

# Appendix A: CAAP Implementation Summary

CITY OF COLUMBIA

SEPTEMBER 2025



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## Introduction

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This document provides a summary of implementation progress for the City of Columbia's Climate Action and Adaptation Plan (CAAP). The summary is intended to inform an update of the CAAP, which will be a five-year plan that aims to:

- Reflect latest climate science/vulnerabilities.
- Reflect stakeholder/community priorities and input.
- Reflect current/future political context.
- Present realistic, defensible actions and implementation strategies.

This document includes a summary of CAAP implementation context, including:

- Progress on CAAP goals, actions, and metrics.
- What's worked well and what hasn't worked as well in CAAP implementation to-date, and why.
- Success stories and case studies.
- Specific barriers and challenges, and opportunities related to CAAP implementation.
- Recent or anticipated technical innovations and external regulatory factors like federal or state policy changes.

This information is informed by qualitative research and quantitative analysis, including review of the following CAAP progress reports, plans, and online information:

- CAAP annual reports (2022-2024)
- Greenhouse gas inventory reports (2021-2023)
- Renewable energy plans (2022-2025)
- Renewable energy reports (2019-2020)
- CAAP dashboard ([comoclimateaction.org](https://comoclimateaction.org))

# Progress on CAAP Goals, Actions, & Metrics

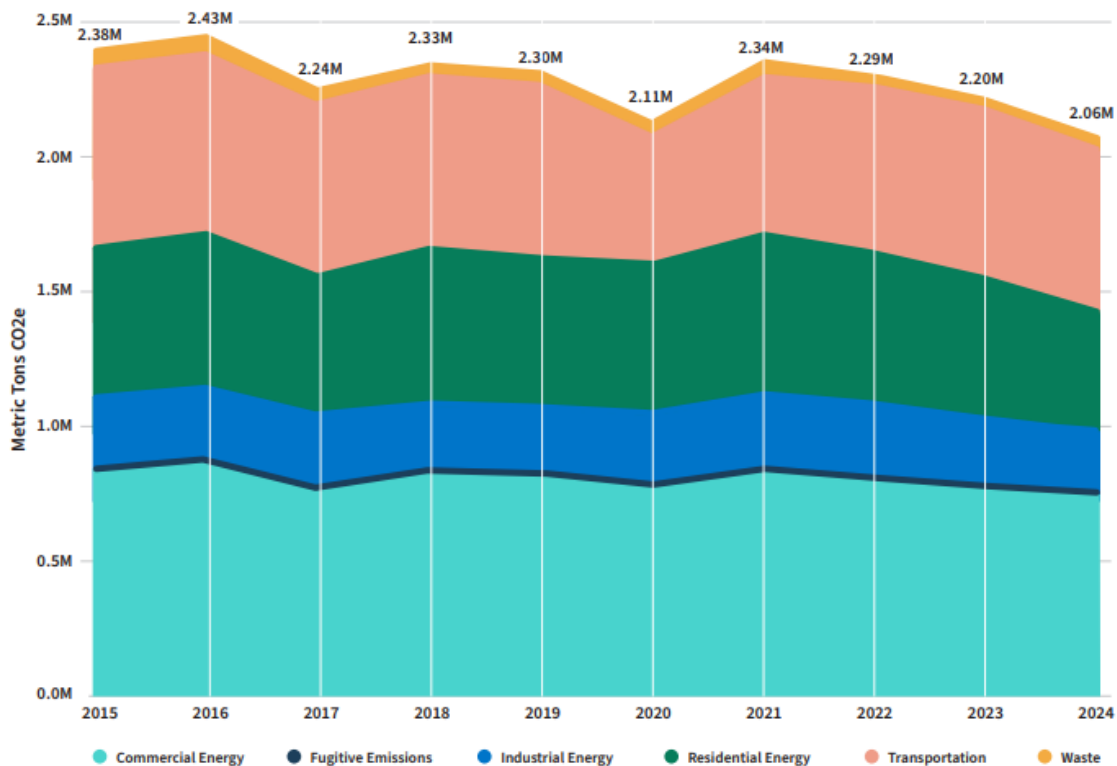
## Overview

The City of Columbia, Missouri, has undertaken significant efforts to address climate change through its Climate Action and Adaptation Plan (CAAP), adopted on June 17, 2019, with Resolution 89-19A. The CAAP establishes ambitious goals for reducing community-wide greenhouse gas (GHG) emissions: **35% by 2035, 80% by 2050, and 100% by 2060 (carbon neutrality)**. For municipal operations, the goals are a 50% reduction by 2035 and 100% by 2050. The CAAP also aims to prepare the community for both sudden and gradual climate-fueled changes.

## Greenhouse Gas Emissions

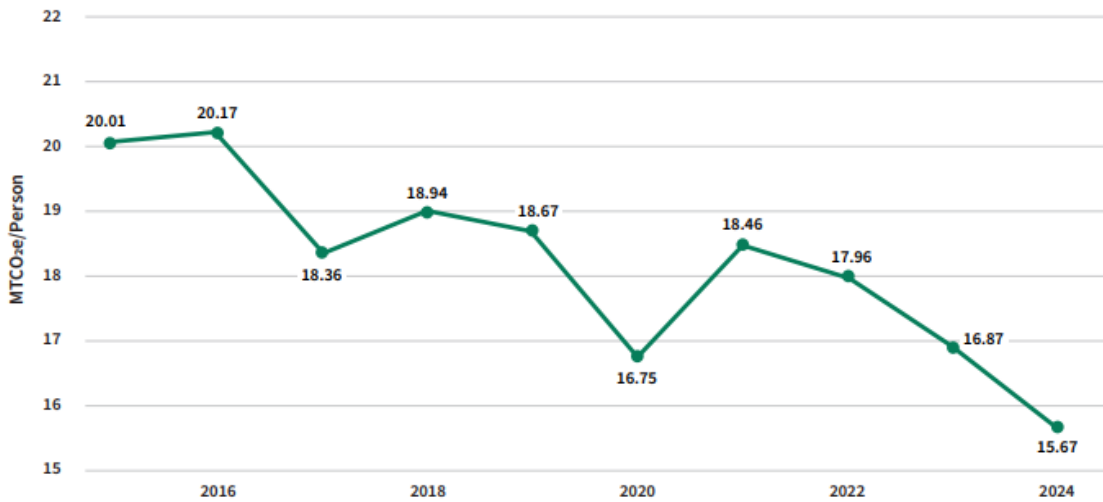
Annual greenhouse gas inventories are conducted to measure both community and municipal emissions, following the *U.S. Community Protocol for Accounting and Reporting Greenhouse Gas Emissions*. Since the 2015 baseline, Columbia has shown progress in reducing its GHG emissions:

- **Community-wide emissions** totaled 2.06 million metric tons of carbon dioxide equivalent (MTCO<sub>2</sub>e) in 2024, representing a 14% decrease from the 2015 baseline (see figure below).



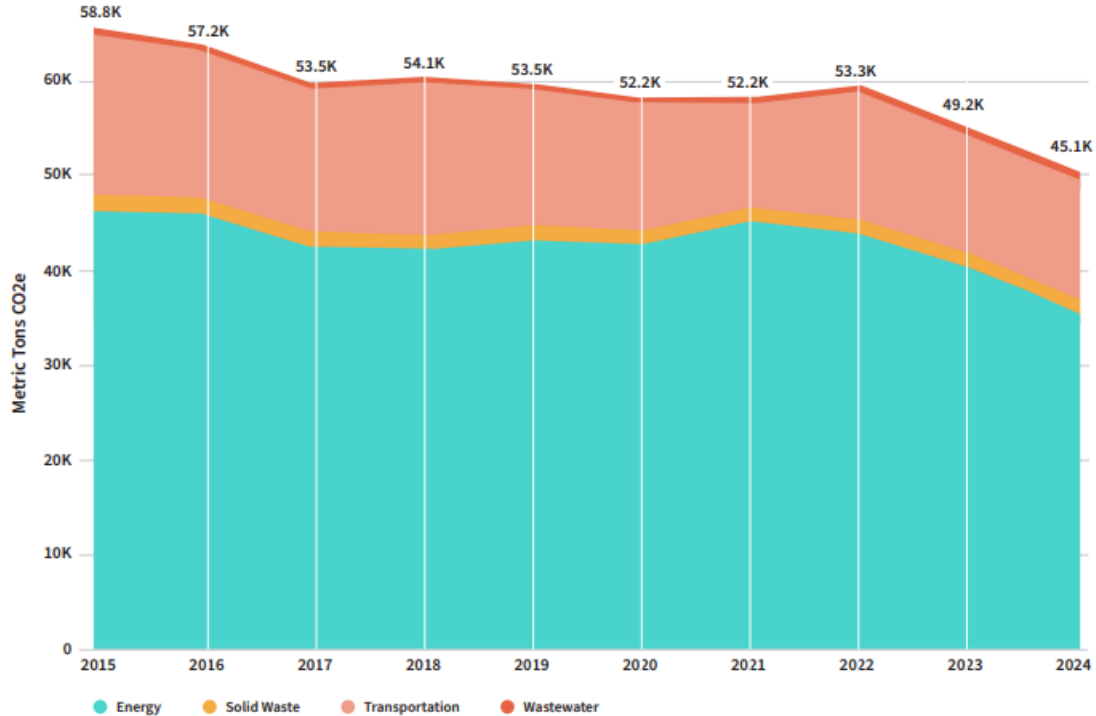
Source: 2024 City of Columbia Greenhouse Gas Inventory

- **Per capita emissions** have also steadily declined, decreasing 21.7% between 2015 and 2024 (see figure below).



Source: 2024 City of Columbia Greenhouse Gas Inventory

- **Municipal operations GHG emissions** have consistently trended downward, achieving an overall 23.3% reduction from the 2015 baseline in 2024 (see figure below).



Source: 2024 City of Columbia Greenhouse Gas Inventory

## Climate Change Impacts & Risks

The CAAP also aims to address the current and potential future impacts of climate change by establishing resilience measures that protect city residents and infrastructure from extreme heat, drought, flooding, and other climate impacts. Key City actions to address these impacts are summarized below.

- The City is addressing **extreme heat** through building and housing weatherization, tree canopy, and energy grid resilience programs. An example is the **Show Me the Relief Map**<sup>1</sup>—an online tool that allows residents to identify the nearest cooling center, public swimming pool, splash park, or water fountain that can help them stay cool during extreme heat.
- The City is addressing **drought** through efforts to conserve water and reduce drought impacts, including water rate structures to encourage reduced water use during drought and ecosystem management such as prairie and wetland restoration to enhance biodiversity. For example, the City's **Irrigation Conservation Program** incentivizes customers to upgrade to more efficient irrigation appliances such as smart irrigation controllers, rain sensors, and high-efficiency sprinkler heads. In FY2024, 32 customers participated, resulting in a rebate payout of \$4,445. The City's **Efficient Flush Program** encourages the replacement of older, less-efficient toilets with WaterSense rated models. In FY2024, 324 participants received a combined \$24,339 in rebates.
- The City is addressing **flooding and stormwater management** through efforts to increase biodiversity and reduce flooding. Columbia is restoring wetlands and prairies to reduce stormwater impacts—roadside prairies play an important role in filtering trash and stormwater pollution. To date, Public Works has converted 29.5 acres of turf grass into native prairie vegetation along roads, medians, and roundabouts. The City is also expanding stormwater capacity through green infrastructure such as street trees, rain gardens, and bioretention facilities. In addition, the Good Stewards team developed a two-year stormwater management plan to guide ongoing maintenance efforts—such as weeding, mowing, and trash removal—to ensure these natural systems continue to filter stormwater effectively

The following sections provide a detailed overview of CAAP progress for the following key sectors. For more information, see the CAAP dashboard at [comoclimateaction.org](https://comoclimateaction.org).

- Energy
- Transportation
- Waste
- Housing, Building, & Development
- Natural Resources
- Implementation & Governance

<sup>1</sup> [CoMoClimateAction.org/category/health-safety-and-well-being/show-me-the-relief-map](https://comoclimateaction.org/category/health-safety-and-well-being/show-me-the-relief-map)

## Progress in Key Sectors

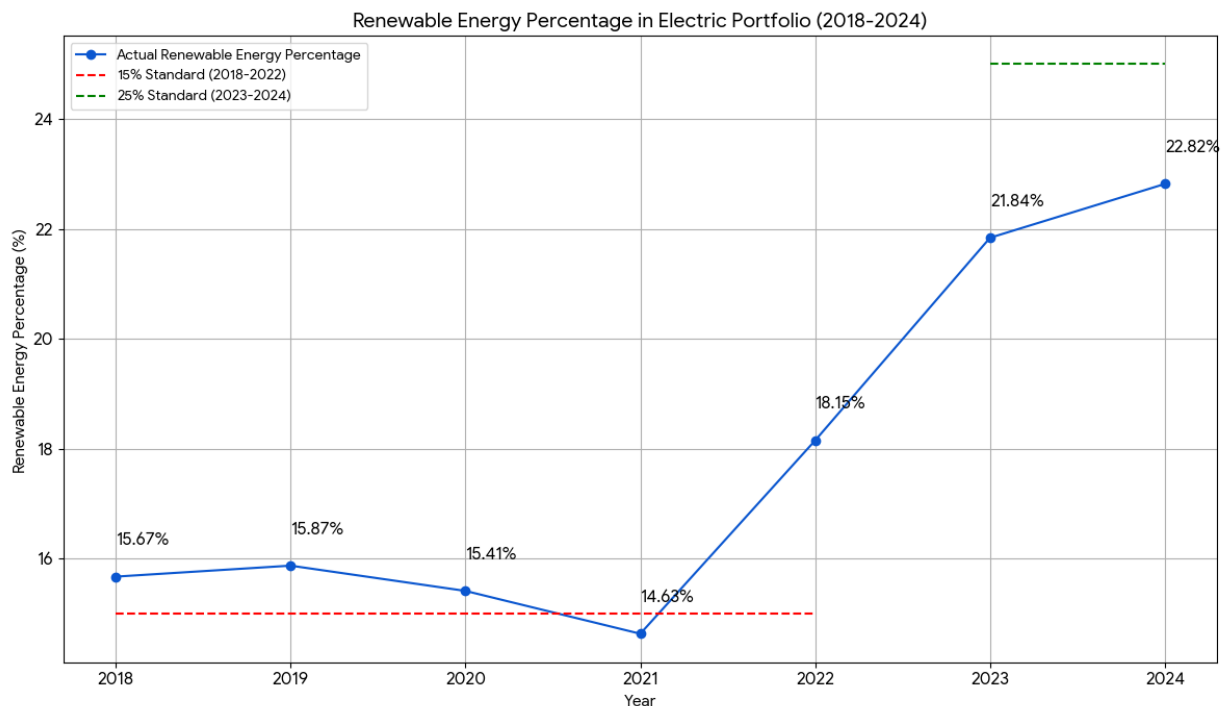
### Energy

The energy sector is the largest contributor to community GHG emissions, accounting for ~70% of total GHG emissions. The City of Columbia's electric utility is the primary electricity provider and the largest single source of GHG emissions.

#### PROGRESS HIGHLIGHTS

#### Renewable Energy Standard Compliance

Columbia Water & Light (CWL), now City of Columbia Utilities, is mandated to purchase increasing levels of energy from renewable resources. Between 2018 to 2024, the percentage of the electric retail usage from renewables grew from 15.67% to 22.82%. This time period saw significant growth in renewable energy usage, but growth is yet to meet the 25% standard. The ordinance requires 25% of electric retail usage from renewables by December 31, 2022, and 30% by December 31, 2028.



#### Renewable Energy Sources and Projects

Approximately **23% of Columbia Water & Light's (CWL) electricity is currently sourced from renewables**, while the CAAP goal is a bold **100% by 2035**—highlighting both early gains and the distance still to travel ([comoclimateaction.org](https://comoclimateaction.org)). The **renewable portfolio** primarily consists of wind, landfill gas, and solar:

- **Wind energy** is a major component, from sources like Bluegrass Ridge (King City, MO), Crystal Lake III (Hancock County, IA), and North Dakota wind Renewable Energy Certificates (RECs). Crystal Lake III wind farm underwent a repower project in 2021, with an updated contract through 2040, expected to increase MWhs and lower costs. Bluegrass Ridge was also repowered in 2024.
- **Solar energy** includes CWL's own projects (e.g., Bernadette site), Net-Metered Customer Production, Free Power Solar (discontinued in 2020), and Truman Solar. Truman Solar (10 MW) began operation in May 2021, significantly expanding CWL's local renewable generation. Customer-installed photovoltaic systems increased significantly from 152 in 2017 to 238 in 2019 and 366 in 2022, with rated capacity growing from 1.486 MW to 4.75 MW. By 2024, there were 74 new installations, increasing rated capacity to 6.34 MW. A community solar program became operational in January 2024, utilizing Truman and Bernadette Solar fields. According to the 2024 CAAP Annual Report, the City's Office of Sustainability has begun a list of potential sites suitable for new solar arrays.
- **Landfill gas** is sourced from the Columbia and Jefferson City landfills. In December 2021, the City Council approved moving forward with the design-build process for a fourth generator at the Columbia Landfill Gas Energy Plant, increasing its capacity from 3.1 MW to 4.2 MW, which was completed in 2024.
- **Future projects** include the Grain Belt Express Clean Line transmission line, expected to deliver 35 MW of wind energy from western Kansas starting in 2029 (initially projected 2021), with a potential expansion to 53 MW. The Boone Stephens Solar project (64 MW) was terminated in June 2022 due to increased costs, prompting staff to seek replacement resources.

## Renewable Energy Costs

The Renewable Energy Standard ordinance limits **electric rate** increases to no more than 3% above what rates would be with non-renewable energy. A 2023 study found that achieving 100% renewable energy by 2030 without RECs would lead to a \$169M increase in net present value compared to the base case, and early retirement of existing thermal resources would have the largest financial impact. The cost of new renewables is not expected to significantly decrease until around 2030.

## Energy Efficiency Programs

City of Columbia Utilities operates **demand-side management (energy efficiency) programs** for residential, commercial, and industrial sectors to reduce overall energy demand:

- In 2022, these programs resulted in an estimated reduction of 4,296 MWh of electricity and avoided 3,153 MTCO<sub>2</sub>e.
- In FY2024, programs provided an estimated avoidance of 6,727 MTCO<sub>2</sub>e, and customers invested over \$10.7 million in efficiency upgrades.

- New programs launched in the summer of 2024 include Efficient Electrification Incentives, Smart Thermostat Rebate, and a pilot Residential EV Charger Rebate. Utility Services Division programs aim to reduce 47,000 MWh and 17 MW of peak load by 2030 (see estimated first-year savings in table below from 2024 CAAP annual report).

| Efficiency Programs               | Energy Savings (kWh) | GHGs Avoided (MTCO <sub>2</sub> e) |
|-----------------------------------|----------------------|------------------------------------|
| Residential Efficiency Incentives | 831,040              | 621.20                             |
| Commercial Efficiency Incentives  | 5,623,025            | 4,203.21                           |
| Commercial and Residential Solar  | 1,095,768            | 819.09                             |

### CAAP ACTION REFLECTIONS

CAAP Team reflections on current energy CAAP actions are summarized as follows:

- Several actions are complete, including offering a Community Solar Program through Columbia Water & Light (W&L) and updating building codes to require new commercial buildings be solar-ready. Other actions are stalled due to **lack of resources or utility software limitations**. The integration of CAAP priorities into W&L planning goals to increase renewable energy purchasing and investments are ongoing.
- **Virtual net metering and permitting improvements** face structural or regulatory barriers and may not be feasible without major utility upgrades.
- Staff noted that some actions are **too vague or duplicative** and may need removal or consolidation (e.g., multiple solar/PV expansion actions).
- Emphasis is shifting toward **energy efficiency and demand-side management** as more cost-effective near-term strategies.
- Grid resilience and storage options were evaluated but deemed **not cost-effective under current rate caps**—to be reconsidered in future planning cycles.

## Transportation

### PROGRESS HIGHLIGHTS

- A notable **78% of residents drive alone to work**, signaling the need for more effective strategies in public transit, active mobility, and land-use integration ([comoclimataction.org](https://comoclimataction.org)).
- Community transportation **GHG emissions** made up ~29% of communitywide emissions in 2024.
- City staff drafted a **Fleet Electrification Policy** in 2022 to phase out fossil fuels in the municipal fleet by 2040, expecting 140 electric/hybrid vehicles (20% of the fleet) by 2028, avoiding 175 MTCO<sub>2</sub>e/year (assuming 40% renewable electricity). This policy was signed and

adopted on July 21, 2023. Since its adoption, the City purchased seven Ford Lightnings, one Chevy Bolt, and six BYD electric buses, as noted in the 2024 CAAP Annual Report.

- A LoNo (low or no emissions) grant was received in 2022 to add **six electric buses** to the City's transit fleet, replacing diesel buses and leading to a 40% electric transit fleet.
- Planning and construction for three City-Fleet **charging stations** began in January 2023. Additional grant funding received in early 2024 will support Level II and DC Fast Charge stations at downtown parking garages, the Daniel Boone Regional Library, and the Columbia Regional Airport.

## CAAP ACTION REFLECTIONS

CAAP Team reflections on current transportation CAAP actions are summarized as follows:

- Many actions are **in progress** (Vision Zero projects, sidewalk expansion, EV roadmap to increase public charging stations, fleet transition), but others require **additional funding or staff capacity**.
- Land use and zoning codes continue to evolve, including the **recent adoption of the Unified Development Code**, efforts to increase **housing and occupancy density**, and efforts to reduce barriers to housing developments on some land types. These efforts have implications for related actions in the CAAP and thus may warrant re-focusing or delaying some CAAP actions.
- **Bike share, car share, and certain parking reforms** may not be realistic without private-sector partners or broader code updates.
- Redundant or low-return actions (e.g., anti-idling enforcement, carpool programs) are flagged for **removal from the CAAP**.
- Stronger integration between **transportation planning and housing/land use policies** is needed to meaningfully reduce driving.
- The 2024 CAAP annual report indicated that certain actions related to revising street design standards to prioritize walkability and improving reliability of bus service are in motion through the reception of grant funding to evaluate issues and the initiation of introductory meetings with the transit manager.

## Waste

Waste emissions accounted for less than 2% of community emissions in 2024. The City's dashboard notes that **the majority of community waste could be composted or recycled**, pointing to significant opportunity for waste diversion and GHG reductions in the waste sector ([comoclimateaction.org](https://comoclimateaction.org)).

### PROGRESS HIGHLIGHTS

- There was no change in solid waste emissions between 2023 and 2024. Between 2022 and 2023, solid waste (landfill) GHG emissions decreased 2.45%. Solid waste emissions in 2023 were 40% lower than the 2015 baseline.
- City-collected landfill contributions fell by 1.18% in 2024, with the City's share of waste dropping from 50% in 2014 to 38% in 2024 according to the CAAP annual report.
- Waste collection events, such as the 2022 event for tires and electronic waste, diverted 27.8 tons of e-waste and over 19 tons of tires.

### CAAP ACTION REFLECTIONS

CAAP Team reflections on current waste CAAP actions are summarized as follows:

- The CAAP action to reduce landfill waste and increase waste diversion is in progress, although progress has been hindered by destruction of the City's Material Recovery Facility (MRF) by the April 20, 2025 tornado. As the City evaluates options to rebuild or replace the MRF, there are opportunities to align and further CAAP goals in collaboration with the solid waste utility.

## Housing, Building, & Development

### PROGRESS HIGHLIGHTS

- The **Building Energy and Transparency Policy** was passed in 2021, requiring all municipal buildings to be benchmarked. By 2023, 65 municipal buildings were benchmarked, representing the most comprehensive view of the portfolio. In 2023, building energy accounted for 62% of the City's total municipal GHG emissions. By 2024, benchmarking efforts were 100% complete for eligible City buildings.
- **Municipal Building Energy Use Intensity (EUI)** was 21% higher than the National median for a comparable portfolio in 2024. The emissions intensity was 18% more than the national median. Fire Station 11, completed in September 2023, features a ground-source heating/cooling system and roof-mounted solar panels, marking the largest solar installation on a municipal building to date. The City is pursuing performance contracting to implement energy efficiency improvements in facilities.
- The City launched a **Rental Energy Efficiency project** in 2022 to improve energy efficiency in rental housing. In 2023, a **Rental Home Energy Score pilot program** was launched, offering free energy efficiency assessments to rental properties.

## CAAP ACTION REFLECTIONS

CAAP Team reflections on current housing CAAP actions are summarized as follows:

- Multiple **energy efficiency incentive programs** are already in place or completed, especially for new construction and retrofits. Building codes change every three years, which can affect the tracking and measurement of progress.
- Additional measures that are in progress include **rental efficiency standards, building labeling, and deep retrofit programs**.
- Actions that are awaiting resources include fossil fuel phase-out measures such as Community Cost Share Fund to provide energy efficiency education and improvements, incentives to switch to electric heat pumps, and phase energy efficiency building requirements into the building code.
- **Resilience-related building actions** such as the use of light-colored roofs to improve cooling and construction limits in flood zones to reduce flooding impacts are awaiting resources.

## Natural Resources

### PROGRESS HIGHLIGHTS

- The City is working on initiatives to enhance biodiversity and improve climate resilience. This includes **converting mowed turf grass** along roadsides and medians to native prairie vegetation, which also contributes to carbon emissions reduction.
- The City's 2022 "**Show Me The Heat**" project surveyed residents' lived experiences of extreme heat at in-person events, collected temperature readings with volunteers to identify urban heat islands, and gathered feedback on extreme heat solutions. The project has evolved into "Show Me The Relief," a mobile app for residents to find nearby places to cool off such as splash parks and public swimming pools.
- The Good Stewards CAAP Team is working to increase tree canopy in urban heat islands. The City has partnered with several organizations, including the Missouri Conservation Corps, Forest ReLeaf, Love Your Block, and the Arbor Day Foundation (which is piloting a tree planting program in Ridgeway and West Ash neighborhoods).
- Funding requests for **green infrastructure** maintenance have been made to improve the City's capacity to maintain natural assets like street trees, parks, and rain gardens.

## CAAP ACTION REFLECTIONS

CAAP Team reflections on current natural resource CAAP actions are summarized below:

- Actions to increase climate resilience and the carbon sequestration capacity of **public and private lands** have been recommended for removal due to overlap with existing efforts or efforts relying on state action.

- **Water conservation strategies** including a new rate structure and technical assistance programs are complete while efforts to update building codes are awaiting resources.
- Staff recommend consolidating or reframing actions into broader strategies (e.g., **landscape connectivity plan, prioritizing native plants**) to improve coordination.
- Several actions overlap with existing city efforts (Urban Forest Master Plan, landscaping guidance) and may need integration with **other city plans**.
- **Flooding and stormwater management** strategies are awaiting resources and quantifiable targets.
- Food system actions (supporting local food, urban farming, entrepreneurship) are recognized as **ongoing but can be strengthened with timelines and coordination**. Efforts to increase local food production are in progress while the development of urban farming regulations are awaiting resources.

## Implementation & Governance

### PROGRESS HIGHLIGHTS

- The City of Columbia consistently receives an **A- score from the Carbon Disclosure Project (CDP)**, indicating strong performance in climate mitigation and adaptation. This score puts the City in line with peer cities for mitigation and adaptation measures.
- The **Climate and Environment Commission (CEC)** and City of Colombia staff collaborate to meeting sustainability goals by advising the City Council, providing input on budget priorities, monitoring CAAP implementation, and engaging with the community on climate and environmental issues.
- The Office of Sustainability won a grant from the **Energy Efficiency and Conservation Block Grant Program** in 2024 to support energy efficiency and renewable energy at City-owned facilities such as the installation electric vehicle charging stations. The funding has not yet been received and the status of this federal grant program is unknown at this time.
- The **Integrated Electric Resource and Master Plan (IERMP)**, completed in 2021, guides CWL's long-term energy planning and incorporates CAAP goals related to energy supply. A study to evaluate options for achieving 100% renewable energy by 2030 was initiated in 2022 and completed in 2023.

### CAAP ACTION REFLECTIONS

CAAP Team reflections on other CAAP actions are summarized below:

- **Resilience and equity** actions (such as utility assistance, cooling access, resilience hubs) are important to CAAP implementation but many are still **awaiting resources**.

- Progress has been strong on **organizational capacity and reporting** with the creation of a Community Climate Commission, CAAP Teams, adaptation dashboard, and the completion of annual reports to track KPIs.
- Staff emphasized the need for **funding, resources, and integration across departments** to move beyond planning and ensure successful implementation.
- Equity-focused reporting and engagement (neighborhood vulnerability analysis, CAAPtains, outreach materials) are in progress but need **sustained support**.
- Health and safety actions including **mosquito and tick trapping programs** to reduce vector-borne disease are awaiting resources.
- Code updates to include **backyard and community gardens** in new developments are awaiting resources while increasing funding for **weatherization projects for low-income residents** are in progress.

## CAAP Update Considerations

Progress on CAAP goals, actions, and metrics suggest the following considerations for the CAAP update:

- **Simplification and Strategic Focus** – Staff noted that several actions are duplicative or unrealistic (e.g., multiple overlapping solar/net metering items in energy, or car share/carpool programs in transportation). This reinforces a desire for a **streamlined CAAP with fewer, higher-impact priorities**, rather than a long list of actions that may not move forward.
- **Practicality, Measurability, and Accountability** – Many actions lack clear metrics or are difficult to measure, such as “managing natural areas” or “expanding transit” without defined targets. The update should emphasize **actions that are specific, measurable, and adaptable**, supported by improved tracking systems like the existing CAAP dashboard.
- **Financial and Resource Alignment** – A recurring theme was resource limitations: utility billing software currently prevents virtual net metering, stormwater and resilience projects require new funding, and many housing/building efficiency upgrades depend on incentives. The updated CAAP should **tie actions more closely to financial feasibility** while actively seeking external funding and partnerships to expand capacity.
- **Collaboration and Integration** – Progress has been strongest where actions are integrated into existing plans and processes—for example, Vision Zero safety projects and energy efficiency programs are already embedded in ongoing City work. Staff stressed the need for **better cross-departmental alignment and community involvement** so CAAP priorities are not siloed but mainstreamed into codes, planning, and resource management.
- **Equity and Community Resilience** – Actions around cooling access for low-income households, transitional housing options, and resilience hubs highlight the importance of

**equity-centered implementation.** Staff emphasized that updated strategies should focus not just on technical feasibility but also on ensuring benefits reach vulnerable populations.

- **Maintaining Momentum and Relevance** – Some areas, like renewable energy purchasing and fleet electrification, are already progressing, while others (e.g., microgrids, district heating, urban farming ordinances) have stalled. The update provides an opportunity to **reinvigorate urgency, phase out infeasible actions, and align with today’s opportunities** in funding, technology, and community partnerships.

## Policy & Technological Context

### Regional

At the regional level, Columbia participates in planning and collaboration efforts that provide both opportunities for coordination and highlight gaps in resources.

- Columbia and the Missouri Department of Natural Resources (MDNR) engaged in EPA's **Climate Pollution Reduction Grant (CPRG)** planning process, which provides a framework for emissions reduction strategies.
- Missouri did not secure **CPRG implementation funding**, creating both a funding gap and an opportunity for Columbia to take on a leadership role.
- **Partnerships** with universities, nonprofits, and neighboring jurisdictions such as Boone County can help fill regional capacity gaps and strengthen Columbia's climate initiatives.

### State

At the state level, Missouri has limited climate policy commitments, which increases the importance of local action and leadership.

- The state has **no binding greenhouse gas reduction targets**, so municipalities like Columbia set their own ambitious climate goals.
- Funding opportunities exist through mechanisms like the **Environmental Improvement and Energy Resources Authority**, but they are limited and highly competitive.
- Columbia's CAAP serves not only as a local plan but also as an important **state-level model** for climate leadership.

### Federal

At the federal level, unprecedented funding opportunities are available, though the political environment adds uncertainty.

- The **Inflation Reduction Act (IRA)** and **Infrastructure Investment and Jobs Act (IIJA)** have created historic opportunities to fund renewable energy, electrification, efficiency, transportation, and resilience projects. Columbia is already benefiting, such as through EV bus and charging station grants.
- The **EPA's Climate Pollution Reduction Grants (CPRG)** provide planning and implementation support directly aligned with CAAP goals.

- The **current political context creates uncertainty**: proposals to scale back clean energy tax credits and renewable funding could reduce available resources for cities like Columbia.
- Even if some incentives are reduced, many **funding channels** (e.g., CPRG, state allocations) will likely remain, and long-term market trends continue to drive down renewable energy costs.

## Technology

Emerging technologies can help Columbia advance its CAAP goals more effectively, enhancing resilience, equity, and efficiency.

- **Digital Twins and AI for Climate Resilience**: Cities like Houston and Amsterdam are using AI-powered digital twins to model flooding, heat islands, and energy systems, enabling smarter, real-time decision-making ([New York Climate Action Council](#), [Reuters](#)).
- **Microgrids and Distributed Energy**: Illustrations from Ann Arbor and Washington, DC show how home and community microgrids—paired with heat pumps, solar panels, and batteries—drive clean energy access, resilience, and cost savings ([Financial Times](#)).
- **Advanced Energy Storage**: Innovative solutions, like Energy Vault’s gravity-based storage system, offer long-duration storage that avoids lithium-ion limitations—an emerging tool for urban infrastructure integration ([TIME](#)).
- **Smart City Infrastructure**: Integrated systems using Advanced Metering Infrastructure (AMI) and Supervisory Control and Data Acquisition (SCADA) can improve efficiency and resilience of city infrastructure. These systems can also incorporate AI to identify and troubleshoot problems and support broadband connectivity—enabling cities to manage water, energy, and assets more efficiently and sustainably ([Performance Services](#)).
- **Grid-Enhancing & Transactive Energy Technologies**: Technologies that increase transmission capacity and enable dynamic energy trading (transactive energy) improve grid efficiency and flexibility—a useful approach for managing distributed generation ([americanprogress.org](#)).
- **GIS-Driven Green Infrastructure Planning**: Columbia could leverage GIS-based approaches for designing rain gardens, bioswales, green/blue roofs, and other infrastructure that supports urban cooling, water management, and carbon storage ([en.wikipedia.org](#)).

## CAAP Update Considerations

Given this context, Columbia’s CAAP update should balance near-term opportunities with preparedness for shifting policy and funding landscapes.

- **Leverage near-term federal funding**. Maximize opportunities under the Inflation Reduction Act, IIJA, and CPRG programs while strong federal resources are available.

- **Plan for long-term stability.** Emphasize strategies like energy efficiency, building electrification, and community resilience that remain cost-effective and impactful even if incentives decline.
- **Strengthen equity and resilience.** Directly tie new funding and programs to benefits for vulnerable households and neighborhoods (e.g., targeted energy upgrades, cooling access, and resilience hubs).
- **Enhance data and capacity.** Modernize metering, integrate utility and City data, and consider smart tools (e.g., sensors, digital models) to improve tracking and decision-making.
- **Support local clean energy and resilience.** Explore distributed solar, battery storage, and small-scale microgrid pilots as ways to increase reliability and community access to clean power.
- **Integrate green infrastructure.** Use planning and GIS tools to guide investments in tree canopy, stormwater management, and cooling strategies in high-priority areas.
- **Build partnerships.** Work with universities, nonprofits, and utilities to pilot new approaches and share capacity for implementation.

# Barriers, Challenges, & Opportunities

## Barriers and Challenges

CAAP implementation progress reports and implementation team feedback revealed the following overarching implementation barriers and challenges:

- **Cost limitations and financial burden.** High costs create barriers to renewable energy expansion and can constrain broader CAAP progress. For example, the City's 3% renewable energy rate cap was exceeded by nearly 58% in 2022 due to grid congestion and Crystal Lake wind contracts, while new solar PPAs proposed in 2023 would have required a 12–13% rate increase. Early retirement of coal plants would also bring large divestiture and transmission costs.
- **Project delays and market volatility.** Delays and external market dependencies undermine reliability of progress. The Boone Stephens Solar PPA was terminated in 2022, and the Ironstar wind project has been repeatedly delayed to 2027–2029, contributing to missed renewable targets in 2023–24. Reliance on the MISO market leaves CWL exposed to congestion, weather, and transmission risks, while shifting to SPP would incur uneconomical wheeling costs.
- **Infrastructure and data constraints.** Outdated systems and lack of centralized data hinder measurement and adaptive management across the CAAP. For example, Columbia's Automated Meter Reading (AMR) technology limits advanced rate design and energy tracking, while many CAAP actions (e.g., natural resources management) lack clear metrics or monitoring frameworks, reducing accountability.
- **Overly complex or unfeasible actions.** Too many duplicative or impractical actions dilute staff capacity and limit impact. Examples include overlapping net metering proposals in the energy sector, transportation actions such as bike share without viable partners, or broad natural resource measures without measurable outcomes.
- **Equity and resource limitations.** Limited resources hinder the ability to deliver equitable outcomes and resilience benefits. For example, actions like expanding cooling access and energy efficiency support for low-income renters are awaiting resources.

## Opportunities

CAAP implementation progress reports and implementation team feedback revealed the following potential opportunities to consider for the CAAP update:

- **Strong policy and planning framework.** Columbia's CAAP has a solid foundation of mandates and long-term goals that support ongoing progress. For instance, the renewable energy ordinance (2004) and CAAP (2019) set ambitious GHG targets, while CAAP priorities are embedded in the Integrated Electric Resource and Master Plan (IERMP). City Council is now

considering ordinance updates, such as a 40% renewable target by 2035 paired with stronger risk analyses.

- **Renewable portfolio expansion.** Continued diversification of renewable energy resources can help strengthen supply and resilience. Recent examples include the Truman Solar 10 MW facility coming online, repowering projects at Crystal Lake (+40,000 MWh annually) and Bluegrass Ridge (+79% generation), and feasibility studies for utility-scale battery storage and solar on municipal buildings.
- **Robust energy efficiency and demand-side management (DSM).** Efficiency and demand management provide cost-effective, scalable pathways to meet CAAP goals. CWL's programs deliver \$2.32 in benefits for every \$1 spent, with more than 6,700 MTCO<sub>2</sub>e avoided in FY2024. Planned offerings such as heat pump water heater incentives, smart thermostats, and electrification upgrades demonstrate broad potential.
- **Advancements in transportation electrification.** Shifts in fleet and infrastructure create visible progress and momentum. Examples include the 2023 Fleet Electrification Policy, newly awarded grants for six new electric buses (bringing the fleet to 40% electric), construction of City-owned charging stations, and rebates for residential EV chargers.
- **Community engagement and equity initiatives.** Engagement and equity-centered efforts enhance accountability and ensure benefits are shared broadly. For instance, campaigns like "Show Me the Heat" and "Show Me The Relief" address urban heat islands with community input. Additionally, Columbia maintains an A- CDP score for transparency and benchmarks municipal building energy consumption and emissions to track progress. Staff are dedicated to critical equity-focused actions, such as housing resilience, food systems, and cooling access.

## Conclusion

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Since adopting its Climate Action and Adaptation Plan (CAAP), Columbia has made progress in renewable energy procurement, energy efficiency, transportation electrification, and organizational reporting. Yet the City's review of focus-area actions highlighted recurring themes: too many actions are duplicative, overly specific, or not measurable; equity-focused initiatives remain underfunded; and limited staff capacity slows implementation. These findings point to the need for a more streamlined, strategy-driven CAAP update.

Key **barriers** include financial constraints such as the 3% renewable energy rate cap, delays and cancellations of major projects (e.g., Boone Stephens Solar, Ironstar wind), reliance on volatile wholesale markets, outdated metering infrastructure, and under-resourced equity measures like resilience hubs and cooling access.

At the same time, Columbia has strong **opportunities**. The City benefits from a solid policy framework, successful demand-side management programs, and tangible wins like the Truman Solar facility, Crystal Lake repowering, and expansion of the electric bus fleet. Community engagement initiatives such as "Show Me the Heat/Relief" further strengthen equity and transparency.

The broader **policy and funding context** underscores both opportunity and uncertainty. Federal investments through the Inflation Reduction Act and Infrastructure Investment and Jobs Act provide unprecedented resources, though political shifts could reduce incentives. Missouri lacks binding climate targets and missed CPRG implementation funding, making Columbia's local leadership role even more critical.

Looking forward, the CAAP update should:

- **Streamline and refocus** on fewer, higher-impact, measurable strategies.
- **Maximize federal and state funding** while preparing for potential policy rollbacks.
- **Center equity and resilience** so vulnerable communities benefit directly.
- **Strengthen partnerships and internal capacity** to support implementation.
- **Maintain long-term vision** to ensure continuity through shifting political and market conditions.

In short, Columbia's CAAP progress shows both achievements and constraints. The update is an opportunity to refocus, align actions with available resources, and build a more resilient path toward long-term climate and community goals.