disproportionately impacted communities, and because they might have additional barriers to engagement, more targeted outreach will be needed.

A sustainability strategy that only serves a subset of the population isn't truly sustainable. The goal of this plan is to provide access to sustainability solutions - and their co-benefits - to residents and business owners in Broomfield equitably. Energy Outreach Colorado, the Energy Resource Center, and other non-profits can help Broomfield families who can't afford energy efficiency improvements. An [equitable sustainability strategy](#) provides cross-cutting solutions that enable access to transit, provide access to clean energy, incentivize action through financial support, and stimulate workforce development.

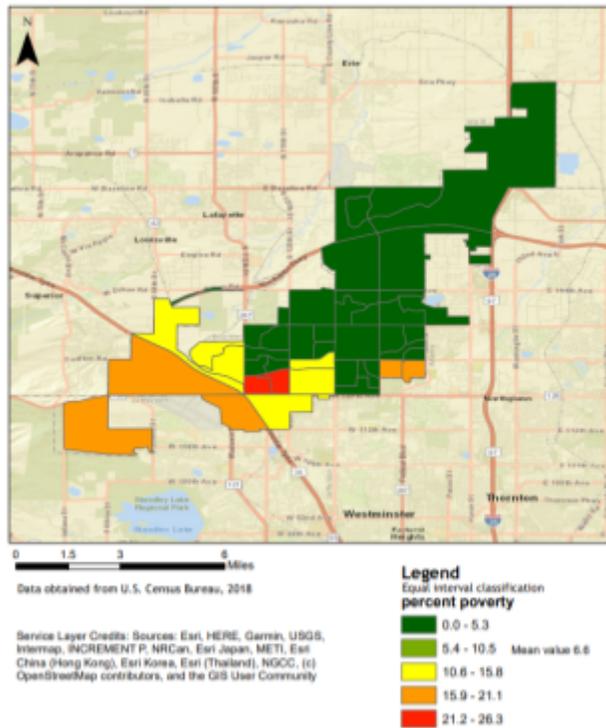


Figure 10: City and County of Broomfield percent of population 150% below poverty level

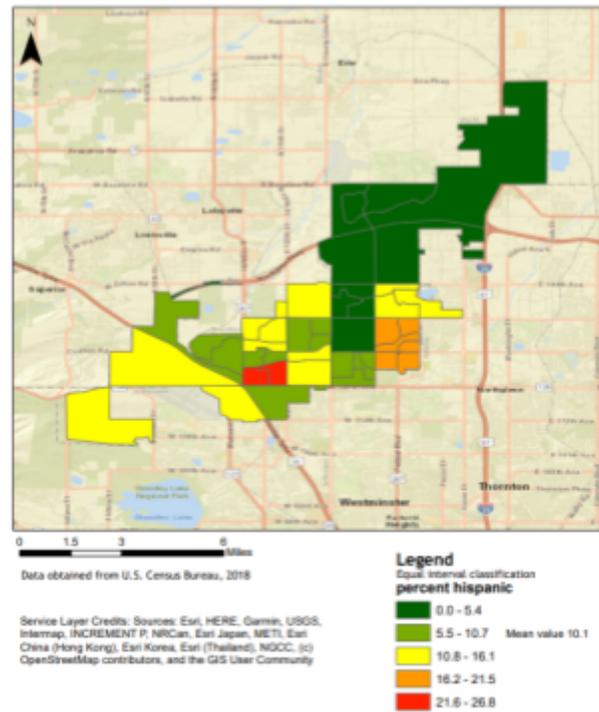


Figure 11: Percent of population that is hispanic by census block group

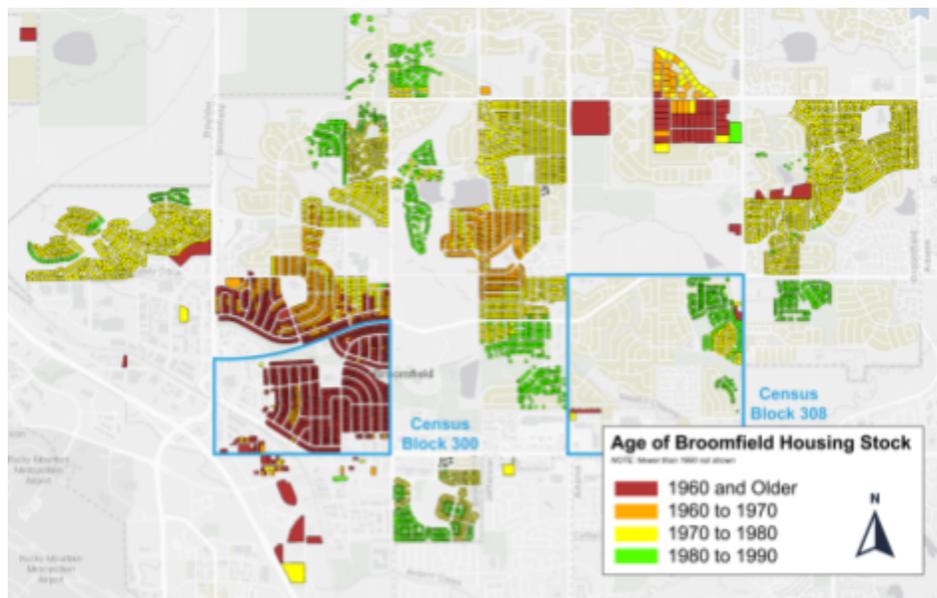
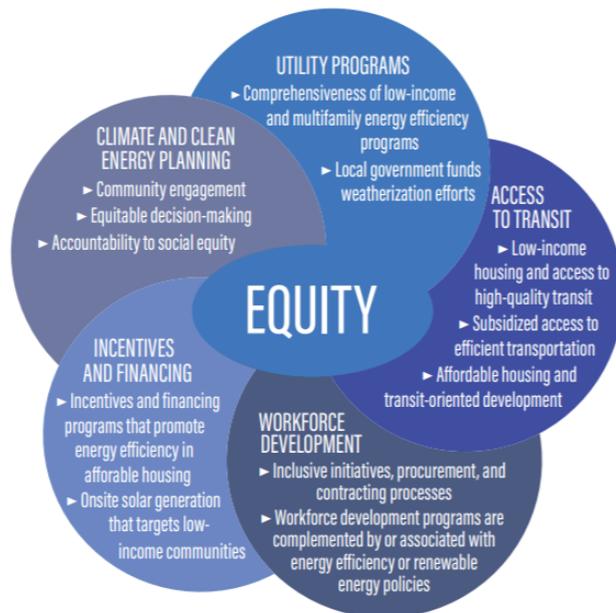


Figure 12: Map indicating age of Broomfield's housing stock

CCOB worked with the [Colorado Communities for Climate Action](#) (a statewide network of local governments working on climate action) to develop a set of questions that can be used to assess the equity impact of each proposed sustainability program or policy:

1. Who is impacted by this action negatively and positively?
2. How can we ensure that underserved populations benefit from this action and are unburdened by this action?
3. How can we use this action to meet the authentic and culturally appropriate needs of underserved populations and build their capacity?
4. How can we engage and empower underserved populations in the planning and implementation of this action?
5. How does this action foster relationship-building and trust with community partners?

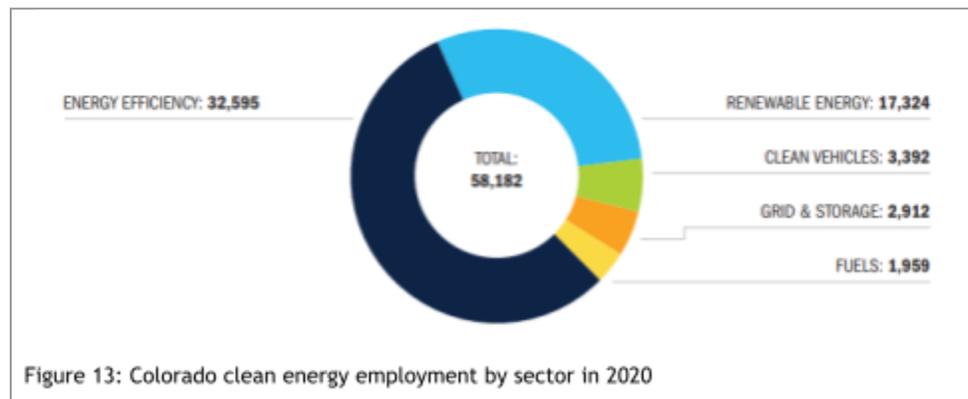


It is through this lens, utilizing tools from the Colorado Department of Public Health and Environment’s [Climate Equity Framework](#), and in alignment with the City Council’s prioritization of DEAI, that the GHG Reduction Plan was developed and will be implemented.

Workforce Development

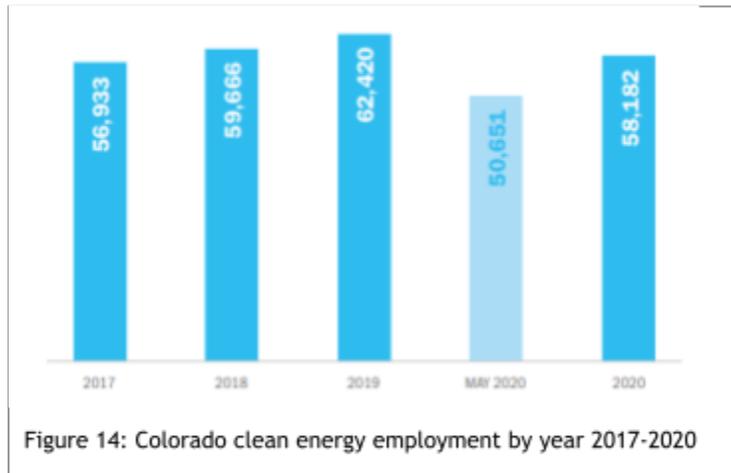
As governments set GHG reduction targets, a green labor workforce will be needed to help communities reach their goals. Communities have an opportunity to take advantage of this transition by developing a green workforce which supports renewable energy, energy efficiency, and electric vehicles (EVs). The transition to a clean energy economy, a shift from fossil fuels to renewable energy, could reduce [74% of total US GHG emission](#) and could add as many as [24 million jobs globally](#) by 2030 in the areas of renewable energy, energy efficiency, EVs, and multimodal transportation.

[Renewable energy](#) and energy efficiency are two areas that will experience the highest job growth. Solar installers and wind technicians jobs are projected to grow 105% and 96%, respectively. Energy efficiency



jobs, an estimated [2.2 million workers](#), make up most of the US clean energy workforce. To reach net-zero emissions by 2050, [4 million energy efficiency jobs](#) would be created by 2030, vastly increasing the amount of energy efficiency jobs.

Colorado’s clean energy sector remains the top employment occupation. There are more than [58,000 clean energy workers](#) employed in Colorado, accounting for a little more than [1 out of every 50 jobs](#) (Figures 13 & 14).

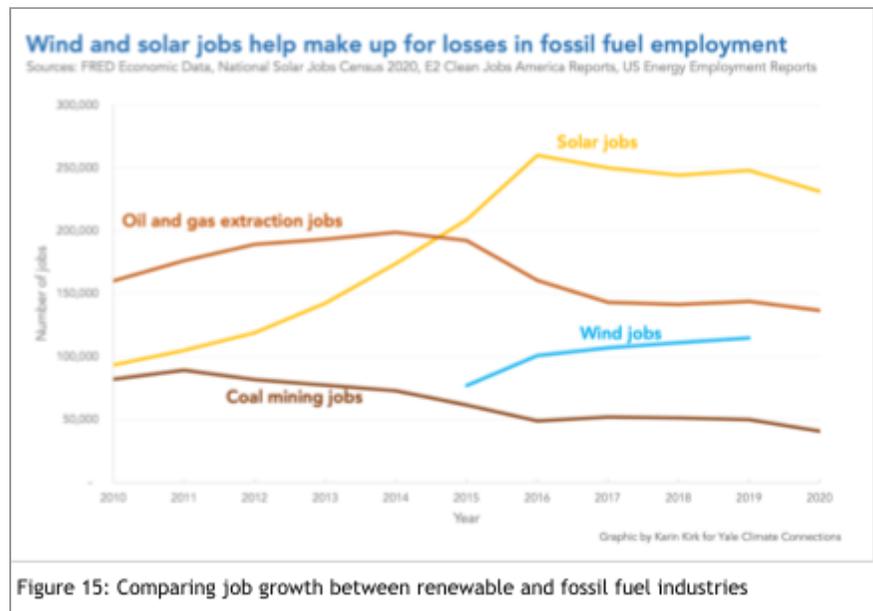


The impacts of investing in renewable energy spreads across industries. According to the [2021 Clean Jobs Colorado report](#), clean energy jobs account for more than 12% of all construction jobs, 7% of jobs in other services (repair and maintenance), 4% of wholesale trade occupations, and 5% of all positions in the professional and business services sector.

There are more job opportunities in renewable energy than fossil fuel sourced energy. In early 2020, there were nearly [3.4 million clean jobs](#). According to the [Environmental Defense Fund](#), wind and solar job growth have been outpacing those in the coal industry ([Figure 15](#)).

Jobs in the renewable energy sector pay higher than average wages. [According to research](#) by the Brookings Institute, clean energy workers earn higher and more equitable wages when compared to workers nationally, with mean hourly wages exceeding the national average by 8 to 19%. [Another study](#) found the median hourly wages for clean energy jobs overall are about 25% higher than the national median wage.

One of the benefits of jobs in a clean energy economy is that they can’t be outsourced to other countries. Clean energy jobs like energy efficiency upgrades, grid modernization, and the installation of solar arrays and wind turbines can be done in rural areas, too, benefiting smaller





communities in the clean energy transition.

In recent years, Colorado legislators have passed legislation emphasizing workforce development in communities where coal plants are shutting down. [Senate Bill 19-236](#) requires utilities to submit a workforce transition plan when proposing retirement of a coal-fired power plant and [House Bill 19-1314](#) creates the Just Transition Office which is meant to provide support to coal workers, grants for communities impacted by coal transition, and requires electric utilities that propose to retire a coal-fired power plant to file a workforce transition plan with the Just Transition Office.

More recently, [Legislation \(HB21-1264\) was passed](#) in 2021. It allocated \$75 million for workforce development through the [Colorado Workforce Development Council](#) for “reskilling, upskilling, and next-skilling opportunities for Coloradans that lead to industry-recognized credentials and get people working in growing industries.”

The economic impacts of the COVID-19 pandemic have impacted Colorado’s clean energy economy, resulting in job losses for the first time. While jobs saw a temporary dip due to COVID, clean energy jobs are on the upswing and will accelerate due to recovery policies.

Employment in the EV sector could rise to [150,000 jobs by 2030](#) if the transition to EVs included expanding domestic supply chains. Policies and federal funding will need to support the development of a domestic supply chain in order for EVs to create jobs. EVs have fewer moving parts and require less labor which makes it even more critical that the components of



EVs are manufactured in the United States to create local jobs. A smart policy approach would offer incentives to domestic EV manufacturers.

A multimodal approach to transportation prioritizes walking, biking, and public transportation, such as buses and trains, making it easier for people to get from their homes to work without the need of a car. Transportation is one of the [largest](#)

[contributors of GHG emissions](#) and getting cars, particularly internal combustion vehicles, off the road is a primary strategy to reduce GHG emissions in Broomfield.

Reducing GHG emissions in Broomfield presents an opportunity for Broomfield residents to take advantage of green jobs in emerging markets. Regardless of the education background, a clean energy economy creates well paying jobs. The Broomfield community is well-positioned to take advantage of the growth in this sector.

Climate Resilience

According to [The Center for Climate and Energy Solutions](#), “Climate resilience is the ability to anticipate, prepare for, and respond to hazardous events, trends, or disturbances related to climate. Improving climate resilience involves assessing how climate change will create new, or alter current, climate-related risks, and taking steps to better cope with these risks.”

The City and County of Broomfield’s GHG reduction plan prioritizes sustainability strategies as a response to the impacts of a warming climate and worsening air quality. Responding to climate change involves a [two-pronged approach](#):

1. Mitigation: Reducing emissions of and stabilizing the levels of heat-trapping gasses in the atmosphere. This document is primarily focused on mitigation strategies.
2. Adaptation: Adapting to the climate change already in the pipeline. Climate resilience focuses on adaptation by reducing our vulnerability to harmful effects of climate change.

A few examples of how Broomfield is adapting to worsening air quality are listed below:

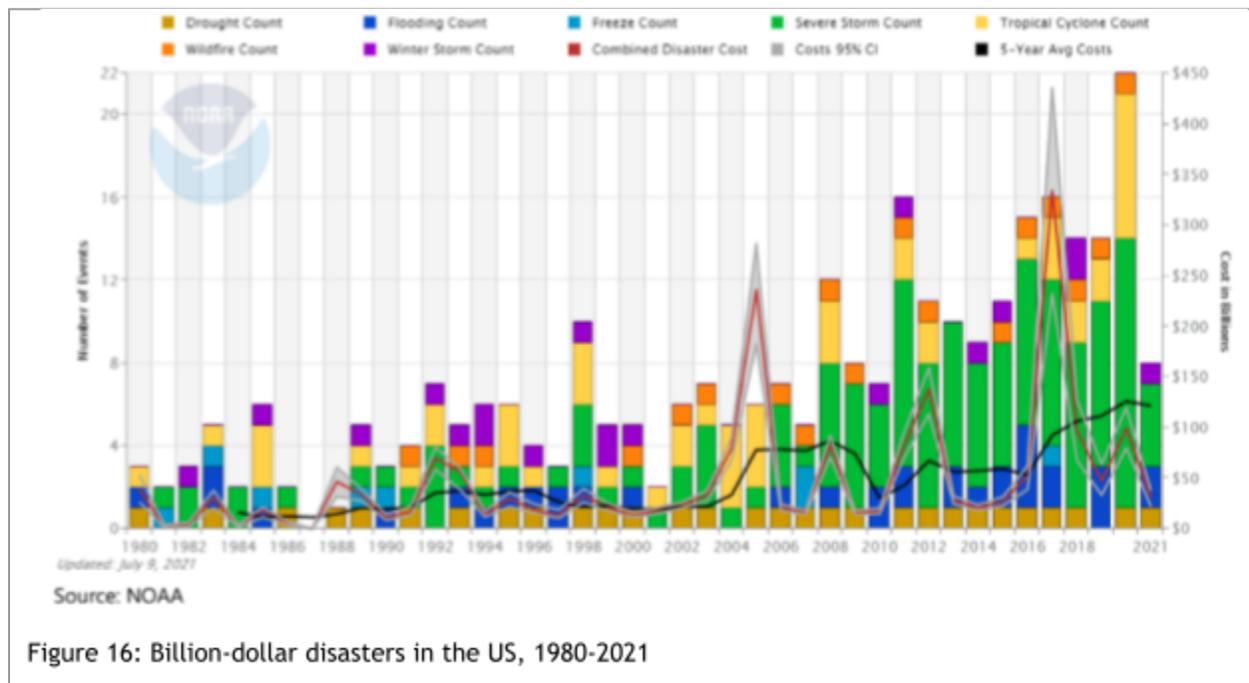
- building more healthy and energy efficient buildings as well as upgrading existing buildings
- launching programs promoting EVs, expansion of bike lanes and e-bikes, and public transportation alternatives
- prioritizing climate justice for disproportionately impacted communities by developing programs tailored to their needs.
- Investing in air quality management systems to monitor emissions from local oil and gas development

Cities and municipalities are on the [frontlines of climate adaptation](#) and resiliency efforts. Municipalities are working to build flood defenses, planning for heatwaves and higher temperatures, and taking measures such as installing water-permeable pavement to better deal with floods and stormwater and improve water storage and use.



The COB [Hazard Mitigation Plan](#) identifies “extreme heat” and “drought” as two of the highest priority hazards facing Broomfield constituents. Some climate resilience strategies identified in Broomfield’s Hazard Mitigation Plan include:

- The Windy Gap Firing Project, a reservoir being built in Larimer County, will increase Broomfield water capacity providing Broomfield with rights to 29% of the storage volume.
- The Siena Reservoir pump station and pipeline project will help provide additional water capacity to Broomfield constituents.
- To reduce heat and lower the impacts of the [heat island effect](#), a tree-planting initiative has been identified in Broomfield’s hazard mitigation plan to encourage residents and businesses to plant trees with high yielding shade.
- To mitigate fire risk, a project looking at how ecological restoration on open space can create resilience from natural hazard impacts.



The economic-impacts of climate related natural disasters have been steadily increasing ([Figure 16](#)). According to the [National Institute of Building Sciences](#), each dollar of federal grant assistance spent on risk mitigation returned \$6 in value. Risk mitigation may include updating buildings to municipal standards to ensure buildings are able to withstand floods, winds, earthquakes, and fires.

The most vulnerable populations are often disproportionately impacted by climate change. [These groups](#) include children, older adults, communities of color, people with disabilities, and low-income communities. The [social impacts of climate change](#) include health effects, food security, livelihood security, migration, water security, cultural identity, and other related risks. These populations may not have access to the transportation required in the event of a natural disaster.

The State of Colorado Resilience Office's published a [resiliency framework](#) (Figure 17) that focuses on six resiliency priorities - future-ready economy and workforce, climate and natural hazard resilience, building and infrastructure sustainability, agriculture and food security, housing attainability, and community capacity. Recently, the federal government released the plans of [20 federal agencies](#) that outline their resilience to climate change impacts.

Working in concert with Broomfield's Hazard Mitigation Plan, CCOB is leveraging state and federal resiliency planning opportunities to ensure climate resilience at the local level.

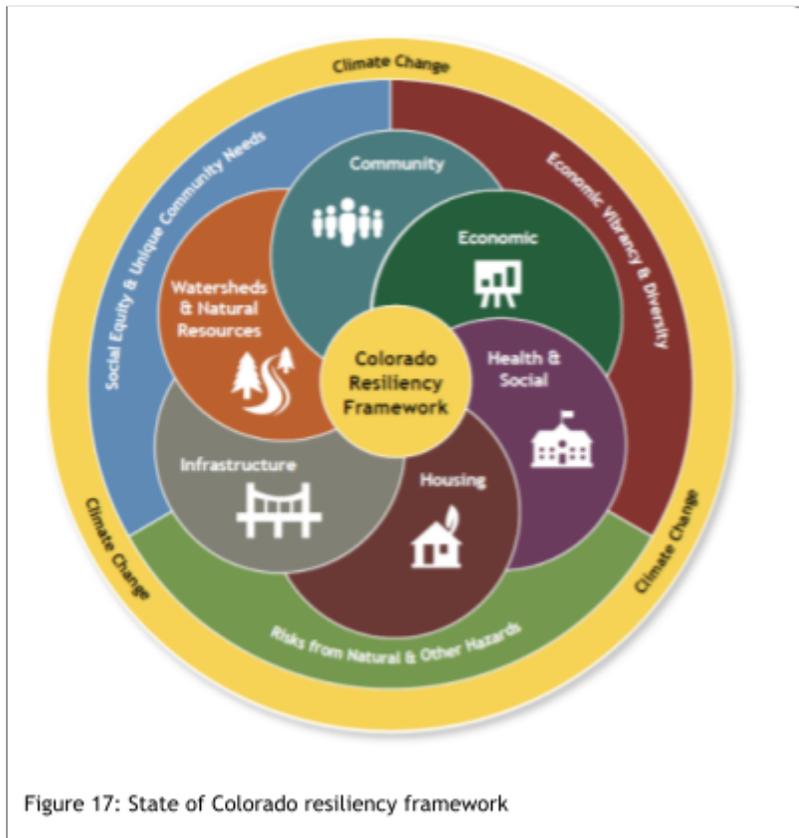


Figure 17: State of Colorado resiliency framework





Stakeholder Engagement

Building and implementing a successful GHG reduction plan requires coordination and input from a wide variety of local, regional and national partners. CCOB employed a broad strategy that maximized resources from nonprofit, academic, philanthropic, and government resources.

The team built upon strong relationships with aligned organizations to draw on best practices, participate in policy coalitions, leverage existing resources, obtain additional funding, formalize partnerships, and access cutting-edge research.

Such ongoing efforts will allow CCOB to become a leader in sustainability and reach the GHG Reduction Goals with the broadest of coalitions. Key groups that were engaged include:

- residents
- employees
- nonprofits
- universities
- regional networks
- philanthropy
- businesses
- industry experts
- research institutions
- financial institutions
- peer sustainability offices
- local, state and federal government



The following sections will detail Broomfield's efforts on interdepartmental collaboration, external partnerships, and community outreach as part of developing a set of cross-cutting Transportation and Energy proposals, resulting in the GHG Reduction Plan.

Interdepartmental Collaboration

Most of the GHG Emissions Reduction Plan’s goals will overlap with the ongoing priorities and responsibilities of other CCOB departments. Collaboration across departments and divisions was a crucial element in building a realistic and achievable GHG reduction plan, and that close coordination is also critical for successful implementation. In order to design feasible, cost-effective, impactful sustainability solutions, key department experts are the most important part of the planning and implementation process.



For example, in order to develop a residential energy efficiency outreach program, it’s necessary to gather input on program design from a variety of departments: Health and Human Services, Communications, DEAI (Diversity, Equity, Access and Inclusion), Housing, Public Health, and Workforce Development. Similarly, designing EVs or new solar programs requires a coalition made up of a broad range of staff input.

Strategic Initiatives convened an interdepartmental Sustainability “matrix” with

regular meetings to facilitate coordination. The goals were to tap into staff’s institutional knowledge, leverage subject-matter experience, rely on internal expertise, and incorporate diverse understandings of the community in order to design and deliver policies and programs that deliver the highest benefit to the community. The sustainability team also had numerous one-on-one strategy sessions with a multitude of departments to incorporate ideas and identify potential challenges.

Maintaining open lines of communication ensures that sustainability solutions can also overlap and accelerate other departments’ priorities. This model also eases the way for future resource collaboration regarding grant applications, technical assistance, training, access to interdisciplinary networks, and other external guidance.

Because this is a multi-decade strategy document, encompassing a range of departments and concerns, any policy or program proposal will be further fleshed out within the sustainability matrix before execution.

Partnerships

A project as ambitious as building a GHG Reduction Plan relies on the support and input of a range of regional and national partners from various sectors. CCOB employed the expertise and analytical tools of government, nonprofit, and academic entities to develop this robust sustainability strategy, taking into account unique local factors and available Colorado resources. Key partners are listed below, without whose help the project could not have been completed:



- [University of Colorado at Denver Department of Civil Engineering](#): conducted initial baseline GHG inventory and provided policy recommendations for achieving goals
- [ACES](#): set goals for GHG emissions; prioritized potential programs and policies for evaluation within the framework GHG plan; chaired subcommittees on Transportation, Energy and Waste; communicated with city leadership about sustainability goals and progress; provided technical and content development guidance for the plan itself
- [Zero Waste Associates](#): co-facilitated a series of community listening sessions to gather public input on Energy, Transportation and Zero Waste initiatives
- [University of Colorado Boulder Master of the Environment program](#): provided four graduate students who conducted extensive research on energy and transportation topics, wrote sections of the GHG plan, performed GHG calculations on policies and programs to reach targets, developed the impact analyses, and crafted case studies of best practices
- [ICLEI](#): engaged in ongoing technical support (including recommending high-impact science-based pathways to 2030 and 2050) and guided the team through the GHG software ClearPath
- [McKinstry](#): led the Energy Performance Contract (EPC) process to analyze energy efficiency, renewable energy, fleet electrification and EV infrastructure potential for municipal operations
- [The Brendle Group](#): consulted on community-wide potential for energy efficiency, renewable energy, and EV infrastructure
- [Drive Clean Colorado](#): conducted analysis on municipal fleet electrification
- [Broomfield FISH](#): supported community outreach efforts to gather resident feedback on the GHG emission plans
- [Colorado Communities for Climate Action](#): engaged in state-wide climate policy efforts on behalf of Broomfield and a network of municipal peers to advance sustainability
- [CEO](#): granted funding to support the EPC, and technical assistance throughout the planning process
- Colorado peers - Strategic Initiatives has looked to other Sustainability Offices in local governments around the state, and sought their input on planning, implementation,

policy, strategy, best practices, funding, staffing, and other elements related to achieving GHG reduction and Zero Waste goals. Communities who have generously offered their expertise include Boulder, Denver, Westminster, Fort Collins, Lafayette, Longmont, Louisville, Edgewater, Colorado Springs, Wheatridge, Eagle County, Boulder County, and others.





Community Outreach

A critical component of creating local sustainability policies and programs is gathering input from members of the community. People representing various sectors (including residents and business owners) want a voice in ensuring that Broomfield’s sustainability offerings meet their needs. CCOB, in conjunction with consultants, developed a broad community outreach strategy encompassing listening sessions, webinars, workshops, online surveys, and tabling at events to educate and gather feedback (Figure 18).



Figure 18: ACES members tabling at a community event

The overall goals of the community outreach process were to identify sustainability barriers and successes and to gather input on how to identify which initiatives the participants would like to prioritize in order for Broomfield to achieve GHG emissions reduction and community benefits. Additionally, the process served as a means for residents to stay informed about the sustainability planning process, for municipal staff to maintain open lines of communication with constituents, and for sustainability to gain more visibility in the public sphere.

The robust 2021 engagement calendar is laid out below:

MAY	JUN	JUL	AUG	SEP	OCT
PHASE 1: INSTITUTIONAL OUTREACH					
	PHASE 2: ONLINE OUTREACH GROUPS				
		PHASE 3: ONLINE WORKSHOPS			
			PHASE 4: IN-PERSON WORKSHOPS		
				PHASE 5: HOA DISCUSSIONS	
	ONLINE SURVEYS				
	TABLING AT COMMUNITY EVENTS				

- Phase 1 of community engagement focused on one-on-one meetings with key Broomfield businesses and institutions to gather interest and assess concerns. The team asked some of the largest local businesses (many of which are national and international corporations) about their sustainability goals, challenges, and wins. These conversations allowed the Sustainability team to establish relationships with these institutions and document sustainability leaders in the area, in order to develop a peer learning network for future workshops and collaboration.
- Phase 2 consisted of a series of online discussion groups (Figure 19) aimed at identifying sustainability barriers. CCOB communications channels were employed to broadcast invitations to a wide range of community members in order to involve different demographics. These small-group conversations with businesses, renters, and homeowners provided insights into what challenges exist that prevent the adoption of energy efficiency, renewable energy, EVs, multimodal options, recycling, and other zero waste practices.

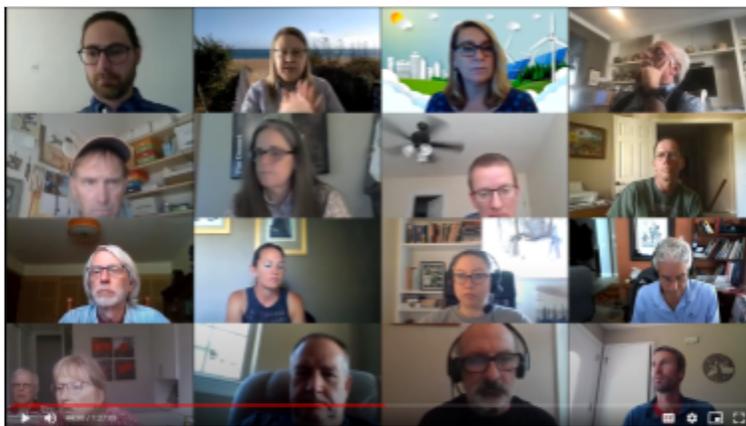
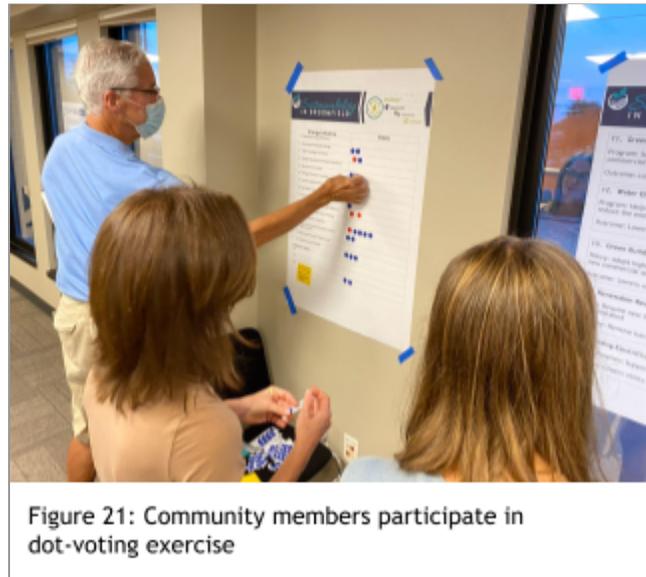
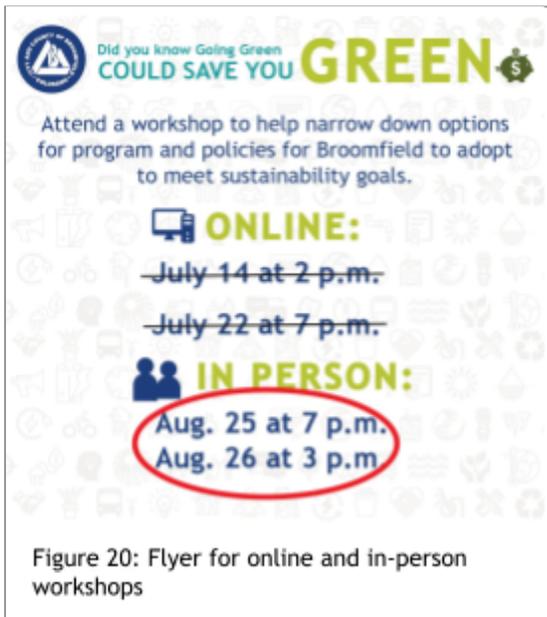


Figure 19: Screenshot of online community workshop

- Participants also provided their suggestions for how to overcome those barriers.
- Phase 3 consisted of several online workshops (Figure 20), aimed at prioritizing sustainability solutions, including potential policies and programs. This was yet another venue for open dialogue about what residents want to see in their communities, in terms of transportation, energy and zero waste.
 - Phase 4 of the community outreach process included hosting in-person workshops (Figure 21) to allow larger groups of residents to dive into breakout discussions on the topic of their choosing. Not only were they able to provide feedback on prioritization of sustainability solutions, but also provide feedback on implementation.
 - In Phase 5, the Sustainability team gave presentations and hosted listening sessions at Home Owners' Associations (HOAs) throughout Broomfield.



Throughout the summer of 2021, residents were also invited to fill out online surveys regarding sustainability barriers and priorities and submit questions and comments to the sustainability team through the [Broomfield Voice Sustainability Hub](#). Volunteers from ACES also staffed informational tables at community-wide events throughout the summer, where on-site surveys were conducted (including in Spanish) and residents were guided towards other opportunities for engagement.

The outreach efforts were supported by the CCOB Communications Department, which provided collateral materials, [social media posts](#), [video content](#), copyediting, graphics, and strategy guidance. In order to reach the broadest audience, the messaging was disseminated through eblasts, newspaper articles, signage at CCOB facilities, ads, email networks, [flyers](#) at local businesses, nonprofit partners, newsletters, and [door hangers](#). In addition to a community-wide strategy, the team targeted underserved populations using geographic information systems and census data, in conjunction with the Diversity, Equity, Access, and Inclusion (DEAI) Department and local community groups.

Methodology

1. The first step in the process was the Broomfield City Council's adoption of Resolution No. 2020-169 - the [Greenhouse Gas Emissions Reduction Resolution](#).



2. Broomfield's Sustainability staff and ACES members began the process of developing a Sustainability Plan by commissioning a study from the University of Colorado at Denver. [That report](#) included an initial GHG inventory and laid out broad strategies for reducing GHGs. These concepts formed the basis for the more detailed steps that followed.



3. These were cross-referenced with national best practices from the [American Committee on an Energy Efficient Economy](#) (ACEEE) and workshopped with appropriate CCOB departments and teams.



4. ACES subcommittees then developed priority lists for strategies they thought Broomfield should pursue in the areas of Transportation and Energy.



5. Broomfield received intensive technical assistance from [ICLEI](#), which prepared a list of [high impact actions](#) that cities with similar profiles would pursue to achieve deep carbon savings. These included building electrification, EV adoption, and energy efficiency.



6. A team of graduate students from [University of Colorado Boulder's Master of the Environment](#) program built a more refined GHG inventory in ICLEI's ClearPath software platform, which would be the basis for building future reduction strategies and projections.



7. As part of the municipal EPC (through a grant from the [CEO](#)), [McKinstry](#) performed a similar analysis on CCOB operations, determining the energy savings potential of a portfolio of municipal buildings.



8. During the process, the Sustainability team collaborated with other CCOB departments on the development of potential programs and policies, in order to craft the most effective, impactful strategies.



9. Through [Xcel Energy's Partners in Energy](#) program, the [Brendle Group](#) performed an energy [gap analysis](#) to identify energy efficiency and renewable opportunities in Broomfield's residential and commercial sectors. This allowed for more accurate targeting of programmatic goals.



10. From there, the strategies laid out by the technical assistance partners named above were entered into the ClearPath software to calculate the collective impact of the recommended energy and transportation policies and programs.



11. The team again collaborated interdepartmentally to gain the best insights, direction, and guidance.



12. The final recommendations were collected into the GHG Reduction Plan for City Council's consideration.



Related Policies & Strategies

A successful sustainability strategy builds upon and cross-resources existing strategies and policies. By leveraging state, regional, and national policies in the areas of transportation, energy, public health, equity, workforce development, and other areas, CCOB can buttress its own efforts with aligned strategies.

This Sustainability Plan builds upon CCOB’s 2016 [Comprehensive Plan](#), especially its [Environmental Stewardship](#) goals. That document seeks to position Broomfield as a “leader in implementing environmental stewardship policies that help create a desirable and sustainable community now and for future generations.”

Broomfield’s sustainability vision also aligns with the State of Colorado’s Climate Action Plan to Reduce Pollution ([HB19-1261](#)), through which “the Polis Administration has prioritized action on a just and equitable transition to renewable energy and pollution reduction that diversifies and strengthens our economy, creates good-paying local jobs, and improves the well-being of our communities.”

ACES and sustainability staff have also identified key priorities from other existing planning documents in order to leverage resources and improve collaboration. A non-exhaustive list of relevant documents is below:

TRANSPORTATION	ENERGY	OTHER
<ul style="list-style-type: none"> • CCOB Transportation Plan • CCOB Bicycle and Pedestrian Assessment • RTD Northwest Area Mobility Study • RTD Bus Rapid Transit Feasibility Study • US 36 First & Final Mile Study • CO 7 Corridor Plans & Studies • DRCOG 2050 Metro Vision • DRCOG 2040 Metro Vision & Regional Transportation Plan • Colorado EV Plan • Federal EV Charging Infrastructure Goals • Charge Ahead Colorado program • Boulder County EV Charging Requirements for New Construction • Fort Collins EV Readiness Roadmap • Envision Longmont Multimodal Plan 	<ul style="list-style-type: none"> • Colorado Energy Performance for Buildings Bill • Xcel Energy’s Clean Energy Plan • United Power Annual Report & 10-Year Working Plan • Tri-State Responsible Energy Plan • Colorado SB21-246 • Denver’s Net-Zero Energy New Buildings & Homes Implementation Plan • Boulder County BuildSmart Code • Energize Denver Benchmarking requirement • Denver Smart Leasing Program • Colorado Energy Office Energy Code Adoption Toolkit • Denver Solar Co-op 	<ul style="list-style-type: none"> • CCOB Capital Improvement Project Plan • CCOB Open Space & Trails Master Plan • CCOB Public Art Master Plan • CCOB Residential Design Guidelines • Sustainability Strategies from Adams 12 Five Star, Boulder Valley, and Jefferson County School Districts

In addition, the federal Administration has rejoined the [Paris Climate Agreement](#), which presents an opportunity for local governments to accelerate their own GHG reduction goals. Broomfield stands ready to partner with federal agencies on sustainable investments that

prioritize green jobs, equity, and clean energy. By identifying “shovel-ready” projects (for example, for environmental retrofits and building upgrades), Broomfield can prepare for anticipated grant and technical assistance applications from Washington, DC.

Impact Analyses

CCOB identified several potential policies and programs for the GHG Reduction Plan. Altogether, these policies and programs are projected to meet the ambitious goals of 90% reduction of GHGs by 2050 for the community wide scale and 100% reduction for government operations by 2045. Impact analyses lay out the details of the proposed policies and programs. The sustainability impact analyses include background, project focus area, collaborators, outcomes, cost, and co-benefits.

These impact analyses help staff and consultants prioritize and analyze potential policies and programs, as well as quantify projected impacts. They also help staff and consultants further develop the policy or program, following City Council input, ensuring ease of implementation in 2022.

As staff and consultants developed the GHG Reduction Plan, they sought an analytical approach that would allow for a deep dive into three main focus areas: Transportation, Energy, and Zero Waste. CCOB staff and consultants utilized an impact analysis tool to calculate GHG reduction and other qualitative and quantitative metrics based on the policy or program details.

For example, one impact analysis examines the potential impact of Broomfield increasing EV adoption, and not only examines factors such as quantifiable outcomes, but also incorporates best practices and case studies from other communities' GHG reduction strategies.

Impact analyses help pave the way for communications with City Council, coordinating departments, external parties, and ACES to make decisions about a proposed policy or program. As Broomfield continues to move towards meeting its sustainability goals in the future, the impact analyses will also be used to benchmark progress.

Impact Analysis for: NAME OF PROJECT	
DATE	
Project Background	
IN THIS SECTION, OUTLINE THE ISSUE AND INCLUDE:	
<ul style="list-style-type: none"> High level background on the issue and why/how the proposed project addresses the problem Any previous action taken or existing policy/ program (at CCOB) that relates to or supports the proposed project Alignment with existing policies and goals (CCOB Comp. Plan, State Goals, Paris Agreement, ACES Goals, etc.) Alignment with other actions/programs in peer cities & counties or CO State Insert data and/or links to reports and external sources Any other relevant background information Is this supportive of any comprehensive plan (or other CCOB plan) action steps or policies? 	
Project Focus Area	
FOR EXAMPLE: WASTE REDUCTION	
Proposed Action, Policy or Program	
WHAT IS THE PROPOSED ACTION?	
<ul style="list-style-type: none"> Brief & specific What are the components of the project? [Is there a projected timeline? Are there phases? Is this a one time initiative or is this an ongoing program? What is the proposed budget/cost? Is this a one time cost or is it ongoing? Revenue neutral/positive in the short or long term? 	
Anticipated Quantifiable Outcomes	
CLEAN, EASILY QUANTIFIABLE OUTCOMES SHOULD BE DETAILED HERE	
<ul style="list-style-type: none"> Cost/benefit analysis (ROI) For example: GHG reduction impact, waste diversion impact 	
Anticipated Co-Benefits	
QUALITATIVE BENEFITS SHOULD BE DETAILED HERE	
<ul style="list-style-type: none"> Return on environment (ROE) Social benefits Resilience Equity Job creation Health City leadership 	
Internal: Involved CCOB Departments/Divisions	
NAME ALL CCOB DEPARTMENTS THAT NEED TO BE INVOLVED IN PROJECT, ALSO NAME PRIMARY CONTACT (INCLUDING IN-KIND CONTRIBUTION)	
<ul style="list-style-type: none"> For example: Public Works, Jane Doe In-kind (staff time) or needs a new FTE/PT? 	
External: Coordinated Opportunities	
NAME ALL CURRENT OR POTENTIAL EXTERNAL COLLABORATORS ON THE PROJECT	
<ul style="list-style-type: none"> Business, nonprofit, partner government, etc. Also list primary or potential contacts 	
Metrics	
<ul style="list-style-type: none"> GHG reduction Dollars saved % Improvement etc. 	
GHG Reduction Impact	
Low Medium High	
Implementation Timeframe	
Short Term Medium Term Long Term	

Figure 22: Sample impact analysis structure

ClearPath Calculations

CCOB built its inventory and forecasts in [ClearPath](#), the emissions management software suite from [ICLEI-USA](#), which provides access and support as a benefit of membership in the organization. This methodology is utilized by more than 500 local government entities in the US that are working towards meeting the goals laid out in the [Paris Agreement](#) on climate change.



The ClearPath tool is founded on the principle “analyze, act, accelerate” - the necessary steps for any climate action plan. In 2021, ICLEI partnered with the [Cities Race to Zero](#) initiative and provided [Science-Based Targets](#) for 2030 that align with the strategies laid out by the [Intergovernmental Panel on Climate Change \(IPCC\)](#), which then paved the way to achieve carbon neutrality by 2050. Local ICLEI technical advisors worked with a team of researchers from the [CU Boulder Master of the Environment](#) program to calculate Broomfield’s 2017 baseline inventory. This incorporated numerous inputs such as [Google Environmental Insights Explorer](#) (IEI) Transportation data, utility data, housing data, and other known externalities.

From that data (plus projected population growth and other factor sets), the team was able to extrapolate the “business as usual” forecast scenario, indicating what emissions would look like if no action was taken. This allowed multiple reduction strategies to be modeled in the software, including key transportation and energy policies and programs, in order to chart a variety of potential paths to achieve Broomfield’s GHG reduction goals.

During the implementation phase starting in 2022 and beyond, ClearPath provides a framework for monitoring progress towards goals and reporting to external stakeholders.

SCIENCE-BASED	<i>“Aligned with Earth’s limits and societal sustainability goals”</i> The scope and ambition of the target at actor level is aligned with the scientific limits that define a safe space for humanity, and societal sustainability goals/targets that define a just future for nature and people.
TARGETS	<i>“Measurable, actionable, and time-bound objectives”</i> Actors must be able to measure a baseline, take action, and track progress with a reasonable level of effort.



Recommended Policies & Programs

The GHG Reduction Plan is a recommendation for a 28-year pathway, and can only be implemented in a way that's sustainable vis-a-vis staffing, budget constraints, CCOB priorities, City Manager direction, and City Council guidance.

Keys to long-term success include:

- Starting with foundational elements
- Identifying near-term wins that will be impactful
- Leveraging existing resources
- Moving slowly but diligently towards goals
- Staff driving the process with ACES input
- Further refining calculations before bringing individual proposals to City Council
- Continuous vetting of strategies with impacted CCOB departments
- Fully fleshing out potential policies and programs in terms of intended and unintended consequences, including costs to residents and CCOB operations
- Ongoing community engagement
- Involvement in advocacy groups which promote beneficial policy on the regional, state and federal levels
- Pursuing implementation in a way that reduces barriers to access, promotes widespread participation, and is equitably financed/resourced
- Annual GHG inventory reporting
- Updating the plan every 5 years

General guidance for how to embark upon a path towards emission reductions was provided by C40, the international climate agency that supports global cities' decarbonization efforts. According to C40, an [accelerated approach](#) (Figure 23) would prioritize grid decarbonization, optimizing energy use in buildings, and enabling "next-generation mobility", i.e., transit-oriented development (TOD), mass transit, walking, cycling, shared vehicles, etc.

Broomfield's primary launching-off point for the GHG Reduction Plan was ICLEI's evaluation of Broomfield's classification of community emissions. Due to its suburban geography, Broomfield is

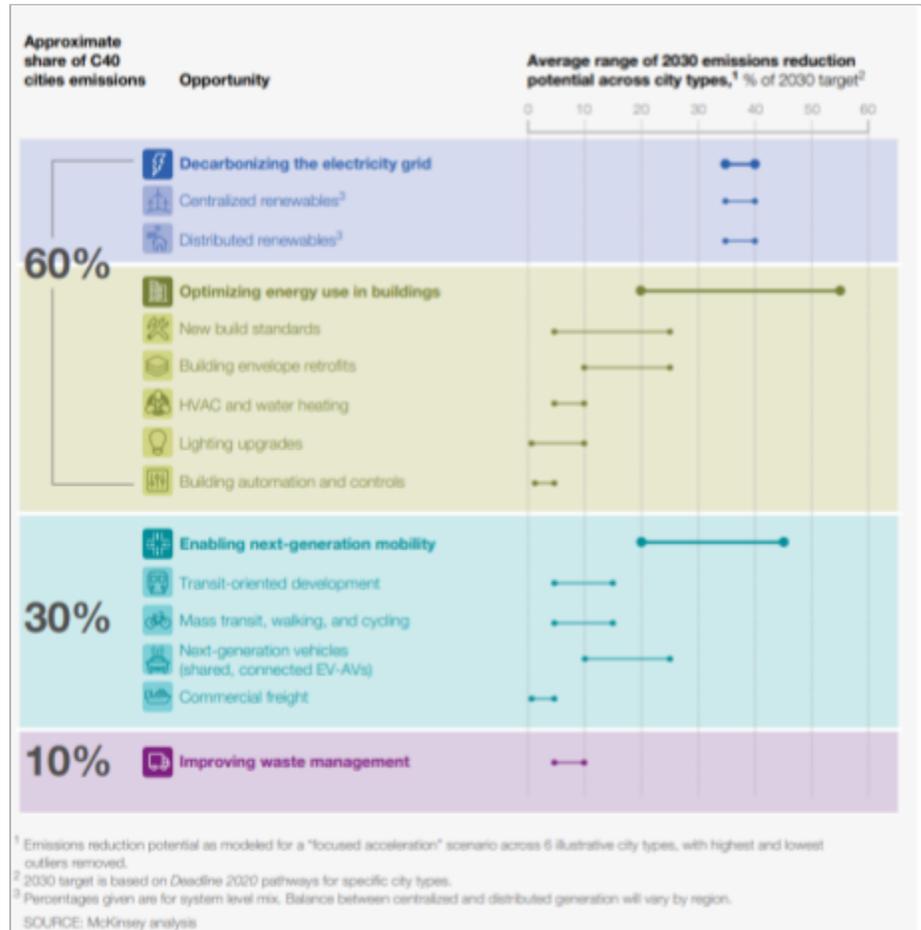


Figure 23: Top 12 opportunities by action area

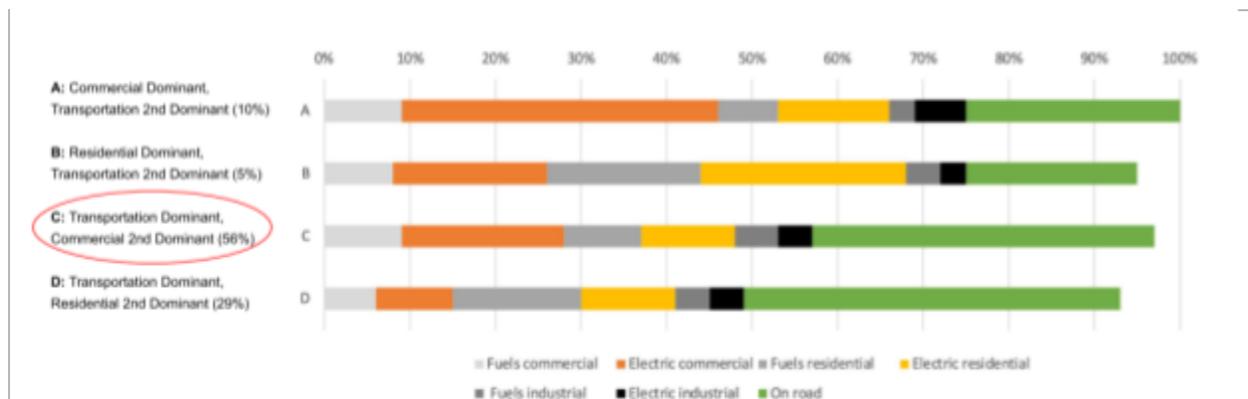


Figure 24: Broomfield is considered a Transportation Dominant, Commercial 2nd Dominant community based on emissions data

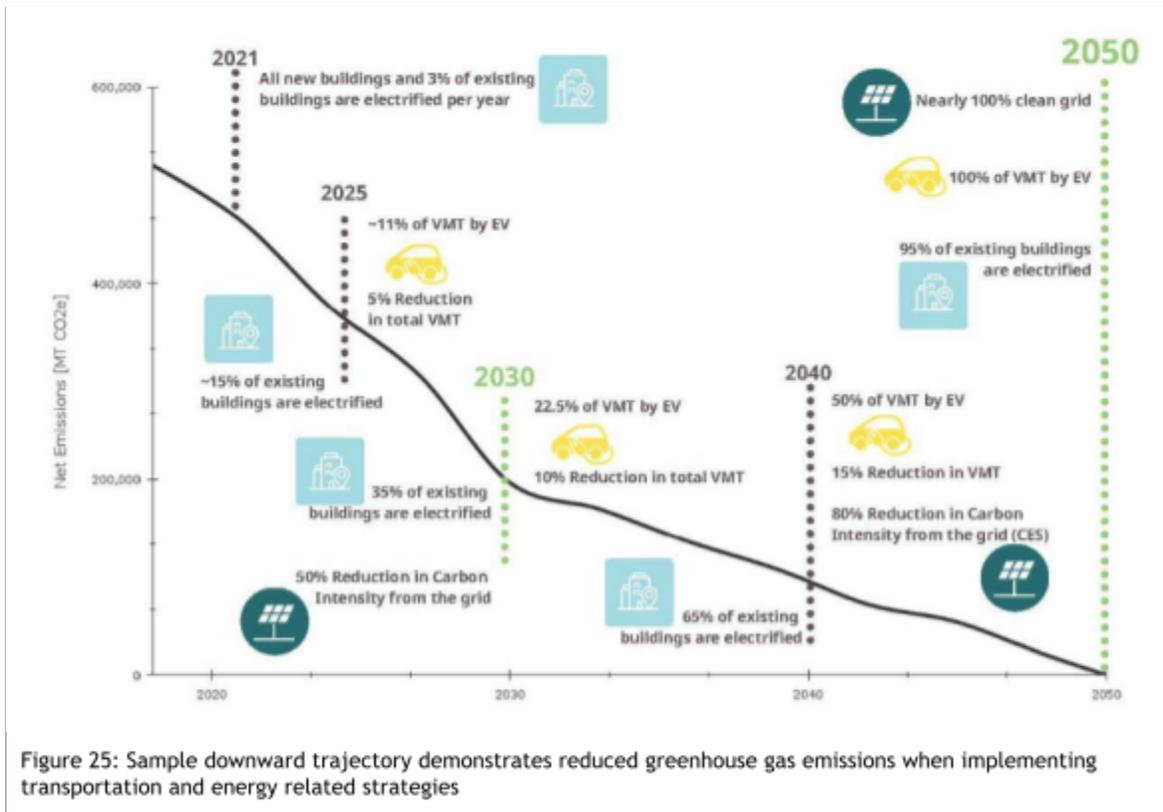
considered a transportation-dominant community, with an emissions profile roughly reflected in Figure 24.

From that classification, ICLEI was able to provide a sample trajectory of how a similar community (also in Broomfield’s Transportation-Dominant category) would reach ambitious GHG emissions reduction goals. The pathway guidance in Figure 25 demonstrates deep carbon reductions that result from primarily focusing on several strategies: transitioning to EVs and electrifying homes (fuel switching from gas to electric), combined with grid decarbonization, as well as energy efficiency.

By conducting an analysis of Broomfield’s GHG emissions estimates, ICLEI then produced a rough mixture of High Impact Strategies the community would need to undertake to reach the goals. The breakdown of these categories is listed in Figure 26, with energy efficiency a crucial addition to the strategies already listed.

Over 65% of Broomfield’s goals will be accomplished primarily through Xcel’s and United Power’s long-term transition to renewable energy (Figure 27). This means that as local residents and businesses use less energy, install heat pumps, and put solar panels on their roofs, their efforts will be accelerated and aided by the utilities’ cleaner energy sources (which are regulated by the Colorado Public Utilities Commission).

With a rapidly decarbonizing grid on the Front Range, Broomfield’s efforts will take advantage of, and amplify, the efforts of local electric utilities.

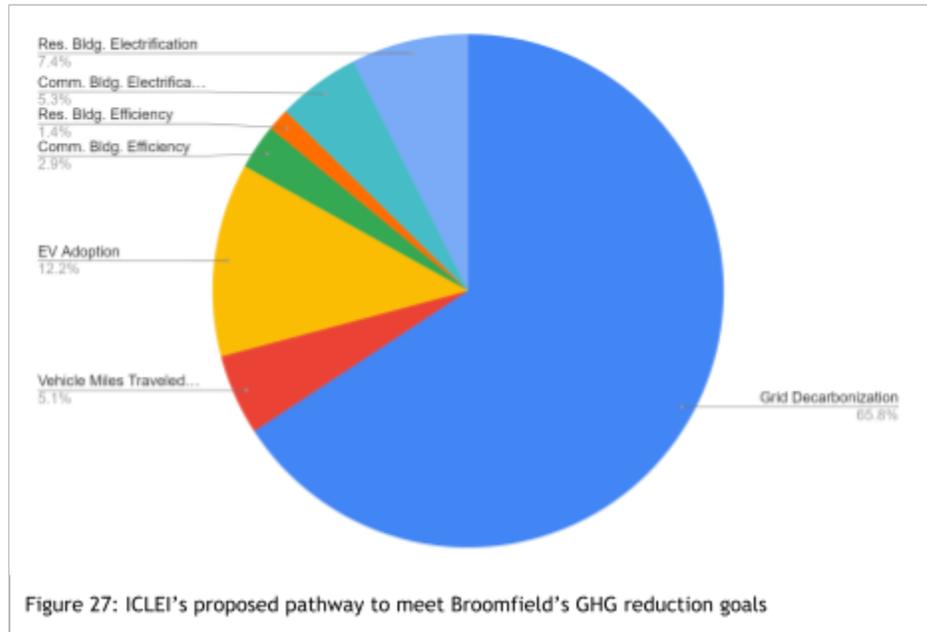


Type	Name	Net Reduction (MT CO2e)	Description
Grid Decarbonization	CES	435,554	Clean Energy Standard: 80% Reduction in carbon intensity (kg CO2/MWH) by 2030.
High Level VMT Reduction	Moderate (10% VMT Reduction)	33,719	10% Reduction in total VMT
On-Road Electric Vehicles Adoption	California-BAU (6% Annual Growth)	80,724	30% of VMT is EV by 2030. This action influences an increase in Residential & Commercial buildings electricity emissions.
Commercial Building Efficiency	IECC New + 5% Existing	18,942	All new buildings and 1% of existing Sq FT (renovations and turnover) will meet IECC 2018 (37.30% reduction in building EUI) & 5% Existing Sq FT (renovations and turnover) EUI is reduced by 20%.
Residential Building Efficiency	IECC New + 5% Existing	9,310	All new buildings and 1% of existing Sq FT (renovations and turnover) will meet IECC 2018 (37.30% reduction in building EUI) & 5% Existing Sq FT (renovations and turnover) EUI is reduced by 20%.
Commercial Building Electrification	5% EB Electrified	34,808	5% of existing SF per year is electrified. This action influences an increase in Commercial buildings electricity emissions.
Residential Building Electrification	5% EB Electrified	49,069	5% of existing SF per year is electrified. This action influences an increase in Residential buildings electricity emissions.

Figure 26: ICLEI's recommended high impact strategies for Broomfield

Abbreviation Key	
SBT	Science-Based Target
HIA	High Impact Actions
VMT	Vehicle Miles Traveled
EV	Electric Vehicles
SF	Square Feet (ft ²)
EB	Existing Buildings

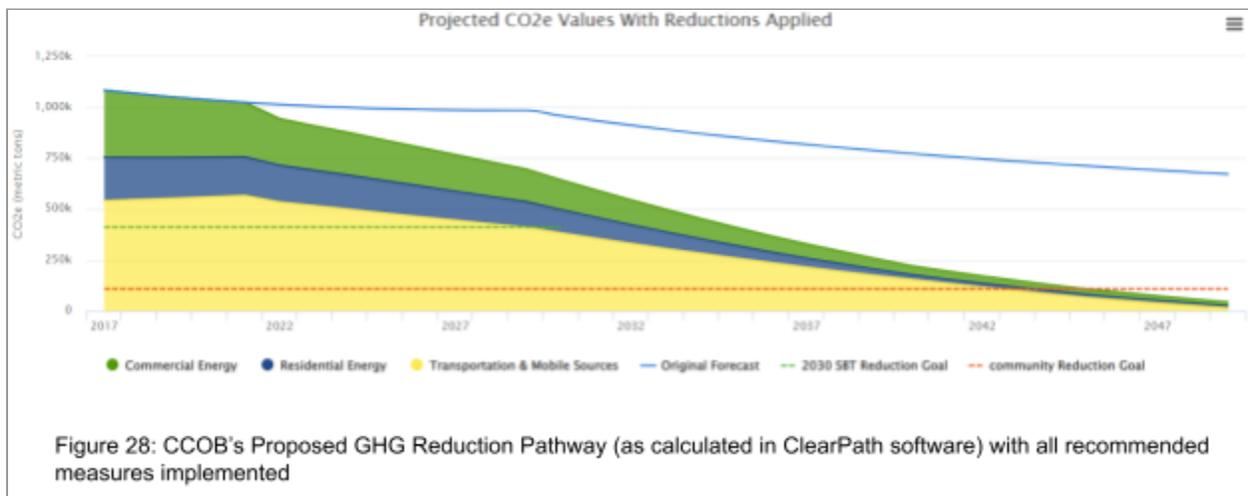
This GHG reduction strategy details the recommended actions needed to achieve *the remaining 35% of carbon emissions* reductions to meet the 2050 goals. The proposed pathway includes a set of actions that, when combined, provide Broomfield with a multi-decade framework to achieve its GHG reduction goals.



To arrive at those calculations, the Sustainability staff, the CU Boulder team of graduate students, and ACES, conducted further analyses in the ClearPath software, incorporating data from the Brendle Group and McKinstry, as described later in this section.

Figure 28 shows the combined impact of these Energy and Transportation initiatives, demonstrating the cumulative reduction through 2050. The blue line represents a "Business As Usual" forecast, i.e., if no action was taken. The red line indicates the target. By layering on policies and programs described within this chapter, Broomfield can exceed its goals by mid-century, achieving the cost-saving, health, workforce, resilience, social, and equity goals laid out in earlier chapters.

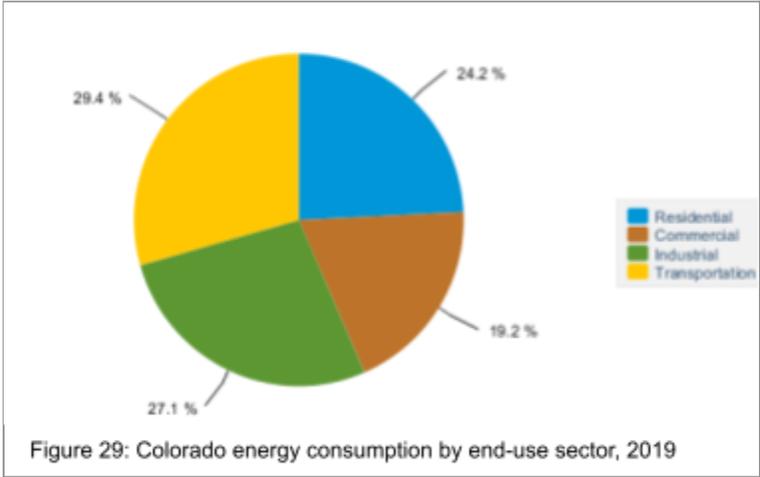
Details on the proposed Energy and Transportation strategies are detailed in the sections below.





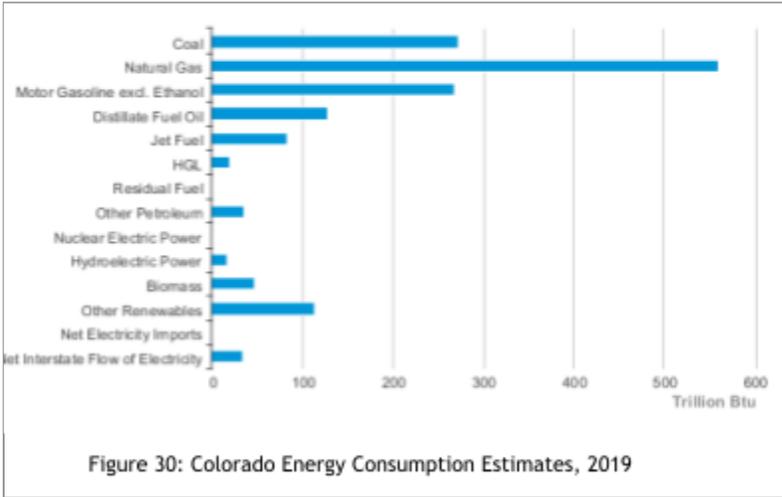
Energy

Energy is a broad term used to describe what powers daily lives, from fuel in a car to electricity for turning on lights and appliances. Electricity end users are usually classified into residential, commercial, and industrial use (Figure 29). Most commercial energy uses HVAC (heating, ventilation, air conditioning) (25%) and lighting (10%). Residential energy use mostly consists of heating and cooling (31%) and water heating (12%). Many different types of sources can generate electricity, and the ratio of sources largely depends on geographic location and the adoption of new technology.



Energy Sources

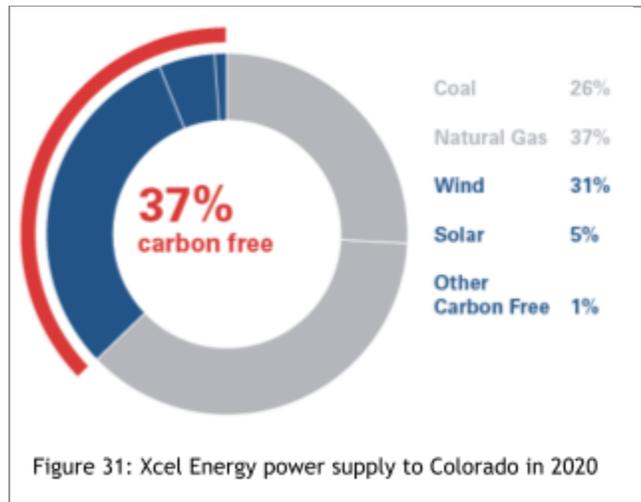
Fossil fuels are energy sources that were formed from the decomposition of organisms; they cannot be replenished on a human timescale. Coal and natural gas are the most common forms of fossil fuels and produce GHG emissions when burned to create electricity to power vehicles, tools, and appliances. Besides fossil fuels, other sources of energy include geothermal, solar, and wind--also called renewables. Renewable energy sources replenish quickly and are sustainable. Clean renewable sources, which exclude biofuel energy as it produces GHGs, do not directly produce GHGs. While nuclear power also does not produce GHGs, it is not defined as renewable.



Colorado’s energy portfolio is a mix of different energy sources ([Figure 30](#)). Energy efficiency reduces the amount of energy used. This alleviates demand for energy on the electricity providers and saves money for residents as well. Combining renewable energy with energy efficiency is instrumental in creating a sustainable city.

Electricity

CCOB is serviced by two different electric utility companies, Xcel Energy and United Power, which produce electricity from various energy sources. As of 2020, [Xcel Energy’s energy mix](#) includes 37% natural gas, 26% coal, 36% renewable energy, and 1% other carbon-free such as biomass, hydro and nuclear power (Figure 31). as seen in the chart to the right. [Xcel plans](#) to completely phase out coal, reduce carbon emissions by 85% from 2005 levels by 2030, and go 100% carbon-free by 2050.



[United Power](#) is a distributor that receives virtually all of its energy from Tri-State Generation and Transmission Association. Their [energy mix](#) from 2017 includes 49% coal, 2% natural gas, 30% renewable energy, 9% market purchases, and 10% non-renewable energy purchased from another power company. Although United’s contract with Tri-State limits the distribution company from purchasing more than 5% of externally-produced renewable energy, the company has committed to reducing 100% of coal-related emissions.

Driven by customer demand and Colorado voter influence, utilities are adopting a more sustainable energy portfolio and the [State of Colorado](#) has a goal of 100% renewable energy by 2040. [Xcel Energy](#) and [United Power](#) have committed to increasing the production and distribution of renewable energy and promotion of energy efficiency practices. [Xcel Energy](#) and [United Power](#) have renewable energy programs and rebates for energy efficiency.

Other Benefits of Sustainable Energy

Increasing [energy efficiency](#) and [renewable energy production](#) not only benefits the environment, it can also have many health, workforce, equity, and economic benefits. GHG emissions and use of gas and other chemicals in the home coincide with



the release of chemicals into the air (including carcinogen benzene, nitrous oxide, etc.) which can cause cardiac and respiratory problems, especially in vulnerable populations like children and the elderly. Sustainable energy use can reduce one's annual energy bill and contribute to economic vitality through the creation of [new jobs](#) and the support of local businesses. Sustainable energy use expands opportunities across multiple sectors and improves human health and wellbeing.

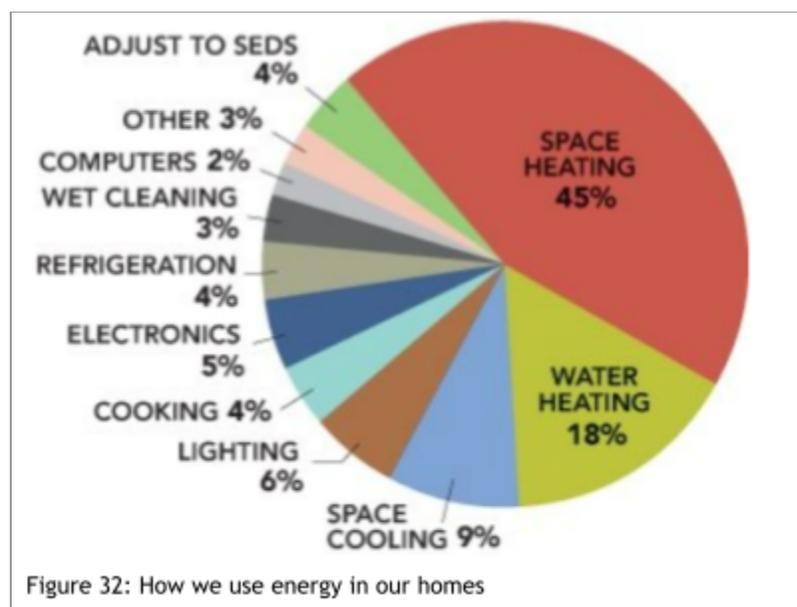
Energy Efficiency

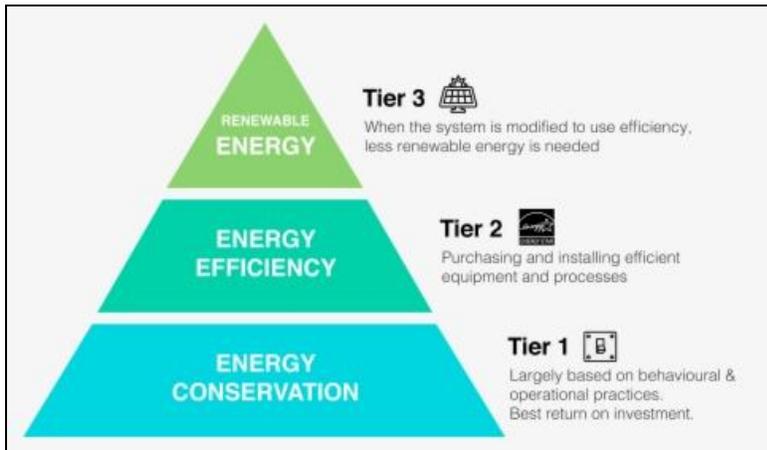
Energy efficiency is an important tool in reducing GHG emissions because it reduces the overall amount of energy needed to power homes and businesses. Energy can include electricity, but it also includes natural gas and other fuels needed to power equipment and appliances like water heaters and stoves. In addition to GHG reduction, energy efficiency has economic, utility, and resilience [benefits](#).



Buildings account for 40% of national energy use, according to the [US Department of Energy](#) (DOE). Most of building energy use goes towards space heating and water heating ([Figure 32](#)). The US Energy Information Administration estimates that [5% of electricity losses](#) occur during the transmission and distribution of electricity. The US collectively spent nearly [\\$402 billion](#) on electricity in 2019.

Incorporating energy efficiency can help residents and commercial businesses, and industries save money. According to the DOE, national building energy use could be cut by [20-35% by 2030](#) if cost-effective, [energy-efficient technologies](#) (that exist today) are applied across the country. Specifically, in residential buildings, households could save between \$200-\$400 annually. These cost





savings are reflected in utility bills; energy efficiency can also improve the durability of technology and equipment, reducing the frequency of needed maintenance. These savings can be invested into the US economy elsewhere by supporting local businesses or other household priorities and help alleviate financial burdens for low-income households.

Energy efficiency can be achieved through behavioral changes and physical equipment

upgrades. Behavioral changes include turning off lights in empty rooms and unplugging electronics when not in use (as these items still consume a small amount of energy even when not being used). Physical equipment, such as a programmable thermostat and efficient appliances, can help residents and businesses lower their energy consumption. Rebates and incentives are often available for energy efficient appliances. These types of retrofits may have a higher upfront cost but prove to have the most long-term savings and are often needed as replacements.

"I would love to see support for improving the energy efficiency for those who can't afford to finance it themselves."
- Broomfield Resident

Energy efficiency efforts can also expand the green workforce by creating [new jobs](#) and employee training opportunities. Using less energy can help stabilize the price of electricity due to [reducing electricity demand](#), especially at peak demand periods. This reduces the volume of electricity that needs to be produced using polluting fuel sources.

CASE STUDY: Energy Efficiency in the Adams 12 Five-Star School District

Adams12 Five Star School District has benefited from financial and GHG savings through the implementation of energy efficiency initiatives including the creation of a sustainability plan, promotion of educational programs, and installation of equipment and appliance upgrades. The average annual energy cost for a high school can be upwards of \$100,000. Increasing energy efficiency will allow a school district to save money on its energy bill and reallocate that funding towards programs and other priorities. Energy efficiency not only results in financial savings but will reduce GHG impact and improve student health and wellness as well.

The district's first-ever [Sustainability Management Plan](#) addresses energy, water, waste, and student education with regards to reducing GHG impact. Electricity and natural gas include the largest district-wide expenditure, at around 70% of the utility budget. A Sustainability Planning Committee, comprised of over 30 employees and community members within the school district worked together to create the official vision statement, "Adams12 Five Star Schools will develop sustainable practices in our schools and community that will benefit future generations [...] through environmental stewardship and education, leaving a smaller footprint on the world."

While the renewal of the plan, which expired in 2020, was put on hold during the pandemic, the district will publish an updated version in the next few years.

Environmental clubs and green teams at various schools in the district help reduce energy use by modeling sustainable behavior and inspiring students to do the same. These individuals can also bring energy efficiency practices home to their families—furthering community energy savings. One of the most notable programs within the district is the Energy Challenge, in which schools compete to reduce their energy use.

Besides energy saving programs, most physical energy efficiency upgrades start with the installation of LED light bulbs. Shannon Oliver, the Energy and Sustainability Manager for Adams12 Five Star, says, “[LED lighting] has some of the quickest returns [on investment] (often less than 5 years). In addition to lighting, appliance upgrades also save on energy and maintenance costs.”

Thunder Vista P-8 in Broomfield

The most energy efficient school within the district is Thunder Vista P-8 in Broomfield. The school is [Collaborative for High Performance Schools \(CHPS\) Verified](#), which sets high standards for environmental and social responsibility. The facility’s Energy Use Intensity (EUI) is half of the average for a typical US public school (24 kBtu/sqft./yr vs. 48.5 kBtu/sqft./yr).



The school recently received new kitchen appliances and a complete replacement of old lighting with more efficient LED bulbs. This school also has been designed with [passive heating and cooling](#) features such as insulation, orientation, and [ground-source heat pumps](#), which use stable temperatures from the Earth to supplement the school’s HVAC system. If more school districts adopt energy efficiency programs, the community’s overall GHG footprint would decrease, and energy savings could be used for teaching and student services.

Renewable Energy

Renewable energy is any energy source that can be replenished over a human lifetime. The two most common renewable energy sources in [Colorado](#) are wind and solar ([Figure 33](#)). Other forms of renewable energy include [geothermal](#), water ([hydropower](#) and [tidal power](#)). Wind and solar are intermittent, and typically produce electricity about half of the time and cannot be dispatched on command. Energy storage can help mitigate energy demand. Battery storage is a growing form of energy storage. The [US Energy Information Agency \(EIA\) projects](#) that there will be 59 gigawatts hours (GWh) of storage capacity on the grid by 2050; in 2018 there were just 869 megawatts hours (MWh) of [installed capacity](#).



Currently, renewable energy is projected to account for 42% of US electricity generation by 2050 ([Figure 34](#)). This projection will not be enough to meet the GHG reduction goals outlined by the [Paris Agreement](#), but goals could be met with significant high capacity additions of renewable energy and other measures such as reducing energy demand.

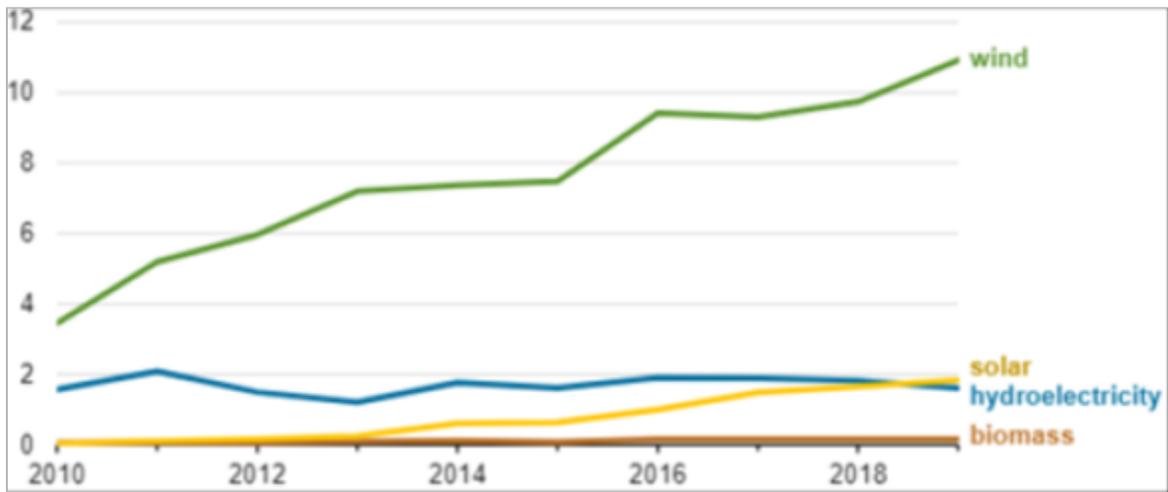


Figure 33: Colorado electricity generation from renewable sources 2010 - 2019

In order to meet GHG reduction targets, there must be an increase in installations of renewable energy and other clean energy technologies. While upfront costs are high, they are continuing to decrease every year. Currently, [a solar system](#) can cost between \$0.80-3.00 per Watt and wind energy is about \$0.77-0.85 per Watt. A residential or commercial solar system can be paid off in about 10-17 years. With a warranty of about 25 years and energy production exceeding that, solar energy owners see significant financial savings.

Aside from purchasing a physical system for a building, large organizations commonly enter into a [power purchase agreement](#) (PPA) and smaller energy consumers can subscribe to a local community solar garden if they are available. This model allows customers to purchase solar energy generated offsite; the generated electricity is sold to an electric utility, and the utility then distributes that energy to its service area and applies bill credits to the subscriber. The subscribers often see financial savings due to the low fixed cost of solar energy.

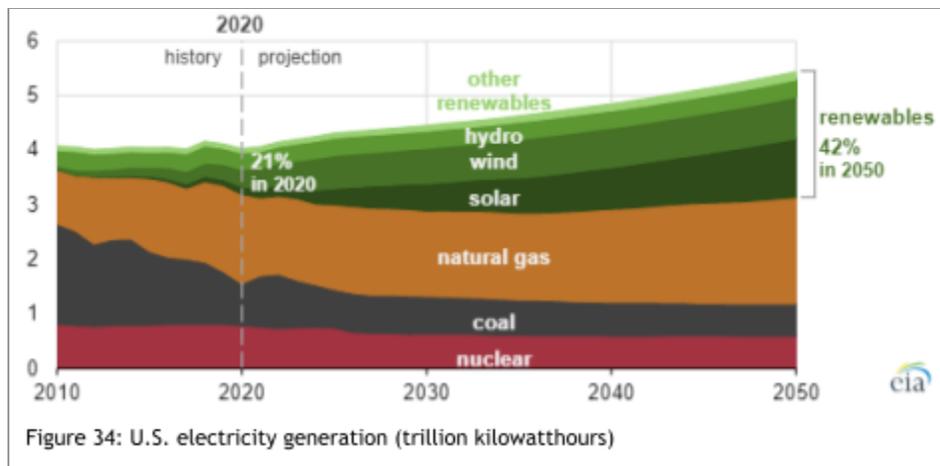
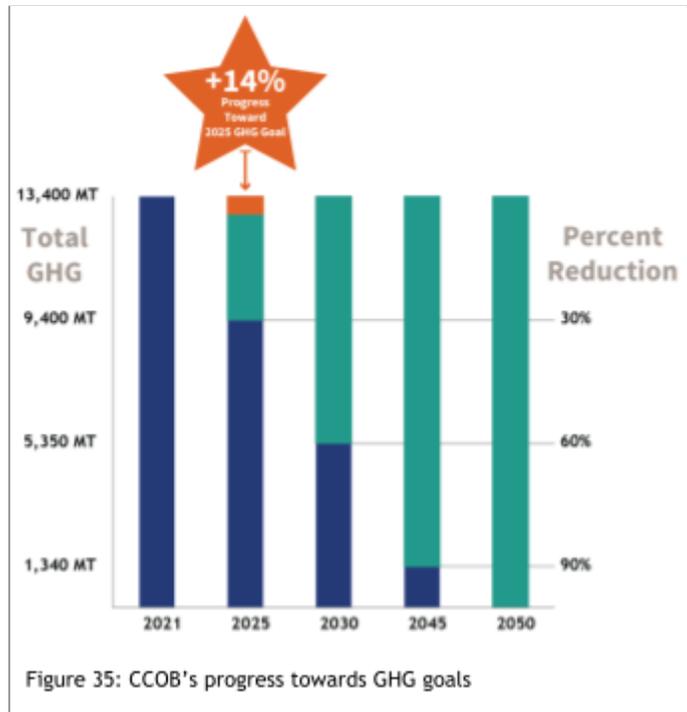


Figure 34: U.S. electricity generation (trillion kilowatt-hours)

Finally, consumers can purchase [renewable energy certificates](#) (RECs) to certify that their energy usage is generated by renewable energy sources. This method encourages the development of renewable energy systems due to proven market demand and revenue generated from RECs. The most successful implementation of RECs is a mixture of purchasing RECs and direct investment in clean energy technologies.

By utilizing low costs for the development of renewable energy, implementing energy efficiency upgrades, and rapidly adopting these technologies, GHG emissions targets can be achieved. This will also create jobs, improve health, and benefit the environment.

Beginning in July of 2021, Broomfield started purchasing 1M kWh/yr. of wind energy through United’s Green Energy program. This advances the 2025 municipal government GHG reduction goal by 14% (Figure 35).



CASE STUDY: Broomfield United Methodist Church Solar Projects

[Broomfield United Methodist Church \(UMC\)](#), like many other organizations, is reliant on donations for income. For such a financial model, every dollar counts. One passionate church member wanted Broomfield UMC to reap the financial and environmental benefits that solar energy can provide. Utilizing available incentives for solar energy and a generous donation, in 2012 the church was able to install solar panels on the roof of their building.



The 9.5 kW solar system generates electricity that is directly sold to Xcel Energy. This system generated 11.9 MWh of electricity in 2020--that is enough energy to power an [average home](#) for 13 months and avoid over 13,000 lbs of [GHG emissions](#). In total, the solar system is large enough to offset about 4% of the church’s energy use and brings in over \$1,000 each year. For a church that is reliant on donations for income, this extra revenue is a great source of consistent funding.

Pleased with the rewards, Mindy Davidson at Broomfield UMC says, “In the future we want to install more solar panels to offset even more energy use!” The vision for additional panels includes generating their own power for the building and selling back excess energy. If the church can secure funding along with added financial incentives, they will add solar to account for all of their energy use. Broomfield UMC has been a model of solar energy in the community for almost a decade and continues to show that all property owners can invest in solar energy.



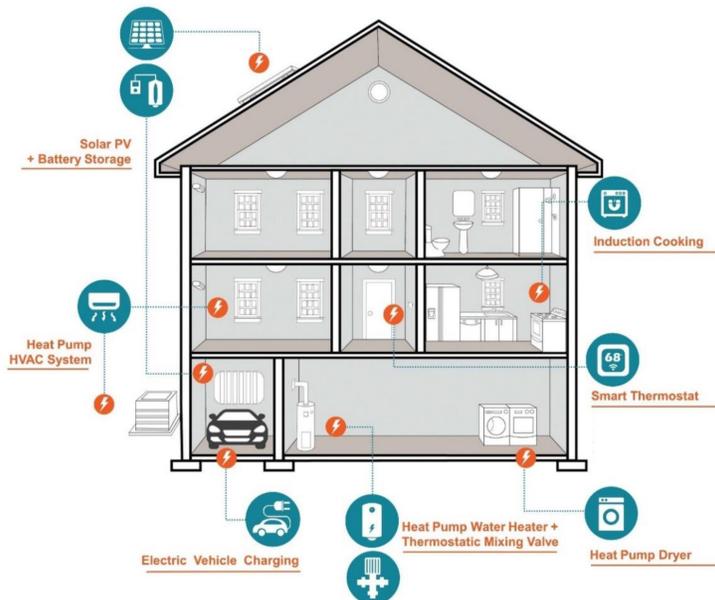
Electrification

[Electrification](#) refers to the process of replacing technologies that use fossil fuels with those that use electricity as a source of energy instead. The terms “[building electrification](#)”, “beneficial electrification,” and “building decarbonization” all describe shifting the source of energy used for heating and cooling in a building from fossil fuels to electricity.

In the United States, buildings account for roughly [40% of the country's energy use](#) and GHG emissions, and nearly half of all homes rely on natural gas as their primary heating fuel. According to the [2017 Broomfield GHG Final Report](#), residential and commercial buildings make up 43.5% of Broomfield’s emissions.

As the grid becomes “greener” the benefits of electrification capitalize on a cleaner grid. According to [Xcel Energy’s 2021 Clean Energy Plan](#), Xcel Energy plans to reduce carbon emissions by 87% by 2030 compared to 2005 levels and provide customers with electricity from 80% renewable sources. The goal of electrification is for all buildings to be powered by

solar, wind, and other sources of zero-carbon electricity.



[Heat pumps](#) offer an energy-efficient alternative to furnaces and air conditioners for all climates. Air source heat pumps or heat pump water heaters are three to five times more energy-efficient than their natural gas counterparts. A recent [Rocky Mountain Institute \(RMI\) report](#) found that cold climate heat pumps can heat homes even when temperatures outside are below -10 degrees Fahrenheit.



The State of Colorado has set goals towards electrification and heat pump adoption. According to Colorado's [2020 GHG Pollution Reduction Roadmap](#), the state has a target of 60% market share for heat pumps by 2030 and suggests 200,000 homes (12% of the housing stock) could be converted by that time.

In addition to heat pumps, buildings can be electrified using induction stoves, electric dryers and other appliances, electric vehicle charging stations, and solar PV systems with battery storage.

Electrification not only reduces GHG emissions, but also improves public health and indoor air quality. According to a [recent report](#) from RMI, cooking with gas can lead to nitrogen dioxide and carbon monoxide levels that would violate outdoor pollution standards. [A meta-analysis](#) of 21 studies found that children living in homes with gas stoves had a 42% higher risk of experiencing asthma symptoms.

As homes transition away from fossil fuels towards electrification, the grid will need to be enhanced to handle the additional capacity. Older homes may need panel upgrades to support the electricity loads coming from heat pumps, EV chargers, and electric appliances.

For new development, not needing to pay for a gas line will reduce costs. This reduction counters the increase of upfront costs of building all-electric and energy efficient homes. For example, in Pitkin County, the [Basalt Vista Affordable Housing Community](#) consists of all-electric and energy efficient homes as a solution to affordable housing and housing availability for school teachers.

CCOB is leveraging regional partnerships to increase energy efficiency and a long-term path towards fuel switching, or a gradual transition of the local building stock to electric.



Recommended Energy Policies and Programs

Having walked through the “Why” of sustainability actions earlier in the document, and having explained the broad strokes of “What” Energy solutions to implement, the plan now delves in this section further into “Which” of those paths to pursue. The “How” is discussed in greater detail in the Impact Analyses (see Index).

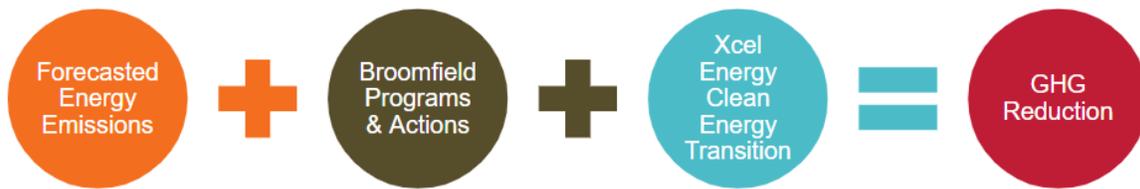
In order to identify the appropriate set of energy strategies required to meet Broomfield’s goals, the sustainability team partnered with several technical assistance providers throughout 2021 and into 2022. These external consultants provided additional data analysis and support that helped narrow down the high impact policies and programs to be included in ACES’ recommendations to the City Council.

Partners in Energy

[Partners in Energy](#) (PIE) is a 2-year collaboration with [Xcel Energy](#) to develop and implement community energy efficiency and renewable energy goals. Broomfield worked with PIE to access the tools and resources to enable community-driven energy planning and implementation. Through this relationship, Xcel provided:

- Refined gap analysis by forecasting future consumption
 - Based on population growth through 2050
 - Model EV adoption to cover additional electricity consumption
- 2017 through 2020 utility consumption data and emissions factors
- Greening of the Grid data (i.e., utility shift toward renewable energy)
- Total energy picture to address GHG emissions
 - Forecast to establish targets, inform strategies

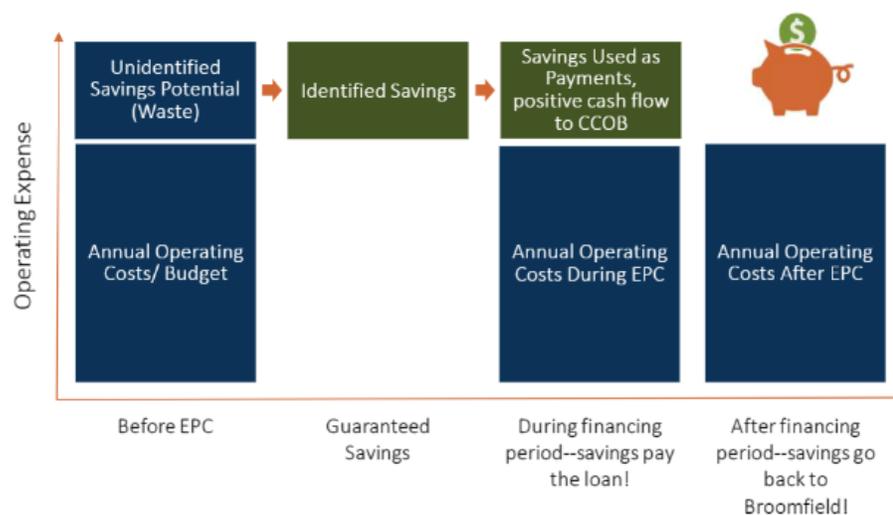
Based on this strategy modeling, PIE and Xcel recommended the following energy actions:



Strategy	GHG Impact	Co-Benefits
ENERGY EFFICIENCY		
Energy Efficiency	High	Cost savings, indoor air quality, jobs
Building Code (Efficiency)	Low	Increased efficiency from construction, decrease utility bills, decreased need for expensive retrofits
RENEWABLE ENERGY		
Renewable Subscriptions	Low	Get to 100% renewable electricity faster, contribute to additional renewables on grid
Net-Metered Rooftop Solar	Low	Potential resiliency benefits when paired with storage, jobs
ELECTRIFICATION		
Existing Building Electrification	High	Indoor air quality improvements, decreased variability in utility bills, jobs
New Construction Building Electrification	Medium	Indoor air quality improvements, decreased variability in utility bills, decreased need for more expensive retrofits, jobs
Offsets, Technology Improvements, or Other	As needed	

Energy Performance Contractor

Through an [Inter-Governmental Agreement](#) with the [CEO](#), CCOB allocated funds in January 2021 to hire an Energy Performance Contractor, and selected [McKinstry](#) through a competitive bid process. The EPC conducts an investment grade audit of municipal buildings and facilities, then provides a list of cost-saving



projects (retrofits and upgrades) for potential implementation.

McKinstry’s team have been convening regular meetings with Facilities, Communications, Finance, and Strategic Initiatives staff to identify energy efficiency, renewable, EV charging station, water efficiency, and other GHG-reduction opportunities. Broomfield has the flexibility to determine which projects to pursue and the most appropriate means of financing. Further findings from the EPC will be presented to the City Council later in 2022.

ClearPath Calculations / Energy Investments

Utilizing the PIE / Xcel projections for broad guidance (and incorporating preliminary EPC data), the sustainability team developed more detailed calculations for energy policies and programs within the ClearPath software, per page 56, laying out a suite of energy efficiency, renewable energy and building electrification measures. (Renewable energy actions are calculated in ClearPath as already built into the grid decarbonization efforts, rather than measured as individual carbon reductions.)

Estimated cost projections and staff investments for the energy programs are integrated into the overview chart. Such initial budgets are subject to funding availability (including grants and other incentives), further stakeholder engagement, leveraging of partnerships, and advances in technology, and may change. Many of these measures are already included as existing Broomfield budget priorities, as part of a capital improvement plan or other departmental project.

The time frames are broken down into three phases, representing a slow but diligent pathway towards the goals:

1. FOUNDATIONAL (2022-2023) - near-term wins that leverage existing resources
2. TRANSFORMATIONAL (2024-2025) - heavier lifts with a longer planning timeline
3. ASPIRATIONAL (2026 - 2050) - interventions requiring deeper stakeholder engagement and/or technological advances

The key for icons used on the chart is provided below:

	STAFF INVESTMENT	IMPLEMENTATION COST	GHG REDUCTION
<i>Low</i>			
<i>Medium</i>			
<i>High</i>			

Individual proposals will undergo further calculations, identification of resources, and input from appropriate departments before being brought to the City Council. Final implementation figures may vary from impact analysis estimates, depending on program details, scoping, council approval, subcontractors, etc.

PROPOSED ENERGY ACTIONS	STRATEGY	IMPLEMENTATION TIMEFRAME
Phase 1: Foundational (launch = 2022 - 2023)		
ENERGY EFFICIENCY	Increased Code Compliance	
	Single Family Energy Efficiency	
	Commercial Benchmarking 50k+ sq. ft.	
	CCOB Sustainability Training	
	Commercial Energy Efficiency	
	LED Street Lights	
RENEWABLE ENERGY	Residential Rooftop Solar	
	Residential Solar Subscriptions	
	Commercial Solar Subscriptions	
	Commercial Rooftop Solar	
	CCOB Solar	
ELECTRIFICATION	Existing Residential Fuel Switching	
Phase 2: Transformational (launch = 2024 - 2025)		
ENERGY EFFICIENCY	School Curriculum / Clubs Energy Efficiency	
	School Energy Efficiency	
	CCOB Operations & Maintenance Training	
	Green Lease	
	Multi-Family Energy Efficiency	
	Commercial O&M Training	
ELECTRIFICATION	Existing Commercial Fuel Switching	
	CCOB Heat Pumps	
Phase 3: Aspirational (2026 launch → 2050)		
ELECTRIFICATION	Residential Electrification (New Buildings)	
	Commercial Electrification (New Buildings)	

Energy Details

Details on the recommended energy policies and programs are outlined below:

Increased Code Compliance

An additional staff member will collaborate with Broomfield developers, contractors, and other building professionals to provide training, support, education, and outreach to ensure adherence to current and updated codes. This person may also analyze existing energy codes and recommend adoption of new codes to ensure new buildings, remodels, and retrofits include energy efficient updates for reduced GHG emissions in the future.

Single Family Residential Energy Efficiency

Broomfield will launch an educational outreach campaign aimed at aiding residents in reducing energy use. Through a partnership with local utilities Xcel Energy and United Power, a community-wide effort will promote the adoption of residential energy efficiency measures, including co-hosting workshops, webinars, educational events, demonstrations, and trainings, as well as connecting to available incentives and financing.

Commercial Building Energy Efficiency

Broomfield will launch an educational outreach campaign aimed at aiding commercial properties and tenants in reducing energy use. Through a partnership with local utilities Xcel Energy and United Power, a community-wide effort will promote the adoption of commercial energy efficiency measures. Low- and no-cost upgrades can be targeted towards building occupants, while higher-ticket investments in buildings can be coupled with existing incentives and targeted towards property owners.

Commercial Building Benchmarking 50k+ sq. ft.

CO HB21-1286 was signed June 24, 2021, which requires buildings over 50,000 square feet to annually collect and report energy use data to the CEO. Energy use must meet performance standards listed in the bill. This data must be reported and proved every 5 years. Broomfield will assist in the community-wide compliance with the new bill, including liaising with the CEO and utilities to assist commercial and multifamily buildings measure and reduce their GHG impact.

CCOB Sustainability Education

Educating city employees on sustainability, zero-waste, and GHG reduction will give employees an opportunity to better understand and identify shared goals between their departments' core functions and one of City Council's key priorities: environmental sustainability. Learning about the intersection of sustainability and human health, building codes, housing, jobs equity, etc. will increase interdepartmental collaboration, leveraging of resources, alignment of messaging, and overall participation in sustainability initiatives.

LED Streetlights

LEDs are one of the most actionable and popular methods of energy efficiency. In addition to GHG savings, LEDs emit less heat and are more temperature stable, which makes them more fire safe compared to traditional lamps. Through a partnership with United Power, Public Works will replace 132 street lights (168 bulbs) in Broomfield. This action will be split into three phases, with the first phase including the most savings.

School Curriculum / Clubs Energy Efficiency

School Energy Efficiency

There are six school districts in CCOB with different levels of sustainability implementation. Broomfield will engage with local school district operations/sustainability/energy managers to coordinate training opportunities for school staff and help with evaluative site visits and energy benchmarking, unless it was already recently completed. School districts will be encouraged to incorporate low-cost energy efficiency measures and distribute sustainability messaging for in-classroom curricula.

CCOB Operations & Maintenance Training

Green building training for municipal operations staff will reduce energy usage through the optimal operation and maintenance of municipal buildings, in the context of the EPC. Training municipal staff in sustainable building operation will allow CCOB to lead by example on improving the energy performance in municipal buildings and provide a pathway to guide commercial buildings along a similar trajectory.

Green Lease Education

Green leases are designed so that improvements in building efficiency or sustainability are paid for by the resulting savings. Depending on whether it is a net or gross Green Lease, the landlord or tenant will share cost and savings from energy efficiency upgrades. Broomfield staff will support and promote Green Leases in the multifamily and commercial sector to help tenants and landlords to collaborate on energy efficiency projects. The support will include workshops and educational materials.

Multifamily Energy Efficiency

Energy efficiency programs provide education, incentives, trained contractors, and savings for multi-family and apartment dwellers. No-cost and low-cost upgrades can be targeted towards building occupants, while higher-ticket investments in buildings can be coupled with existing incentives and targeted towards property owners.

Commercial Operations & Maintenance Training

Promoting green building and operating trainings will increase energy efficiency within commercial building stock through the use of more sustainable practices and equipment.

CCOB will connect with other public and private employers to provide an avenue for sharing information about annual training programs. Target employers may include contracting and construction companies, large (commercial or industrial) building operators, leasing companies, and multifamily complex owners.

Residential Rooftop Solar

A bulk solar purchasing program allows single family homeowners to combine efforts to collectively receive technical assistance, make informed purchases, and negotiate a volume discount on the solar energy systems. Broomfield will educate residents about local options for a bulk solar purchasing program, including connecting to available incentives and financing.

Residential Solar Subscriptions

A community solar garden allows residents who cannot put rooftop solar on their homes because of financial means, roof orientation, roof condition, property ownership, or other reasons to have access to renewable energy by subscribing to a garden for a set amount of kWh to cover their business's energy demands. This makes renewable energy accessible to renters and people of a variety of income levels. Broomfield can explore several potential paths available to pursue a community solar garden, including partnering with existing community solar gardens in neighboring counties.

Commercial Solar Subscriptions

A community solar garden allows business owners who cannot put rooftop solar on their businesses because of financial means, property ownership, or other reasons to have access to renewable energy by subscribing to a garden for a set amount of kWh to cover their business's energy demands. This makes renewable energy accessible to renters and businesses of a variety of income levels. Broomfield can explore several potential paths available to pursue a community solar garden, including partnering with existing community solar gardens in neighboring counties.

Commercial Rooftop Solar

A bulk solar purchasing program allows commercial property owners to combine efforts to collectively receive technical assistance, make informed purchases, and negotiate a volume discount on the solar energy systems. Broomfield will educate businesses about local options for a bulk solar purchasing program, including connecting to available incentives and financing.

CCOB Solar

Working through the EPC, Broomfield will identify key sites for solar installation on municipal properties, collaborating with the CEO and the Finance team to determine appropriate funding mechanisms and ROI calculations.

Existing Residential Fuel Switching

Working with utilities to support residential education on electrification, its benefits, and available incentives, Broomfield will use permitting and building data to target electrification at the point of equipment failure. Coordination with contractors and other building professionals will support education and training in order to accommodate the growing pipeline.

Existing Commercial Fuel Switching

Working with utilities to support commercial education on electrification, its benefits, and available incentives, Broomfield will use permitting and building data to target electrification at the point of equipment failure. Coordination with contractors and other building professionals will support education and training in order to accommodate the growing pipeline.

CCOB Heat Pumps

Installation of heat pumps as an energy-efficient alternative to furnaces and air conditioners at municipal facilities, as part of larger electrification effort across the building portfolio.

Residential Electrification (New Buildings)

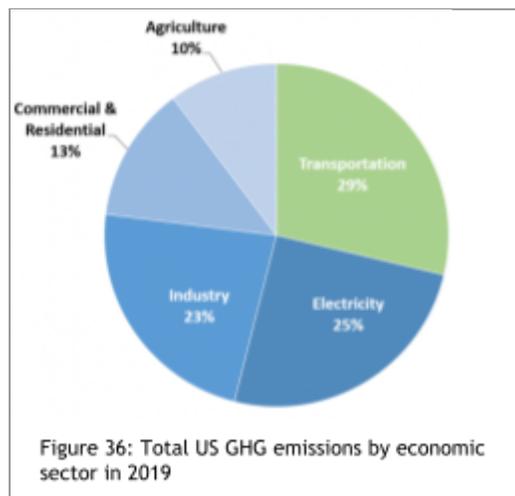
Broomfield will explore new building codes that would require all new residential construction projects to be fully electrified. Key components include working with stakeholders such as utilities, contractors, developers, and other building professionals to identify strategies, best practices, and target dates. These steps can be coupled with incentives and/or other long term pathways to adoption.

Commercial Electrification (New Buildings)

Broomfield will explore new building codes that would require all new commercial construction projects to be fully electrified. Key components include working with stakeholders such as utilities, contractors, developers and other building professionals to identify strategies, best practices and target dates. These steps can be coupled with incentives and/or other long term pathways to adoption.

Transportation

The transportation sector includes the movement of people and goods by car, truck, train, ship, airplane, and other methods of transit. The majority of GHG emissions from transportation are [CO₂](#) emissions resulting from combustion of petroleum-based products in internal combustion engines (ICE). The largest sources of transportation-related GHG emissions include passenger cars, medium- to heavy-transport trucks and light-duty vehicles, including sport utility vehicles, pickup trucks, and minivans. The EPA has indicated [these sources](#) account for over half of the emissions from the transportation sector. The remainder of GHG emissions come from other modes of transportation, including commercial aircrafts, ships, boats, and trains.



Current US GHG transportation emissions are [29%](#) of the overall GHG emissions in the prevailing atmosphere (Figure 36). Reducing transportation emissions regionally will effectively contribute to national goals and efforts towards establishing long term air quality improvement. Regional transportation planning can play a role in reducing air quality impacts, including strategies such as Transportation Demand Management (TDM), which encourages employers to create new incentives and initiatives to reduce employee commuter traffic.

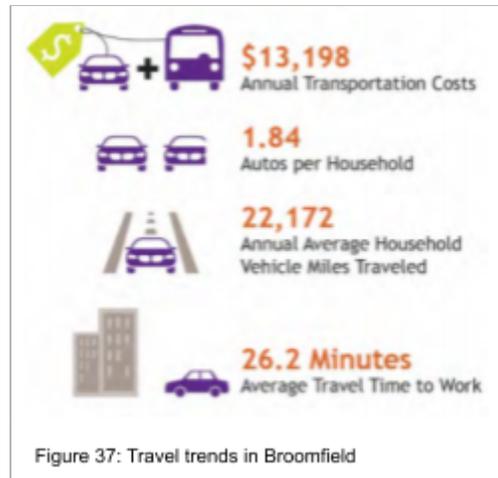
Wherever possible, Broomfield seeks to align with the [DRCOG \(Denver Regional Council of Governments\) Metro Vision Performance Metrics](#):



- 20% housing near high frequency or rapid transit
- 25% housing in urban centers (currently along Highway 36 and I-25/CO-7) as defined by DRCOG
- 45% employment near high frequency or rapid transit
- 50% employment in urban centers
- 35% of commuters use travel mode other than SOV
- 10% decrease in vehicle miles traveled per capita per day per the baseline of 2010

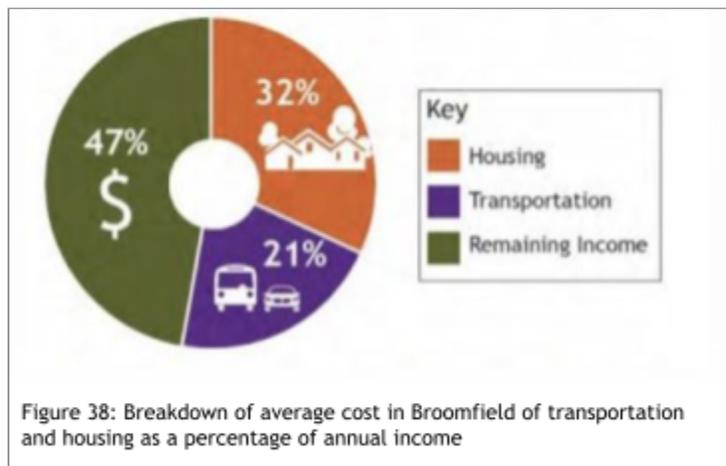
[Colorado’s GHG Pollution Reduction Roadmap](#) cites transportation as being the largest source of pollution. It calls for 2050 goals of 100% of all cars electrified and 100% market share for vehicle sales of Zero Emission Vehicle (ZEV) trucks and buses. These goals will be accomplished through investments, innovation, standards, policies, and partnerships.

In CCOB, transportation represents [42% of GHG emissions](#). This is expected to increase as the county reaches its projected [26% growth rate by 2027](#). Adopting multimodal transportation options and universal EV penetration can help mitigate these impacts. The number of companies establishing regional operations in Broomfield are also expected to increase, which will be an added contributor to local growth and commuters.



According to Broomfield [demographics](#), the average resident in Broomfield commutes [26.2 minutes](#) for work one way (Figure 37), while 1.43% of Broomfield residents commute in excess of 90 minutes, these commutes are called super commutes. In addition, in 2019, 75.1% of Broomfield residents drove alone to work, 10.6% worked at home, 6.93% carpoolled to work, and 4% took transit. According to the [2017 GHG inventory](#), SOVs contributed approximately 38% of the 1.2 metric tons of CO2 emitted within Broomfield. ICE SOVs emit multiple pollutants that contribute to the designation of an ozone nonattainment area.

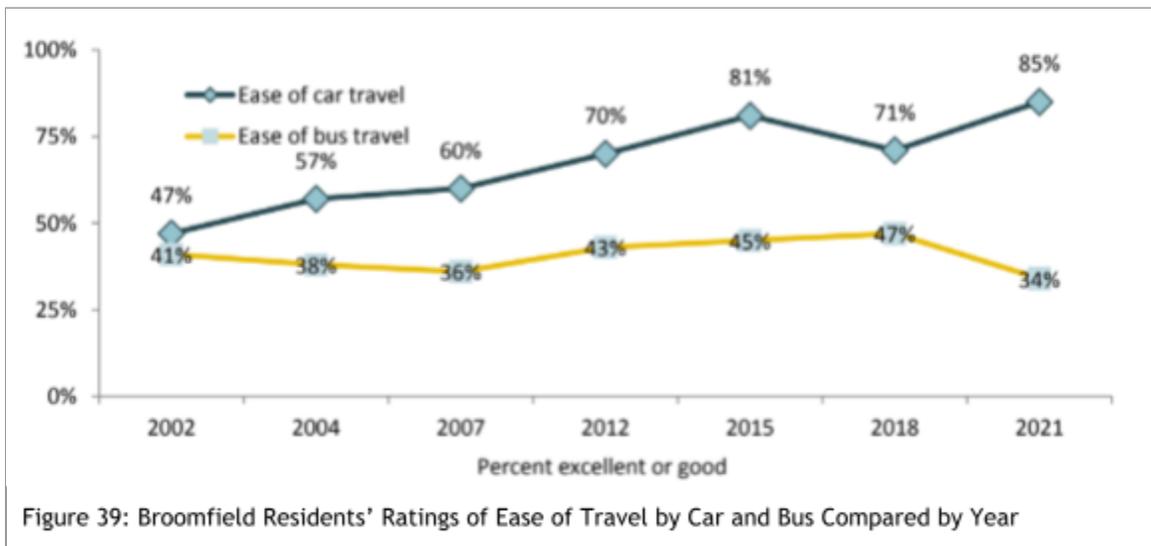
The Denver Metropolitan/Northern Front Range area was designated in 2019 as a serious [ozone nonattainment area](#), where the quality of air does not meet EPA air quality standards. When high in the atmosphere, ozone protects us from harmful radiation from the sun. Lower in the atmosphere, ozone is formed when sunlight mixes with pollutants emitted by ICE, oil and gas production, and other industrial processes. High levels of ground-level ozone can cause [health](#)



[concerns](#) for sensitive individuals, particularly the elderly, young children, and those with asthma or other respiratory problems.

According to the US Census Bureau, Broomfield’s population under the federal poverty line is [4.1%](#) and Broomfield residents spend approximately [21%](#) of their income toward transportation (Figure 38). Given the high impact on monthly costs due to usage and maintenance of an ICE SOV, many residents throughout the community can not afford or access transportation.

Communities with strong public transportation and universal adoption of EVs can reduce the nation’s carbon emissions by [37 million metric tons per year](#). The 2021 [CCOB Community Survey](#) (Figure 39) demonstrated that - in the transportation category - “[benchmark comparisons against other communities in the nation and the Front Range were generally higher or much higher for Broomfield, except for ease of travel by bus, which was lower.” Making alternative transportation options available can increase access to transportation to a broader population and provide economic benefits as well as the environmental benefits.



Implementation of both EV [adoption](#) and [multimodal transportation](#) are crucial in reducing GHGs within the transportation sector. Multimodality addresses the many ways public transportation users get to and from a public transportation stop or center to access a public transportation service, or just get directly to their destination without also needing public transit. EVs are powered by electricity stored in a battery rather than gas. Though the exact amount of

emissions from EVs is dependent on how the electricity used to power them is generated, EVs generally produce less emissions compared to traditional gas-powered vehicles.

Published in 2016, the [Comprehensive Transportation Plan](#) outlines Broomfield’s transportation vision and goals. By providing a well connected and well maintained multimodal and street infrastructure system, Broomfield strives to accommodate all modes of transportation including but not limited to: pedestrians, bicycles, automobiles, and buses. With prioritized equity and accessibility in mind, the transportation plan will support economic vitality, reduce dependence on ICE SOVs, and minimize environmental impacts.

Electric Vehicles

EVs do not require gasoline as their primary source of fuel and therefore do not directly emit GHGs. While the majority of the electrical grid remains run by fossil fuels, EVs offer a cleaner form of transportation even when charged by legacy technologies.

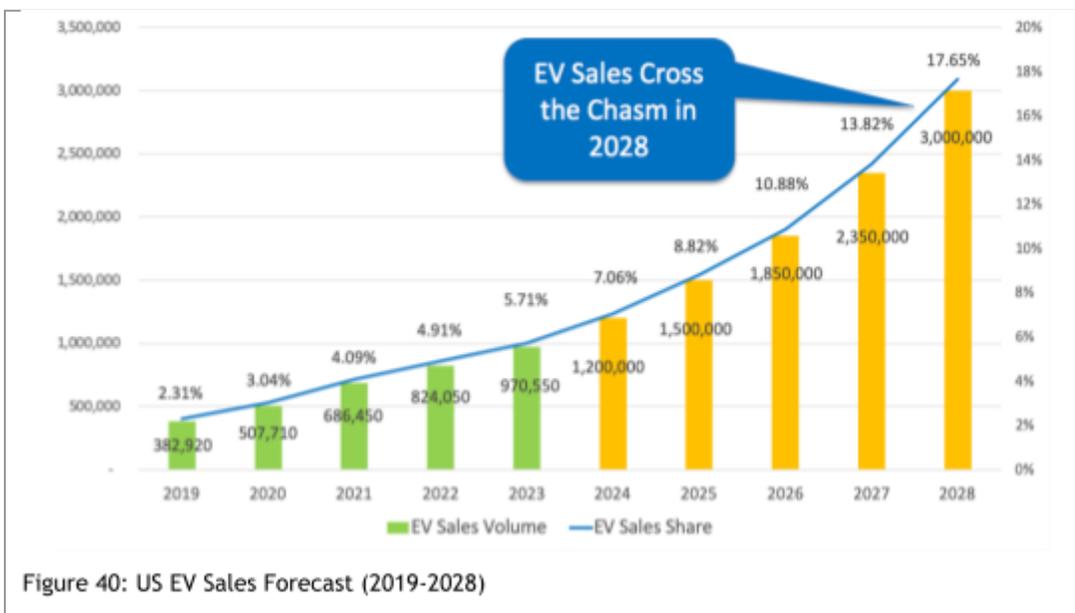
Current Broomfield demographics and traffic patterns highlight the need to switch from ICE vehicles to EVs to reduce GHGs. Broomfield has the opportunity to lower carbon emissions and ozone dramatically by increasing EV adoption and infrastructure.

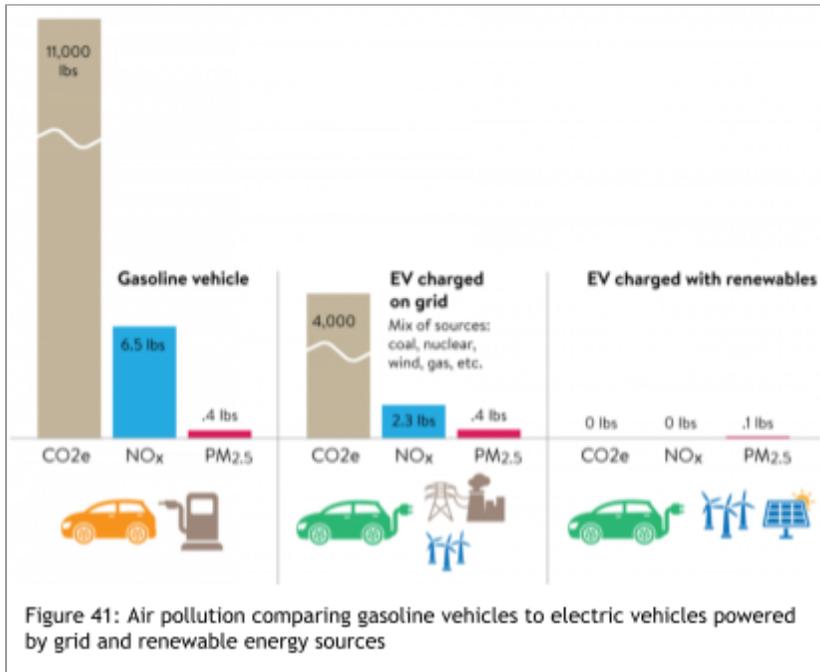
Challenges and Opportunities

A recent EV market research study showed that:

- 67% of respondents expressed concerns about running out of charge before reaching their destination
 - even though 80% of people drive their primary vehicle 30 miles or less per day and most EVs can travel more than 100 miles on a charge
 - and many can travel in excess of 200 or 300 miles.
- 54% of respondents did not know that one can charge an EV at home by plugging into a standard three-prong wall outlet.
- 29% of non-EV owners stated they plan to purchase an EV in the next 3 years and 34% noted plans to purchase within 4 to 10 years.

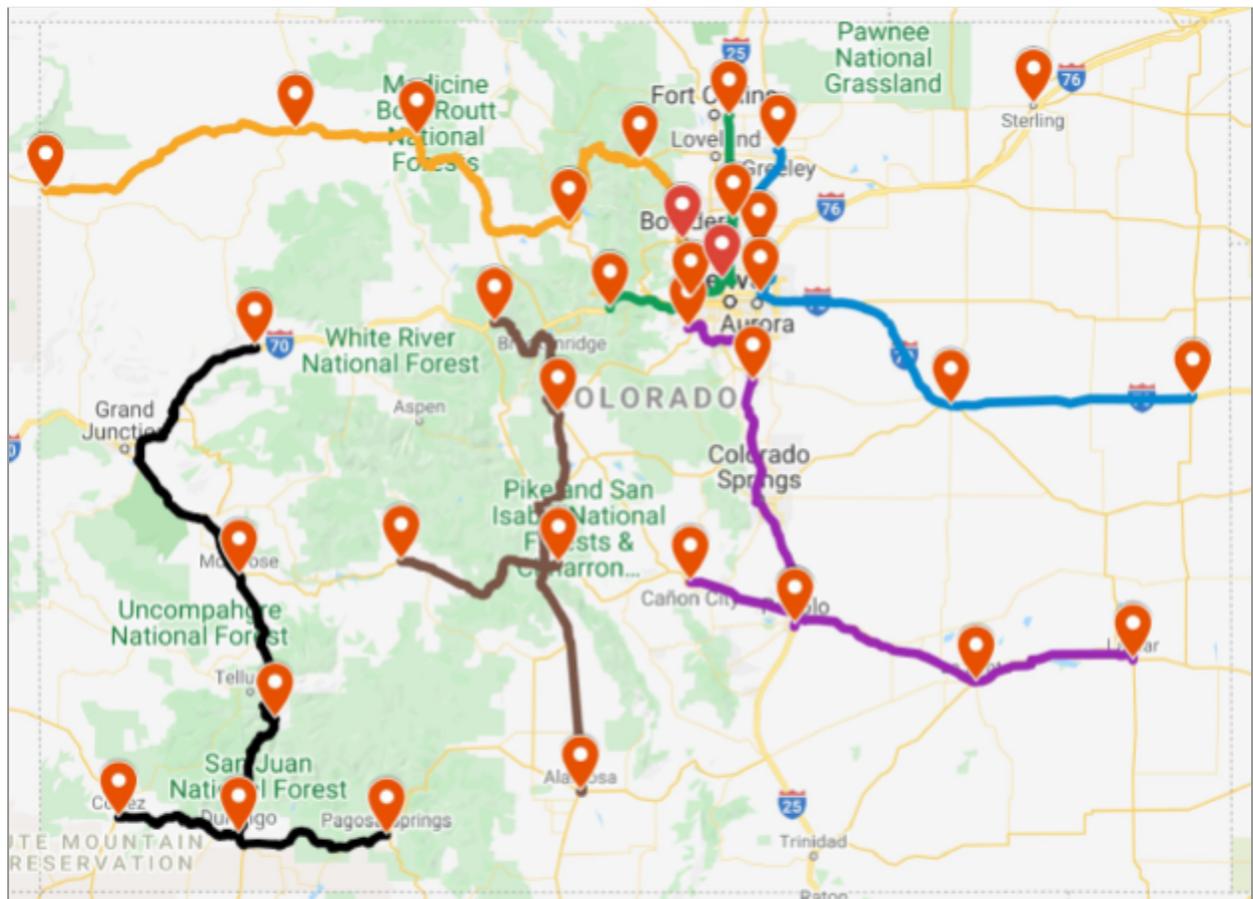
(Source: <https://energyoffice.colorado.gov/press-releases/colorado-releases-electric-vehicle-education-and-awareness-roadmap>)





In the United States, sales of EVs have been growing and are projected to increase close to 18% by 2028 (Figure 40). EVs are predicted to be the future of the transportation system, with at least 70% of car sales expected to be EVs by 2040. The Federal Administration has also set the goal of having 500,000 new EV charging stations built by 2030. The state of Colorado has also announced a goal of having 940,000 EVs on the road by 2030.

Colorado ranks among the top three US states for EV



[adoption rates](#). States with EV incentives often represent the highest rate of adoption. Several of these incentives take the form of EV tax credits that are provided by the [state](#) and [federal](#) government, as well as by local utility providers. This makes the cost more accessible to car buyers, as the [average initial cost](#) of an EV is higher than an ICE vehicle.

The GHG saving potential of EVs is laid out in the ([Figure 41](#)). While prices may be higher initially, individuals can save up to [\\$4,600](#) in maintenance costs over the life of the vehicle, in addition to average [\\$800-\\$1000](#) annual fuel savings. There are numerous EV models available for multiple price ranges within the US. And as EV demand and availability increases, the price for an EV will drop further, making EVs more accessible to a broader spectrum of consumers. In addition, now that the EV market is starting to accelerate, used models of EVs are starting to become available, creating more accessibility to those who can not afford a new EV. However, access to charging stations remains a barrier that needs to be addressed.

A map from [Colorado's 2020 EV Plan](#) shows the current charging infrastructure that is currently in place throughout the state, demonstrating the need for a far more comprehensive and interconnected system in order to achieve greater EV market penetration ([Figure 42](#)).

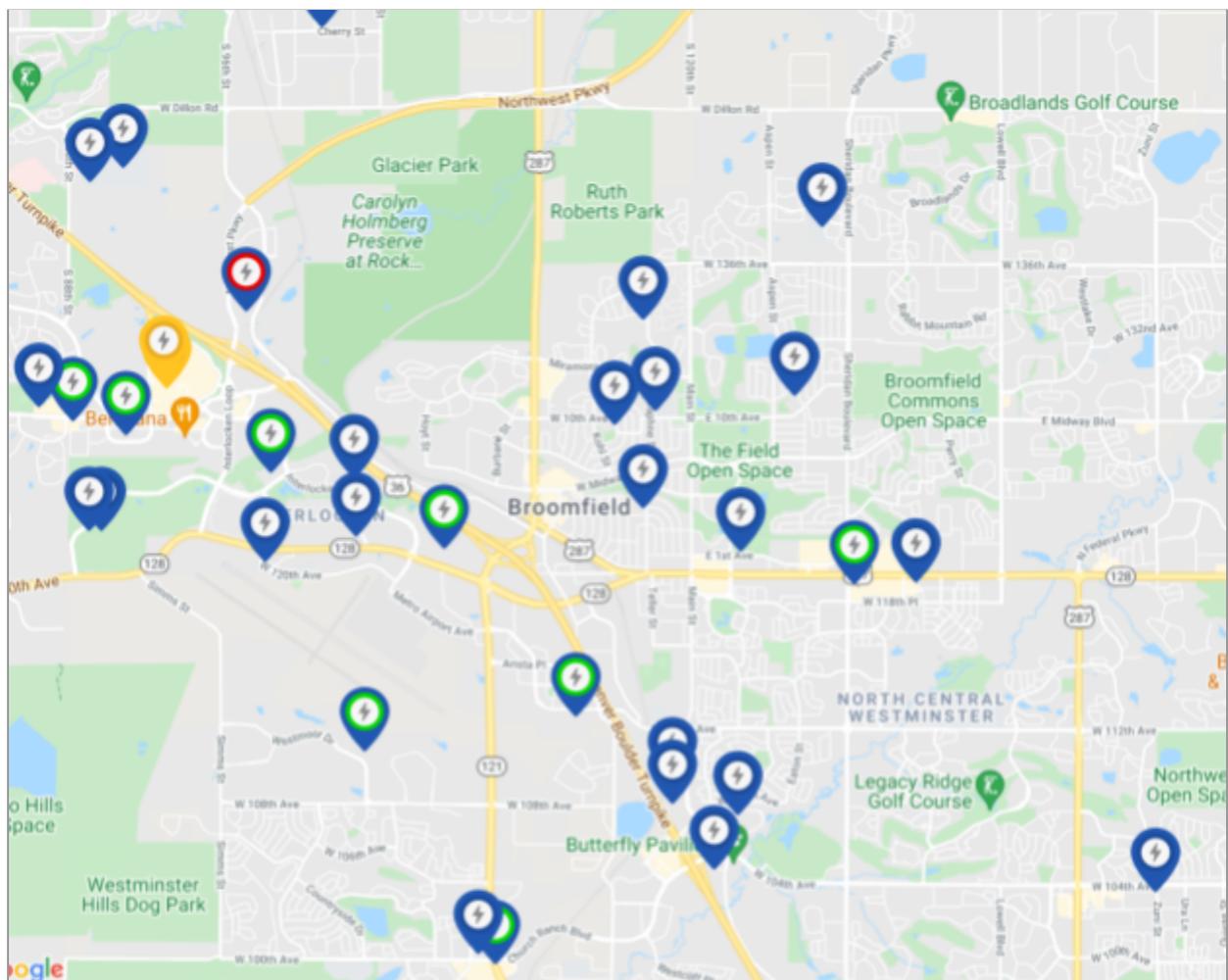


Figure 43: Map showing EV chargers in the Broomfield area

CCOB is well positioned for implementation of an expanded EV charging infrastructure. Broomfield has been designated a key link in the statewide EV network due to its prime location between Boulder and Denver along the US 36 corridor and between Denver and Fort Collins along the I-25 corridor. Broomfield’s current charging infrastructure (mapped by ChargeHub) shows the growth potential in the local community to accommodate accelerated EV adoption ([Figure 43](#)).

“Broomfield needs more charging stations at all city facilities”
- *Broomfield Resident*

This is a historic moment in the technology of cars that places individuals and specifically Broomfield residents at the forefront to take advantage of regulatory and industry advances to widen access to EVs.

CASE STUDY: City of Madison, Wisconsin’s Fleet Electrification

“Transportation causes a majority of harmful emissions with both global GHG and also local air quality effects. However, by transforming the way we conduct transportation, we can attack emissions every day and help solve the problem before it is too late.” Those are the words of Mahanth Joishy, Fleet superintendent of Madison, WI, who left New York City Fleet and came to Madison in 2017, when there were no EVs in the fleet. Four years later, Madison has electrified 4% of their fleet with over 60 EVs.

Madison is also switching from regular diesel to [biodiesel](#) for medium and heavy duty equipment, which helped the city realize 90% of their emissions reductions of nearly 3,000 tons of CO2 eliminated since 2018.

Biodiesel, soy tires, HEVs, and EVs are all part of the Madison Fleet, and they’ve also [partnered with local farmers](#) to create biodiesel for their fleet. Their biodiesel is made from soybean plants, waste cooking oil, and agricultural waste. In addition, Madison has placed 650 soybean oil based tires into their fleet. The soybean tires are less fossil fuel intensive, perform better, and last longer than normal tires, and they are available for purchase to anyone!



Another win for Madison is their [solar powered auto garage](#). Madison created their auto garage based on the principle that regardless of whether or not the fleet is electrified, if the EV is still being plugged into a grid significantly powered by fossil fuels, then emissions are still being released (albeit less). Madison is the first and only municipality in

North America to operate an [electric fire truck](#), made by a local Wisconsin company, Pierce.

While Madison was searching for solutions to transportation problems, they used monetary savings as one of the proponents for electrifying their fleet. This includes converting the police department fleet to Teslas. By switching to high speed and instant torque Teslas beginning this year, Madison expects to save copious amounts of money on reduced fuel and maintenance costs for detective vehicles. Lastly, Madison used funding from the local power utility Madison Gas & Electric to purchase charging stations.

Madison has received several benefits from their fleet emissions reduction projects including [monetary savings from fuel](#) and maintenance costs, and demonstrating municipal leadership as the community moves towards greater EV adoption.

Multimodality

In the Denver Metropolitan / Northern Front Range area, traffic congestion and crowded roads have increasingly become the norm (though the COVID pandemic has recently [shifted travel patterns, commutes and freight movement](#)). The ICE SOVs clogging the interstates and highways are also a major contributor to the region's overall GHGs. In Broomfield, transportation-related air pollution is expected to increase as the county reaches its projected [3.1% annual growth rate by 2027](#). In addition to this population growth, the number of Broomfield businesses is also expected to grow, thereby adding more daily commuters.

Today, 86% of Broomfield residents travel outside of the area for work, while 88% of Broomfield-based employees travel into the city/county ([Figure 44](#)). To alleviate these challenges, one solution employed by many regions is the development of a robust multimodal transportation system.

In addition to GHG generated through commuting. GHG is also generated by short, local trips. [DRCOG data](#) indicates that in the Denver region 43% of all trips

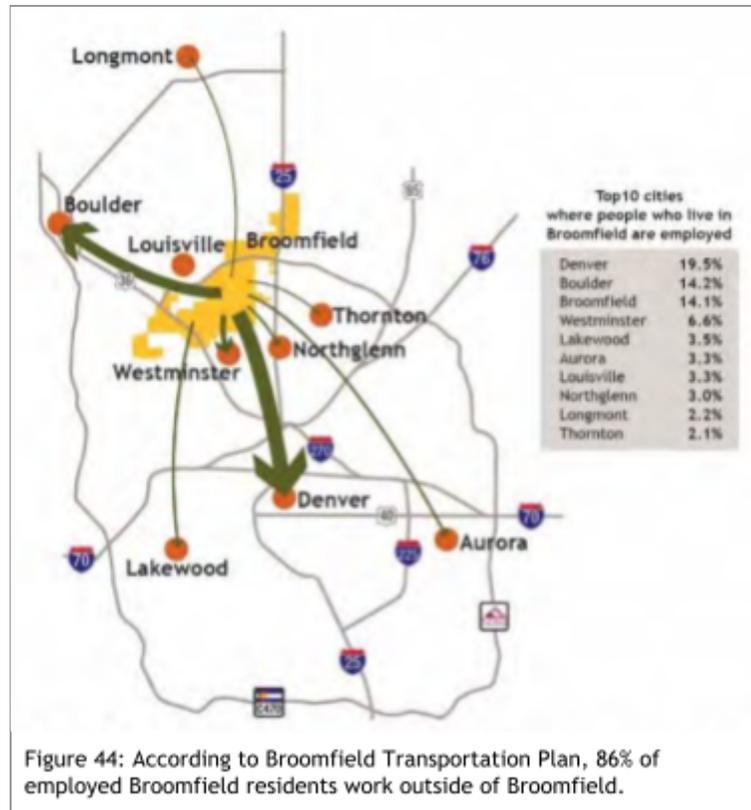


Figure 44: According to Broomfield Transportation Plan, 86% of employed Broomfield residents work outside of Broomfield.

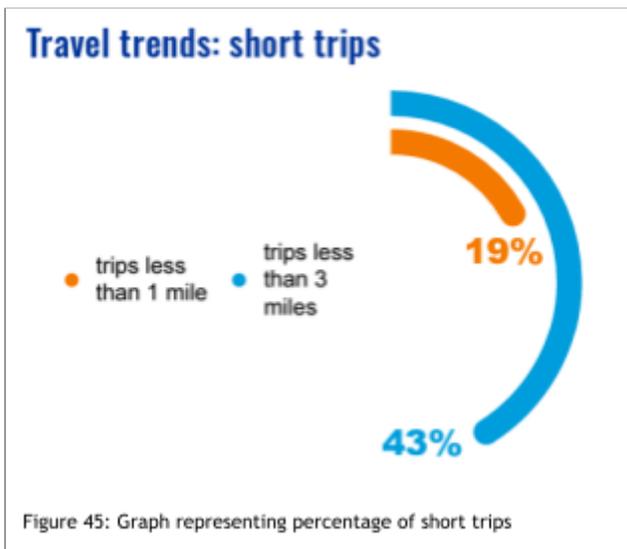
"Can the city consider adding more pedestrian/bicycle underpasses?"
- Broomfield Resident



are less than three miles and 19% of trips are less than one mile (Figure 45). Well-connected, high-comfort regional active transportation corridors, pedestrian focus areas, short-trip opportunity zones, and local active transportation networks work together to create the conditions necessary to make bicycling and walking viable for everyday trips and reduce unnecessary SOV trips.

Multimodality describes the multiple ways community members can get to work, school, recreation, shopping, and other destinations. These methods include walking, biking, riding feeder public transportation systems (i.e., utilizing bus transport to connect with commuter rail), and other options other than the one-person-one-car model.

Throughout the state of Colorado, municipalities are working on incorporating traditional public transportation with newer innovative technology such as car sharing, electric bikes, bike sharing programs, and micro mobility, all in the interest of reducing VMTs and GHGs. In Broomfield, residents can currently take advantage of multimodal networks through the Regional Transportation District (RTD), Easy Ride (senior and individuals with disabilities transport program), and over [244 miles of existing bicycle paths](#).



The [US 36 First and Final Mile Study](#) (“first and final mile” refers to the connective mobility modes to get to a destination) recommends micro-mobility as a strategy, encompassing e-bikes, scooters, bicycles and motorcycles. CCOB continues to invest in multimodal transportation as a way to connect the community in a way that safely and efficiently accommodates the diverse needs of local citizens.

CASE STUDY: Fort Collins e-bikes and e-scooters

Since 2007, Fort Collins has been identified as an [ozone nonattainment area](#) by the EPA. SOVs emit [25%](#) of the city’s GHG emissions, and contribute other air pollutants like NO_x, SO₂, and particulate matter. The City of Fort Collins responded to these sustainability challenges with the publication of the [Climate Action Plan](#) in 2015 and the Sustainable Transportation strategy in 2020 ([FC Moves](#)). FC

Moves prioritizes a range of active transportation modes, including public transportation, cycling, walking, EVs, and micro mobility options.

The newest component of this strategy is [Spin](#), a micro mobility program consisting of 200 e-bikes and nearly 1000 e-scooters, which launched in the summer of 2021 in partnership with Colorado State University. The program covers the entire Fort Collins area and includes geofencing technology that restricts utilization of scooters in areas deemed unsafe, i.e. major roadways, and outside the city limits.

The program is designed to reduce the use of SOVs, increase active transportation utilization, and reduce GHGs. "The ultimate goal is to [replace car trips with scooter and bike trips](#)," according to Amanda Mansfield, Fort Collins' Transportation Planner.

Riders can access the e-bikes or e-scooters through a user-friendly app, where they can search for nearby devices, unlock the device (\$1 per use), and pay to ride (30 ¢ per minute). There's also a subsidized option for low-income residents and qualifying CSU students, and there are plans to provide accessible options such as e-trikes and recumbent e-trikes for residents with disabilities.

Anyone wanting to get from point A to B in something other than a SOV now has an affordable, climate-friendly option for exploring Fort Collins!





Recommended Transportation Policies and Programs

Having walked through the “Why” of sustainability actions earlier in the document, and having explained the broad strokes of “What” Transportation solutions to implement, this section delves further into “Which” of those paths to pursue. The “How” is discussed in greater detail in the Impact Analyses (see Index).

ClearPath Calculations / Transportation Investments

Utilizing the ClearPath calculations, the team mapped out the transportation policies and programs in order to meet target GHG reductions on page 72, which encompass EV and multimodality strategies.

Estimated cost projections for the transportation programs are incorporated into the chart. Initial budgets and staffing projections are subject to funding availability (including grants and other incentives), further stakeholder engagement, leveraging of partnerships, and advances in technology, and may change. Some measures are already included as existing Broomfield budget priorities, as part of a capital improvement plan or other departmental project.

The time frames are broken down into three phases, representing a slow but diligent pathway towards the goals:

1. FOUNDATIONAL (2022-2023) - near-term wins that leverage existing resources
2. TRANSFORMATIONAL (2024-2025) - heavier lifts with a longer planning timeline
3. ASPIRATIONAL (2026 - 2050) - interventions requiring deeper stakeholder engagement and/or technological advances

Individual proposals will undergo further calculations, identification of resources, and input from appropriate departments before being brought to the City Council. Final proposal figures may vary from impact analysis estimates, depending on program details, scoping, council approval, subcontractors, etc. (See page 55 for the icon key.)

PROPOSED TRANSPORT. ACTIONS	STRATEGY	IMPLEMENTATION TIMEFRAME
Phase 1: Foundational (launch = 2022 - 2023)		
ELECTRIC VEHICLES	2030 - EV education & outreach + charging network	
	Fleet Electrification	
MULTIMODALITY	Clean Commute: Employer TDM Program	
	Livable Streets	
	Promotion of RTD Ecopass	
	Clean Commute: CCOB Employee TDM Program	
	Expansion of Bikeway Network	
Phase 2: Transformational (launch = 2024 - 2025)		
ELECTRIC VEHICLES	EV-Readiness Codes for New Construction	
MULTIMODALITY	RTD Incentives & Initiatives for Low Income Residents	
	Expand Mobility as a Service & Mobility on Demand	
	E-Bike Sharing Micro Mobility Program	
Phase 3: Aspirational (2026 launch → 2050)		
ELECTRIC VEHICLES	2050 - EV education & outreach & charging network	
	EV Carshare	

Transportation Details

Details on the recommended transportation policies and programs are outlined below:

EV Education & Outreach + Charging Network

CCOB will launch a public engagement and education campaign designed to support increased EV adoption (in line with state goals). This campaign will include public outreach events, educational sessions, website resource guides, partnership developments, and other strategies aimed at increasing EV adoption and ownership within CCOB. This campaign will include alignment with local dealerships, CDOT, DOE, Drive Clean Colorado, and other local partners to increase EV adoption, and will be coupled with a community-wide strategy to increase EV charging infrastructure. CCOB will engage with underserved populations to reduce barriers such as cost, access, education, and charging infrastructure. The first phase of this transition will go through 2030, after which technology advances and more beneficial financial models are expected to accelerate EV adoption through 2050.

Fleet Electrification

CCOB plans to gradually replace its fleet vehicles with EVs. Public Works has developed an initial 5 year plan showing vehicle replacement through 2026 based on these criteria. Factors included are proposed price and replacement time. Within that plan, staff has also identified proposed municipal charging sites to charge fleet EVs. Fleet vehicles have criteria for replacement, and when vehicles are up for replacement, they will be considered against those criteria, also taking into account GHG reduction potential in replacement.

EV Readiness Codes for New Construction

Investigate developing EV Readiness code for new construction (built with the capability to charge EVs), and implement those that are feasible & reasonable for Broomfield, (depending on stakeholder input), which *may* include:

- A review of best practices for new commercial and residential properties to install EV infrastructure in a percentage of parking spaces, depending on the density of parking spaces of the development.
- Consider new commercial properties with two or more parking spaces including a minimum number of EV ready spaces. The International Energy Code Council (IECC) defines an EV ready space as one that is ready to support a Level II charger.
- Consider new commercial developments with a certain number of parking spaces to make a minimum percentage of all spaces “EV capable,” which is defined as having electrical panel capacity and space to support a branch circuit to each parking space.
- Consider requiring a minimum percentage of parking spaces to be EV-Ready for new multifamily residential buildings with 3 or more units.
- Consider new one- and two-family dwellings to include at least one EV-Ready space per unit.

EV Carshare

Car sharing is a type of short-term car rental or subscription service where users pay based on usage, resulting in access to vehicles without the steep cost of car ownership, with the added

benefits of reducing vehicle distance traveled, improving urban land use and development, and reducing GHG emissions. Broomfield can explore partnership models with a variety of alternative future car ownership models, i.e., co-ownership, autonomous vehicles, etc. Carsharing primarily serves residents in need of transportation for short trips, as an extension of the transportation network, and as an enhancement of mobility options, complementing transit and active mode trips. These programs would provide EV car share opportunities to local residents, with an equity focus, including subsidies for low-income residents and siting EVs in proximity to low-income multi-family housing.

Multimodal strategies can be divided into the following categories:

Commuter Oriented	Programmatic	Infrastructure
Clean Commute: Employer Transportation Demand Management	Expand Mobility as a Service (MaaS) and Mobility on Demand (MoD)	Livable Streets
Clean Commute: CCOB Employee TDM Program	RTD Incentives & Initiatives For Low Income Residents	Expansion of Bikeway Network
Promotion of RTD Ecopass	E-Bike Sharing Micro Mobility Program	

Clean Commute: Employer Transportation Demand Management

A Clean Commute Program / ETRP (Employee Traffic Reduction Program) is a Transportation Demand Management (TDM) strategy targeting work commutes, encouraging employers to create new incentives and initiatives to reduce employee commuter traffic. Clean Commute promotes transportation alternatives to provide travel choices and mobility for people of all ages, abilities, and incomes. A TDM program encourages and incentivizes reduction in single-occupant vehicle trips, peak hour trips, and VMT by employees who commute to and from a worksite through measures such as telework, flexible work schedules, public transit, ridesharing (carpool and vanpool), employee shuttles, bicycling, walking, and/or other methods that meet employers' specific capabilities and business needs. Clean Commute can be advanced as a voluntary action (though if the bill passes there would also be a tax credit incentive available). CCOB should encourage employers with 100 or more employees at a single worksite to work with local supporting Transportation Demand Management Organizations (TMOs) to develop and implement a Clean Commute Program, with the goal of reducing the number of SOV trips to and from the worksite.

Clean Commute: CCOB Employee TDM Program

Broomfield can be a leader in TDM and pilot programs to help other employers also implement a Clean Commute Program. Clean Commute promotes transportation alternatives to provide travel choices and mobility for people of all ages, abilities, and incomes. A TDM program encourages and incentivizes reduction in single-occupant vehicle trips, peak hour trips, and VMT by employees who commute to and from a worksite through measures such as telework, flexible work schedules, public transit, ridesharing (carpool and vanpool), employee shuttles, bicycling, walking, and/or other methods that meet employers' specific capabilities and

business needs.

Promotion of RTD Ecopass

The RTD Ecopass is an employer- or neighborhood- sponsored pass that provides enrolled employees and communities unlimited rides on RTD buses and trains. Through the use of the Ecopass, employees and residents gain access to regional public transportation at cheaper rates. By taking advantage of the RTD Ecopass program, employers will get a discount depending on how many employees are at a work site. The Ecopass program is also available to neighborhoods and communities, giving residents the opportunity to afford public transit services at a lower rate than an individual or family pass. Broomfield may invest in developing programs and partnerships to promote utilization of Ecopass within the business community and in neighborhood networks.

Expand Mobility as a Service (MaaS) and Mobility on Demand (MoD)

Maas and MoD services can include third party managed programs or RTD programs, including Flexride. Flexride is RTD's shared-ride bus service, available for anyone to connect to other RTD regional bus and train stations. Riders can also use Flexride to get direct access to schools, businesses, or other amenities within the service area. Expanding RTD Flexride geographically (currently, only part of Broomfield has access to Flexride), hours, and operational capacity will enhance accessibility and provide more transportation options for Broomfield residents throughout the county, as well as reduction of ICE SOV reliance.

RTD Incentives & Initiatives For Low Income Residents

Broomfield can work with employers, housing, regional and nonprofit partners to increase utilization of, expand availability and raise awareness of existing programs such as the RTD LiVe program (which provides extra discounts for low income riders). Broomfield may also consider providing additional incentives such as free or discounted bus, rail, or transit passes, reimbursements, or subsidized financial costs for transportation modes other than ICE SOVs. Combining incentives with improved transit services and higher density development can increase public transit use and reduce automobile use.

E-Bike Sharing Micro Mobility Program

Bike sharing systems are a form of micro mobility that are often self-serve, station-based or dockless, with memberships or usage-based pricing structures. One benefit of the system is to help close the gap between the first and final mile while commuting, which can include the multiple modes of transportation that get a user to and from public transportation. Bike sharing can also provide another option of mobility during the work day at a work site or offer options to residents in higher-density neighborhoods and for visitors at hotels. A bike share fleet with electric-assist bicycles (e-bikes) can further expand usage and accessibility. Shared use micro-mobility could also include e-scooters or other forms of personal mobility devices. Working with regional partners and neighboring communities, Broomfield can examine the feasibility and potential usage rates of a shared use micro-mobility system in the community, with a focus on improving access to first and final mile commute needs and supporting underserved and low income areas, with the potential for incentives or discounts for qualifying residents.

Livable Streets

Livable streets, also referred to as “[complete streets](#)”, help create safe and accessible communities especially for the most vulnerable populations, people who have experienced systemic underinvestment, or whose needs have not been met through older transportation approaches. This includes children, people with disabilities, older adults and people who do not have access to a single family vehicle. Livable streets improve equity, safety and public health while reducing transportation costs and congestion. A livable street consists of safe bikeways, walkable sidewalks, and car lanes. By further expanding livable streets throughout Broomfield, CCOB will prioritize safer, slower speeds for those who use streets over high speeds for motor vehicles.

Expansion of Bikeway Network

Expanding and improving bicycle infrastructure ensures that a network is in place to make bicycling a viable mode of travel to, from, and within Broomfield. This implies that the infrastructure is more accessible to all ages and abilities. This type of bicycle infrastructure prioritizes safety, access, and equity, thereby enhancing enjoyment, health, mobility, and opportunities for all residents to use the bicycle for utilitarian trips. This replaces vehicular trips and increases health and enjoyment in the community.

Looking Ahead

In the current environment, with sustainability strategies accelerating at the local, state, federal and international level, Broomfield is well positioned to chart its path towards a sustainable future. The climate crisis demands bold action from individuals, communities, corporations, and government entities. Now is the time to rise to the task, and invest in a multi-decade vision that will lead to environmental, social, equity, health, resilience and workforce benefits for all residents.

The coming years will bring with them challenging conversations about how to prioritize sustainability initiatives amidst so many other key municipal services, but local governments are increasingly identifying partners, stakeholders, best practices, funding and data that can help them reach their goals. Broomfield is well on its way.



Appendices



Acronyms / Definitions

- ACES - Advisory Committee on Environmental Sustainability
- AQI - Air Quality Index
- Btu - British Thermal Unit
- CCOB - City and County of Broomfield
- CDPHE - Colorado Department of Public Health and Environment
- CEO - Colorado Energy Office
- CO₂ - Carbon Dioxide
- DEAI - Diversity Equity, Access & Inclusion
- DOE - Department of Energy
- DRCOG - Denver Regional Council of Government
- EPA - Environmental Protection Agency
- EPC - Energy Performance Contract
- ETRP - Employee Trip Reduction Program
- EV - Electric Vehicles
- GHG - Greenhouse Gas
- ICE - Internal Combustion Engines
- LED - Light Emitting Diode
- MF - Multi Family
- MW - MegaWatts
- PIE - Partners in Energy
- REC - Renewable Energy Credit
- RMI - Rocky Mountain Institute
- RTD - Regional Transportation Department
- SOV - Single Occupancy Vehicles
- TDM - Transportation Demand Management
- VOC - Volatile Organic Compounds
- VMTs - Vehicle Miles Traveled
- ZEV - Zero Emission Vehicle

Links to Impact Analyses

(to be added)

ENERGY	ENERGY EFFICIENCY	Increased Code Compliance
		School curriculum/clubs Energy Efficiency
		Single Family Residential Energy Efficiency
		City Staff Sustainability Education
		Commercial Building Benchmarking 50k+ sq. ft.
		Multifamily Energy Efficiency
		Green Lease Education
		Municipal Green Building Operations & Maintenance Training
		Public School Energy Efficiency (electricity)
		Public school Energy Efficiency (natural gas)
		Commercial Building Energy Efficiency
		Commercial Green Building Training Events
	LED Streetlights	
	RENEWABLE ENERGY	Commercial Renewable Subscriptions
		Residential Renewable Subscriptions
Rooftop Solar (Residential)		
Rooftop Solar (Commercial)		
Municipal Solar		
ELECTRIFICATION	Residential New Construction Electrification	
	Existing Commercial Fuel Switching	
	Existing Residential Fuel Switching	
	Commercial New Construction Electrification Requirements	
		Heat Pumps Municipal Buildings
TRANSPORTATION	ELECTRIC VEHICLES	2050- EV education & outreach, natural EV adoption, and EV charging network
		2030- EV education & outreach, natural EV adoption and EV charging network
		EV- Readiness code
		EV carshare
		fleet electrification
	MULTIMODALITY	Employee Trip Reduction Program (TDM)
		livable streets
		Transportation Demand Management Program CCOB employees
		Expand RTD Flexride and service areas
		Incentives and Initiatives for low income resident on RTD
		Promotion of Ecopass
		E-bikes
		Expansion of Bike Lanes

