



CLIMATE ACTION & ADAPTATION PLAN

June 2019



Table of Contents

Report Introduction	2
Mayor's Statement	3
Letter from Mayor's Task Force	4
Acknowledgments	5
Executive Summary	6
Plan Development & Objectives	11
Plan Development Process	12
Climate and Equity	14
Climate Action Goals and Targets	16
Why Act?	19
Why Act? Summary	20
Climate Change and Columbia	21
Risk and Vulnerability	22
Columbia's Contributions to Climate Change	24
Progress to Date & Concurrent Efforts	29
Existing Climate Efforts	30
Moving This Plan Forward	33
Implementation Strategy	34
Levers for Affecting Change	35
Timeline for Implementation	36
Sustaining Community Support	38
Tension Point — Balancing Funding Needs & Community Priorities	39
Monitoring and Evaluation	40
Cross-Cutting Strategies and Actions	42
Sector-Specific Strategies & Actions	45
Strategies and Actions Summary	46
Modeling Impact: The Wedge Analysis	47
Energy	48
Tension Point — Good for All	50
Housing, Buildings and Development	51
Transportation	54
Tension Point — Density & Community Character	57
Waste	58
Tension Point — Upstream Emissions are Important, But Hard to Track	60
Health, Safety and Well-Being	61
Tension Point — Are Affordable Housing & Land Preservation in Conflict?	63
Natural Resources	64
Appendices	67

CAAP Report

Introduction

Columbia's Climate Action & Adaptation Plan (CAAP) lays out a vision and strategy to address risks posed by climate change and to contribute to international efforts to reduce greenhouse gas (GHG) emissions. Cities are poised to lead climate change efforts. Collectively, the world's cities are responsible for 70% of GHG emissions.¹ Cities are also at the frontlines of bearing climate change impacts, such as urban heat islands, flooding, drought and risks to optimal public health. With this Plan, Columbia is joining a global coalition of cities committed to reducing climate change impacts. Columbia is also leading Missouri, as we often do, on climate action and adaptation measures.

The effects of increased global GHG emissions threaten Columbia's resources and quality of life. Extreme heat, drought, higher incidence of severe storms and reduced air quality are growing threats in Columbia due to climate change. By taking action to reduce our community's contribution to worldwide emissions and prepare for climate risks, the City of Columbia can better protect the wellbeing of its residents for decades to come. The purpose of this Plan is twofold:

1. To prepare Columbia's natural and built environments (neighborhoods, resources and systems) and people to be more resilient to the impacts of climate change.
2. To reduce GHG emissions communitywide through targeted municipal, residential, industrial and commercial activities.

The Plan was written for the community and by the community. Significant contributors included the public, the Mayor's Task Force on Climate Action & Adaptation Planning (Task Force) and City staff. In development since 2017, through a process that included multiple community and City of Columbia staff workshops, Task Force meetings and two public surveys, this plan focuses on effective actions. These actions achieve the greatest emission reductions and increase our community preparedness in the most cost-effective and equitable manner. The entire community—businesses, residents and municipal government—all have a role in both implementing the Plan and enjoying its benefits.



1 - "Hot Cities: Battle-Ground For Climate Change." UN Habitat. 2011. http://mirror.unhabitat.org/downloads/docs/E_Hot_Cities.pdf

Mayor's Statement



*Brian Treece
Columbia Mayor*

People have lived in the varied landscapes of the place we call Columbia for thousands of years.* In 1818, European settlement of this area started with a town called Smithton, on the hills just to the west of the intersection of Providence and Broadway. Settlers decided to stay and work to build a life because of the opportunities this place offered them: a reliable water source and productive land to sustain them and help to build the community we call ours today. The journey from Smithton to Columbia has been one of enormous changes. Footpaths became highways and a village grew to Missouri's fourth largest city. The changes that made Columbia came along with vision, effort and a belief in the potential and value of Columbia as a community. This Plan is an important moment in our story. It is a decision to put forth the effort, change and perseverance required to keep Columbia resilient and thriving.

Just as the founders of Smithton had to reimagine the land before them and believe in their ability to meet the challenges of building a new community, this Plan requires an openness to change and new ideas to ensure that Columbia continues to be the best place to live, work, learn and play.



* - The City of Columbia, Missouri, respectfully acknowledges the indigenous occupants of the land. We welcome information and stories with which we can pay respect to their ancestors and descendants.

Letter from the Mayor's Task Force on Climate Action & Adaptation Planning

The debate on man-made climate change has been closed for some time, leaving us with only two important questions: What are we going to do to reverse our direction and start an improvement process? And simultaneously, what are we going to do to better prepare ourselves to withstand the effects of a changing climate? Change can be uncomfortable, and many members of the community will question the need to move rapidly to implement this Plan. Achieving the implementation of this Plan will offer many benefits to our community, including cleaner air, better resilience to severe weather and improved health.

Columbia began answering these questions in 2017 when, with Council approval, Mayor Treece signed on to the Global Covenant of Mayors for Climate and Energy. The enclosed document, Columbia's Climate Action & Adaptation Plan, is another step in our participation in that Covenant.

This Plan is the result of Columbia City staff, Cascadia Consulting and the Mayor's Task Force on Climate Action & Adaptation Planning—appointed 16 months ago as a resident body to help guide this effort. We are also grateful to the members of the community who attended workshops or provided input through surveys and other formats. All involved have poured many hours of time into creating this Plan. Speaking for the Task Force, who have voluntarily shared these hours, our belief is that combating climate change is the preeminent mission of our time. Columbia, along with the thousands of other cities in the Global Covenant of Mayors, can make a difference. We intended this document to be bold and transformative. If it is judged to fall short of those lofty goals, it should be told that it was not from a lack of effort.

This Plan is a start, only a beginning. We hope that it is a strong foundation, but even more, we hope that implementation of this Plan begins immediately. With proper implementation, it will quickly evolve and become better, larger and ever more used as implementation proceeds. When needed changes are discovered and improvements and enhanced targets are created, the Task Force will be the first to applaud their appearance. The consequences of climate change cannot be understated. The dire implications that are predicted for our future is a clarion call for immediate and sustained action, beginning with leadership at its highest calling.

Sincerely,
Jay Hasheider
Chair



The Mayor's Task Force on Climate Action & Adaptation.



CAAP Report — Acknowledgments

We would like to express deep gratitude for those who contributed to the development of this Plan.

Columbia City Council:

Brian Treece, Mayor
Clyde Ruffin, Ward 1
Michael Trapp, Ward 2
Karl Skala, Ward 3
Ian Thomas, Ward 4
Matt Pitzer, Ward 5
Betsy Peters, Ward 6

Mayor's Task Force on Climate Action & Adaptation Planning:

Aimee Davenport
Alex Antal
Annette Triplett
Brionna Emerson*
Carolyn Amparan
Chris McLeland*
Dale Tidemann*
David Reed
Hallie Thompson
Jay Hashieder
Kim Wade
Malcolm Bragg*
Mark Alexiou
Mason Brobeck*
Quinn Cunningham
Raghu Raghavan
Rob Wolverton
Ryan Kaufmann
Thomas Jensen

**notes former member of the Task Force*

City of Columbia Project Management Team:

Barbara Buffaloe
Ben Kreitner
Danielle Fox
Eric Hempel
Lelande Rehard
Mike Heimos
Patricia Weisenfelder
Ramon Garza

The following City of Columbia staff provided expert feedback and assisted with the development of the plan.

City of Columbia internal staff team:

Adam Kruse
Bill Cantin
Christian DeVerger
Christian Johanningmeier
Dave Dittmer
Dave Nichols
Gabe Huffington
George Hampton
Glenn Cobbins
Heather Cole
Jack McManus
John Glascock
Judy Hubbard
Kori Thompson
Leah Christian
Lucia Bourgeois
Mike Snyder
Rachel Bacon
Ryan Williams
Sara Humm
Sarah Perry
Sarah Talbert
Shane Creech
Stephanie Browning
Steve Hunt
Terry Freeman
Tim Teddy
Toni Messina
Zach Waller

Consulting Team:

Cascadia Consulting Group
Kim Lundgren Associates
Nikki McGruder
Shockey Consulting Services

And of course, the entire Columbia community!

Executive Summary

The effects of increasing global GHG emissions threaten Columbia's resources and the quality of life for Columbia's residents. Columbia's Climate Action & Adaptation Plan (CAAP) lays out a vision and strategy to address risks posed by climate change and contributes to international efforts to reduce GHG emissions. The **purpose of this plan** is twofold:

1. To prepare Columbia's natural and built environments (neighborhoods, resources, and systems) and people to be more resilient to the impacts of a changing climate.
2. To reduce GHG emissions communitywide, through targeted municipal, residential, industrial and commercial activities.

Developed over a year-long engagement process with the public, the Task Force, and City staff, the Plan focuses on activities that achieve the greatest emission reductions or do the most to increase our community preparedness in the most cost-effective and equitable manner.

Columbia's vision is to be the best place for everyone to live, work, learn and play.

The Plan sets specific GHG emissions reduction targets. The City's 80x50 target, an 80% reduction in GHG emissions by 2050, is broadly accepted by cities, states and nations and prepares the City for carbon neutrality by 2060. The 80x50 target aligns with the Paris Agreement and scientific understanding of the reductions necessary to avoid catastrophic risks of climate change associated with 2.0°C increase in average global temperature.² The following targets are for GHG emission reductions below a 2015 baseline.

- **Communitywide Target:** 35% by 2035, 80% by 2050 and 100% by 2060.
- **Municipal Operations Target:** 50% by 2035 and 100% by 2050.

To achieve this ambitious emissions reduction goal and to adapt to climate change, this Plan includes sector-specific goals, strategies and actions. The sectors are energy, housing, buildings and development, transportation, waste, health, safety and well-being, and natural resources. Successful implementation of these strategies and actions will require continued cooperation and commitment across the community, including the public sector, private sector, residents and businesses.

2 - The City considered using 2010 as a baseline year for consistency with the Intergovernmental Panel on Climate Change (IPCC) Special Report findings, but decided to use 2015 due to data inconsistencies in the 2010 GHG inventory.



Sector-Specific Strategies

Energy

- Increase on-site renewable energy installations in new and existing buildings.
- Maximize Columbia Water & Light's renewable energy purchasing and production.
- Revisit and adjust Columbia's Renewable Energy Ordinance to meet climate goals.
- Create a resilient energy grid.
- Manage energy demand to reduce peak energy use.

Housing, Building and Development

- Increase energy efficiency in residential, commercial, municipal and school buildings.
- Decrease the impact of building stock on local air pollution and GHG emissions.
- Decrease use of fossil fuels in housing and other buildings.
- Support development of buildings that are resilient to anticipated future conditions.

Transportation

- Prioritize safety and convenience of walking, biking and riding transit.
- Build a thriving public transit system.
- Create a bikeable and walkable community.
- Shift land use patterns to shorten trips and reduce the need to drive.
- Encourage use of low- to zero-emissions vehicles.
- Reduce use of and reliance on personal vehicles.
- Improve efficiency of vehicle traffic.

Waste

- Encourage reuse.
- Reduce landfill waste through customer education, rate structures and increase City recycling programs.
- Expand composting participation and operation.
- Divert construction and demolition waste.
- Require and incentivize recycling.
- Encourage proper disposal of products containing high Global Warming Potential (GWP) gases.
- Upgrade solid waste facilities.
- Track waste diversion.

Health, Safety and Well-Being

- Include vulnerability assessments in planning efforts and enhance communication tools and strategies to prepare the community for anticipated climate change impacts.
- Reduce incidences of heat-related illness and death.
- Prevent and prepare for increased incidence of vector-borne diseases.
- Plan for a potential increase in demand for mental health care.
- Increase production of local food.
- Assure food security, particularly among the most vulnerable populations.

Natural Resources

- Increase the accessibility and quality of habitat for native plants and animals.
- Encourage water conservation.
- Improve stormwater management.
- Minimize risks to flood-prone areas.

Executive Summary — Cont.

The Plan also contains an implementation strategy that outlines protocols and templates for plan implementation, monitoring and evaluation. Appendix B is the Priority Action Matrix, which details actions and the associated timeframes, responsible parties and next steps. It also includes key performance indicators for tracking progress, templates for reporting on indicator and action progress and internal protocols for City implementation.

While there are strong benefits to climate action it also includes, there are also areas where climate action goals may conflict with other community priorities. An example is the challenge of infill development for affordable housing needs that potentially decreases natural areas and changes the traditional community character. This Plan seeks to transparently identify these tensions and start discussions about how to both meet the need for climate action and advance other community goals. These tensions points can be found on pages 39, 50, 57, 60, and 63.

To be successful, the CAAP must be an iterative process. This Plan has set goals, strategies and actions. As it is implemented, staff and community members will continually evaluate the key performance indicators, calculate environmental and financial impacts and then revise the goals, strategies and actions, as required. Outreach, engagement and education will be required throughout this process to succeed.



The Youth Advisory Council hosted a creative writing competition in spring 2019. The prompt for the competition was “Write about Climate Action and what 2050 will look like.”

The below poems were selected from the Youth Advisory Council to be included in the CAAP.

Breath Slowly

by Marissa Moore, Battle High School

Breathing in oxygen.
Breathing out carbon dioxide.

That’s how I start my day.
That’s how I end my day.
Even when I’m not aware,
Even when I’m asleep,
That’s what I’m doing.
That’s what we all do.

When you’re walking around town,
Driving your car or going to school.

When you’re not breathing,
You’re holding your breath.
You’re in a chemical-filled pool
Or you’re trying to take a sip of water.
Maybe it’s out of a little plastic straw,
Or a clear bottle from the store.
It doesn’t matter too much,
Because in the end...
You’ll just throw it away.
It doesn’t really matter.
It’s just one piece of plastic.

Maybe you’ll remember next time,
And it’ll all be fine.
Right?
But it won’t be.

Because next time,
Even if you remember,
It’ll be too much work,
The trash can is closer.
And they’re still going to make plastic,
So why does it matter?

Yes, they’ll still make plastic,
They will still chop down trees,
The world will always be a bad place
But there will come a day when it’s too much to bear
There will come a day
When you’re breathing in air,
Nitrogen and Carbon Dioxide,
But not Oxygen this time.

Columbia

by Riley Cole, Battle High School

Unforgotten our pollution
From systemic neglect,
Striving for green revolution
Or what had we to protect?
Now sunlight runs the rooftops
And skies sing blue,
Land away from political stops
With all white clouds dancing too.
How have our markets flourished?

A foreigner may contest,
Let the facts be furnished
Lay his eagerness to rest.
Columbia sought its own reason,
Indeed we came together
A host of communal gardens
Dependent on the weather.
Our coal planters unearthed,
But their jobs are not lost,
Into clean careers they’ve immersed
Without any exhaust.

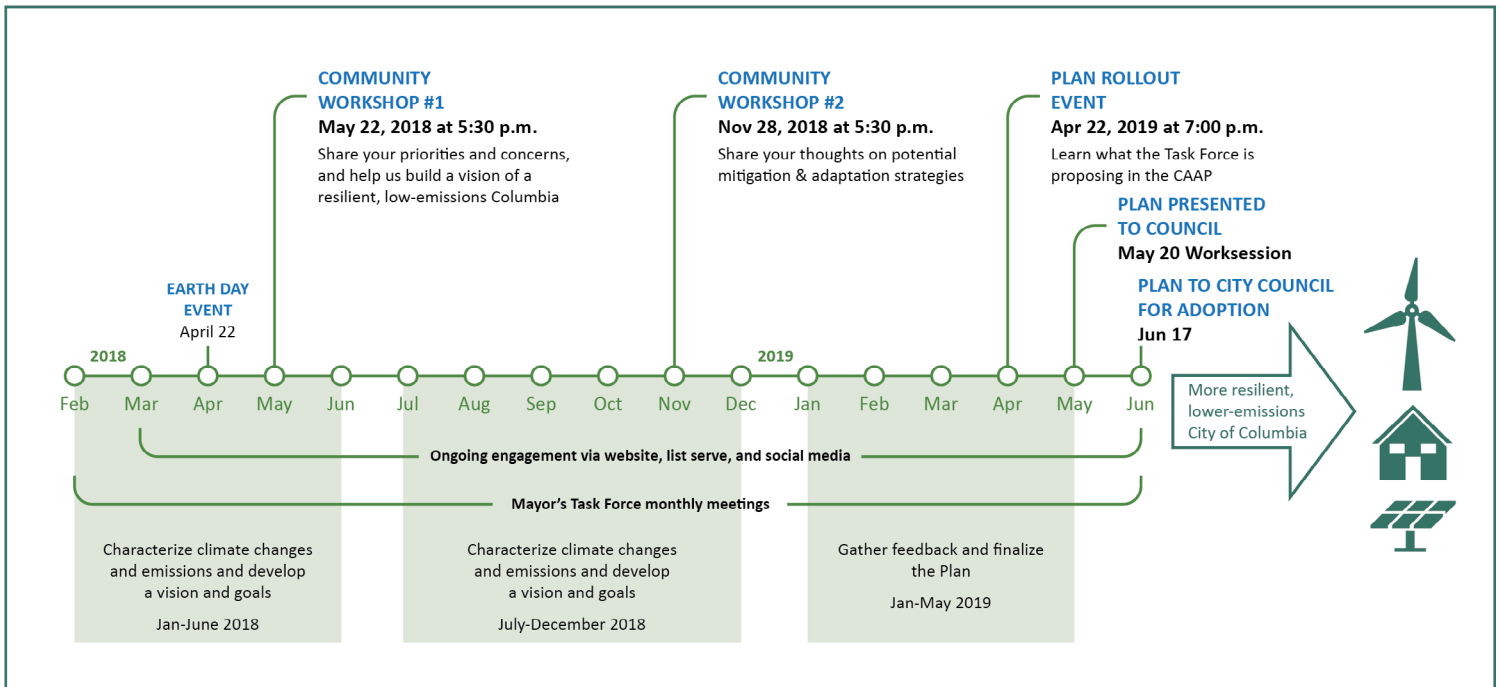
The target was colossal
With a grand action plan
To never become the fossil
Instead, thrive where we can.
Springs leak into mellow falls,
Breeze slights a wintry glade,
All energy is balanced
As the buoyant seasons wade.

Page left intentionally blank

PLAN DEVELOPMENT & OBJECTIVES

Plan Development Process

This Plan is the product of over a year-long public and stakeholder engagement process that included three community workshops, online public surveys, presentations at board and commission meetings, engagement at community events, collaboration with concurrent planning efforts and close collaboration with the Task Force.



The community workshops provided the public with an opportunity to learn about the planning process, provide feedback on the Plan's vision and strategies, and discuss priorities, challenges and solutions with the project team and other community members. The online public surveys gathered input on issues, ideas, and mitigation and adaptation actions.

The City of Columbia engages in multiple planning processes in the normal course of business. Concurrent to the CAAP process, community input was, and will continue to be, reviewed from the following efforts:

- City of Columbia Strategic Plan
- City of Columbia Vision Zero Plan
- Community Development Consolidated Plan
- Columbia Utilities Integrated Management Plan
- Columbia Utilities Integrated Electric Resource and Master Plan
- CATSO Long Range Transportation Plan
- Columbia/Boone County Public Health and Human Services Community Health Improvement Plan

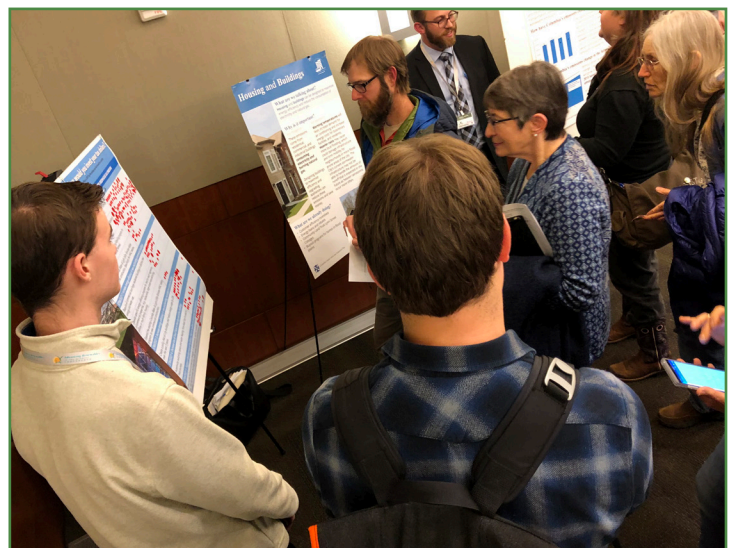
The project management team for this Plan has incorporated feedback from public and stakeholder engagement processes into this Plan. This reflection respects the conversations our neighbors are having on what makes Columbia the best place to live, work, learn and play—and what opportunities for improvement exist to achieve this vision.

Columbia's Voice: Results from Community Surveys

In fall 2018 and spring 2019, there were over 1900 responses to online community surveys for the CAAP. Responses from the surveys indicate:

- Strong community support for immediate action to reduce GHG emissions from energy and land use and prepare for a changing climate.
- Strong agreement that Columbia should be a leader when it comes to proactively addressing climate change.
- Support for adoption of the CAAP, and belief that the Plan effectively provides direction to City government and staff on actions to address climate change.
- The top actions for addressing climate change include:
 - >> Designing streets and traffic controls to lower vehicle emissions and support walkability.
 - >> Replacing the City's vehicle fleet with hybrid and electric vehicles.
 - >> Offering incentives for energy and water efficiency, solar readiness and stormwater management that go beyond code.
 - >> Requiring recycling at multifamily residences.
 - >> Investing in innovative technologies to enhance renewable energy usage (e.g., energy storage, combined heat and power, microgrids).
 - >> Aligning the municipal utilities' strategic plans help the community meet climate action objectives.
 - >> Requiring landlords to manage and to mitigate mold and fungus in rental units.
 - >> Increasing native tree cover on public and private property.

This final CAAP was revised to reflect feedback received through these surveys, including questions from the public regarding cost, impact and other details of plan implementation.



Climate and Equity

It is important that the CAAP was developed and is implemented through an equity lens. Each CAAP action should be implemented in a manner that promotes equity and mitigates structural racism and historic inequality. Providing equitable access to climate action and adaptation benefits requires meeting community needs and implementing measures that address existing vulnerabilities and inequalities. The CAAP will also consider where climate action strategies may lead to adverse, unintended impacts. For example, improving bike lanes and adding open space could spur gentrification and displacement. Similarly, additional City fees and rate increases could add new burdens to low- and fixed-income communities.

Ways to ensure that equity is considered throughout the CAAP implementation process include:

- Designing policies and programs that serve disadvantaged communities first.
- Focusing policies and programs on communities experiencing high pollution burdens, poverty, health issues, and exposure to climate hazards.
- Proactively engaging community leaders and members on an ongoing basis.
- Using an equity checklist when implementing actions. See the example list below.

Below are key equity considerations and questions, drawn from the City of Portland's Climate Action Plan, to consider before implementing climate actions:

- **Disproportionate impacts:** Does the proposed action generate burdens (including costs), either directly or indirectly, to communities of color or low-income populations? If yes, are there opportunities to mitigate these impacts?
- **Shared benefits:** Can the benefits of the proposed action be targeted in progressive ways to reduce historical or current disparities? Are the benefits dispersed not only equally, but equitably?
- **Accessibility:** Are the benefits of the proposed action broadly accessible to households and businesses throughout the community, particularly communities of color, low-income populations, minority-owned, women-owned and emerging small businesses?
- **Engagement:** Does the proposed action engage and empower communities of color and low-income populations in a meaningful, authentic and culturally appropriate manner? Are community stakeholders involved and engaged in implementation?
- **Capacity:** Does the proposed action help build community capacity through funding, an expanded knowledge base or other resources?
- **Alignment and partnership:** Does the proposed action align with and support existing communities of color and low-income population priorities, creating an opportunity to leverage resources and build collaborative partnerships?
- **Relationship building:** Does the proposed action help foster the building of effective, long-term relationships and trust between diverse communities and local government?

- **Economic opportunity and staff diversity:** Does the proposed action support communities of color and low-income populations through workforce development, contracting opportunities or the increased diversity of City staff? Does it engage leaders in those communities?
- **Accountability:** Does the proposed action have appropriate accountability mechanisms to ensure that communities of color, low-income populations, or other vulnerable communities will equitably benefit and not be disproportionately harmed?

Equity Actions in the Plan

While equity will need to be considered in implementing every strategy and action within this Plan, there are particular actions for which equity considerations will be critical, such as:

Implementation: I-2.1.4	Develop a process for requiring mitigation, adaptation and climate-equity impact assessments for all new policies and projects that meet threshold criteria, such as cost burden, vulnerability, or increase to net emissions.
Implementation: I-3.2.1	Create a report that identifies the differential impact of climate change on neighborhoods and communities.
Implementation: I-3.2.2	Develop and incorporate equity metrics in the evaluation of CAAP activities. This evaluation will be used as a criterion for the CAAP Action Group, Community Climate Commission, and budget team during review of program cost, viability and success.
Energy: E-2.1.2	Ensure equitable implementation of grid resilience actions by partnering with high risk neighborhoods and non-governmental organizations to develop resilience hubs—community facilities that offer power and other services during times of need. Establish criteria to screen and select locations for community microgrids to support grid and community resilience.
Housing Buildings and Development: H-1.1.2	Increase energy efficiency funding options for families (e.g., low-interest financing, on-bill financing, Pay as You Save, PACE, etc.).
Housing Buildings and Development: H-1.6.2	Develop affordable and efficient (temporary/transitional) housing options.
Transportation: T-1.5.4	Preserve and enhance affordable housing as well as infill development, especially near bus service.
Health, Safety and Well-Being: HS-1.1.6	Conduct a needs assessment of accessible community centers for extreme weather or other emergency situations. Create a development improvement plan, if needed.
Health, Safety and Well-Being: HS-1.2.2	Increase availability to cooling mechanisms in low-income housing and rental units (e.g., air conditioning units, fans, window screens).

Climate Action Goals and Targets

City staff and Task Force members worked closely with the Columbia community to set overarching goals for the CAAP. These goals set the foundational framework for the strategies and actions of the CAAP and allow Columbia to track progress on achieving its vision for climate action. The goals below include GHG reduction targets in line with global scientific, peer-reviewed studies on necessary emissions reductions. To set reduction targets, the Task Force assessed Columbia’s forecasted GHG emissions, listened to public input, reviewed peer cities’ targets, and reflected on the community’s climate ambitions.

Using the 2015 GHG inventory as a baseline year, the community and municipal reduction targets are:³

Communitywide GHG Emissions:	Municipal Operations GHG Emissions:
35% by 2035	50% by 2035
80% by 2050	100% by 2050
100% by 2060	

This 80x50 communitywide target, an 80% reduction in GHG emissions by 2050, is broadly accepted by cities, states and nations and prepares the city for carbon neutrality by 2060. The 80x50 target aligns with the Paris Agreement and scientific understanding of the reductions necessary to avoid catastrophic risks of climate change.⁴

To assess the feasibility of attaining these communitywide targets, the City commissioned the development of a wedge analysis. This forecasting analysis estimates potential GHG emission reductions associated with strategies and actions in the Plan. Wedge analysis findings, presented at the beginning of the Sector-Specific Strategies and Actions section, suggest that full implementation of the CAAP will be sufficient to meet the community’s near- and long-term GHG emission reduction targets.

To support achievement of the community’s overarching GHG emission reduction goal, and to adapt to climate change, this Plan includes sector-specific goals for climate action. For each emissions reduction or adaptation sector, these overarching goals will guide the implementation of CAAP strategies in support of Columbia’s climate vision.

3 - The City considered using 2010 as a baseline year for consistency with the Intergovernmental Panel on Climate Change Special Report findings but decided to use 2015 due to data inconsistencies in the 2010 GHG inventory.

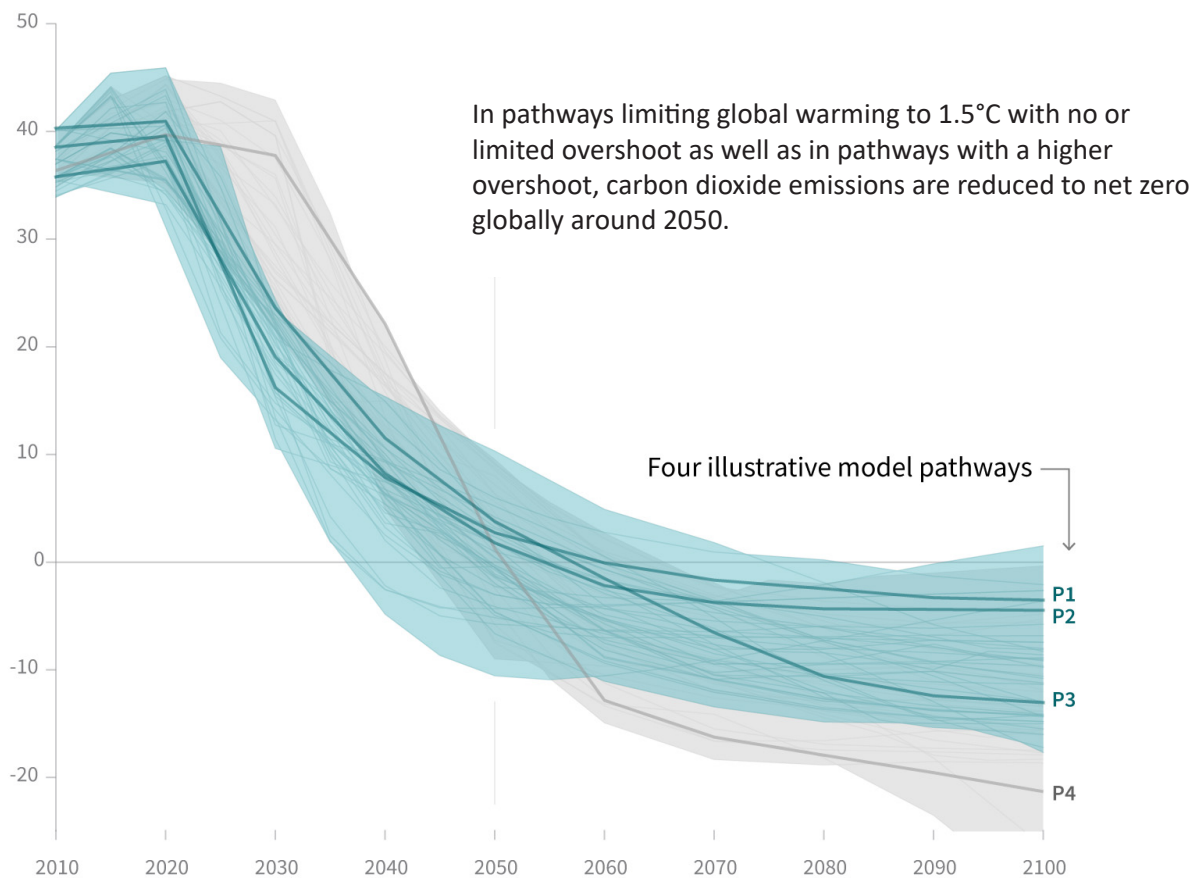
4 - “Framework for Long-Term Deep Carbon Reduction Planning.” Carbon Neutral Cities Alliance. 2018.

Columbia's Goals and the IPCC

This Plan is intended to allow for course corrections, giving us the ability to address the evolving science of climate change. In 2018, after Columbia had approved its 80x50 goal, the Intergovernmental Panel on Climate Change (IPCC) released a special report that describes the expected impacts of 1.5°C and 2.0°C warming and lays out pathways for limiting average global warming to those levels. As illustrated by the figure below, the report indicates that limiting warming to 1.5°C can only be achieved if action is taken to reduce global carbon dioxide emissions by about 45% from 2010 levels by 2030 and to net zero by around 2050. Limiting warming to 2°C requires net global carbon dioxide emissions to decrease by about 25% from 2010 levels by 2030 and reach net zero by around 2070. We will continue to work to meet the most rapidly attainable emissions reductions.

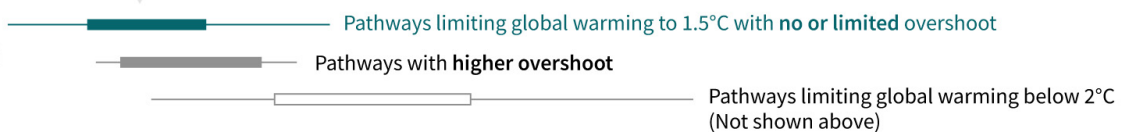
Global total net CO₂ emissions

Billion tonnes of CO₂/yr



Timing of net zero CO₂

Line widths depict the 5-95th percentile and the 25-75th percentile of scenarios



Source: IPCC Special Report on 1.5°C

Page left intentionally blank

WHY ACT?

Why Act?

Taking action to address climate change makes sense for the Columbia community.

To achieve the global GHG emissions reductions needed to prevent significant climate impacts, all cities across the country, including Columbia, will need to do their part to reduce GHG emissions. Cities such as Columbia will also need to prepare for locked-in, inevitable impacts resulting from GHGs already in our atmosphere.

In addition to these needs, many actions to address climate change also support to other community priorities and goals. For example, climate action can save community costs from climate-related impacts, improve public health through better air quality and more active lifestyles, and make public spaces more beautiful through tree and native species plantings.

This section provides an overview of what climate change means for the Columbia community. It begins with projections of how climate change will impact Columbia and continues with estimates of the City's annual contribution of carbon pollution to the Earth's atmosphere.



Climate Change and Columbia

Climate change is caused by an increase in the abundance of heat-trapping gases in our atmosphere. Human activities worldwide, primarily the burning of fossil fuels and clearing of forests, have contributed to the increased concentration of these GHGs in the Earth’s atmosphere. Increased concentrations of carbon dioxide and the resultant increase in global temperature both contribute to a multitude of cascading impacts from climate change. These impacts include changes in precipitation intensity and frequency, natural animal and plant systems, sea level and disease risk.

Climate change is different from weather. Climate change is a shift in the long-term, average weather patterns. The current, rapid pace of climate change is unprecedented and may exceed many plants’ and animals’ abilities to adapt. Furthermore, each year human activities continue to release GHGs into the atmosphere makes it more difficult to reverse this trend. The rapid rate at which our actions contribute to climate change must be met with an equally urgent and intense effort to reduce emissions and remove GHGs from our atmosphere.

Columbia has already begun to experience the impacts of climate change, and these observed changes are anticipated to worsen over time. Observed and projected future changes in the local climate are summarized below:⁵

	Observed Changes (since 1889)	Projected Future Conditions (by 2050)
 Temperature	+1.3°F increase in average annual temperature	+50 days per year above 95°F
 Precipitation	+10% increase in precipitation	+7% increase in average annual rainfall Summer droughts more common
 Air Quality	13 days of unhealthy levels between 2012 and 2014	Poor air quality days are more common and severe
 Severe Storms and Tornadoes	High tornado activity has occurred earlier in the year	More favorable conditions for storms

5 - Much of the information included in this summary was based on the Climate in the Heartland report analysis, which used historical climate data from the Columbia Regional Airport weather station, 28 National Weather Service cooperative stations across Missouri, and climate change projections completed by Iowa State University scientists based on downscaled data from the international Coupled Model Intercomparison Project 3 (CMIP3) and nine different global climate models.

Risk and Vulnerability

To better understand the extent to which these climate changes will affect Columbia, this Plan includes a climate vulnerability assessment. The vulnerability assessment was conducted with support from the Task Force and City staff and identifies key climate-related risks to Columbia’s resources.

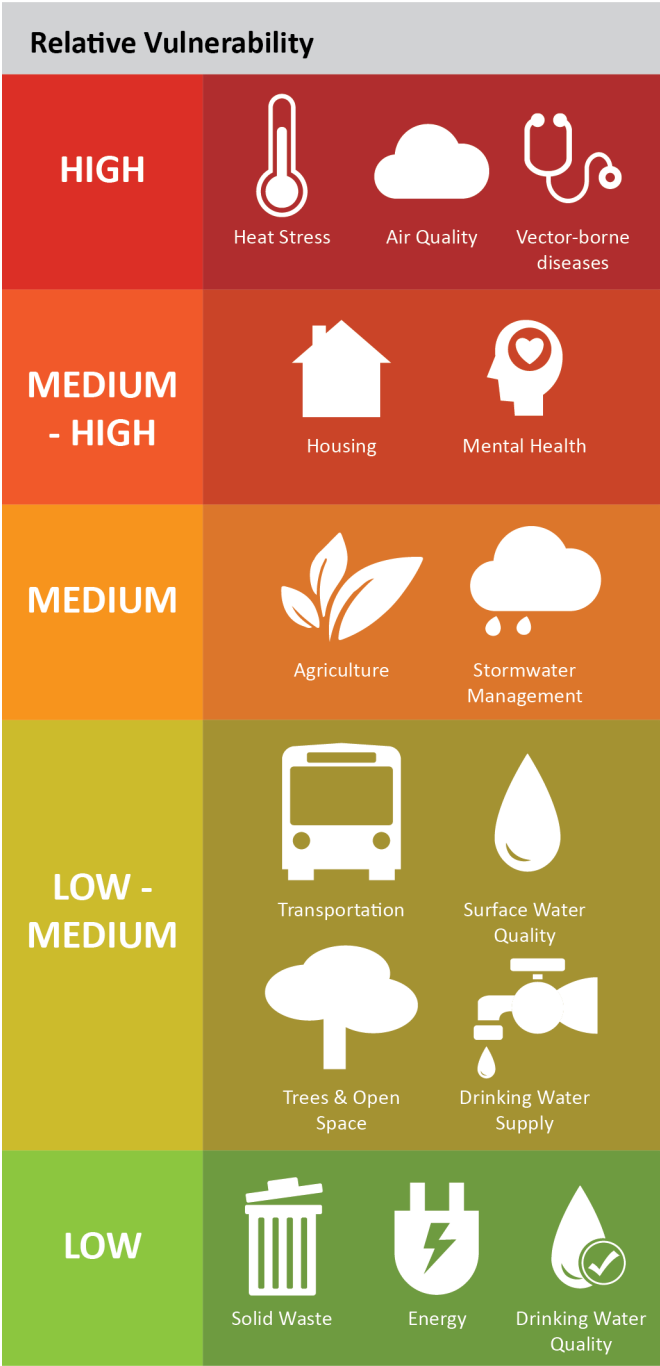
The vulnerability assessment assigns vulnerability rankings to key systems within the Columbia community (see figure), taking into account three key factors in relation to anticipated climate change impacts:

- **Exposure:** The number of people and value of assets in harm’s way or at risk due to their physical location.
- **Sensitivity:** The severity of the consequences of being exposed to these risks and the degree to which climate change exacerbates existing stressors.
- **Adaptive Capacity:** Steps the City and community are already taking to prepare for climate change impacts and whether they have existing capacity to accelerate and/or expand those efforts, if needed.

A summary of the impacts of climate change to populations, regions or infrastructure that are especially vulnerable within the following focus areas:

- Health, safety and well-being
- Natural resources
- Water supply and quality

Full vulnerability assessment findings are provided in Appendix A.



Health, Safety and Well-Being

The areas of particular concern in this sector are an increase in days with poor air quality and greater exposure to allergens, heat-related illness and vector-borne diseases. Another concern often not immediately recognized is the effect of changing environmental conditions on our community’s mental health. The actual impacts of climate change, and even the potential for their occurrence, can lead to negative impacts on mental health. Long-term changes to weather patterns and extreme events also affect food prices as well as safety and property concerns associated with flash flooding.

Natural Resources

The effects of warming climate conditions, higher temperatures, high rainfall events and drought, expose our existing natural habitats and agricultural crops to more stressful conditions, higher incidence of pests, diseases, and invasive vegetation. While changes to conditions may also bring a longer planting window and growing season, the impacts of extreme conditions may outweigh those benefits.

Drinking Water Supply and Surface Water Quality

Warming temperatures, increasing drought and other changes in precipitation may limit water resources and increase demand. Columbia's water supply is likely sufficient to meet demands even under future conditions. In addition to public education, investments are currently being made to ensure and expand sufficient water infrastructure. The quality of the water in our streams and lakes will likely be negatively impacted by more frequent and heavier rain events when untreated stormwater increases pollutant concentrations. Heavier rain events may also erode stream banks, which increases sediment and degrades aquatic habitats.

Actions our community are currently taking to address some of the issues above appear on pages 30-31.

The Social Cost of Carbon Pollution

Social, environmental and economic costs of climate change, largely due to burning fossil fuels, are not included in the price we pay for the fuels themselves. Burning fossil fuels results in economic consequences, such as infrastructure damage from flooding, fires or extreme storms. Despite the very real nature of these costs, the market price of fossil fuels does not include these societal cost externalities.

Identifying the true social costs of burning fossil fuels can help policymakers decide if investments in climate action are cost effective. Researchers, including those at the U.S. Environmental Protection Agency (EPA), have worked to quantify the economic losses associated with each metric ton of carbon dioxide burned. This is called the Social Cost of Carbon.

The EPA estimates a range of possible social costs of carbon depending on the year and discount rate applied to the future. These estimates range from \$36 per metric ton of carbon dioxide equivalent (MTCO_{2e}) in 2015 to \$69 per MTCO_{2e} in 2050.⁶ However, the EPA acknowledges that current modeling does not include all important damages—estimates by other agencies and researchers are far higher. Some recent estimates have determined the social cost of carbon could be as high as \$100-\$200 per MTCO_{2e}.⁷

To reach Columbia's 2050 goal, the community will need to reduce emissions by 2.3 million MTCO_{2e} compared to the business-as-usual scenario. Using the 2050 estimated social cost of carbon of \$69 per MTCO_{2e}, achieving this reduction would equate to \$158 million in avoided societal costs.

6 - "The Social Cost of Carbon." 2017.

7 - Ricke, K., Drouet, L., Caldeira, K., & Tavoni, M. (2018). Country-level social cost of carbon. *Nature Climate Change*, 8(10), 895. Pindyck, R. S. (2019). The social cost of carbon revisited. *Journal of Environmental Economics and Management*, 94, 140-160.

Columbia's Contributions to Climate Change

Columbia has been reporting its community GHG emissions every five years, since 2000, and recently completed its first GHG inventory of municipal operations. Activities that result in the release of GHG emissions include burning fossil fuels for transportation and energy, disposing of waste in landfills and treating wastewater. From 2000 to 2015, community GHG emissions increased by 12%, to 2.4 million MTCO₂e in 2015. However, per capita emissions decreased over that time period from 25.7 MTCO₂e to 20.5 MTCO₂e/person. The first municipal GHG inventory found that municipal operations including providing the community with locally generated energy, wastewater treatment and solid waste services resulted in the release of 163,523 MTCO₂e in 2015.

Community Emissions Profile

The community emissions inventory accounts for the emissions associated with activity within Columbia. When residents burn fossil fuels within the city, by driving cars and burning natural gas to heat homes, those emissions count towards the inventory. Sources of GHG emissions from the Columbia community include commercial, residential, industrial energy use, transportation, and waste.



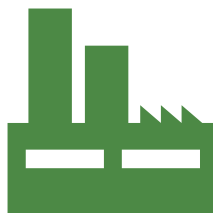
Residential

The residential sector includes single and multifamily homes.



Commercial

The commercial sector includes most businesses and institutions, including retailers, office space, government operations and universities.



Industrial

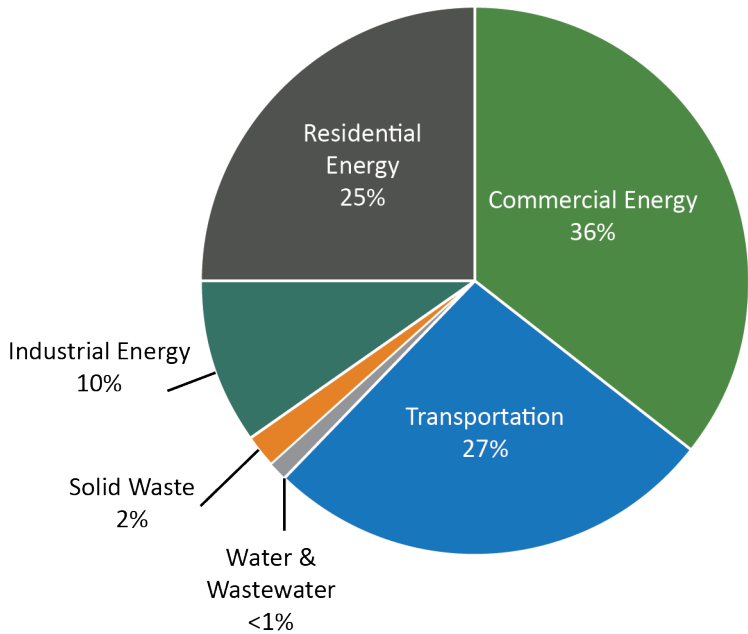
The industrial sector includes facilities that host industrial processes, including energy generation facilities.



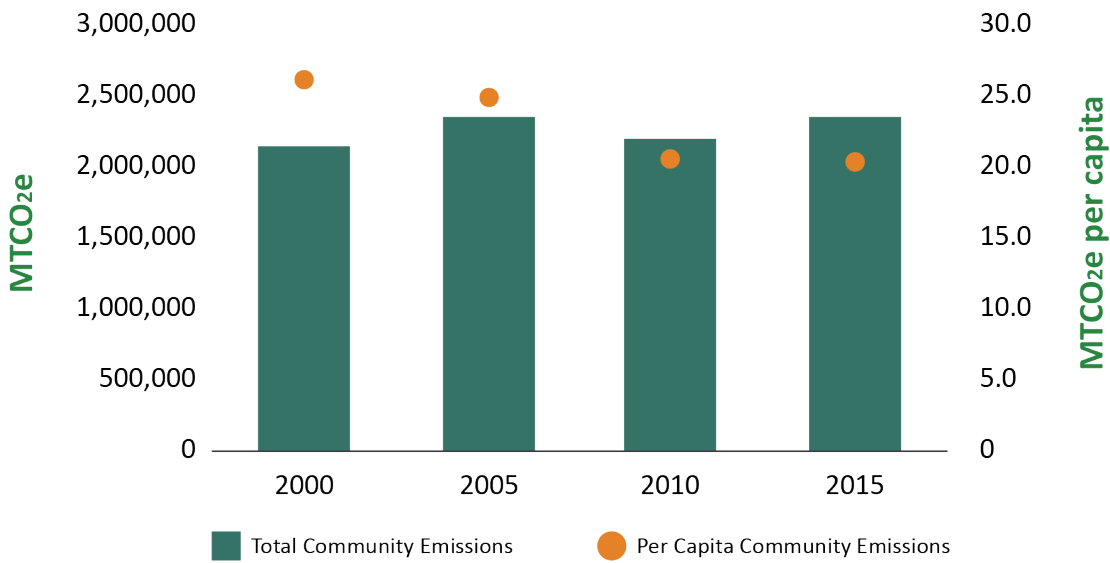
When residents and businesses consume electricity, the inventory counts emissions associated with the production of electricity, even if those emissions occur outside city boundaries. Columbia’s total GHG emissions were 2,429,305 MTCO₂e. It would take over 3 million acres of new forest to sequester this much carbon in one year.⁸

Sources of community-wide GHG emissions in Columbia include transportation, residential, commercial and industrial energy use, and waste (in MTCO₂e, for 2015).

At 63% of the total, electricity emissions are the single largest source of emissions for Columbia. Three utilities provide electric power to the community: Columbia Water & Light, University of Missouri Columbia Power Plant and Boone Electric Cooperative. In order to serve their customers’ needs, each has both local generation facilities and purchases power from remote production facilities. Eight percent of total emissions are from natural gas usage.



Total communitywide GHG emissions in Columbia have fluctuated over time, while per-capita emissions have largely decreased.



8 - “Greenhouse Gas Equivalencies Calculator.” United States Environmental Protection Agency. December 2018. <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>

Municipal Emissions Profile

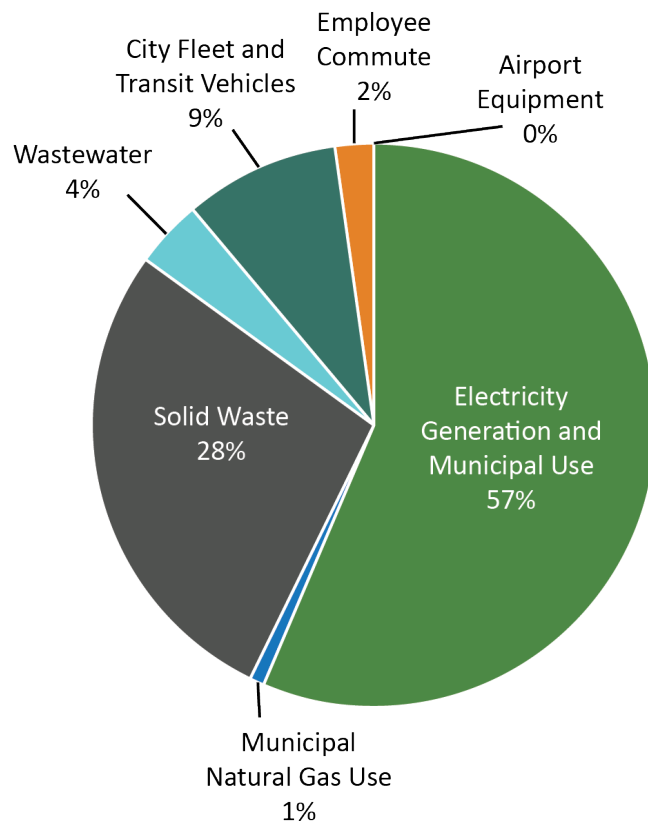
As a part of the development of this Plan, a municipal emissions inventory was completed. Two perspectives of this inventory are presented below. The first accounts for the impact of the full range of utilities and other services provided to the community by the City (e.g., solid waste, water and wastewater treatment, public transportation and electricity), as well as the impact of day-to-day operations as an organization. The second represents the impact of the daily operations of the City of Columbia as an organization.

Emissions are from:

- Electricity generated locally by the City of Columbia as well as the electricity used for City operations and generated elsewhere.
- Natural gas used at City facilities.
- Fuel oil used for heating at the airport.
- Treatment of solid waste and wastewater.
- Use of fuels in City-provided public transportation, City fleet vehicles, City employee commuting, and ground equipment at Columbia Regional Airport.

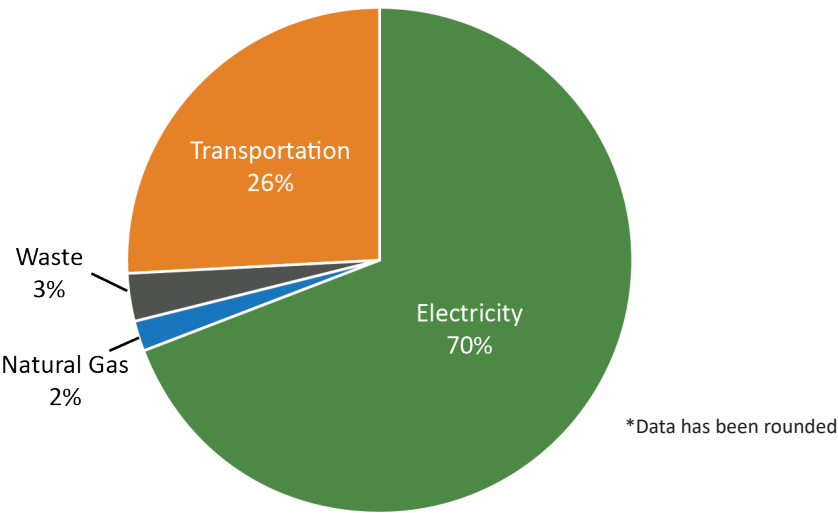
Energy emissions total 92,821 MTCO₂e, 58% of the 2015 municipal inventory. Emissions associated with landfill operations and wastewater treatment total to 53,072 MTCO₂e (31%). GHGs associated with the operation of City fleet and transit vehicles, City employee commuting and ground equipment at the airport total 17,630 MTCO₂e, 11% of the total emissions. Reporting total emissions from these sources is important and will continue to inform broader process changes and our progress toward meeting community emissions reduction goals.

Sources of GHG emissions from City of Columbia operations including community utility use (2015, total = 163,523 MTCO₂e). Emissions from airport ground equipment and fuel oil use (0.05% and 0.06% respectively) are not labeled here for clarity.

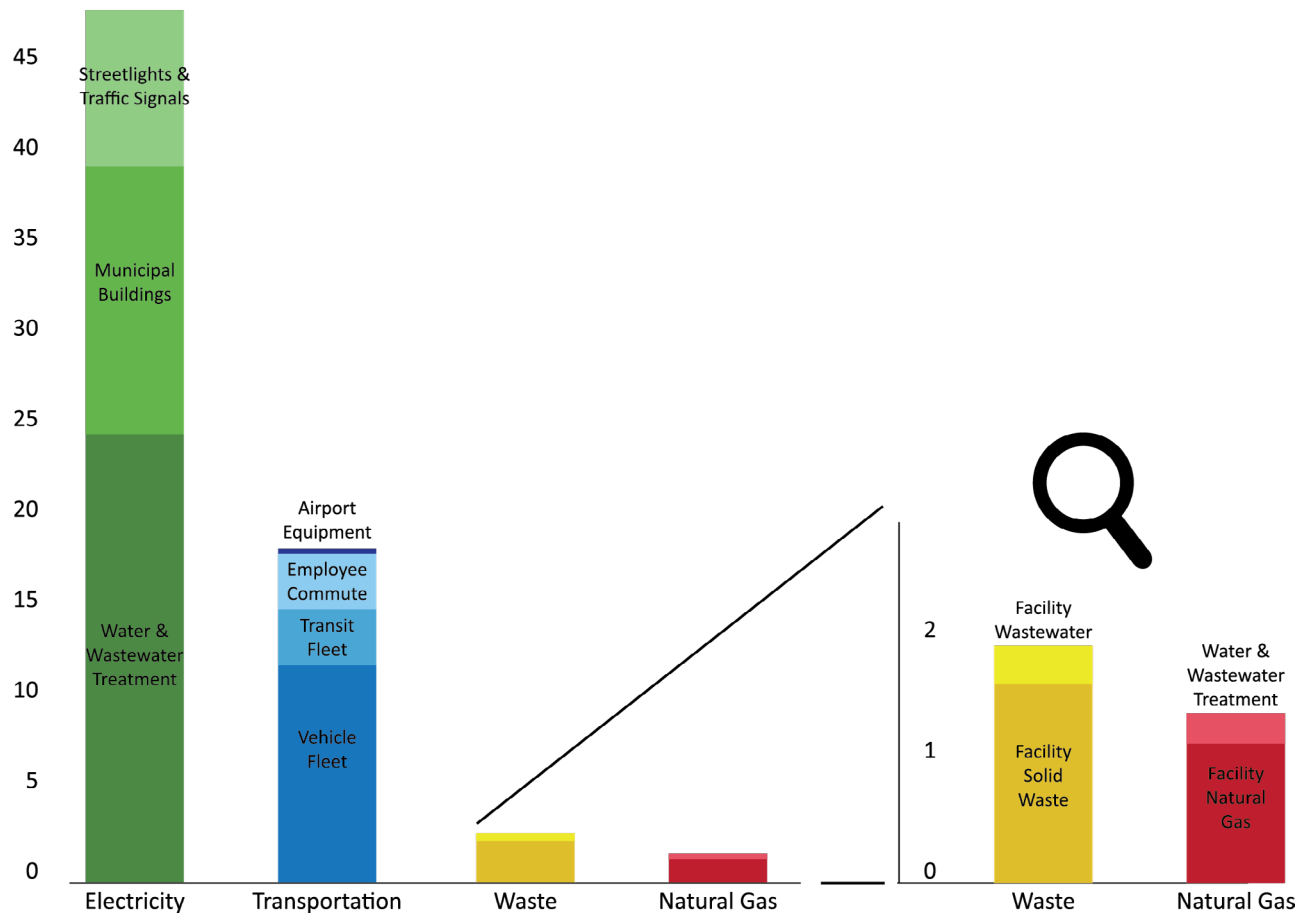


The chart below removes the emissions impact of providing utility services to the community at large. Instead, it represents the emissions impact of day-to-day operations of the City of Columbia as an organization. Progress toward the municipal emissions reduction goals of 50% by 2035 and 100% by 2050 will be measured using the accounting represented below.

Sources of GHG emissions from City of Columbia operations excluding community Utility use (2015, total = 68,252 MTCO_{2e}).



Detailed contribution of business activities to municipal emissions (2015, total = 68,252 MtCO_{2e}). Emissions from fuel oil use at the airport (96 MTCO_{2e}) are not included here for clarity.



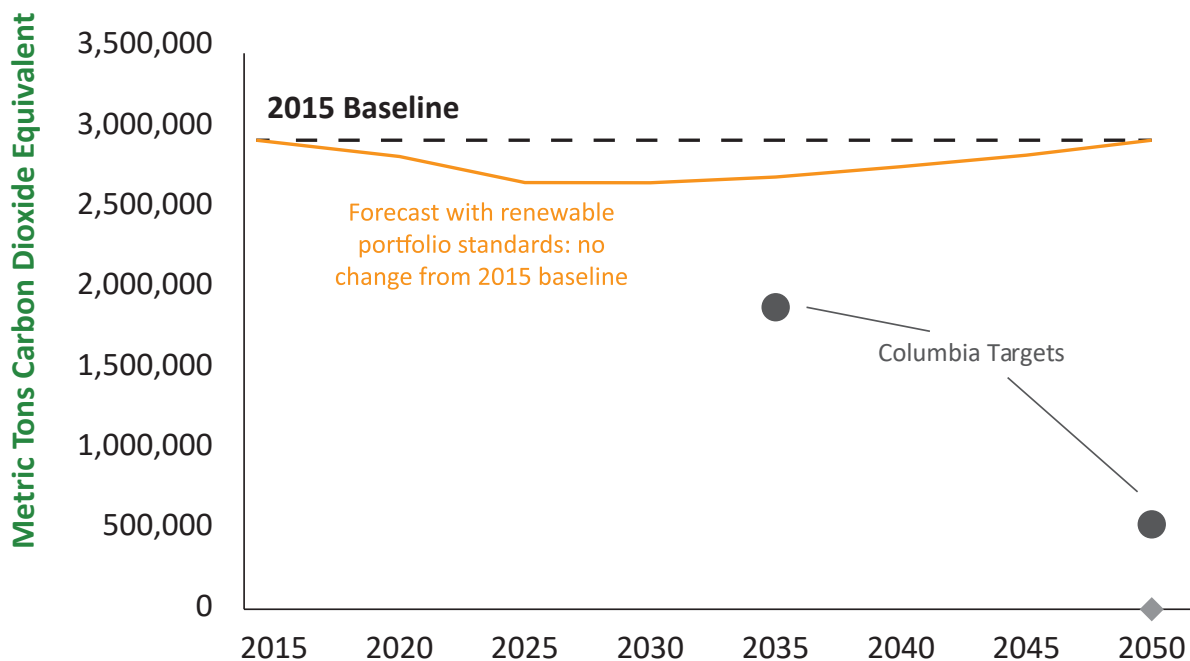
How will emissions change in the future?

A business-as-usual forecast provides an estimate of potential future emissions, assuming that the City takes no further action. It considers the influence of external factors on Columbia's emissions, such as population growth, changes in the regional electricity fuel mix and energy demand.

The following key assumptions for Columbia's business-as-usual forecast were refined in consultation with the Task Force and City staff:

- 1.3% annual employment growth rate from the CATSO-County-City Employment Projections 2050.
- 1.5% annual population growth rate from the CATSO-County-City Employment Projections 2050.
- Reductions in personal vehicle carbon intensity factors based on CAFE standards.
- Energy demand projected linearly based on 2012-2017 electricity demand.⁹
- The City meets its renewable portfolio standards (RPS): 15% renewable energy by 2017, 25% by 2022, and 30% by 2028.

The forecast estimates that Columbia's overall emissions will be roughly the same in 2050 as they are in the baseline year, 2015. This scenario conveys the need for ambitious climate action to meet the City's short- and long-term emission reduction goals. The goals needed to curb the increase in average global temperature to 1.5°C is also provided for context.¹⁰



9 - This energy demand forecast does not take into account anticipated future demand from electric vehicles.

10 - Source: IPCC Special Report on 1.5°C (2018)

PROGRESS TO DATE & CONCURRENT EFFORTS

Existing Climate Efforts

Columbia is already taking initiative to mitigate its climate impact and promote community well-being. Columbia's City Council and staff are working to provide sustainability programs for the community, adopted building codes and policies to support climate change action, and improved municipal operations. To date, the City has taken the following steps, organized by sector:

Climate

- Endorsed the U.S. Conference of Mayors Climate Protection Agreement.
- Established the Mayor's Climate Protection Awards to recognize local businesses and organizations that promote sustainability.
- Formed a Mayor's Task Force to guide development of the CAAP.

Health, Safety and Well-Being

- Advocates for local, healthy food production.
- Partners with regional emergency responders on preparedness planning.
- Created nine public warming/cooling centers.
- Participates in the Voluntary Action Center's Air Conditioner Exchange and Summer Fan programs.
- Collaborated to create an Agriculture Park.

Energy

- Adopted Renewable Energy Ordinance that requires an increasing percentage of electricity to be generated with renewable sources.
- Provides solar photovoltaic rebates and loans for customers.
- Has entered into 10MW solar power purchase agreement.
- Operates landfill gas to energy plant at the municipal landfill.

Transportation

- Provides Go COMO bus services.
- Uses compressed natural gas and electric vehicles.
- Adopted Vision Zero to make Columbia's roads safer.
- Efforts of GetAbout Columbia to improve walking and biking opportunities.
- Implements Columbia Imagined, the City's plan for community development.
- Maintains and builds trails systems connecting residents, including the development of a 30-mile loop.



Waste

- Provides waste audits and consulting.
- Maintains a bioreactor landfill/bioenergy plant.
- Provides yard waste and recycling drop-off centers.
- Manages household hazardous waste and paint for reuse.
- Provides waste education through public events, the Recycling Ambassadors program, compost workshops, the CoMo Recycle and Trash app and Waste Wizard.
- Runs programs to properly dispose of waste through drug takeback, e-waste, tire collection, fix-it fairs and commercial food waste recycling.

Housing and Buildings

- Provides energy efficiency incentives, energy loans, and rebates to residential and commercial customers.
- Created the Community Land Trust Lynn Street Cottages.
- Runs buyout programs for homes in floodplains.
- Provides home repair and rehabilitation funds to low- and moderate-income families.
- Updated building and zoning codes

Natural Resources

- Conducts habitat restoration projects.
- Manages native pollinator gardens.
- Uses native plants to landscape roundabouts, medians, and along roads.
- Adopted the Emerald Ash Borer Management Plan to prepare for infestation.
- Purchasing land and creating parks so that no one is more than half a mile from recreational green space.

Water Supply and Quality

- Proposed Water Treatment Plant upgrades.
- Inspects and maintains hundreds of stormwater treatment and control structures.
- Sells rain barrels and provides homeowners with native, low-input landscaping assistance.
- Created backup storage of water for emergencies.
- Adopted stormwater management program and plan.

Education and Outreach

Activities and programs include:

- Recycling Ambassadors
- TreeKeepers
- Stream Team
- Composting workshops and community gardens
- Energy and water conservation education
- Classroom and school waste audits
- Native plant education
- Fix-it fairs
- Bicycle safety classes and repair co-op

Page left intentionally blank

MOVING THIS PLAN FORWARD: IMPLEMENTATION STRATEGY

Moving This Plan Forward: Implementation Strategy

Implementing the CAAP requires motivating staff, finding funding for strategies, involving community members to make key changes and sustaining momentum. Columbia has already taken steps to improve community sustainability. The following implementation strategies build on those efforts to ensure the CAAP strategies are completed, and climate-positive business practices are institutionalized. This section of the plan includes:

- A **timeline** for taking action, including projects that could be started tomorrow as well as transformations that will happen over the long term.
- A **plan** for sustaining community, government and stakeholder buy-in. Making progress on climate action requires leadership and commitment from the City government and from the community. Community engagement has been a vital part of the CAAP development process and sustained community support is going to be equally important moving forward.
- A **structure** for ongoing monitoring, evaluation and reporting on CAAP progress. Investing in data collection and consistent reporting is a key aspect of implementation. City staff will track and regularly report on CAAP indicators, GHG emissions and notable progress on implementing strategies. Evaluation of progress will include revisiting project priorities based on new information regarding action need, effectiveness, feasibility and cost.



Levers for Affecting Change

Development of the actions in this Plan required identification of appropriate levers, or mechanisms, for affecting change. These levers represent tools within the City and community’s toolbox for taking action. Levers can take the form of carrots (voluntary incentives to encourage desirable behaviors) or sticks (mandatory instruments to discourage undesirable behaviors). The planning team identified the most appropriate levers for each goal and strategy during the strategy evaluation process (see Plan Development Process section for more information). This Plan includes a mix of both carrots and sticks. During the implementation phase, carrots may be prioritized first to gauge effectiveness before introducing needed sticks to reach goals.

Potential levers and their definitions are listed below:

- **Policy:** Introduction of new or revised formal policies that delineate guidance, requirements, or specifications.
- **Capital Improvement Project (CIP):** Development of, or changes to, physical structures or systems.
- **Monetary Instrument:** Introduction or adjustment of monetary mechanisms for encouraging target behaviors, such as rebates, subsidies, loan programs or taxes.
- **Information/Education:** Development and distribution of informational materials, implementation of education, outreach, or technical assistance programs, or conducting a study.
- **Partnership/Collaboration:** Building or fostering key partnerships or collaborations that could support learning or synergistic action.
- **Management Practice:** Informal adjustment of ongoing operations, processes or practices.

Examples of actions in the plan for each of the above levers include:

Lever Type	Example Action	
Policy	HS-1.3.1	Create anti-idling policies and enforcement plans.
Capital Improvement Project	E-1.1.3	Install solar panels on all City buildings and sites, where feasible.
Monetary Instrument	H-1.1.2	Increase energy efficiency funding options for families (e.g., low-interest financing, on-bill financing, Pay As You Save, PACE, etc.).
Information/Education	W-2.2.1	Study the short- and long-term cost/benefit of a City composting program.
Partnership/Collaboration	T-1.5.5	Partner with Columbia Public Schools to adjust school siting requirements to prioritize building schools in walkable and bikeable areas.
Management Practice	I-2.1.1	Hold biannual meetings with all division heads to highlight progress, plans and challenges related to projects with climate impacts.

Actions labeled “other,” might not be identified yet. Reasons could include uncertainty regarding the most effective lever or need for further research. In those cases, it is envisioned that definition of these levers and other additional specifications would be developed during the plan implementation phase. Actions labeled “priority” have more details on implementation in the Priority Action Matrix in Appendix B.

Timeline for Implementation

Climate actions build on each other and all require community, staff and elected officials' support. A specific overview of year-one implementation is outlined below, followed by a broader priority action list for initial implementation. City staff will review actions labeled "priority" for next steps sooner than actions labeled as "other." Implementation details for all priority strategies and actions in the plan are provided in Appendix B.

Year One Implementation Overview

The initial focus will be on forming the foundation for ongoing action by creating institutional accountability and maintaining public support. Year-one actions include:

- Create Community Climate Commission to advise staff on the implementation of the CAAP.
- Ensure the critical functions of the Plan are adequately staffed and supported.
- Identify opportunities for, and barriers to, the equitable implementation of CAAP strategies.
- Form an internal CAAP Action Group with representatives from across City departments tasked with short- and medium-range planning of CAAP implementation activities.
- Create a data management and reporting system for key performance indicators of activities related to CAAP goals.
- Include a report in the City Manager's proposed budget on the existing and proposed projects that improve mitigation and adaptation efforts.
- Develop specific funding options for CAAP priorities.



A Comprehensive, Phased Approach: Priority Early Actions

Many strategies and actions in this plan are interrelated. The planning team considered these interrelationships in designing a phased approach to plan implementation. The following actions would be prioritized early in CAAP:

Clean Fuel Foundation:

Behavior change is hard and takes time to achieve. Efforts to change our community driving habits, car purchasing decisions, and home and business energy consumption requires careful planning, time-intensive policy development and resource-intensive programming—often with unknown outcomes. Given this uncertainty and the sometimes slow-developing results, focusing on establishing a clean, affordable and renewable electricity source as a first phase of CAAP implementation directly addresses over 60% of our total community emissions. Achieving 100% renewable electricity will leverage the impact of actions requiring a shift from fossil fuels to electricity (e.g., gasoline to electric vehicles), making them more impactful and attractive. This approach also builds on the existing renewable energy goals of our municipal electricity utility, Water & Light. Furthermore, pathways toward achieving 100% renewable electricity such as community solar and renewable energy credits (RECs) are well-established approaches and could be emulated from other utilities across the country. Prioritizing these clean fuel actions will provide an important and viable early success for the CAAP that can help energize the community and facilitate achievement of the City's near-term emission reduction goals.

Fuel Switching:

With a 100% renewable electricity pathway identified and underway, we can begin shifting focus to fuel switching. Specifically, prioritizing a transition of our residential and business energy use in transportation and buildings from fossil fuels to renewably generated electricity. This includes actions to transition fuels used for space and water heating in buildings to renewable electricity as well as requiring or encouraging electric passenger vehicle adoption. We see this path as a viable option for Columbia, as the current high dependency on single-occupancy vehicles is unlikely to change dramatically in the near-term, and purchasing decisions made now will have lasting impacts. For example, the average U.S. household replaces vehicles only every 10 years, so actions taken now may not realize their full potential until 2030 at the earliest. Continued improvements to our existing transit, biking and walking infrastructure will also be a key element in reducing our transportation emissions. Reducing reliance on fossil fuels also brings economic, public health, and resilience benefits, as consumers are no longer subject to price fluctuations in natural gas and petroleum markets, and local air pollution from internal combustion engines is eliminated.

Affordable Density:

Actions to prepare for and increase density bring a host of benefits to a community. When people live closer together, the average size of living and work space declines, heating and cooling costs go down, the need for individual vehicles is reduced, and travel distances decline. Increasing density would also require new construction in Columbia, presenting an opportunity to incorporate energy-efficient technologies from the start. Dense communities can create other opportunities for climate mitigation and adaptation, such as eco-districts, avoided development of important natural areas and habitats, and increased social cohesion and resilience. As noted in the tension points on pages 57 and 63, it will be important to create density in a manner that does not conflict with other adaptation and equity goals. For example, optimizing green space and tree canopy cover to provide carbon sequestration, shade and habitat.

Sustaining Community Support

Throughout the CAAP development process, **public input** has been essential to informing CAAP priorities. Moving forward, the actions of individuals will be necessary to meet City emission reduction targets. The City will continue to foster conversations on climate change and climate leadership through public engagement by partnering with existing community groups, neighborhoods and business groups in climate action. In addition to informing CAAP priorities, public input throughout the CAAP development has also fostered numerous education programs and outreach ideas that will be developed and promoted as the Plan is implemented. These ideas range from public service campaigns around the importance of properly inflated tires for vehicle efficiency to including GHG emissions information on utility bills.

To formally maintain public participation in CAAP implementation, CAAP strategies include creating a **Community Climate Commission**. This commission will advise staff, maintain community engagement and provide accountability.

Additionally, strengthening City **staff capacity** and knowledge will help maximize the speed and impact of CAAP implementation. Internal staff development can include workshops on climate change, support for strategy implementation and development of CAAP planning metrics.





BALANCING FUNDING NEEDS & COMMUNITY PRIORITIES

Funding and resources are tight for the City of Columbia and for most local governments. Anytime council, staff or residents bring forward new programs and projects we must answer the fundamental question, how can we pay for this? It is a fair and important question and ultimately reflects the values and priorities of the community. The actions outlined in this Plan are no exception. How do we reprioritize, find new resources and rethink funding mechanisms without dropping other community priorities?

There is \$435 million requested for projects in the Fiscal Year 2020 Capital Improvement Plan, with few of the projects funded at any given time. Every ballot, bond issue and budget requires rigorous prioritization by staff, Council and citizens. Master plans, strategic plans, engineering assessments, customer satisfaction, and a host of other data sources and plans help guide project prioritization. Reaching the goals adopted by the community in this plan will require reexamining those projects for ones that help, ones that can be changed and ones that hinder. Every project and program is important to someone, and reprioritization ultimately requires addressing and adjusting expectations.

Some of the actions in this Plan may be funded by increasing existing revenue sources or creating new ones. This requires the City as an organization and a community to find answers to important questions: How do we structure taxes, fees, and rates so that they are fair and equitable?

Should increases be applied across the board or be tied to usage and impact? Changes to funding are fraught with controversy and will likely present the risk of a new burden to some segment of the population.

One way to improve efficiency is through communication among City employees. To do this, we must first remove barriers between departments. We use the term “breaking down silos.” When silos exist in organizations and communities, progress on shared issues can suffer and become needlessly expensive. Social justice, affordable housing, economic development, public safety, non-motorized transportation, and climate action are all priorities with a great deal of overlap and can suffer from siloing. The implementation strategies and actions on pages 42-43 set the groundwork for breaking down silos. The CAAP offers cross-priority actions that can help us achieve outcomes across a wide array of priorities. The challenge will be focusing on the desired outcomes from an organizational perspective, instead of a single, siloed priority area. The actions in this plan can be implemented with the right mix of prioritization, raising of new funds and a rethinking of how we achieve the priorities we set for our City.

Monitoring and Evaluation

City staff will conduct ongoing monitoring, evaluation, and reporting on CAAP progress. This section outlines a high-level plan for these activities. Key aspects of monitoring and evaluation include:

- **Conducting annual GHG inventories** and report results to City Council. GHG inventories inform progress towards meeting reduction targets and highlight areas that need additional action.
- **Establishing performance metrics and a tracking structure** for monitoring progress within City departments. Monitoring key performance indicators (KPIs) will help track progress on individual CAAP actions.
- **Evaluating and reporting progress.** Reporting the status of CAAP implementation to City Council annually will ensure there is consistent progress.
- **Adapting strategies and actions.** The results of the GHG monitoring and evaluation of actions using key performance indicators will be used to update the CAAP as necessary to meet CAAP goals.

What will be tracked?

Two primary elements of the CAAP will be monitored:

- **Action progress:** More qualitative descriptions of progress the City is making toward implementation actions in the Plan.
- **Key performance indicators:** Quantitative metrics that indicate progress towards higher-level goals and target outcomes of the Plan.

Where will indicators be tracked and reported?

City staff will calculate and track all indicators. Key indicators will be publicly viewable on the online CAAP dashboard.

City staff will develop annual progress reports for City Council and the public. Progress reports will include a detailed appendix with indicators and action-by-action progress.

Who will track indicators?

City staff will be responsible for calculating and reporting on indicators.



How often will CAAP indicators be updated?

The majority of indicators will be updated annually. Some indicators may be updated less frequently depending on how often new data is available.

What is the process for reviewing indicator progress?

The City will hold annual division-level meetings to identify goals, review progress, and identify course corrections and next steps. A dedicated group within the City, including Office of Sustainability staff, will develop work plans from division-level outcomes.

How often will the CAAP be updated?

This CAAP was designed to be a living document. The CAAP, including targets and goals, will be updated every five years. The strategies and actions in this foundational CAAP reflect the latest available technologies and best practices in the climate action and adaptation field. However, to continue meeting the goals of this Plan effectively, the Columbia community must have the ability to adapt as new technologies change and best practices evolve. The ongoing monitoring and evaluation practices will reveal what is working, what is not working and what course corrections may be warranted. Updating the CAAP every five years will allow Columbia to adaptively manage its climate actions and ensure that the Plan continues to optimally serve the community.



Cross-Cutting Strategies and Actions

Implementation-1. Establish climate action as a priority for the City Council and the community.

Strategy I-1.1: Include CAAP objectives in Council priorities	
I-1.1.1	Use recommendations in the annual report to identify budgetary priorities that support implementation of the CAAP.
I-1.1.2	Identify State and Federal legislative issues that support the goals of the CAAP and enable its implementation.
Strategy 1.2: Utilize Community Climate Commission to support accountability, implementation, and awareness of the CAAP in the community.	
I-1.2.1	Create Community Climate Commission to advise staff on the implementation of the CAAP. The Commission will represent the diversity of the community with relevant expertise in the social, scientific, economic and environmental components of CAAP strategies.
I-1.2.2	Advise staff in the preparation of an annual CAAP progress report and recommendations for City Council.
I-1.2.3	Present annual CAAP progress report policy and budget priorities to City Council for acceptance.
I-1.2.4	Identify opportunities and barriers to equitable implementation of CAAP strategies.

Implementation-2. Establish CAAP goals as priorities in the activities of the City of Columbia as an organization.

Strategy I-2.1: Support integration of climate goals in all Divisions.	
I-2.1.1	Hold biannual meetings with all division heads to highlight progress, plans and challenges related to projects with climate impacts.
I-2.1.2	Form a CAAP Action Group with representatives from across departments tasked with short- and medium-range planning of CAAP implementation activities.
I-2.1.3	Develop a decision matrix to be used to integrate mitigation and adaptation priorities into City planning and standards (e.g., zoning, construction standards, CIP review). City departments will utilize forecasted model data (e.g., climate, health, population, economic, etc.) during these processes, where available.
I-2.1.4	Develop a process for requiring mitigation, adaptation and climate-equity impact assessments for all new policies and projects that meet threshold criteria, such as cost burden, vulnerability or increase to net emissions.
Strategy I-2.2: Incorporate CAAP goals into the budget process.	
I-2.2.1	Integrate annual CAAP report goals during the budget review process at the direction of the City Manager.
I-2.2.2	Include a report in the City Manager's proposed budget on the existing and proposed projects that improve mitigation and adaptation efforts.
I-2.2.3	Assessment of progress toward CAAP goals shall be included in the City Manager's annual performance review by the City Council.



Implementation-3. Strengthen City capacity to support community climate action.

Strategy I-3.1: Improve City staff capacity and knowledge of their role in meeting climate goals.	
I-3.1.1	Create a data management and reporting system for key performance indicators of activities related to CAAP goals.
I-3.1.2	Create and distribute an annual municipal adaptation and GHG emissions report to staff to be used in assessment of current and proposed activities.
I-3.1.3	Conduct annual GHG emissions inventories, including identification of improved processes for quantifying net carbon sequestration and solid waste emissions.
I-3.1.4	Continue to align performance measurements of CAAP actions with existing planning metrics.
I-3.1.5	Provide training and other capacity building opportunities to staff to facilitate creative, climate positive innovations in operations, project design and implementation.
Strategy I-3.2: Support equitable climate action.	
I-3.2.1	Create a report that identifies the differential impact of climate change on neighborhoods and communities.
I-3.2.2	Develop and incorporate equity metrics in the evaluation of CAAP activities. This evaluation will be used as a criterion for the CAAP Action Group, Community Climate Commission and budget team during review of program cost, viability and success.
Strategy I-3.3: Develop community leadership capacity for and involvement in climate action.	
I-3.3.1	Align existing City educational and engagement programs with CAAP goals and programs. Provide additional support to education and outreach for the CAAP and its individual actions.
I-3.3.2	Engaging with community partners, identify unmet community needs, barriers and opportunities to improve access to the green job economy for all community members.
I-3.3.3	Design and promote CAAP educational materials to ensure full engagement of community members by using methods that are accessible and relevant to all.
I-3.3.4	Develop CAAPtains to serve as ambassadors for the CAAP activities, especially youth.
Strategy I-3.4: Secure organizational and staff implementation capacity.	
I-3.4.1	Develop specific funding options for CAAP priorities.
I-3.4.2	Track cost savings associated with CAAP action across the City organization and allocate for use in supporting further mitigation and adaptation actions.
I-3.4.3	Evaluate staffing requirements to ensure successful CAAP implementation and allocate required resources.
Strategy I-3.5: Support CAAP progress through regular, transparent community reporting and education.	
I-3.5.1	Use online dashboard to report on the status of CAAP priority actions/KPIs (e.g., progress of actions that have been initiated, implementation schedule of other actions not yet started, community and municipal GHG emissions, equity impacts of actions implemented).
I-3.5.2	Host a community event every two years to celebrate the annual progress report on the implementation of the CAAP.

Page left intentionally blank

SECTOR-SPECIFIC STRATEGIES & ACTIONS

Sector-Specific Strategies and Actions

The following sections detail the strategies and actions the City and community will need to take to help reach our carbon pollution reduction and climate resiliency goals. To reduce community and municipal GHG emissions, Columbia will have to accelerate the adoption of clean energy, reduce miles traveled in fossil fuel vehicles, phase in electric appliances and reduce waste. Maximizing climate resilience will require ensuring the built environment can sustain people in extreme heat, through flooding and changing ecological conditions. The City will achieve this by developing building resilience, creating climate-resilient green space, and providing community centers. This Plan’s actions focus on policies, programs and infrastructure. It is expected that education and outreach programs will be developed as we implement actions. Some of the potential education actions discussed during the Plan’s development are included in the introduction for each sector.

The goals of the CAAP address both climate mitigation (reducing GHG emissions) and climate adaptation (improving resilience to climate impacts) and are denoted as follows:



Climate **mitigation** strategy
(reduces GHG emissions)



Climate **adaptation** strategy
(increases resilience to
climate impacts)



Mitigation & adaptation strategy
(addresses both mitigation
and adaptation goals)

Guide to reading Sector-Specific Strategies charts. Example:

M Goal of sector to reduce emissions or increase resiliency.

Strategy to meet goal		
Action Number (for organizational use)	Action to be taken to meet strategy	Priority or Other Priority: Action was rated high and implementation is recommended to begin within five years. Other: Action might not begin with five years and/or might need foundational actions to happen first.

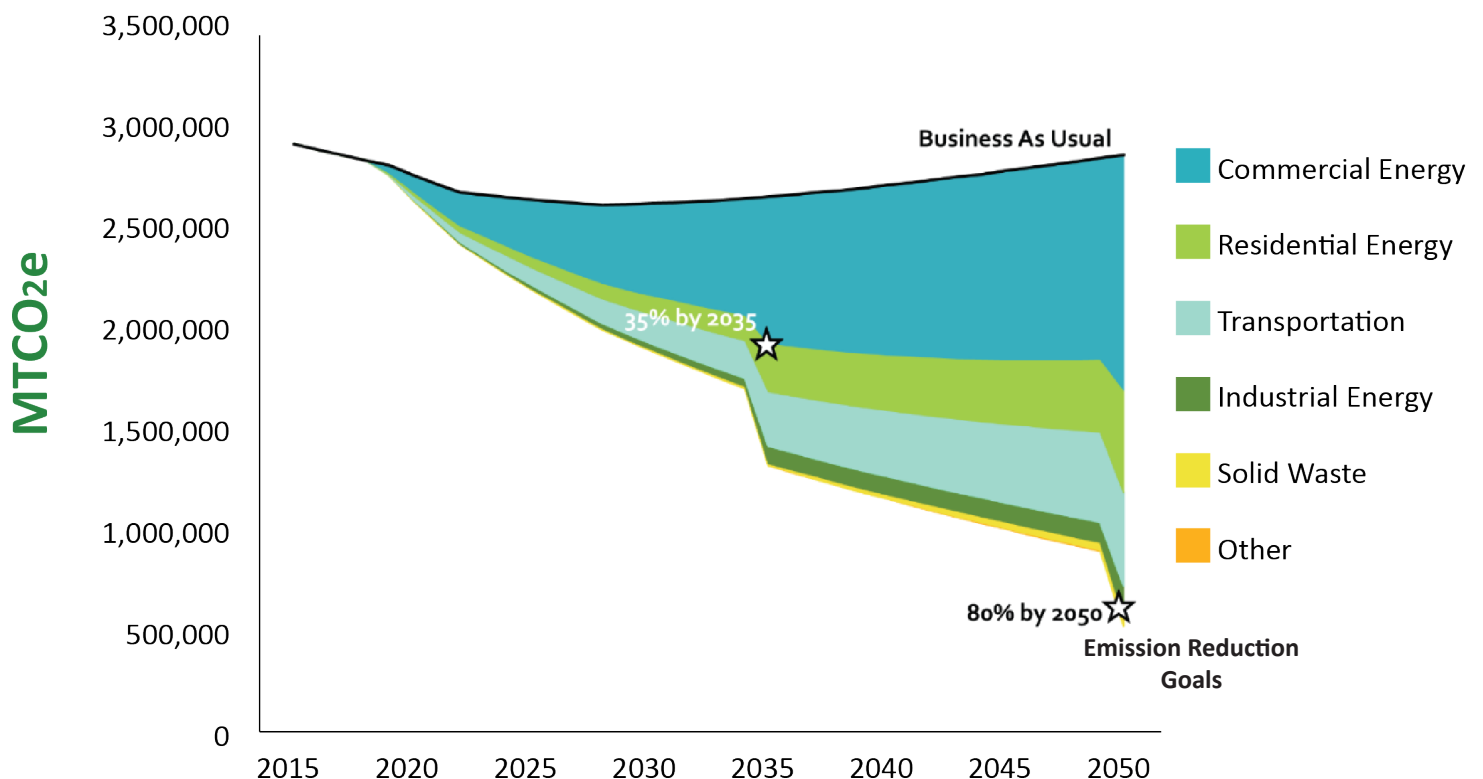
Modeling Impact of CAAP Strategies: The Wedge Analysis

The wedge analysis models the potential impact of fully implementing CAAP strategies. The wedge analysis uses Columbia's business-as-usual emissions and incorporates emissions savings associated with cleaner electricity, reductions in energy demand, efficient vehicles, solid waste management and tree carbon sequestration. The wedge analysis suggests that if Columbia fully implements the strategies and actions of the CAAP, the community can meet its GHG reduction targets. **Specifically, the wedge analysis shows Columbia can achieve a 56% reduction in communitywide emissions from 2015 levels by 2035, and an 83% reduction by 2050.**

The wedge analysis:

- Is based on the City's current community GHG emissions inventory.
- Is based on best estimates of what is possible given current and anticipated technologies, policies, programs and human behavior.
- Does not take costs of actions into consideration (i.e., assumes that the City will find and commit funding to the action).
- Accounts for interactions among strategies and actions.
- Includes consideration of future climate change impacts on heating and cooling energy use.

Wedge analysis of Columbia's communitywide GHG emissions, depicting potential emission reductions from identified strategies as compared to a business-as-usual scenario (by sector).



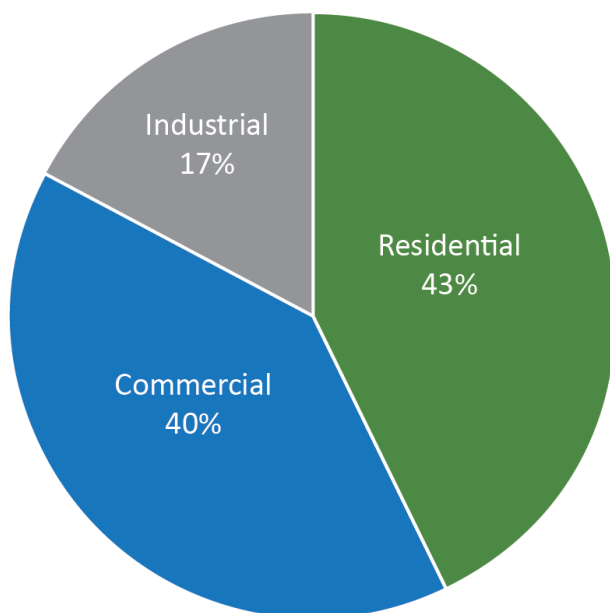
Energy

Energy refers to electricity generated and delivered to the Columbia community. Energy consumption accounts for 70% of Columbia’s total GHG emissions, and adopting clean energy is by far the most impactful modeled CAAP strategy. Energy-related emissions come from electricity and natural gas used in homes, businesses and industry. Columbia’s electricity is the primary factor in energy emissions, which means adopting renewable energy sources for electricity has a large impact on community GHG emissions.

Climate change will impact energy use in Columbia. As air temperatures rise, the use of air conditioning may increase, leading to increased energy use, household cooling costs and GHG emissions. Households with lower annual incomes may be less likely to have air conditioning or may be more affected by increased energy costs.

Strategies and Actions

Energy Use by Sector, 2015



This sector includes strategies for increasing renewable energy generation, managing energy demand and increasing grid resilience. To increase renewable energy installation, the City can install solar panels on municipal buildings, streamline permitting for renewable energy and support community solar programs. Adopting renewable energy can reduce energy costs and reduce air pollution associated with coal-produced electricity.

Columbia Water & Light can support CAAP goals by purchasing and producing renewable energy and moving towards 100% renewable electricity generation. Increasing grid resilience helps support the City’s energy supply in times of natural disaster and peak energy demand. For example, distributed energy storage can help smooth out the peaks and valleys of renewable energy sources like wind and solar and improve community capacity to maintain electricity with regional outages. Additionally, behavior change can help the utility manage peak demand during the hottest parts of the summer. Reducing peak demand helps the utility and ratepayers save money and prevent outages.

Throughout this, and every sector, education and outreach will play a critical role. City staff, the Task Force, and community members noted frequently during this process that the programs, policies, and changes needed to meet the CAAP goals can only be valuable if people know they exist, why they are helpful and how to access them. Implementation strategy I-3.3: “Develop community leadership capacity for, and involvement in, climate action,” prioritizes this crucial strategy to ensure education and outreach will be a part of its successful implementation.



M Goal E-1. Increase local renewable energy generation and procure renewable electricity.

Strategy E-1.1: Increase on-site renewable energy installations in new and existing buildings.

E-1.1.1	Offer community solar program through Water & Light.	Priority
E-1.1.2	Develop and implement virtual/aggregate net metering policies and procedures with Water & Light to allow privately developed community solar.	Priority
E-1.1.3	Install solar panels on all City buildings and sites, where feasible.	Priority
E-1.1.4	Streamline and offer expedited permitting for renewable energy installations.	Priority
E-1.1.5	Make it easier for large multi-family, commercial, and industrial customers to maximize the benefit of using their space for photovoltaics (e.g., feed-in tariff, third-party lease agreements, roof space rental).	Priority
E-1.1.6	Require production meters on all new net-metered photovoltaic installations.	Priority
E-1.1.7	Determine the true value and potential of customer-owned photovoltaics to the infrastructure, economics and renewable goals of Water & Light. Analysis should include time of generation, capacity credit, distribution circuit support, customer characteristics, technical and market potential, etc.	Priority
E-1.1.8	Require all new commercial buildings to be solar ready.	Other
E-1.1.9	Establish a permit lease program for photovoltaic on buildings connected via net metering open to Water & Light and third party vendors.	Other

Strategy E-1.2: Maximize Columbia Water & Light's renewable energy purchasing and production.

E-1.2.1	Include CAAP priorities in Columbia Water & Light's long-range electric and water resource planning goals.	Priority
E-1.2.2	Consider all renewable energy sources on a cost per metric ton of carbon dioxide equivalent reduction in the City's integrated electric resource plan.	Priority
E-1.2.3	Invest in local renewable energy generation.	Other

Strategy E-1.3: Revisit and adjust Columbia's Renewable Energy Ordinance to meet climate goals.

E-1.3.1	Remove 3% rate cap to allow for increased investment by Water & Light in renewable energy resources.	Priority
E-1.3.2	Codify through ordinance Columbia Water & Light's responsibility to meet 100% renewable energy generation or purchase by 2035, including parameters for the use of Renewable Energy Credits (RECs) and equity and cost impacts.	Priority

MA Goal E-2. Maintain reliability of local energy supply and local distribution.

Strategy E-2.1: Create a resilient energy grid.

E-2.1.1	Develop energy storage (battery) programs for all customer types to reduce peak demand, support electric grid reliability and improve the effectiveness of solar and other renewable energy options.	Priority
E-2.1.2	Ensure equitable implementation of grid resilience actions by partnering with high-risk neighborhoods and non-governmental organizations to develop resilience hubs—community facilities that offer power and other services during times of need. Establish criteria to screen and select locations for community microgrids to support grid and community resilience.	Priority
E-2.1.3	Maintain current rate of reliability due to weather related power outages. Investigate energy storage possibilities, such as batteries, to increase reliability.	Other

Strategy E-2.2: Manage energy demand to reduce peak energy use.

E-2.2.1	Install meters that allow for rate structures incentivizing lower electricity use at peak hours.	Priority
E-2.2.2	Increase, enhance and implement demand side management programs.	Other
E-2.2.3	Implement utility scale energy storage.	Other



GOOD FOR ALL

Will our sustainable vision of Columbia support economic growth for the Community and opportunities for its families?

An important part of the evaluation process for the actions in this CAAP has been their impact, positive negative or undetermined, on factors beyond their intended effect. For example, in Columbia, where the majority of housing units are renter-occupied, an action by the City requiring rental properties meet efficiency standards has the potential to affect multiple aspects of many people's lives.

While the action is intended to reduce energy use emissions and improve tenants' ability to meet basic needs, its ultimate implementation must balance impacts to property owners' cost of doing business as well. The business impacts of policies can be balanced by incentives, financing and compliance options. The effect of energy efficiency improvements can be increased with tenant education and awareness of efficient rental options.

By design, the Task Force included representation of many parts of the community - small and large businesses, developers, insurance agencies, students, advocacy groups, etc. - with the goal to broadly consider how to achieve the benefits from CAAP actions while maintaining and improving the vitality of our community resources. As a result, spirited discussion accompanied the evaluation of Plan actions during the

development process. Wherever possible, the Task Force chose to emphasize incentives and support when actions depend on businesses, institutions or residents making investments in energy efficiency, renewable energy, process changes or elsewhere.

Small businesses are a fundamental resource providing jobs, goods and services and resilience to our community. To arrive at the energy efficiency and renewable energy goals in the Plan, many actions either rely on, or benefit greatly from, the participation of the small business community. These same actions can provide great benefit to merchants, restaurateurs, tradespeople and service providers. For example, Pedestrian- and transit-oriented business districts reduce emissions and improve local air quality, while at the same time are shown to be more economically productive.¹¹ Developing virtual net metering and community solar programs will allow groups of businesses or residents, renters and other community members to take advantage of falling renewable energy prices and economies of scale.

Throughout the planning process, a balance was sought between the need to make progress and the cost to our community members. Final design and implementation will also require attention to the positive, negative and undetermined impacts of the Plan on all of us.

11- Bent, E. M., & Singa, K. (2009). Modal Choices and Spending Patterns of Travelers to Downtown San Francisco, California: Impacts of Congestion Pricing on Retail Trade. *Transportation Research Record*, 2115(1), 66–74. <https://doi.org/10.3141/2115-09>

Housing, Buildings and Development

Housing and buildings can be designed to maximize energy efficiency and reduce the consumption of electricity and natural gas. These emissions come from residential, commercial, and industrial buildings consuming electricity and burning natural gas. Designing buildings to maximize efficiency and upgrading appliances can reduce these emissions and save money.

Climate change will impact housing, buildings, and development as warmer temperatures increase cooling costs and heavier rains increase the risk of local flooding. Flooding could damage infrastructure and limit mobility for residents in neighborhoods in flood-prone areas of the city. The City's current stormwater infrastructure may not be able to handle the amount of runoff that is expected in the future, as heavier rainstorms occur more often.

Strategies and Actions

Improving energy efficiency in the built environment and managing energy demand has social and economic benefits. Strategies focus on increasing energy efficiency support through incentives, requirements and energy performance ratings. Supporting energy efficiency for low-income residents through rebates and landlord requirements will help tenants spend less money on energy and reduce GHG emissions. The Utility Services division of City of Columbia Utilities has the opportunity to manage programs that incentivize efficient appliances and reduce peak demand. Additionally, building energy use disclosures can drive energy efficiency improvements. By monitoring their energy usage, commercial, industrial and residential buildings can identify opportunities for energy savings. Strategies focus on reducing energy use across all sectors through monitoring, building upgrades and behavior change.

These programs will require the development and implementation of training programs for professionals (e.g. contractors, designers, landlords, realtors, etc.) in the built environment. Education and outreach will help show the impact of the built environment on a larger scale. Educational opportunities for residents will also be provided, so that smart, sustainable choices can begin at home.

Columbia will work towards achieving zero-emissions buildings and increasing climate resilience. The City can develop policies and incentives that phase in electric appliances as the City adopts clean energy. Supporting development of buildings that can withstand projected weather changes through code updates will help new buildings be resilient to climate changes.



MA Goal H-1. Reduce housing-, building-, and development-related energy consumption and improve resiliency.

Strategy H-1.1: Increase energy efficiency in residential buildings.		
H-1.1.1	Promote and offer incentives for improving residential energy efficiency during retrofit projects that exceed existing building energy code requirements. For example, using higher performance insulation materials in order to meet new construction energy code standards.	Priority
H-1.1.2	Increase energy efficiency funding options for families (low-interest financing, on-bill financing, Pay As You Save, PACE, etc.).	Priority
H-1.1.3	Establish a date by which all rental housing will be required to meet basic energy efficiency standards at license renewal.	Priority
H-1.1.4	Develop and test an energy performance rating/labelling program for homes listed for sale or upon rental license renewal.	Priority
H-1.1.5	Phase in NetZero or highly energy efficient building requirements into the building code.	Other
H-1.1.6	Develop standard deep retrofit specifications and incentives for existing residential building owners to reduce the carbon footprint of the building to zero.	Other
H-1.1.7	Promote and offer incentives for improving residential energy efficiency in new construction (e.g., insulation, energy-efficient windows, electric heat pumps). New construction incentives shall support measures for projects that exceed code requirements.	Other
H-1.1.8	Formalize a Community Cost Share Fund for tax advantaged donations to go towards energy efficiency education and improvements for renters. Track with event attendance and participation in rental efficiency improvements.	Other
Strategy H-1.2: Increase energy efficiency in commercial buildings.		
H-1.2.1	Provide assistance to commercial buildings above a minimum gross floor area to track energy and water usage. Require all such commercial buildings to disclose their energy and water use.	Priority
H-1.2.2	Develop specific energy efficiency programs for hard-to-reach segments of commercial properties (e.g., commercial rental, restaurants, large scale manufacturing, offices, affordable multifamily housing).	Priority
H-1.2.3	Promote and offer incentives for improving energy efficiency (e.g., insulation, energy-efficient windows, electric heat pumps) in newly constructed commercial properties. New construction incentives shall support measures for projects that exceed code requirements.	Priority
H-1.2.4	Identify funding strategies to ensure rebate budgets are sufficient to meet expanded offers and goals.	Priority
H-1.2.5	Create Utility Services rebate programs that provide incentives based on energy use reduction in addition to demand reduction (e.g., lighting controls, outdoor lighting, energy recovery ventilation, carbon dioxide controls, custom rebate).	Other
H-1.2.6	Require newly constructed buildings larger than 15,000 square feet to meet LEED Gold, Enterprise Green Communities, the 24 National Green Building Standard ICC/ASHRAE 700, or an equivalent certification.	Other
H-1.2.7	Require existing buildings larger than 15,000 square feet and exceeding minimum alteration thresholds to meet building certification of LEED Silver, Enterprise Green Communities, the 27 National Green Building Standard ICC/ASHRAE 700, or an equivalent certification.	Other
H-1.2.8	Develop deep retrofit standard requirements and incentives for owners of existing commercial buildings less than 15,000 square feet to reduce the carbon footprint of the building to zero.	Other

Strategy H-1.3: Increase energy efficiency in municipal and school buildings.		
H-1.3.1	Create a policy that all City buildings shall reduce energy usage by 20% over the next five years.	Priority
H-1.3.2	Create a policy, to be part of assigned duties and presented during new employee orientation, that City employees shall turn off lights and equipment when they are done using them.	Priority
H-1.3.3	Introduce a policy that requires all new and existing municipal buildings to meet and maintain energy and resource efficiency standards (ENERGY STAR, LEED, Home Energy Score or other).	Priority
H-1.3.4	Introduce a policy that requires all municipal buildings to be benchmarked with the current Energy Score rating, the energy use intensity (kBtu/sqft) and the energy reduction goal. These benchmarks and goals shall also be posted on the City's website.	Priority
H-1.3.5	Create a target of net zero energy use at all municipal buildings by 2025.	Other
H-1.3.6	Work with school districts to support energy efficiency programs, geothermal energy and solar energy installation.	Other
Strategy H-1.4: Decrease the impact of building stock on local air pollution and GHG emissions.		
H-1.4.1	Require that the City adopts the International Building Energy Conservation Codes for municipal, commercial and residential buildings as written.	Priority
H-1.4.2	Improve training, certification, and education opportunities for professionals involved in the disposal and use of refrigerants.	Other
H-1.4.3	Require, when cost comparable, that new air conditioning units use refrigerants with low global warming potentials (e.g., carbon dioxide or ammonia instead of hydrofluorocarbons).	Other
H-1.4.4	Develop incentive programs to transition lawn care companies and homeowners from using fuel-burning lawn equipment (e.g., lawn mowers, blowers) to electric.	Other
Strategy H-1.5: Decrease use of fossil fuels in housing and other buildings.		
H-1.5.1	Incentivize switching space and water heating from fossil fuel-based to electric heat pumps.	Priority
H-1.5.2	Invest in district heating and cooling for downtown City and County buildings.	Other
Strategy H-1.6: Support development of buildings that are resilient to anticipated future conditions.		
H-1.6.1	Require light colored roofs and/or a minimum specified reflectance for commercial roofs when new or at replacement.	Other
H-1.6.2	Develop affordable and efficient (temporary/transitional) housing options.	Other
H-1.6.3	Introduce a policy that limits new construction in the 500-year flood zone and/or requires infrastructure to be elevated two feet above anticipated flood level (no infrastructure equipment in lowest level).	Other

Transportation

Transportation refers to the form and function of transportation systems, including private vehicles, public transportation, and walking and biking infrastructure. Transportation activities made up 27% of Columbia’s GHG inventory in 2015. Local, on-road transportation of passengers in privately-owned vehicles account for the majority of these emissions in Columbia.

Climate change may lead to more intense rain events and flooding, affecting road conditions in Columbia. Floods could temporarily block roadways and trails. Warmer temperatures and extreme heat may weaken pavement and require more maintenance. On the other hand, warmer winters may mean fewer instances of freezing and thawing and therefore less demand for other types of maintenance. Columbia residents who rely on walking or biking may be more exposed to extreme heat and poor air quality.

Strategies and Actions

Expanding public transit and building bicycle and pedestrian infrastructure will help reduce GHG emissions by reducing reliance on personal vehicles for transportation. This includes funding public transit expansion and prioritizing walking and biking infrastructure. Implementing the City’s Vision Zero plan will be important for success.

Building sidewalks, bike lanes, crosswalks and other infrastructure can fill-in connectivity gaps identified in City plans. Additionally, creating walkable communities through mixed-use development and infill can connect neighborhoods to schools, community centers and local businesses. This will help reduce the distance people need to travel to meet basic needs.

When people do need to travel in vehicles, Columbia can help encourage low emissions options. Within the City’s own operations, Go COMO, Columbia’s public transit system, uses nine electric buses. City fleets can add electric and hybrid vehicles and the City can encourage private adoption of zero-emission vehicles by increasing the number of electric charging stations in public parking areas.

All transportation strategies and actions require the City to increase advocacy for the use of multi-modal transportation in Columbia. Efforts to change the public perception of non-personal vehicle transportation is necessary to achieve success in reducing transportation emissions.

Many actions below focus on adjusting the share of different modes of transportation to reduce transportation related emissions. The following mode shares provide a path for us to meet our transportation emission reduction targets:

	Baseline*	2035	2050
Single Occupancy Vehicle	78%	40%	10%
Carpool	9%	20%	5%
Transit	1%	17%	40%
Walking	5%	13%	25%
Biking	1%	10%	20%

*From 2012-2016 ACS values do not total to 100% due to some ineligible responses.



M Goal T-1. Reduce travel by car.

Strategy T-1.1: Prioritize safety and convenience of walking, biking and riding transit.

T-1.1.1	Prioritize transportation funding for Vision Zero engineering improvement projects to create safe streets for people walking, biking and riding transit.	Priority
T-1.1.2	Revise street design standards to prioritize people walking, biking and riding transit while also accommodating vehicles.	Priority
T-1.1.3	Prioritize transportation funding to achieve mode share goals.	Priority

Strategy T-1.2: Build a thriving public transit system.

T-1.2.1	Improve efficiency, convenience and reliability of bus service and infrastructure (e.g., increase frequency, shorten wait times, construct bus stop shelters).	Priority
---------	--	----------

Strategy T-1.3: Create a bikeable community.

T-1.3.1	Build and maintain a network of on-street protected bike lanes on streets with speed limits above 30 mph. Build other bike facilities (e.g., bike boulevards, etc.) on streets with lower traffic/speed.	Priority
T-1.3.2	Establish a bike share program.	Other

Strategy T-1.4: Create a walkable community.

T-1.4.1	Accelerate building sidewalks, crosswalks, and other walking infrastructure in high-need areas and fill connectivity gaps as identified in the Sidewalk Master Plan.	Priority
T-1.4.2	Install universal design accessibility features at crossing locations to ensure the crossing is accessible for everyone (e.g., pedestrian traffic signals, audible signals).	Priority

Strategy T-1.5: Shift land use patterns to shorten trips and reduce the need to drive.

T-1.5.1	Revise zoning codes to favor walkable, connected neighborhoods in the existing built environment, near schools and new development.	Priority
T-1.5.2	Incentivize infill and mixed-use development (e.g., through alternative code compliance, fee waivers, density bonuses, investment prioritization, development impact fees, tax benefits).	Priority
T-1.5.3	Revise zoning codes to encourage Accessory Dwelling Units (i.e., mother-in-law units).	Priority
T-1.5.4	Preserve and enhance affordable housing, especially near bus service, to prevent displacement of vulnerable populations.	Priority
T-1.5.5	Partner with Columbia Public Schools to adjust school siting requirements to prioritize building schools in walkable and bikeable areas.	Other
T-1.5.6	Eliminate parking minimums and reduce surface parking.	Other

M Goal T-2. Reduce GHG emissions from vehicles.

Strategy T-2.1: Encourage use of low- to zero-emission vehicles.

T-2.1.1	Introduce a policy to replace City fleet vehicles and buses with electric and hybrid options at the time of replacement, and require emissions standards, testing and biofuel preference for any combustion vehicles remaining in the fleet.	Priority
T-2.1.2	Create an electric vehicle roadmap to increase number of electric charging stations in public parking areas (e.g., schools, parks, libraries, City-owned parking garages, near City Hall) and in commercial and high-density residential areas.	Priority
T-2.1.3	Encourage installation of electric vehicle charging capacity in single family and multifamily residences (e.g., how to address residences that lack garage access).	Priority
T-2.1.4	Incentivize the purchase of electric vehicles through rebates on vehicles and/or residential chargers.	Other

Strategy T-2.2: Reduce use of and reliance on personal vehicles.

T-2.2.1	Solicit a car share program, such as Zipcar or Get Around, to provide cars in a central location.	Other
T-2.2.2	Identify locations and partners to facilitate carpooling, telecommuting options, and parking buyback programs for municipal and other employers in the region.	Other

Strategy T-2.3: Improve efficiency of vehicle traffic.

T-2.3.1	Implement street design to improve road and vehicle efficiency (e.g., roundabouts, synchronize traffic signals, road diets).	Other
---------	--	-------





DENSITY & COMMUNITY CHARACTER

Growth and development have been hot topics for Columbia residents for decades. Recent high-rise student housing developments in the downtown area, multifamily developments in predominantly single-home neighborhoods and mixed-use development in residential areas have all elicited diverse community opinions. When done thoughtfully, mixed-use and higher-density development play a critical role to reduce for emissions and build resilience. It is also important to address concerns of increased traffic, reduced parking and changes to neighborhood character.

Mixed-use and higher-density development helps shorten travel times, increase usage of transit and reduces the need to own a car. Denser development is more energy efficient and reduces the costs of providing public services. These benefits help reduce greenhouse emissions and create stronger and more resilient neighborhoods. Recent apartment construction downtown and mixed-use developments throughout the city demonstrate a demand for this type of beneficial development. This philosophy is also reflected in City's 2013 Comprehensive Plan, "Columbia Imagined - the Plan for How We Live & Grow" and in provisions in the 2016 Unified Development Code, which support dense/walkable neighborhoods, infill development and a compact urban boundary. To successfully navigate this or any new approach requires an openness to change by businesses, government and residents.

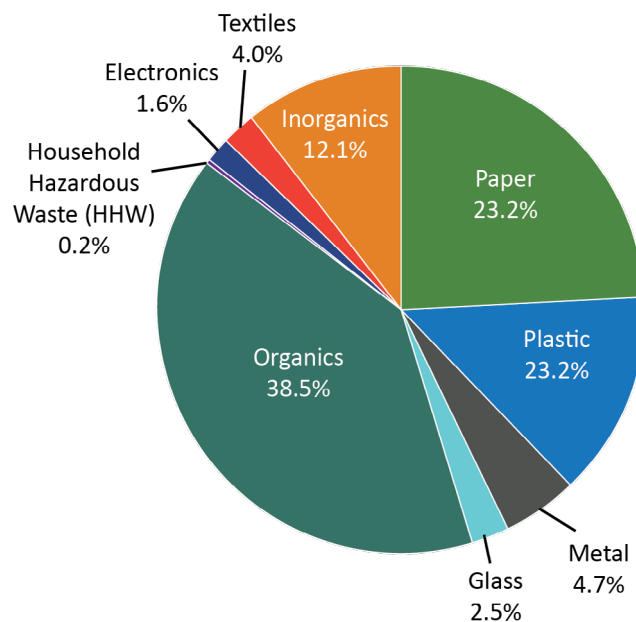
Tensions around these projects have created controversy and taken over community conversations. They have even drawn criticism from supporters of more sustainable development. Reduced parking availability, increases in vehicular and foot traffic and changes to a neighborhood's visual characteristic are concerns. They are also concerns we can address as a community for future developments. Columbia is growing and accommodating that growth with sustainable development is vital for meeting our GHG emission reduction goals. Continuing the community conversation around sustainable development will support our progress in meeting the goals in this Plan.

Waste

When waste goes to landfills, it breaks down and generates greenhouse gases. GHG emissions from the disposal of solid waste contributed 2% to Columbia’s 2015 inventory. There are opportunities to reduce emissions associated with various parts of the lifecycle of goods and services, including manufacturing, use and disposal. Overall, reducing consumption is the most effective way to reduce waste. For waste that is generated, diverting materials to recycling or compost can reduce remaining emissions.

Although not measured in the City’s GHG inventory, consuming goods carries a significant carbon footprint, notably from meat consumption, home construction, and the purchase of furniture, clothing, and vehicles. Reducing material consumption, through green purchases, reuse and repair, reduces consumption emissions.

The majority of waste generated by Columbia residents and businesses could be composted or recycled, as indicated by findings from the last waste composition study (Source: MDNR 2016-2017 Statewide Waste Composition Study; data for Columbia Landfill; “inorganics” largely includes construction and demolition waste).



Strategies and Actions

Waste reduction strategies involve both behavior change and access to recycling and composting. An understanding of the waste stream is essential in identifying waste diversion opportunities. Therefore, strategies include regular waste characterization. To incentivize waste diversion, strategies focus on requiring all homes have access to recycling, proper construction and demolition waste management and rate structuring to encourage recycling implementation.

Reducing emissions associated with consumption and lifecycle management of products include appropriately disposing of appliances using hydrofluorocarbons, reusing and repairing damaged appliances and salvaging usable materials from demolition.

Promotional and instructional materials on how to reduce waste, reuse materials, and recycle goods will be required to successfully implement the CAAP.

M Goal W-1. Reduce waste generation.

Strategy W-1.1: Encourage reuse.

W-1.1.1	Create a reuse program for curbside collection and purchase a warehouse to store and sell items that are not accepted by local non-profit groups.	Priority
W-1.1.2	Partner with local organizations (e.g., Habitat for Humanity for demolition waste pickup and reuse.	Priority

M Goal W-2. Increase diversion.

Strategy W-2.1: Reduce landfill waste through customer education, rate structures and increasing City recycling programs.

W-2.1.1	Restructure all solid waste rates to reduce the amount of waste sent to the landfill.	Priority
W-2.1.2	Require multifamily homes to offer on-site recycling for residents.	Priority

Strategy W-2.2: Expand composting participation and operation.

W-2.2.1	Study the short and long term cost/benefit of a City composting program.	Priority
W-2.2.2	Offer five days a week (Monday through Friday) collection for food waste and certified compostable material at businesses. Change the type of compost operation or increase land allocation to handle additional feedstock, as needed.	Other
W-2.2.3	Offer curbside compost collection to all residential properties (e.g., single-family and multifamily) for yard waste, food waste and certified compostable products. This service is optional for all residential properties.	Other

Strategy W-2.3: Divert construction and demolition (C&D) waste.

W-2.3.1	Research management practices of construction and demolition waste diverted from the landfill.	Priority
W-2.3.2	Promote a C&D recycling industry in Columbia by preparing ordinance and construction permit changes that would be implemented if a C&D recycling company wishes to operate in the Columbia area. City staff will actively seek C&D recycling companies that might be interested in the Columbia area following the proposed policy changes.	Other

Strategy W-2.4: Require and incentivize recycling.

W-2.4.1	Offer positive reinforcement and indirect financial incentives to encourage businesses and residents to divert material from the landfill.	Priority
W-2.4.2	Develop and enforce ordinances requiring commercial customers to recycle material streams like cardboard, paper, beverage containers, etc.	Priority
W-2.4.3	Offer quarterly curbside bulky-items pickup for residents and businesses.	Other

M Goal W-3. Improve waste system management.

Strategy W-3.1: Encourage proper disposal of products containing high Global Warming Potential (GWP) gases.

W-3.1.1	Research and add best practices for recycling hydrofluorocarbons (potent GHG used in refrigeration and air conditioning) in next CAAP update.	Priority
---------	---	----------

Strategy W-3.2: Upgrade solid waste facilities.

W-3.2.1	Remodel and upgrade the City's Material Recovery Facility to increase processing capacity, add sortation technology and provide space for additional material types to be recycled, including (but not limited to) e-waste, mattresses, cartons and household hazardous wastes.	Priority
W-3.2.2	Research new technologies for enhanced landfill methane capture.	Other

Strategy W-3.3: Track waste diversion.

W-3.3.1	Conduct a comprehensive waste composition study every five years.	Priority
---------	---	----------



UPSTREAM EMISSIONS ARE IMPORTANT, BUT HARD TO TRACK

The GHG emissions documented in this Plan do not represent an important category of emissions produced by our community. These are the upstream emissions associated with the production of food, material goods, and services and are exceptionally difficult to measure. These are considered consumer-based emissions, which rely on individual preferences and external sustainability initiatives. We cannot predict how the crops are grown or the type of materials used in clothing or furniture. We also cannot predict how the resources are extracted, processed and transported to our community. Global economic trade also limits our ability to reduce upstream GHG emissions, as products are often imported using the most cost-effective method, regardless of the environmental costs. Furthermore, residents can be limited by financial constraints or, more broadly, social inequality.

Some actions in the Plan encourage the lifestyle changes that are necessary to reduce consumer-based emissions. However, our ability to collect benchmarking data and document progress is very limited. Currently, we are not including this information in our community or municipal GHG emissions. As clearer methodologies are available, we will incorporate them into Plan updates. All of us can continue to work toward a more sustainable lifestyle by considering upstream emissions in our choices. We can shop local, repair and reuse materials, and make a conscious effort to purchase recyclable or compostable products.

Health, Safety and Well-Being

Health, safety and well-being includes addressing impacts of climate change, such as heat stress, air quality, allergens, food security, vector-borne disease and mental health. Climate change can disproportionately impact communities that are already at risk of harm, such as low-income families, communities of color, the elderly, children, and homeless populations. Extreme heat can endanger people without shelter or air conditioning. The City can prepare for climate impacts by investing in community resources and public health.

Strategies and Actions

To reduce negative climate impacts, strategies focus on addressing local air quality, food security, energy costs and community resources. Many mitigation strategies have adaptation benefits. For example, warmer temperatures increase ground-level ozone, but efforts to minimize fossil fuel vehicle use can improve local air quality. Waste management strategies can also work synergistically with adaptation. As the climate changes, food production, and therefore food sales, may become more expensive. Preventing food waste through food donation can support multiple climate goals.

Preparing for extreme weather events can involve improving civic engagement and community resources. The City can promote neighborhood-led action, including preparedness training, public involvement in disaster planning and creation of community resilience centers.

A Goal HS-1. Prepare the community, public safety and health services for anticipated climate change impacts.

Strategy HS-1.1: Include vulnerability assessments in planning efforts and enhance communication tools and strategies to prepare the community for anticipated climate change impacts.		
HS-1.1.1	Develop and implement a plan to monitor climate change related illnesses. Utilize results in resource and policy planning, with particular focus on neighborhoods. Communicate results to the public on a periodic basis.	Priority
HS-1.1.2	Coordinate with community health improvement teams to incorporate climate change and CAAP goals into the Community Health Improvement Plan and Health Impact Assessment.	Priority
HS-1.1.3	Review and effectively communicate emergency and evacuation plans on a regular basis to update for climate change forecasted data, paying particular attention to flooding, extended heat waves and tornadoes.	Priority
HS-1.1.4	Build City staff capacity to support community-led, neighborhood-focused resilience actions (e.g., identifying best practices, establishing resilience hubs and implementing neighbor-based emergency response).	Priority
HS-1.1.5	Partner with outside agencies to offer community resilience model training.	Priority
HS-1.1.6	Conduct a needs assessment of accessible community centers for extreme weather or other emergency situations. Create a development improvement plan, if needed.	Other
HS-1.1.7	Deploy point-in-time alert systems (e.g., RAVE, Nixle) to notify people of extreme weather events, periods of dangerous cold, and heat waves and refer them to resources on symptoms and prevention of climate-related illness.	Other
HS-1.1.8	Develop a long-term plan for potential growth in foreign and domestic refugees.	Other
HS-1.1.9	In planning for additional fire stations and resources, incorporate projections for increased grass, brush, and backyard fires.	Other

Strategy HS-1.2: Reduce incidences of heat-related illness and death.		
HS-1.2.1	Identify a sustainable funding source for increased utility assistance for low-income residents, including support for energy efficiency projects, such as weatherization.	Priority
HS-1.2.2	Increase availability to cooling mechanisms in low-income housing and rental units (e.g., air conditioning units, fans, window screens).	Other
HS-1.2.3	Develop a plan to improve bus stop shelters' ability to provide relief from extreme heat (e.g., reflective materials, cooling fans).	Other
HS-1.2.4	Monitor the number of utility disconnects during heat waves and assess if current policy should be updated for changing community needs.	Other
Strategy HS-1.3: Prevent and prepare for increased incidence of vector-borne diseases and illness or injury due to air and water quality issues.		
HS-1.3.1	Create anti-idling policies and enforcement plans.	Priority
HS-1.3.2	Update property maintenance code to manage and mitigate mold or fungus.	Priority
HS-1.3.3	Establish funding for a program to trap mosquitoes and ticks to monitor for disease or disease-carrying species.	Other
HS-1.3.4	Expand outdoor treatment to mitigate the spread of vector-borne diseases when evidence of local disease is identified.	Other
HS-1.3.5	Identify sources of ozone pollution in Boone County and establish a countywide system to gather data and set thresholds to trigger actions.	Other
HS-1.5.6	Conduct a health impact assessment for areas that may have unsafe levels of air pollution from vehicle traffic, and use data to modify zoning.	Other
Strategy HS-1.4: Plan for a potential increase in demand for mental health care.		
HS-1.4.1	Form a team to develop action plans to address climate-related mental health resilience at the individual, neighborhood and community level.	Priority
HS-1.4.2	Ensure the community has robust resources to address increases in violence and crime, particularly domestic violence, during periods of stress including emergencies and heat waves.	Other

A Goal HS-2. Reduce emissions associated with the food system.

Strategy HS-2.1: Increase production of local food.		
HS-2.1.1	Support organizations and schools promoting local food production and community gardens, through partnerships, funding, and educational programs on the benefits of a plant-based diet.	Priority
HS-2.1.2	Review ordinances and development regulations to promote urban farming.	Other
HS-2.1.3	Work with Regional Economic Development, Inc. (REDI) to develop an entrepreneurship program for commercial urban farming.	Other
HS-2.1.4	Update code to provide incentives or require developers to preserve topsoil and provide space for backyard or community gardens.	Other
Strategy HS-2.2: Assure food security, particularly among the most vulnerable populations.		
HS-2.2.1	Continue to provide enrollment assistance for participation in the Supplemental Nutrition Assistance Program (SNAP), the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) Program and other food assistance programs.	Priority





ARE AFFORDABLE HOUSING & LAND PRESERVATION IN CONFLICT?

Land conservation protects and maintains the integrity of the land. Traditionally, areas outside of city limits containing large parcels of forest and grassland were preserved. With population growth, our city limits have expanded into surrounding rural areas, fragmenting the landscape, disrupting ecological processes and displacing the wildlife that support a healthy ecosystem. In addition to lowering the impact of expansion on natural resources, it is important for us to protect and conserve existing green space within city limits.

Affordable housing addresses the gap between wages and housing costs. Affordable housing is generally built where residents may access public transportation, grocery stores and other City amenities. When this development occurs on existing urban open space this could be seen as a conflict between affordable housing and urban land conservation. However, when we recognize our broader needs as a community to ensure that one does not displace the other, we can create a synergy between them that improves each one. For example, creating a development that contains housing and green space that provides a recreation area for residents and habitat for wildlife utilizes the space for both affordable housing and land conservation.

People benefit from open space as it provides trees for shade, clean air and water, mitigation of stormwater runoff and many other ecosystem services. Conservation-based affordable housing can be designed and built to provide both housing and open space that serves the community. The Lynn Street Cottages development is an example of this type of development. The project included the development of eight

affordable owner-occupied homes with near net-zero energy usage design and universal design features. The homes were developed in a cottage housing style arrangement to increase the density of the development. The development also included significant stormwater improvements to benefit the surrounding neighborhood.

Columbia's master plan for community development outlines how neighborhoods may be designed to protect intact habitats while still providing housing by building homes closer together. This design allows natural areas to remain intact and creates an attractive neighborhood feature for residents. Additionally, in more urbanized areas where there is less land available for new development, neighborhood (parks and community gardens) and residential landscaping that uses native plants can help bridge the gap between infrastructure development and ecosystem conservation.

Sustainable communities provide jobs with living wages, affordable housing and the ecosystem services necessary for life. Using management practices to create new partnerships and explore innovative ideas for developments that embody both land conservation and affordable housing will help meet Columbia's need for sustainable land conservation and housing.

Natural Resources

Natural resources refers to street trees, natural areas and biodiversity conservation, as well as water quality and supply. Climate change may increase heavy precipitation, lead to extreme heat and shift the life cycle timing of our natural ecosystems. Maintaining and enhancing natural resources can increase natural resilience to climate impacts.

Strategies and Actions

Strategies include supporting urban forests and greenspace. Urban forests and tree management can help cool homes and businesses during extreme heat events. Greenspace supports wildlife, stormwater management, and recreation. Strategies focus on protecting and managing open space as climate change alters ecosystems. Water conservation is also a key way to protect natural resources. The City can update building codes, focus on incentivizing water conserving appliances and manage roadside vegetation to increase stormwater absorption.

Actions that protect and conserve biodiversity will create a more resilient Columbia. Support for these actions will be community driven education programs focused on the incorporation of nature in everyday life through sustainable landscaping, design and stewardship.

A Goal NR-1. Increase climate resilience and carbon sequestration potential of public and private lands.

Strategy NR-1.1: Increase the accessibility and quality of habitat for native plants and animals.		
NR-1.1.1	Manage publicly-owned natural areas to enhance and maintain diverse native communities.	Priority
NR-1.1.2	Establish and effectively manage native-habitat corridors along trails and utility easement areas to restore and maintain landscape connectivity.	Priority
NR-1.1.3	Create an ordinance that establishes a Transfer of Development Rights program to protect undeveloped lands for land conservation and/or agriculture.	Priority
NR-1.1.4	Support the Urban Forest Master Plan to identify programs and suitable locations to maintain and expand Columbia's urban tree canopy.	Priority
NR-1.1.5	Update current tree preservation requirements to protect tree root systems and large legacy trees during construction.	Priority
NR-1.1.6	Assess whether or not to purchase and preserve greenspace in and surrounding the city by quantifying the equitable, environmental, and economic benefits, along with the costs of maintaining and owning the property.	Other
NR-1.1.7	Require the use of native plants in landscaping at City-owned properties.	Other
NR-1.1.8	Update current development regulations to recommend or require the use of appropriate native trees and plants for new- and re-development.	Other
NR-1.1.9	Identify underutilized paved areas and incentivize conversion to sustainable green space.	Other



MA Goal NR-2. Reduce per capita water usage.

Strategy NR-2.1: Encourage water conservation.

NR-2.1.1	Complete change to rate structure to encourage reduced water use.	Priority
NR-2.1.2	Update building code to require water conservation measures (e.g., grey water infrastructure, drought resistant landscaping) in new construction and renovations.	Other
NR-2.1.3	Develop a technical assistance and incentive program to encourage water conservation behavior and upgrades, such as use of drip irrigation and low-flow toilets.	Other

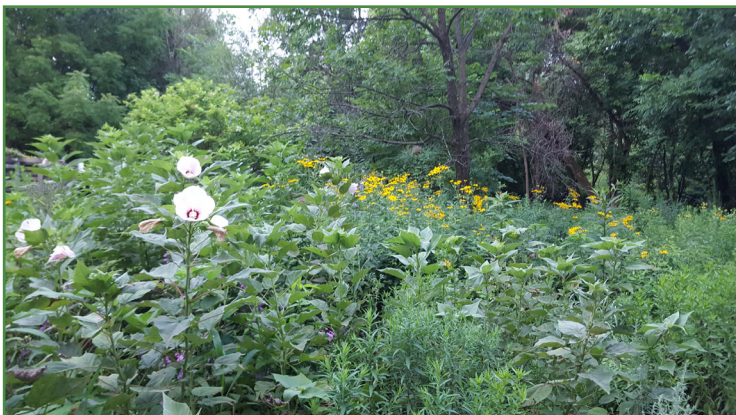
A Goal NR-3. Reduce negative impacts from stormwater runoff and flooding.

Strategy NR-3.1: Improve stormwater management

NR-3.1.1	Implement strategies to mitigate stormwater impacts due to development and redevelopment of properties currently exempted from stormwater management requirements.	Priority
NR-3.1.2	Build more permeable parking lots and driveways and use more recycled materials with concrete.	Other

Strategy NR-3.2: Minimize risks to flood-prone areas.

NR-3.2.1	Mine existing data sources (e.g., FEMA Risk Maps) to identify areas prone to flooding.	Priority
NR-3.2.2	Perform detailed studies to identify areas that are at high risk for flooding and may be a prospect for property acquisition or mitigation.	Priority
NR-3.2.3	Increase stream buffer requirements to provide additional flood water storage and minimize property damage due to erosion and flooding.	Priority
NR-3.2.4	Perform a flood risk assessment using historical data and future precipitation forecasts to identify areas and critical infrastructure vulnerable to flooding.	Priority



COMMUNITY ACTION CHECKLIST



Reduce My Impact From Consumption

- Reduce the amount of food my household wastes.
- Compost organic waste in my backyard.
- Fix things that are broken instead of buying new.
- Use the Household Hazardous Waste and bulky item pick-up programs to properly dispose of old refrigerators, e-waste, air-conditioning units, and household chemicals.
- Learn how and where to recycle items.
- Talk with my contractor about alternatives to traditional building demolition, such as relocation, deconstruction and salvage.
- Shop locally and support local businesses, especially those that demonstrate climate positive actions.
- Support the recycling industry by purchasing items that contain recycled material (e.g., office paper with 40% post-consumer content).
- Support efforts to reduce and limit single-use disposable plastics.
- Replace high-carbon foods with minimally processed foods, fruits, grains, and vegetables.
- Encourage the creation of community gardens on public and private lands, including school campuses, City lands and church properties.
- Start a tool lending library in my community.



Reduce My Energy Use

- Get an energy audit to find ways to increase energy efficiency at home and at work.
- Install energy conserving appliances and fixtures, such as on-demand tankless water heaters, Energy Star appliances and LED lightbulbs.
- Install electric heat pumps, water heaters, dryers, stoves and more.
- Install a programmable thermostat and remember to set it back when I am gone.
- Talk to my neighbors, co-workers and City Council members about policies that reduce our greenhouse gas emissions.
- Use fans or warm clothing to reduce energy I use for air conditioning or heating.
- Strategically place trees in my yard to shade my house and reducing my need for air-conditioning in the summer.
- Consider efficient alternatives to traditional water heaters, such as tankless water heaters, electric heat pump water heaters, or solar thermal hot water heaters.
- Set a goal of reducing my household's hot water use by 15%.



Protect Our Local Waterways

- Don't be a litterbug. Items thrown on the ground are likely to end up in the nearest water source, making clean up even more difficult. Make sure your trash is contained and that any recyclables are properly discarded.
- If you choose to smoke, please dispose of your cigarette butts properly.
- Pick up after your dog. This helps reduce the likelihood of its fecal bacteria ending up in, and increasingly contaminating, local recreational waterways.
- Reduce fertilizer usage. Excessive amounts applied to lawns and gardens wash off and pollute local streams and recreational waterways.



Conserve Water

- Conduct a water audit at my home, and replace inefficient toilets, shower heads and other fixtures.
- Install a rain barrel to harvest rainwater for outdoor use.
- Fix leaks in toilets and faucets promptly.
- Replace turf grass with drought-tolerant landscaping or native plants.
- Install smart technology on existing irrigation systems.
- Wash full loads of dishes and laundry.



Commute Green

- Set a goal to increase the number of trips I make by transit, carpooling, walking or biking.
- Organize a "walking school-bus" to walk a group of kids to school.
- Delay my next purchase of a new vehicle, if it's possible to get more life out of my current car.
- When I decide to make a purchase, I'll investigate electric vehicles and hybrids.
- Use alternatives to air travel when possible.
- Support development that creates vibrant, higher density, mixed-use areas to reduce the need for driving.