

# DENVER

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## 80 x 50 Climate Action Plan

July 2018





# LETTER FROM THE MAYOR

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Dear Neighbors,

Denver has a long history of trailblazing when it comes to climate change. When the city released its 2015 Climate Action Plan, we set a bold new climate goal in line with the recommendations of the scientific community to reduce greenhouse gas emissions by 80 percent by 2050 from a 2005 baseline. The 80x50 Climate Action Plan is the result of almost two years of technical analysis, stakeholder engagement and community outreach.

We engaged experts from leading national, regional and local organizations to help us identify the highest impact strategies that will enable us to realize our goal. The result is an ambitious, but achievable path to 2050. Cities can and must act on climate change. Though cities account for only two percent of land globally, they are responsible for more than seventy percent of carbon emissions.

The tools to solve this generational challenge are available and affordable today. Technologies like wind, solar and battery storage are cost competitive, and market adoption continues to increase exponentially. Denver will focus on the areas of greatest impact, which include the energy used in large buildings, the transportation sector and power generation. By concentrating our efforts, we can get further, faster and witness progress towards our near- and mid-term climate goals.

As you will read in this report, Denver recognizes that aggressive and decisive action is needed to achieve our goal. At the same time, we must ensure equity in access to the benefits of climate action, from reduced utility bills thanks to energy efficiency and new renewable energy programs, to lower operational costs of electric vehicles. Low-income families and other vulnerable communities who historically may have been excluded will be a central part of Denver's climate programs.

Throughout Denver's history, we have experienced pivotal times when it is necessary to shed complacency and raise our voices for progress and prosperity. This is one of those key moments, as we look to preserve our future and contribute to the global requirements of climate action.

Denver is positioned to address the global climate crisis and lead with collaboration and dedication. By tapping into innovation and creativity, we can fulfill our charge to protect our community with a habitable and stable climate.

Respectfully,



**Michael B. Hancock**

Mayor



# LETTER FROM THE EXECUTIVE DIRECTOR

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Greetings Denver,

Climate change is the single biggest issue we face that has negative impacts on both our environment and public health. We see these impacts here in Denver and across the globe. The number of wild fires has increased, ravaging our mountains while degrading air quality from fine particles and ozone precursors that in turn increase the risk of premature death and adverse chronic and acute cardiovascular and respiratory health outcomes. More extreme heat events put vulnerable populations at increased risk, especially here in Denver where we have historically not needed air conditioning.

For this reason, the Denver Department of Public Health & Environment has tracked and reported the city's greenhouse gas emissions -the climate-altering compounds resulting primarily from human-based activity. Informed by that data, and by stakeholder and community input, we have developed an ambitious, yet achievable plan to meet an 80% reduction in those emissions by 2050. We consulted experts from multiple sectors across Denver and the region to help prioritize strategies to leverage the momentum of existing efforts across the energy efficiency, transportation, and electricity generation sectors.

As the largest city within 500 miles, we have an obligation to lead on climate, not only to influence a large area of the mountain west, but also as the agency responsible for protecting the health and environment of Denver. We are proud of our evidence- and data-based approach to mitigation strategies, and humbled by the community response we have received during this process. We look forward to continued collaboration with our partners and the citizens of Denver as we implement the strategies in our plan to protect our environment and public health through the reduction of greenhouse gas emissions.



A handwritten signature in black ink, appearing to read "Bob McDonald". The signature is fluid and cursive.

**Bob McDonald**

Executive Director

Denver Department of Public Health & Environment

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# THE VISION

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Climate change is not only the single greatest public health and environmental threat, it is one of the biggest challenges of our generation. Future generations will judge us on how well we preserved the habitability of our only home — Earth. From local impacts such as worsening air quality and increasing frequency of extreme heat to global impacts like reductions in food supply and sea level rise, the effects will be felt in Denver and around the world.

Cities can bend the curve on carbon because they are responsible for over 70 percent of greenhouse gas (GHG) emissions globally. Denver can implement effective strategies that will help guide our City to a climate safe future in a way that works well for all the businesses and residents of Denver. These strategies will also clean our air and water, make us more resilient, improve our health and preserve quality of life in the city that we love. Our vision is to:

- Make Denver a leader in clean and local energy that comes from the sun, wind, or other innovative renewable technologies.
- Transform Denver buildings into high-performing places to live, work, learn, and play.
- Inspire community action and ensure environmental justice, equity and affordability as Denver transitions to a carbon-free energy system.
- Transform Denver into a community where people walk, bike, take transit, or carpool for most trips in a safe, accessible, and affordable transportation network.
- Guide Denver toward a clean, carbon-free transportation system that improves the health and livability of our communities.
- Make Denver a leader in sustainable, smart transportation through innovative partnerships, policies, programs, and technology.





# INTERIM CARBON REDUCTION GOALS

Denver will aim to meet the following sector specific goals necessary to achieve the 80x50 Climate Goal. These goals were created to ensure there is a clear glide path to 2050 and a strong emphasis on measurable carbon reductions from all key sectors within the scope or influence of local government.

Year	Reduction in GHG Emissions (2005 Baseline)	Buildings	Electricity Supply	Transportation
2020	15% reduction	<ul style="list-style-type: none"> <li>Commercial buildings 10% reduction in energy use</li> </ul>	-	<ul style="list-style-type: none"> <li>200 electric vehicles in the City fleet</li> </ul>
2025	30% reduction	<ul style="list-style-type: none"> <li>Residential single-family homes 10% reduction in energy use</li> </ul>	<ul style="list-style-type: none"> <li>Municipal buildings 100% renewable electricity</li> </ul>	<ul style="list-style-type: none"> <li>15% of Denver vehicle registrations are electric</li> </ul>
2030	45% reduction	<ul style="list-style-type: none"> <li>Commercial buildings 30% reduction in energy use</li> </ul>	<ul style="list-style-type: none"> <li>Community 100% renewable electricity</li> </ul>	<ul style="list-style-type: none"> <li>30% of Denver vehicle registrations are electric</li> <li>Meet Mobility Action Plan goals including:                             <ul style="list-style-type: none"> <li>16% of commuters will use public transit</li> <li>9% of commuters will walk to work</li> <li>8% of commuters will bike to work</li> <li>7.5% of commuters will telecommute</li> </ul> </li> </ul>



Year	Reduction in GHG Emissions (2005 Baseline)	Buildings	Electricity Supply	Transportation
2035	55% reduction	<ul style="list-style-type: none"> <li>Residential single-family homes 20% reduction in energy use</li> <li>New buildings Net Zero Energy</li> </ul>	-	-
2040	65% reduction	<ul style="list-style-type: none"> <li>Reduce thermal heating emissions in residential and commercial buildings 25% and 50%, respectively, through efficiency and fuel switching</li> </ul>	-	-
2045	75% reduction	-	-	-
2050	80% reduction	<ul style="list-style-type: none"> <li>Commercial buildings 50% reduction in energy use</li> </ul>	-	<ul style="list-style-type: none"> <li>100% of light duty vehicles are electric</li> <li>75% of freight trucks will use carbon neutral fuel</li> <li>100% of taxis and transportation network vehicles are electric</li> <li>100% of public transportation will be carbon free</li> </ul>





# HOW WE GET THERE

Leading studies, including a recent analysis released by McKinsey & Company entitled [A strategic approach to climate action in cities—focused acceleration](#), emphasize that cities should focus on a few top priorities to maximize impact. Specifically, the analysis focuses on four areas that match up with Denver’s approach to meet the 80x50 Climate Goal:



optimizing energy efficiency in buildings



decarbonizing the electricity grid



enabling next-generation mobility



improving waste management

Denver is focusing on the top three sectors that will have the largest impact and best opportunities for GHG reductions: buildings, electricity generation, and transportation. Strategies outlined below have proven effective in many other cities. Denver will pursue these strategies and continue to analyze and implement new, innovative practices to ensure we remain on target with our carbon reduction goals.



## Decarbonizing buildings

- Adopt the 2018 International Energy Conservation Code (IECC)
- Participate in IECC code update process to influence the adoption of more aggressive energy codes
- Develop an energy performance program, which would require buildings that are less efficient to make periodic cost-effective, incremental energy improvements
- Develop a stretch code and incentives for new buildings
- Continue to increase building code to net-zero energy for new buildings and to be significantly more stringent for existing buildings by 2035
- Target homes in need of efficiency upgrades and pair with additional strategies like electric vehicles, solar, storage, and fuel switching
- Establish a home energy rating for all single-family buildings so that owners, renters and potential buyers can make informed decisions about a home's efficiency and operating costs
- Set minimum energy efficiency standards for rental properties
- Partner with local and national organizations to facilitate group discounts for energy improvements to maximize program uptake and cost savings

The role of efficiency is strategically important to the feasibility and economics of renewable electricity efforts. Efficiency allows for “right-sized” renewable energy additions, both for distributed and utility scale efforts. Efficiency also is an important means to reduce overall costs for energy, through the absolute reduction of energy consumption. Decarbonizing commercial buildings is one of the best ways to achieve our energy efficiency goals and will play a large role in reducing GHG emissions, propelling Denver toward the goal of a 15 percent reduction of total emissions by 2020 and a 45 percent reduction by 2030.

Denver will continue its [Energize Denver](#) program that focuses on energy efficiency in commercial and multifamily buildings, including the benchmarking requirement. The program requires buildings exceeding 25,000 square feet to annually benchmark their energy use and make that data publicly available. Future programs will require less-efficient buildings to make periodic cost-effective, incremental energy-efficiency improvements.

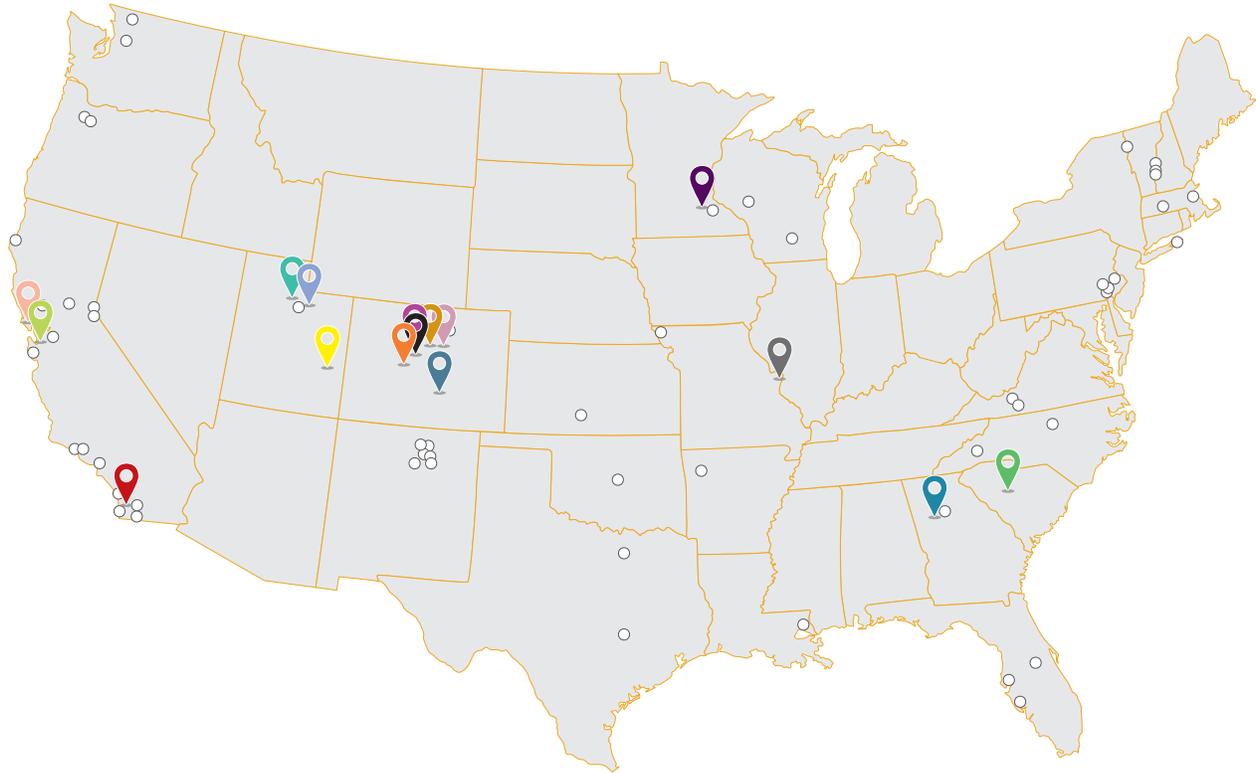
Denver will support stronger building codes by adopting the 2018 IECC to ensure that new construction and major renovation projects are highly efficient. The City will also continually improve codes over time by adopting code updates, creating new policies and incentives like stretch codes, and enforcing them; eventually increasing the code to net-zero for all new buildings. Intermediate strategies also include establishing a green lease program, providing incentives for high-performing, LEED and net-zero buildings, and providing training and outreach to drive investments in energy efficiency and behavioral-based energy efficiency.

These efforts are in line with McKinsey & Company’s recommendations for emissions reductions associated with the commercial building sector. Denver will raise “building standards for new construction, retrofitting building envelopes, upgrading HVAC and water heating technology, and implementing lighting, appliance, and automation improvements.” Since commercial buildings have a lasting presence in communities, ensuring that new buildings and existing buildings achieve high performing building standards is essential to lock in the emissions reductions.

Another important focus of the City is the residential sector. Denver has set a target to decrease energy consumption in single family homes by 10 percent by 2025 and 20 percent by 2035. Denver will provide guidance and develop strategies to drive investments in energy efficiency and behavioral-based changes. Denver will establish minimum energy standards for rental housing and engage property owners to ensure that energy efficiency, renewable energy adoption, and other emissions reduction strategies from fuel switching are implemented cost-effectively for residents. The City will continue to provide resources on existing financing and incentive programs and encourage residents to fully utilize Xcel Energy and Denver programs. The City will explore how sharing a home’s energy score during the home buying and selling process can result in energy and utility bill savings. Additionally, the [Sustainable Neighborhoods certification program](#) gives residents the opportunity to become active partners in making Denver a vibrant and sustainable community, and can help facilitate deeper engagement and actions related to residential energy efficiency.

## Decarbonizing the electricity grid

- Defend and enhance Colorado’s Renewable Portfolio Standard
- Support Xcel Energy’s plans to reduce carbon emissions through the addition of renewable energy projects, energy efficiency and other strategies
- Advocate at the Public Utilities Commission for continued large-scale renewable energy investments
- Increase the capacity and types of customer choice renewable programs available in Denver
- Develop low-income specific customer choice programs, such as 100 percent low-income community solar and other renewable energy programs
- Accelerate smart grid technology through advocacy or programs
- Accelerate the adoption of electricity storage systems, including pumped water, battery, compressed air and other innovation technologies
- Utilize Xcel Energy and Denver’s Energy Future Collaboration Memorandum of Understanding to advance projects and policies that reduce carbon emissions from the electricity grid



A growing number of cities have announced 100 percent renewable electricity goals, over 65 in total, including:

- Aspen, CO 100% by 2015
- Atlanta, GA 100% by 2030
- Boulder, CO 100% by 2030
- Breckenridge, CO 100% by 2035
- Columbia, SC 100% by 2036
- Lafayette, CO 100% by 2030
- Minneapolis, MN 100% by 2030
- Moab, UT 100% by 2032
- Nederland, CO 100% by 2025
- Park City, UT 100% by 2032
- Pueblo, CO 100% by 2035
- Salt Lake City, UT 100% by 2032
- San Diego, CA 100% by 2035
- San Francisco, CA 100% by 2030
- San Jose, CA 100% by 2022
- St. Louis, MO 100% by 2035

In April of 2017, the Denver City Council passed a proclamation “Reaffirming Denver’s Commitment to Planet-Friendly Policies”, which called for joining other cities in pledging to meet 100 percent of our city’s electricity needs through renewable sources by 2030. Denver has now made that pledge and will lead by example to achieve 100 percent renewable electricity for municipal buildings by 2025.

To maximize the potential for impact, Denver will need to assess the ability to rapidly increase the amount of renewable energy, both grid-wide and dedicated specifically to Denver. That is why Denver has embraced the goal of achieving community-wide renewable electricity by 2030. Denver is part of a larger service territory and represents almost 25 percent of the territory load, so we can benefit from renewables on the larger grid while also looking at ways to develop Denver specific renewable capacity. While Denver is calling for 100 percent renewable to meet community-wide electricity demands, there are still important economic and technical considerations for achieving grid-wide renewable penetration above 80 percent. Costs for renewables and battery storage continue to plummet and new technologies may emerge. Carbon capture and sequestration may also play a role in grid decarbonization over time. Denver will continue to work with leading experts to evaluate these opportunities and adjust our plans to react to new innovations in the market.

**“Utilities and regulators must play a central role in ensuring the overall mix of renewables is appropriately balanced at a system level, and that critical components such as energy storage are in place to ensure grid reliability.”**

*A strategic approach to climate action in cities—focused acceleration,*

**McKinsey & Company,**

November 2017

The ability to acquire additional renewable energy will require the partnership of the investor-owned utility, Xcel Energy. To bolster this partnership, Denver and Xcel Energy recently entered into a Memorandum of Understanding called the Energy Future Collaboration. This partnership details respective visions, values, and principles and identifies a framework to achieve our goals. Denver and Xcel Energy are working together to ensure we can accurately track renewable energy towards Denver’s goal. One option being explored is the Certified Grid Mix approach, which has been approved and utilized in other regulatory environments. There is widespread public support in Denver for advancing the renewable electricity goal. Eighty-one percent of survey takers in the community-wide 80x50 survey responded that Denver should set a goal to reach 100 percent renewable electricity. To achieve this target, Denver will act with partners in multiple areas, including pursuing additional renewable energy on new construction, residential rooftops and community solar gardens, and modernizing the grid. Denver will work with Xcel Energy to allow isolated districts and microgrids, increase energy storage, expand renewable choice programs and incentives.

## Decarbonizing transportation

- Advocate that Colorado adopt Clean Car Standards including the Zero Emission Vehicle (ZEV) standard
- Advocate for the ability of electric utilities to rate-base charging infrastructure
- Advocate for elimination of demand charges for DC fast charging
- Expand safe biking and walking infrastructure through direct action by the City or policy
- Increase access and affordability of clean and healthy transportation choices
- Partner with car share companies to provide access to electric vehicles and make subsidized memberships available to low-income people
- Support electric-vehicle workplace charging programs and increase the number of publicly available charging stations
- Create building codes to require charging opportunities at multifamily units and workplaces
- Provide electric-vehicle charging infrastructure in all City buildings
- Support electrification of local and regional delivery trucks and other heavier vehicles
- Fully implement the [Mobility Action Plan](#) to realize all 2030 targets



Denver prioritizes biking, walking and public transit, and values innovative approaches to transportation and mobility. Mobility options other than driving are growing, while electric vehicles are accelerating the market share at a rapid pace. EVs are the only commercially available vehicle that gets cleaner over time as our grid decarbonizes. Denver will create policies, plans, incentives and public awareness campaigns to increase access to charging infrastructure and accelerate market adoption of electric vehicles. The 2030 target is 40 percent of all vehicle registrations in Denver are electric vehicles. In addition to climate benefits, increased mobility options and electric vehicles present the best opportunity to decrease harmful air pollution and avoid non-compliance with health based air quality standards.

## Regulatory and policy drivers

To better plan for needed reductions, Denver analyzed several Business as Usual (BAU) projections that included population growth, changes in energy consumption and vehicle miles travelled, and on the books policies that would impact emissions. The majority of the BAU reductions came from projected increases in efficiencies from the building sector, emissions factor reductions from planned renewable energy projects, and fuel efficiency improvements in new vehicles.

In August of 2017, Xcel Energy filed a Stipulation with the Colorado Public Utilities Commission that detailed their Colorado Energy Plan – “a path to secure long-term and low-cost power for customers, spur economic development opportunities in rural Colorado, and grow the state’s portfolio of wind power, solar power, natural gas and other clean energy sources.” In March 2018, the Colorado Public Utilities Commission granted Xcel Energy the opportunity to present its plan, with the exact timing of implementation and specific amount of renewable energy still to be determined. Denver has worked with Xcel Energy to incorporate potential reductions in emissions per kilowatt-hour through 2026 projections.

On April 2, 2018, the U.S. Environmental Protection Agency (EPA) announced its determination to revise the federal clean car standards that will likely significantly roll back current emission standards for new vehicles beyond 2021. In response, Denver has formally advocated for the state of Colorado to adopt Advanced Clean Car Standards to ensure that these important protections for public health and the environment are implemented even in the absence of strong federal regulations. The Governor has directed the Colorado Air Quality Control Commission to explore the adoption of low emission vehicle standards by the end of 2018. The process for revision of the federal clean car standards could last for many years and therefore Denver did not change its original BAU projections related to more efficient light duty vehicles. However, in subsequent updates to this analysis and report, changes may be made to better reflect outcomes in this sector.

## Equity and community health

Throughout the stakeholder process and within the community input, an overriding theme emerged to ensure equitable access and equitable benefit. One of the six vision statements, developed by stakeholders and reinforced with community input, was: “Inspire community action and ensure environmental justice, equity and affordability as Denver transitions to a carbon-free energy system.” Strategies and policies that arise out of the 80x50 Climate Plan must consider equitable access to benefits and ensure that our most vulnerable populations do not bear a disproportionate cost. Truly, the cost of doing nothing will be borne disproportionately by the most vulnerable. The City will look to universally beneficial strategies that improve efficiencies, while bringing the total cost of home ownership, rent, and transportation down.

**“Tackling climate change could be the greatest global health opportunity of the 21st century.**

**Many mitigation and adaptation responses to climate change are ‘no-regret’ options, which lead to direct reductions in the burden of ill-health, enhance community resilience, alleviate poverty, and address global inequity.”**

**The Lancet Commission**

*www.thelancet.com*

Published online June 23, 2015

Fossil fuel energy production and consumption is a primary source of GHG emissions, but also produces other harmful pollutants, including sulfur dioxide (SO<sub>2</sub>), mercury and other air toxins, and precursors to surface-level ozone (O<sub>3</sub>). By switching to cleaner, renewable energy sources, Denver can improve public health while ensuring safer and more reliable energy. Climate action strategies can also benefit environmental justice communities and assist in delivering more equitable health outcomes.

## Next Steps

In the time between the stakeholder report release and this plan, many events have reinforced that renewable energy, electricity storage and other technological advancements will pave the way for deep carbon reductions in cities like Denver. After Xcel Energy received extremely low bids for renewable plus storage energy resources in January of 2018 as part of its Colorado Energy Plan, the rapid transition to renewables appears to be set for another leap in availability, affordability, and reliability.

As electric vehicles expand their market share, Denver will need a nimble and responsive approach to align strategies with electric vehicle deployment numbers. Likewise, advancements in building efficiency and design will allow the thermal heating sector to decrease in both cost and contribution to community-wide emissions. To ensure the best strategies are deployed to meet Denver’s 80x50 goal, the City will continuously reassess the strategies and goals in this plan to match the technological advancement and economic trends, as well as the climate science.

Many technologies like energy storage were not discussed in depth at the time of the stakeholder process, but since that time have seen rapid improvements in feasibility and cost reductions. Similarly, carbon capture technology was not discussed during the stakeholder process, and if similar improvements in feasibility and cost reduction are demonstrated, it may be considered in the future. At a minimum, all future technologies would need to be evaluated for their absolute emissions reductions potential (from source to site), costs for energy generation, and impact to human health and the environment.



# DENVER'S HISTORY OF CLIMATE ACTION

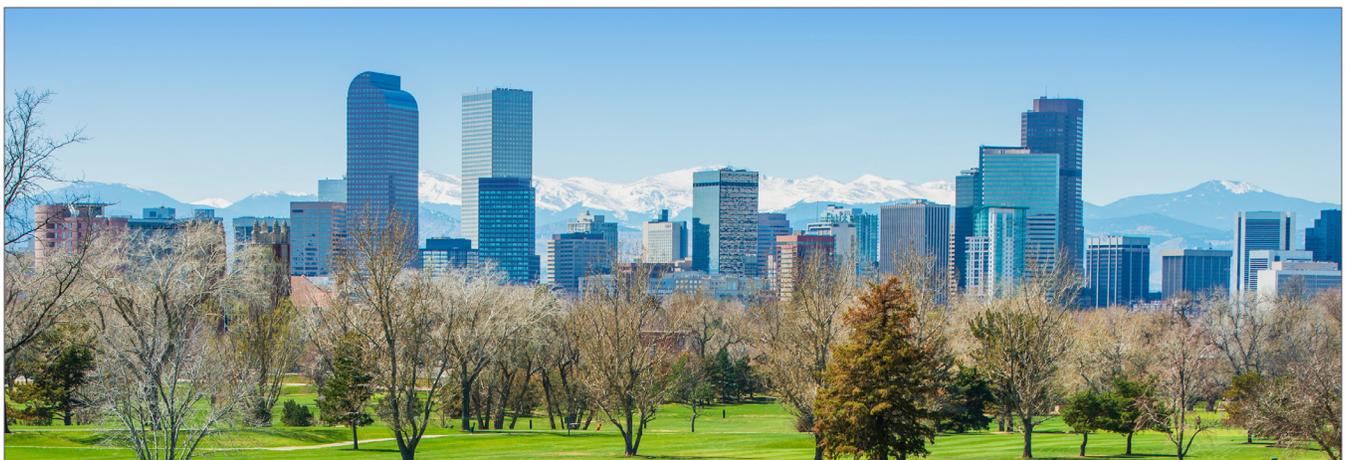
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In 2007, Denver became one of the first large U.S. cities to recognize the potential threats and broad-reaching impacts of climate change by releasing its first [Climate Action Plan](#). Denver was also one of the first cities to sign on to the [Mayor's Climate Protection Agreement](#) of the U.S. Conference of Mayors, the ambitious [Mayors' National Climate Action Agenda](#), and the [Global Covenant of Mayors](#). Denver made significant progress toward meeting these commitments with the release of the [2014 Climate Adaptation Plan](#) and the [2015 update](#).

In 2015, Denver released an updated [Climate Action Plan](#) with analysis and strategies to meet the 2020 climate goal of reducing CO<sub>2</sub> emissions to below 1990 levels. The plan also established the long-term goal to reduce emissions 80 percent by 2050 using a 2005 baseline. Many of the key strategies identified in the plan are being implemented, including a new benchmarking requirement for large buildings that became law in 2016. Voters also recently approved the green roofs ordinance, which offered solar as an option to comply for both new and existing buildings.

In 2017, Denver updated its annual greenhouse gas inventory to meet global reporting protocols and allow for more detailed analysis and tracking of community-wide greenhouse gas (GHG) emissions. Denver's annual GHG inventory, first completed in 2005, evaluates GHG emissions levels and progress made in emissions reduction efforts.

Denver has succeeded in achieving the many climate commitments it has made and will continue to act aggressively to reduce GHG emissions through measurement, disclosure, planning, policy and programs.



Denver Climate Commitments and Progress		
Commitment Group	Action	Summary of Progress
<a href="#">US Conference of Mayors 2007</a>	<ul style="list-style-type: none"> <li>Initiate GHG inventory process</li> <li>Integrate GHG reduction strategies into government operations</li> </ul>	<ul style="list-style-type: none"> <li>Annual inventories since 2009</li> <li>Increases in building efficiency</li> <li>Increases in renewable energy on city buildings/property</li> <li>Increases in fuel efficient and electric vehicles in city fleet</li> </ul>
	<ul style="list-style-type: none"> <li>Promote GHG reduction strategies to community</li> </ul>	<ul style="list-style-type: none"> <li>Utilized federal grants to develop and expand residential and small-commercial energy efficiency</li> <li>Developed community programs for electric vehicles, multi-modal, and transit</li> </ul>
<a href="#">Mayor's National Climate Action Agenda</a>	<ul style="list-style-type: none"> <li>Set Interim Climate Goal</li> </ul>	<ul style="list-style-type: none"> <li>This document establishes interim goals for GHGs and multiple sectors</li> </ul>
	<ul style="list-style-type: none"> <li>Set Long-Term Climate Goal</li> </ul>	<ul style="list-style-type: none"> <li>Denver's 2015 Climate Action Plan Established 80x50 Goal</li> </ul>
	<ul style="list-style-type: none"> <li>Make GHG Inventory Global Protocol Compliant</li> </ul>	<ul style="list-style-type: none"> <li>Denver's 2015 Inventory is now Global Protocol Compliant</li> </ul>
<a href="#">Global Covenant of Mayors</a>	<ul style="list-style-type: none"> <li>Create Adaptation Plan</li> </ul>	<ul style="list-style-type: none"> <li>Written in 2014 and updated in 2015</li> </ul>
	<ul style="list-style-type: none"> <li>Create Mitigation Plan</li> </ul>	<ul style="list-style-type: none"> <li>2015 Climate Action Plan and this report</li> </ul>
<a href="#">We Are Still In</a>	<ul style="list-style-type: none"> <li>Public reporting of all components</li> </ul>	<ul style="list-style-type: none"> <li>Reported to <a href="#">Carbon Disclosure Project (CDP)</a> since 2012</li> </ul>
	<ul style="list-style-type: none"> <li>Maintain commitment to meet or exceed the Paris Accord target</li> </ul>	<ul style="list-style-type: none"> <li>The 2025 target in this report is more aggressive than the Paris Accord target</li> </ul>



# DENVER'S GREENHOUSE GAS INVENTORY

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Denver's annual GHG inventory, begun in 2005, evaluates GHG emissions levels and progress made in emissions reduction efforts. The inventory measures the three most frequently occurring GHGs: Carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O). The inventory categorizes emissions according to Scope and Sector. Inventory Scope is a determination of “where” the emissions occur.

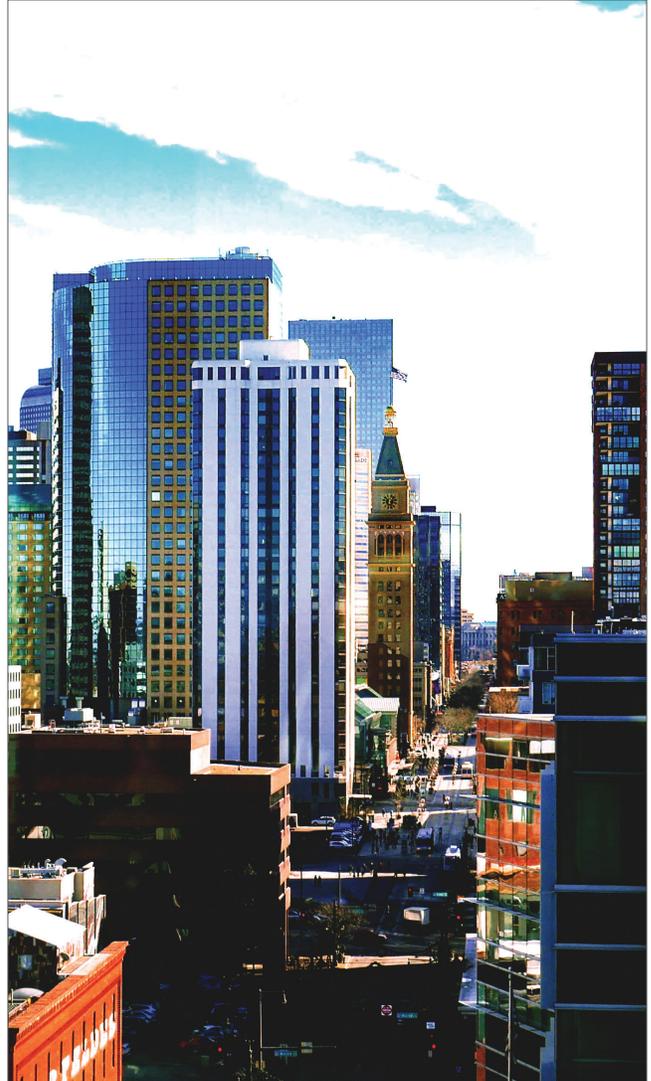
Scope I indicates that the emissions occur within the physical boundary of the city, e.g. vehicle tailpipe emissions and natural gas combustion for heating. Scope II indicates that the emissions occur because of the use of grid-supplied electricity, heat, steam and/or cooling within the city boundary. In Denver's case, electricity is generated (and emissions occur) outside its boundary, but the electricity is used within the boundary of Denver. Scope III emissions are all other emissions occurring outside the boundary but are due to demands within the city boundary, e.g. the transportation fuel used to get products into the city. With most major cities reporting GHG emissions, it is easy to see that one city's Scope I emissions would be another city's scope III emissions. To ensure that double counting does not occur and to enable aggregation of multiple city inventories at a national level, global reporting protocols have been developed to improve consistency and accuracy.

Sources can be broken down into two distinct categories: core emissions and upstream emissions. Core or direct emissions are those that typically occur within the boundary of the city (Scope I) or are more directly controlled/influenced (Scope II), representing the greatest opportunity for action on the part of the city. These include emissions from building energy use, transportation and fuels, street lights, and waste management. Upstream or indirect emissions occur outside the boundary of the city but are demanded by people and businesses, such as refining of fuel, airline jet fuel, cement production, and food packaging and transport. GHG emissions are reported as total and per capita emissions in units of metric tons of CO<sub>2</sub> equivalent (MtCO<sub>2</sub>e).

Denver is proud of its track record in conducting and reporting annual inventories, as well as public reporting of plans, targets and goals for climate mitigation and adaptation. A robust GHG inventory program allows for long-term trajectory analysis and forecasting. Denver will continue to produce and publicly release its annual GHG inventory to report on progress.

## Updated Greenhouse Gas Inventory Methodology

In 2017, Denver updated its annual GHG inventory process to meet global reporting protocols and allow for more detailed analysis and tracking of community-wide GHG emissions. The new protocols have more detailed requirements for breaking out emissions within Scope, Sector, and specific GHG. In many cases, the new methodology requires additional categories of emissions not previously tracked. Most importantly, as more cities update to this new standard, the aggregation of consistently reported data will improve accounting and the ability to develop policies and programs for emissions reductions. However, the new protocol is a change in methodology and as a result makes comparisons of previous years' inventories difficult. Additionally, detailed data required for the current methodology may not be available for previous years' inventories. Denver is in the process of updating its baseline year inventory (2005) to the updated methodology with as much detail as is available. Regardless of inventory method, the major emissions, conclusions, and strategies outlined in the stakeholder report and this report are sound and appropriate. For 2020 goal tracking purposes, Denver will update its GHG inventory using both methodologies.





# 80X50 STAKEHOLDER ENGAGEMENT

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In late 2015, Mayor Michael B. Hancock strengthened Denver's leadership in the effort to prevent the worst effects of climate change by setting a long-term climate goal to reduce GHG emissions 80 percent below 2005 levels by 2050. He also called for a robust stakeholder engagement process to identify strategies to achieve the goal. This plan is the result of that stakeholder process, which included a detailed technical analysis, literature review and extensive consultation with national and international experts.

Denver's 80x50 Climate Goal stakeholder process consisted of two key stakeholder groups: The Technical Advisory Committee and the Task Force. The Technical Advisory Committee worked to create a broad list of systems-based approaches to GHG reductions within four distinct sectors: mobile supply, mobile demand, stationary supply and stationary demand. The Mobile Sector generally includes emissions from transportation, excluding the airport. Stationary Sector generally includes emissions from buildings. Supply side emissions are determined by the type of fuel or energy used, while demand side emissions are determined by the efficiency or amount of energy used for an activity. The Task Force integrated the summary matrix produced by the Technical Advisory Committee into a larger transformative framework. These systems thinkers wove together the technical, financial, market, regulatory and social factors that impact energy systems into a plan that meets the 80x50 Climate Goal.

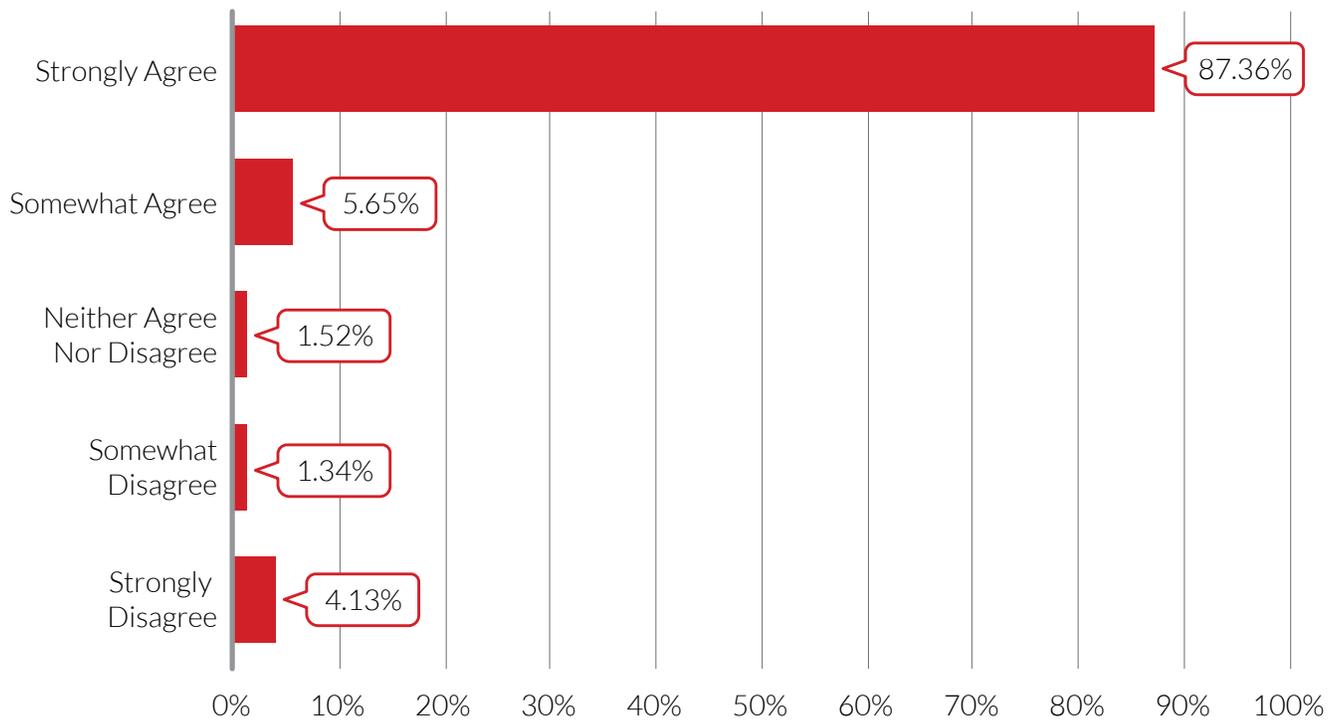
In August 2017, DDPHE published the [80x50 Stakeholder Report](#). The stakeholder report recommends goals and strategies designed to reduce core emissions from residential, commercial and industrial building energy use, vehicular surface travel, and energy supply. The 2015 GHG inventory was the most recent inventory available and used to determine goals during this process.



# COMMUNITY FEEDBACK

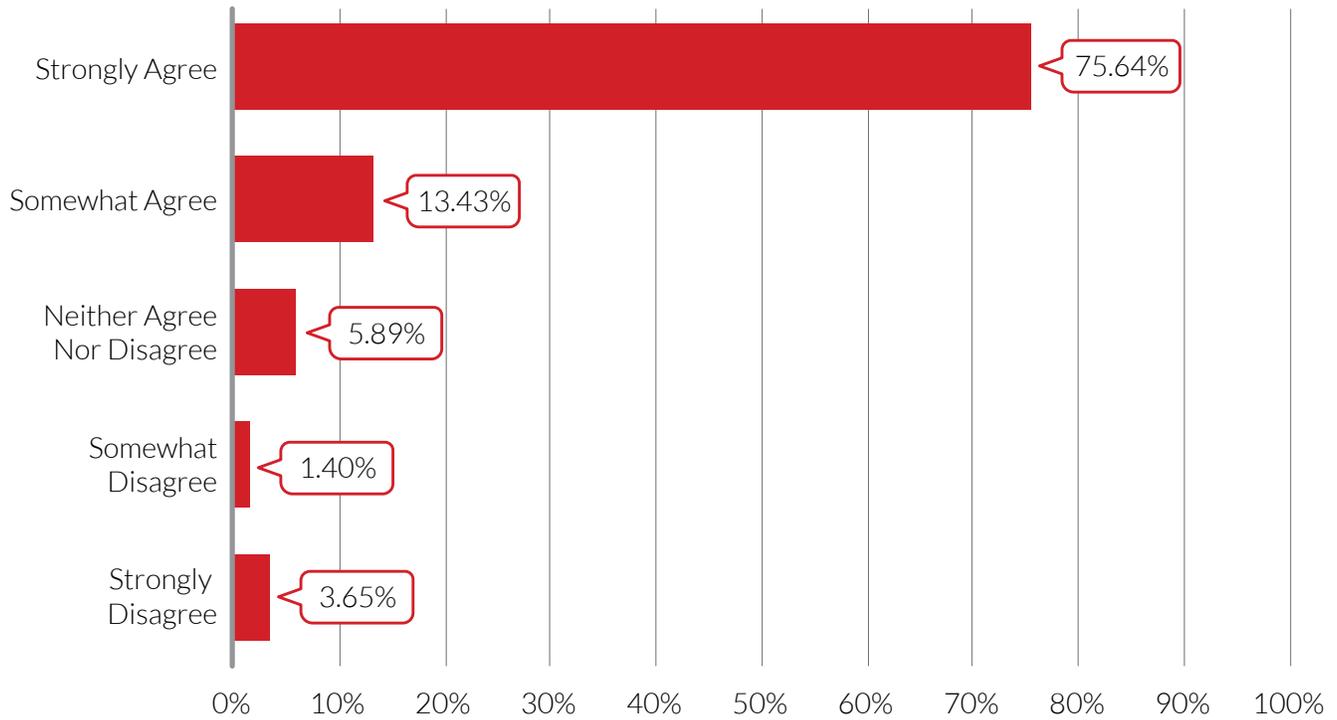
Following the extensive stakeholder process, those who live, work, and play in Denver were encouraged to provide input on the plan by taking the 80x50 Climate Goal Survey or attending community events where the report was presented. The survey was created by DDPHE and distributed online through City channels and community partners. The survey, available in English and Spanish, was posted through SurveyMonkey and was limited by IP address, discouraging respondents from taking the survey more than once. Respondents were not required to answer every question. More than 1,700 respondents took the survey. It was open between September 6th, 2017 and November 25th, 2017 and key findings are highlighted below.

Denver should take aggressive local action to combat climate change.





The 80x50 Climate Goal Stakeholder Report indicates that electricity from renewable sources (like the sun and wind) is very important to meeting the goal. Currently 29 percent of the electricity Xcel Energy provides to Denver is from renewable sources. Xcel Energy plans to increase this percentage to 55 percent by 2026. Denver should partner with Xcel Energy to increase the production of renewable energy. State to which level you agree with this statement.



Some respondents' comments on this question indicated that they felt the city should partner with others beyond Xcel Energy to achieve these goals. Comments included:

Denver should pursue renewable resources from whatever sources are available, including Xcel Energy, but not necessarily exclusively from them.

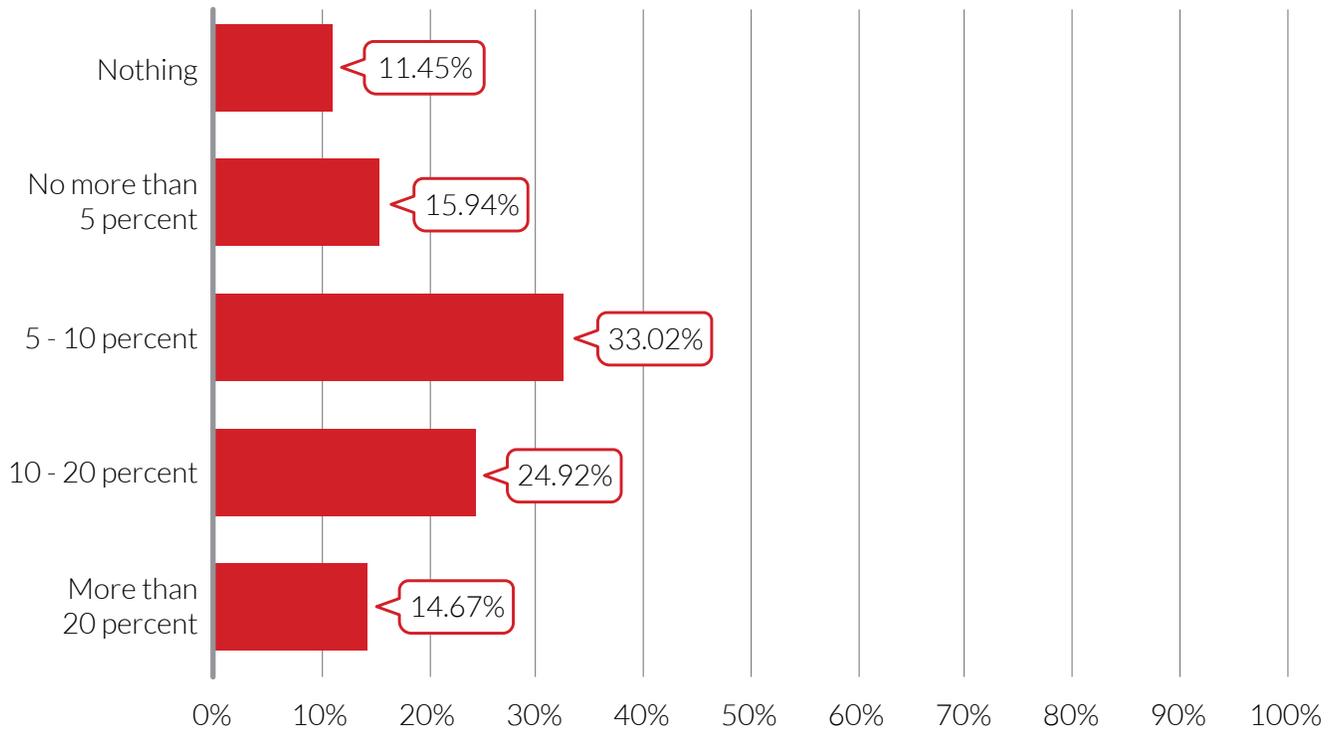
Working with Xcel must just be one part of our energy provider menu.

Why look to only Xcel and rely on their energy production? I think the renewable energy should be way above 55 percent and the goal should be 100 percent.

55 percent by 2026 is not enough.

100 percent by 2026

How much extra on your utility bill would you be willing to pay to achieve 100 percent renewable (or very nearly 100 percent) energy?



When asked to rank the most important factors to consider when working toward implementation of strategies, 55 percent ranked climate impacts as the most important consideration. Second most important was to account for the equity of strategies and solutions.

# ACKNOWLEDGMENTS

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## 80x50 Task Force and Technical Advisory Group

**Marc Alston**

Former EPA staff and Certified Professional Coach

**Chris Armstrong**

CityNOW Director of Smart Mobility  
Panasonic

**Andrea Bailey**

Biofuels Fellow  
Department of Energy

**Rachel Bannon-Godfrey**

Director of Sustainability  
Stantec

**Kathie Barstnar**

President/CEO  
Whiting Management Resources

**Chris Bui**

Lead Policy and Partnerships Coordinator  
Denver Public Health

**Celeste Cizik**

Existing Buildings Team Leader  
Group14 Engineering

**Jacob Corvidae**

Manager  
Rocky Mountain Institute

**Britt Coyne**

Air Quality Program Coordinator  
American Lung Association

**Matthew Crosby**

Program Manager  
Panasonic

**Liz Doris**

Principal Laboratory Program Manager for State,  
Local, and Tribal Programs  
National Renewable Energy Laboratory

**Perry Edman**

Planning Project Manager  
Regional Transportation District

**Maria Eisemann**

Transportation Policy Analyst  
Colorado Energy Office

**Mat Elmore**

Managing Director  
Rocky Mountains at MicroGrid

**Taryn Finnessey**

Climate Change Risk Management Specialist  
State of Colorado Department of Natural Resources

**Greg Fulton**

President  
Colorado Motor Carriers Association

**Angie Fyfe**

Executive Director  
ICLEI

**Julie George**

Director  
HEAL Cities & Towns Campaign at LiveWell Colorado

**Jennifer Gremmert**

Executive Director  
Energy Outreach Colorado

**Jack Ihle**

Manager of Commercial Environmental Policy  
Xcel Energy

**Paul Kashmann**

Representative City Council  
District 6

**Kay Kelly**

Clean Cities Project Leader  
National Renewable Energy Laboratory

**Michael King**

Transportation Planner  
Colorado Department of Transportation

**Robin Kneich**

Office of At-Large  
Councilwoman

**Adam Knoff**

Senior Sustainability Manager  
Unico Properties at 2030 District

**Jeff Lyng**

Environmental Policy  
Xcel Energy

**Patti Mason**

Executive Director  
USGBC

**Wes Mauer**

Transportation Program Manager  
Colorado Energy office

**Steve McCanan**

Mobile Sources Program Director  
Regional Air Quality Council

**Jana Milford**

Professor  
University of Colorado at Boulder

**Scott Morrissey**

Director of Environmental Programs  
Denver International Airport

**Dawn Mullay**

Director of Air Quality and Transportation  
American Lung Association

**Aneka Patel**

Transportation Outreach Specialist  
Downtown Denver Partnership

**Tom Plant**

Senior Policy Advisor  
Center for New Energy Economy

**Tom Poeling**

Director of Energy Solutions  
U.S. Engineering Company

**Paul Scharfenberger**

Director of Finance and Operations  
Colorado Energy Office

**Jake Schlesinger**

Partner  
Keys & Fox

**Robert Spotts**

Senior Transportation/Air Quality Planner  
Denver Regional Council of Governments

**Jeff Su**

Executive Director  
Mile High Connects

**Stacy Tellinghuisen**

Senior Energy/Water Policy Analyst  
Western Resource Advocates

**Will Toor**

Director of Transportation Programs  
Southwest Energy Efficiency Project

**Eric Van Orden**

Product Developer  
Xcel Energy

**James Waddel**

Executive Director  
Denver B-Cycle

**Dace West**

Senior Vice President  
The Denver Foundation

**Lauren Wilson**

Manager  
Xcel Energy

**Nigel Zeid**

EV Specialist  
Nissan

## City and County of Denver Staff

### Department of Public Health and Environment

**Elizabeth Babcock**

Manager Air, Water, and Climate

**Thomas Herrod**

Climate & GHG Inventory Lead

**Sonrisa Lucero**

Sustainability Strategist

**Katrina Managan**

Energy Efficiency Buildings Lead

**Bob McDonald**  
Executive Director

**Taylor Moellers**  
Sustainable Neighborhoods Program Administrator

**Mike Salisbury**  
Transportation Energy Lead

**Julie Saporito**  
Residential Energy Lead

**Gregg Thomas**  
Environmental Quality Division Director

**Jerry Tinianow**  
Chief Sustainability Officer

### **Community Planning and Development**

**David Gaspers**  
Principal City Planner

**Jill Jennings-Golich**  
Deputy Director

**Courtland Hyser**  
Principal Planner

**Scott Prisco**  
Chief Building Official

### **Public Works**

**Kristina Evanoff**  
Senior Multimodal Transportation Planner

### **Consultants**

**Hillary Dobos**  
Principal and Co-Owner  
Lotus Engineering and Sustainability, LLC

**Emily Artale**  
Principal Engineer and Co-Owner  
Lotus Engineering and Sustainability, LLC

**Garret Shields**  
Lead Technical Research Analyst  
BCS, Incorporated

**Natalia Swalnick**  
Former Manager  
BCS, Incorporated

# TERMS AND ACRONYMS

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- CH<sub>4</sub> - Methane
- CO<sub>2</sub> – Carbon dioxide
- GHG – Greenhouse Gas Emissions
- GPC – Global Protocol Compliant greenhouse gas inventory
- MtCO<sub>2</sub>e – Metric tons of carbon dioxide equivalent
- Net-zero – Energy use in a building that is roughly equal to the annual amount of renewable energy created by or for that building
- N<sub>2</sub>O – Nitrous oxide
- O<sub>3</sub> – Surface-level ozone
- SO<sub>2</sub> – Sulfur dioxide





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