STUDY SESSION MEMORANDUM

TO: Mayor and Members of Council

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DATE: June 8, 2021

SUBJECT: Study Session for June 8, 2021
Update on Climate Action Plan

I. EXECUTIVE SUMMARY

> "The United States and the world face a profound climate crisis. We have a narrow moment to pursue action at home and abroad in order to avoid the most catastrophic impacts of that crisis and to seize the opportunity that tackling climate change presents. Together, we must listen to science and meet the moment."
>
> - Executive Order on Tackling the Climate Crisis at Home and Abroad
> Jan. 27, 2021

Society is approaching a critical juncture in confronting the climate crisis, and the Boulder community has an important role to play. Building on the community's history of environmental action and on the lessons learned in more than 20 years of climate work, now is the moment to ensure that the city's climate action efforts amplify the global effort.

The City of Boulder initiated the development of its next-generation climate action strategy in 2019. This memo provides a summary of the key insights of the work that has transpired since and outlines a proposed approach for climate action moving forward.

The community's long environmental legacy features accomplishments in several arenas, including waste reduction, energy, transportation, and conservation. Like many other cities around the world, Boulder's climate legacy reflects a city-centric approach to climate action. This paradigm, however, under which society could halt climate change through the actions of municipal and state government, is outdated.

Scientists tell us that we have until 2030 to make the massive, societal, systems-scale changes required to stave off the worst effects of climate change. While the situation is urgent, we are also in an incredibly inspiring moment. Every day, new leaders join the cause from every corner of the globe, including here in Boulder. Our community is poised to take the next step in this work, however the city's climate action work moving forward must look different than it has in the past. Specifically, the city, working in concert with the community, must:

- Act beyond its boundaries, collaborating with partners, other cities, and government agencies to achieve impact at a larger scale, on topics within the city's sphere of influence.
- Focus city actions in support of achieving larger regional and national climate targets including:
    - Reduce emissions 70% by 2030 against a 2018 baseline
    - Become a Net Zero city by 2035
    - Become a Carbon-Positive[1] city by 2040
- Allocate necessary time and resources to address the impacts of climate change in an equitable manner.
- Build resilience and strengthen community capacity to adapt and thrive
- Focus attention on natural carbon drawdown, which is becoming an increasingly important tool for managing emissions.
- Account for the full scope of emissions in our community, including emissions associated with the creation of the goods and food purchased.
- Address new focus areas for climate action including land use and financial/economic systems.
- Bring the community together with renewed urgency to address the climate emergency and achieve clarity on the required next steps.

The Biden administration has challenged Americans to listen to science and rise to meet this moment. Based on analysis since 2019 and the latest science, the steps outlined above will bring Boulder closer to achieving this directive.

[1] Carbon-Positive means that an activity goes beyond achieving net zero carbon emissions to create an environmental benefit by removing additional carbon dioxide from the atmosphere

Moving forward from the council discussion on June 8, the city's next steps will include:

1. Summer 2021: Return to council with a resolution to adopt new climate goals.
2. Fall 2021: Release a progress report and strategies for climate action to the community in the fall.
3. December 2021: Return to council to review the prioritized set of proposed city organization climate action strategies as well as funding strategies to support this work.

II. QUESTIONS FOR COUNCIL

1) Does council agree with the proposed new systems-based goals, targets, and progress indicators? What other measures of progress should be tracked?
2) Does council have feedback on the equity design principles? Are there principles that are missing?
3) Does council support staff returning in August with a resolution to formally adopt the climate mitigation and adaptation goals, and the equity design principles?
4) Does council have any feedback on the framework for clarifying the role of cities in addressing climate action goals and how this work could extend beyond municipal boundaries?
5) Are there specific strategies, investment priorities or revenue considerations that staff should consider as they prepare for the December 2021 Study Session?

III. BACKGROUND

A. Boulder's environmental legacy

Boulder has long led on actions to preserve the environment, reduce greenhouse gas (GHG) emissions and tackle climate change, with City Council and the community consistently demonstrating support for these efforts. The city's major climate action achievements include:

- Reducing waste: For more than 50 years, the Boulder community has supported programs to divert waste from landfills through recycling and composting. The city's Zero Waste programs educate the community on proper waste sorting and provide access to waste diversion for all Boulder residents, businesses and institutions. In 2020, the community achieved a 53% diversion of waste from the landfill, a benchmark more than halfway to Boulder's target of 85% diversion by 2025. Going beyond waste diversion, the city has begun to explore how to reduce waste created in the first place. By tackling consumption, the community can move to a more circular economy, where waste is designed out of production and all products can be easily recycled, reused or repurposed instead of immediately landfilled.
- Protecting land and water: Boulder's famous greenbelt and open space lands are protected from development, preserving ecosystems, animal habitats and areas for human connection with nature. Boulder, with the support of taxpayers, has built an open space portfolio of more than 45,000 acres. Recently, the city has begun exploring opportunities

for open space land to support the drawdown of carbon from the atmosphere—storing it in plants and soil through a process called carbon sequestration.

- Transitioning to Clean Energy: Nearly half of Boulder's GHG emissions within the city boundary come from electricity generation and another 25% come from natural gas use. The city's climate action efforts have centered around reducing energy use, changing how electricity is generated and transitioning off the use of natural gas. Per capita community electricity use has decreased by 8% over the last 15 years despite 55% increase in gross domestic product per capita. The city's efforts have included municipalization (the city's 2010-2020 effort to localize control over the electricity system); adoption of a net-zero energy code; creation of EnergySmart and Partners for a Clean Environment (PACE), which support energy efficiency in homes and businesses, respectively; adopting the Building Performance Ordinance and cannabis cultivator energy offset requirements; and supporting rooftop and ground-mounted solar in Boulder. These local efforts have substantially influenced Xcel Energy's significant progress on reducing the energy grid emissions in its larger service territory.
- Supporting alternatives to internal-combustion, single-occupancy vehicles: Many of the city's early environmental accomplishments involved supporting biking, walking and bussing as alternative modes of transportation. Boulder's bicycle infrastructure, complete streets, and local and regional bus systems have helped reduce vehicle miles traveled per person since 1990. More recently, the city has engaged in efforts to support the adoption of electric vehicles in the city's fleet as well as by Boulder residents. Boulder County is now home to nearly 6,000 electric vehicles, leading the state in adoption.
- Setting aggressive emissions reduction and renewable energy targets: Since 2002, the City of Boulder has aimed its climate efforts around specific emissions reduction targets. These targets, which have been updated periodically to reflect scientific consensus and urgency, has guided the city's climate work. The city's current targets are:
    - 100% renewable electricity by 2030
    - 100 megawatts (MW) of local, renewable energy production by 2030
    - 80% GHG reduction from 2005 levels by 2050

For more on Boulder's environmental legacy, please review:

- Blog post: Boulder's Climate Legacy
- July 9, 2019 City Council Study Session Memo
- 2019 City of Boulder Community Greenhouse Gas Inventory

B. The City of Boulder's influential role in city-based climate action

The city's legacy of a city-centric approach to climate action has modeled the prevailing wisdom about how to address climate change at a global scale, but this paradigm has been shifting as scientists, policy makers, businesses and institutions grapple with increased urgency to rapidly curb greenhouse gas emissions.

The leadership of cities in adopting ambitious climate goals over the past 20+ years was largely driven by the failure of the 1997 Kyoto Protocol negotiations to create an effective worldwide

commitment to emissions reduction. As it became clear that leading nations, including the U.S., would not participate, cities like Boulder stepped forward and passed resolutions stating their commitments to achieve the Kyoto Protocol's greenhouse gas reduction target (5.2% below 1990 levels by 2012).

This approach set an important precedent that has shaped how most cities have defined and sought to achieve climate action goals. Cities adopted a nation-state model of climate action in which the focus of action and measurement of success were based on achieving emission reduction targets confined to political boundaries — in this case municipal boundaries.

The City of Boulder has played an active role in promoting this model of climate action. After becoming one of the first cities to sign onto the Kyoto Protocol and officially adopt carbon reduction goals (2002, 2006), Boulder has since updated its targets periodically in accordance with scientific consensus on the level of carbon reduction needed to stabilize the climate. Other cities have followed this pattern.

In addition to co-leading a vanguard group of cities to set aggressive targets, the city frequently networks with other cities to share best practices and advance the field. Boulder is a member of several consortiums of city governments (e.g., Urban Sustainability Director's Network (USDN), ICLEI[2] and the Carbon Neutral Cities Alliance (CNCA)) and is an active participant in promoting ambitious carbon and clean energy targets as well as developing solutions to achieve significant carbon reductions at a local scale.

Through these groups, the city has also provided a model for funding climate action. In 2006, voters approved the Climate Action Plan (CAP) tax, which imposes a tax on electricity consumption. This tax, often cited as the first municipal "carbon" tax nationwide, serves as a model for other cities to develop a revenue stream to fund climate action programs and projects. Several cities, including Denver, have since adopted similar measures.

While there are numerous examples of the City of Boulder's climate leadership inspiring and providing a pathway for other jurisdictions, it is now clear that this city-centric model of climate action is not achieving the speed nor scale of emissions reduction needed to combat climate change. The next section will detail the proposal for updating the city's climate action efforts going forward.

IV. ANALYSIS

A. Proposed evolution in approach to climate action planning

There is rapidly increasing awareness worldwide that the city-scale, networking approach to climate action is insufficient to stabilize the world's climate. The underlying assumption of this

[2] ICLEI is a local government sustainability organization with over 2,500 local and regional government members worldwide.

approach to-date has been that as leading cities demonstrated they could successfully achieve emissions reduction within their boundaries, they would inspire other cities to adopt and achieve similar goals. It was assumed that this would, in turn, put pressure on larger public jurisdictions — states and the federal governments — to adopt and achieve similar goals. Now, more than 20 years into this movement, cities will need to develop new approaches that go beyond city-centric strategies to create action sufficient to stabilizing climate supportive of a habitable planet.
The city first discussed these challenges in 2019. In the two years since, the analysis remains consistent, and insights have emerged that respond to these challenges and shape the future of climate action. To summarize:

1. **Challenge:** Current targets are insufficient. The latest science shows that much more aggressive targets are needed to meet the rapidly accelerating impacts of climate change.

Insight: Targets should be updated to reflect the latest science. Climate-leading communities must work to meet these goals more quickly to compensate for those that are not able to transition as rapidly. The implications of a system-based approach should be reflected in goal, target and metric setting.

2. **Challenge:** Cities continue to set aspirational targets to achieve deep emissions reduction without the scope of control and influence that would allow them to achieve these targets. With many of the key factors necessary to achieve such targets requiring broader systemic change — grid-scale energy source changes; regional/national transportation infrastructure changes; market-scale cost of carbon pricing — the pace of city-scale reductions falls far short of the urgency needed to stabilize the climate.

Insight: City-based climate action will need to expand its focus on actions that extend beyond municipal boundaries. At the same time, city-based actions will need to clearly identify where to focus available resources on what is within their control and influence. There must also be focus on leveraging partnerships and other strategies to address critical actions currently outside of the cities' sphere of influence and control. This insight further affirms the knowledge that Boulder cannot achieve the scale of emissions reduction called for without the larger society-scale/systems-scale shifts. These shifts can only come through actions like changing the carbon intensity of grid-scale electricity, increasing the availability of electric vehicles and vehicle charging, eliminating consumption of carbon intense goods and services, and building products, and other actions requiring levels of control beyond a local jurisdiction.

3. **Challenge:** Achieving climate stabilization requires systems-scale changes. Society can no longer rely on individual actions alone and needs to place more emphasis on bigger leverage points, while at the same time ensuring equity is at the center of needed changes. Examples of these larger systems-dependent changes include:

- Reducing large-scale, land-disturbing management activities
- Altering the production and propagation of plastics
- Redesigning electrical grid infrastructure

- Addressing the embedded structures sustaining racism and inequity

These and other considerations are all examples of underlying systems that must be changed but that are not significantly impacted by the isolated, personal choices being made by individuals — or even single communities.

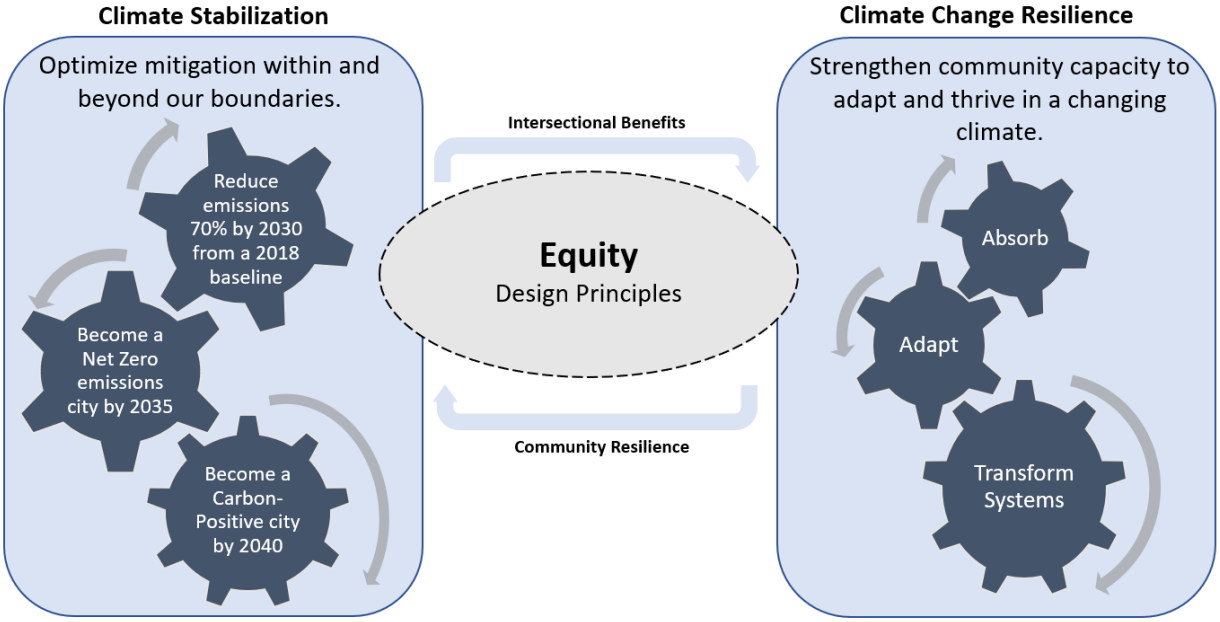
Insight: A more detailed understanding of the systems drivers that must be addressed to create transformational climate action is needed. Redesigning systems will require foundational changes that must be driven by law and policy, reinforced by market mechanisms, enabled by new knowledge and technology, and sustained by social and cultural norms that support these changes. For most cities, including Boulder, the top source of municipal-boundary-level emissions is electricity generation. While there are levers to add local renewables at the margins in cities, deep emissions reductions must, for the most part, come from the large utilities that serve multiple cities. This is an example of systems-level change that the city has long recognized as essential to address the climate crisis.

A more detailed overview of these systems-scale approaches to climate action are described in **Attachment A: Overview of a systems change approach to climate action.**

4. **Challenge:** There is an increasingly urgent need to prepare for significant climate change disruptions and to address the inequities that climate change perpetuates.

Insight: Both adaptation (resilience) and equity must now be considered integral elements in all climate action. The future will be fundamentally shaped by an increasing frequency and intensity of climate-change-caused disruptions. As the primary provider of local public services, local governments will now have to turn an increasing amount of attention and resources towards addressing climate change impacts. At the same time, climate change disproportionately affects those who are both least responsible and most vulnerable to its impacts. All climate actions —both mitigation and adaptation/resilience — must now also integrate considerations to address these intrinsic, structural inequities. *Figure 1* illustrates the interrelationship of the pillars of mitigation and adaptation with the design principle of equity as core areas of climate action. *Figure 1* also introduces several proposed new goals for climate action which are further elaborated on beginning on page 10.

Figure 1: Interrelationship of the core areas of climate action [3]



5. **Challenge:** Energy systems are not the only driver of climate change. Climate stabilization will not be achieved through energy system decarbonization alone. While energy systems remain the largest driver, land-, agricultural- and extraction-based emissions have a significant and growing impact. Further, the energy embodied in materials and services must be mitigated through a more circular focus within our economic systems.

Insight: Consumption-based emissions, which are those associated with goods and services, and emissions caused by land and ecosystem degradation are factors that have been significantly under-represented in the conventional methods of accounting for greenhouse gas emissions — including Boulder's current emission accounting system. Stabilizing climate will require both more inclusive accounting of these impacts and coordinated efforts within and beyond Boulder's boundaries to address these factors.

Because of its long history in climate action, Boulder is uniquely positioned to help clarify the limits of past approaches to city-based climate action and lead new approaches based on these insights. These insights form the basis for an evolved approach to climate action designed to address the more fundamental causes of climate change. As these causes are addressed, there is the potential for not only stabilizing climate but also addressing and transforming a number of other threats that arise from the same root causes creating climate change. Examples of other

[3] Absorb: Minimize sensitivity to existing shocks and stresses. Adapt: Proactively modify conditions and practices in anticipation of shocks and stresses, to reduce sensitivity and exposure over the medium-term. Transform: Create the conditions to facilitate systemic change and produce a positive environment in which people are willing and able to invest and innovate while managing risk.

systemic challenges that can be addressed in this way include resource depletion, biodiversity decline, toxics pollution and social and economic inequities.

Examples of the City of Boulder's system-scale actions
Focusing on systemic actions, while continuing to support individual behavior changes, is emerging as the global paradigm of climate action. The city continues to expand its focus on systems-scale work to include:

Colorado Communities for Climate Action (CC4CA)
The city built on its years of experience in policy development to co-found with Boulder County Colorado Communities for Climate Action (CC4CA), a statewide collaboration of cities and counties to develop and push for state-level climate and energy action. Working with and through CC4CA, Boulder was a pivotal leader in the efforts to develop state-level climate and energy policy that, in 2018, produced some of the most far-reaching state emission reduction objectives in the country. CC4CA has since grown in its influence at the capitol and now represents the interests of nearly one quarter of the state's population through a coalition of 38 local governments.

Circular Materials Economy
Boulder's zero waste work is transitioning toward a system-change approach through the development of a circular materials economy. As a first step, the city, via consulting firm Metabolic, produced the Circular Boulder analysis and roadmap. Metabolic examined the current level of circularity in Boulder by performing an in-depth Material Flow Analysis (also called an Urban Metabolism Study). They also identified hotspots and opportunities that exist throughout the local materials economy and summarized the impacts of some of those hotspots. The information was presented at a public event where the community helped develop the Circular Boulder vision presented in the report. A road mapping workshop was also held with regional waste stakeholders to begin to lay out the strategies and path to circularity. This innovative work is informing the development of Boulder's strategic plan for a circular materials economy, the next evolution of work in zero waste.

Municipalization, State Policy and Xcel Energy partnership
While the city's municipalization efforts, namely taking local control over electricity supply, was previously seen as a viable way to achieve the city's emissions reduction and renewable electricity goals, the local and national attention the ten-year effort garnered had much broader systemic impacts. While the exact impact cannot be quantified, in the very least, Boulder's actions helped drive state policy and supported Xcel Energy's transition off coal-based electricity generation in ways that have already had much larger emissions benefits than simply changing Boulder's local energy supply. Through the voter-approved partnership now being established with Xcel Energy, Boulder will continue to have significant influence over the standards being set for Xcel Energy's performance across its larger service territory.

Legal action

Boulder has also been a national leader in exploring the use of the legal system in pushing for larger systems-level change. Both through its active participation in multi-jurisdiction efforts — like the Clean Power Plan Plaintiffs group — or its climate liability lawsuit with Boulder and San Miguel Counties against ExxonMobil and Suncor, Boulder has demonstrated that there are a range of different levers cities can take hold of to drive more fundamental systems change.

B. A Systems-based framework for goals and targets

Setting science-based mitigation targets

The global community was spurred by the release of the 2018 Intergovernmental Panel on Climate Change (IPCC) Special Report, which highlighted the dire need for aggressive climate action and greenhouse gas emissions reduction if we are to remain under catastrophic levels of warming. It concluded that, to stave off climate catastrophe, humanity needs to do much more, much faster. This realization sparked the City of Boulder to declare a climate emergency in 2019 and initiate the Climate Mobilization Action Planning process. This process includes redefining goals and targets to align with what the science indicates is necessary to keep global warming under 1.5°C. It also includes an increased focus on preparing communities for an increasing frequency and intensity of climate change related stresses and disruptions, particularly for those who are most vulnerable.

According to the Science Based Targets Network Guidance for Cities, the global community must reduce GHG emissions 45% by 2030 and achieve net zero emissions by 2050, at the latest, to avoid catastrophic levels of warming.[4] This is in alignment with the IPCC report, which states that if the global community achieves net zero emissions by 2050, we would have a 50% chance of limiting warming to 1.5°C. For a "likely" 66% chance, we need to emit less than 420 GtCO2 globally, which would require achieving net zero emissions by the mid-to-late 2030s.[5]

Cities across the globe must establish their version of nationally determined contributions towards that global target, taking into consideration their circumstances, capabilities and historical contributions to levels of carbon dioxide in the atmosphere. Many industrialized countries and cities have been the source of dangerous levels of emissions for the past 200 years, these past emissions are termed historical emissions. Other countries are still developing their economies and are permitted to peak their emissions later. These are called late emissions. Determining an emissions reduction target must account for historical emissions, tasking those cities who are responsible for global emissions accumulation with reducing those emissions at a faster and higher rate.

Given Boulder's historic contribution to climate change, with a high emissions rate per capita, our capacity to engage in climate action given high GDP per capita, and a highly climate-engaged community, the city has sought to set ambitious targets that encompass all major GHG

[4] https://sciencebasedtargetsnetwork.org/wp-content/uploads/2020/11/SBTs-for-cities-guide-nov-2020.pdf
[5] IPCC Technical Summary, https://drive.google.com/file/d/1IpZ6znE2eDmXuvcrs2hnKsFXFVvyabZ0/view

emissions and become net zero within a timeframe that increases the global chance of limiting warming to 1.5°C. In this context, the City of Boulder proposes to align its actions in an equity-centered way towards goals of:

- Reducing emissions **70% by 2030** against a 2018 baseline[6];
- Becoming a **Net Zero** city by **2035**; and
- Becoming a **Carbon-Positive**[7] city by **2040**.

To determine our interim 2030 target, staff followed the One Planet City Challenge (OPCC) methodology established by the World Wildlife Fund (WWF), under consultation with ICLEI. For more information on that methodology and the underlying data, see **Attachment B, Science-based methodology for setting mitigation target**.

In determining the net zero target, staff set to follow the guidelines framed in the Race to Zero campaign, in which cities commit to do their part to cut global emissions in half by 2030 and to zero by 2050. For Boulder, that means taking on our relative contribution to limit warming given our historical contributions to emissions, high capacity for impact and the desire of our community to limit warming to the greatest degree possible. In our community engagement work over the past two years, staff has heard from our community members the desire to act as a climate leader by setting aggressive climate targets that align with the higher probability of remaining under 1.5°C of warming. It is for these reasons that staff proposes to take actions that are aligned with the city and region becoming net zero by 2035.

To achieve net zero emissions by 2035, all human-caused GHG emissions produced by the community must be largely eliminated, while residual emissions will be balanced out by removing GHGs from the atmosphere though nature-based carbon sequestration. This will require deep decarbonization of our energy, building, transportation systems to cut emissions to as close to as zero as possible. It will also depend on significant changes in land use planning and ecosystem regeneration to sequester sufficient carbon to both neutralize existing emissions and drawdown previously released carbon (net-positive carbon reduction). These transitions will in turn require economic and financial systems aligned with valuing these actions—and penalizing actions responsible for significant emissions.

Action beyond boundaries

In addition to the climate science evoking a need for cities to recalculate their mitigation goals and targets to limit warming**, it also highlights the fact that cities will not be able to achieve climate neutrality alone, nor will the success of a few cities alone be enough**. To address the systemic nature of these issues, cities must collaborate with private partners, other municipalities and state and federal agencies to achieve impact at a larger scale that extends impact beyond boundaries. It is not sufficient for only a few cities to achieve climate neutrality.

[6] We have updated our baseline year of analysis to 2018 to match the recommendations of the One Planet City Challenge methodology as well as the recommendations of ICLEI. Previously we tracked against a 2005 baseline.
[7] Carbon-Positive means that an activity goes beyond achieving net zero carbon emissions to create an environmental benefit by removing additional carbon dioxide from the atmosphere.

Given that some communities are better resourced and have greater political will to engage in such work, there will be a need for more cross-city collaboration, work outside of boundaries and utilization of economies of scale to create the type of systemic change needed while bringing everyone along in the process. This may mean choosing to expend dollars on programs or efforts that will yield the greatest systems-scale mitigation impact rather than only the optimal impact within a city boundary.

Keeping this greater target, systems-scale mitigation, in mind requires an adjustment to how the city tracks, measures and perceives success. A plausible scenario around achieving 100% renewable electricity by 2030 illustrates this possible trade-off. Boulder could face two options to reach 100% renewable electricity supply by 2030. If one option gets our city alone to 100% renewables, while a project of similar cost could get the entire region to 90% renewable electricity supply —when looking at net mitigation impact, the latter option would yield the greatest impact but may require a sacrifice of achieving that city target as stated.

The city's perception and tracking of success must become more fluid in the future, allowing for these systems-scale dynamics to guide opportunities. The community will still aim for city-based targets detailed in the next section, as they align with current and emerging systems of tracking and accounting. The city's work will continue to align with what the city can do towards achieving a goal of carbon neutral. The city will continue to iterate on the development of local targets that track how city-level actions are contributing towards systems-level progress beyond city boundaries.

<u>Addressing gaps in previous carbon accounting</u>

Carbon drawdown/Sequestration[8]

The data outlined in the IPCC report further highlighted the need for the rapid scale-up of carbon drawdown/sequestration efforts. Given the significant challenges in eliminating all emissions, drawdown actions will play a pivotal role in achieving community net zero goals. Some communities have begun contemplating carbon-positive goals through approaches to managing their land assets.[9] Boulder will be incorporating nature-based carbon sequestration in our inventory process in the coming years, enabling a greater attention to the scaling up of resources that will value our ecosystems, not only for their sequestration potential, but also for their multiple resilience, equity and community benefits.

By measuring and managing carbon drawdown as a mechanism for addressing climate change, the city is helping pioneer a city-based approach to development of this critical sector. Cross-departmental teams are working on efforts to use living systems (ecosystem services) — trees, vegetation, soils — to drawdown and use carbon to increase our resilience to climate change.

[8] "Drawdown" is used in this document to refer specifically to actions designed to draw carbon down out of the atmosphere using natural systems. It is used synonymously with the more scientific but less recognized term "sequestration". Some uses of "drawdown" such as the book "Drawdown" by Paul Hawken refer to a larger suite of actions that include emissions reduction.

[9] Park City, Utah and San Luis Obispo are two communities Boulder has been interacting with around this type of goal.

Actions include increasing trees/shade that will reduce urban heat island impacts; increasing carbon capture into trees/shrubs/plants/soil to increase the water holding capacity of our lands; capturing carbon into vegetation that reduces air and water pollution; drawing carbon into habitat for pollinators and critical species. These approaches contribute to both emissions management objective and increase community resilience. They also enhance the beauty and health of the landscapes that are an integral part of Boulder's character.

Using equity principles, these solutions can also be designed to ensure that the benefits created — both locational and economic — are focused first on those places and communities with the greatest vulnerability. Locally, we need to prioritize areas facing the highest risk and vulnerability to climate impacts — fire, flooding, drought. Economically, we need to recognize the ways historic racism, redlining and other factors contribute to reduced tree canopies, depleted or polluted soils and other environmental impacts. Through directing natural climate solutions to these types of areas, we can create intersectional solutions that address both climate stabilization objectives, climate change resilience objectives, and equity-oriented distribution of benefits.

Scope of emissions accounting

There is a growing recognition that previous city GHG inventories did not adequately account for the full scope of emissions associated with the community. Emissions inventories since 2005 have focused solely on the production-based emissions **within the administrative boundary** of the city government, under the GPC Protocol's (Global Protocol for Community Scale GHG emissions) BASIC level reporting. This included:

- *Scope 1:* GHG emissions from sources located within the city boundaries, including: energy and transportation fuel combustion, fugitive emissions, solid waste treated within the city, wastewater treated within the city.
- *Scope 2:* GHG emissions occurring because of the use of grid-supplied electricity, heat, steam and/or cooling within the city boundary.
- *Scope 3*: GHG emissions that occur outside the city boundary because of activities taking place within the city boundaries, focusing on solid waste treated outside the city and wastewater treated outside the city.

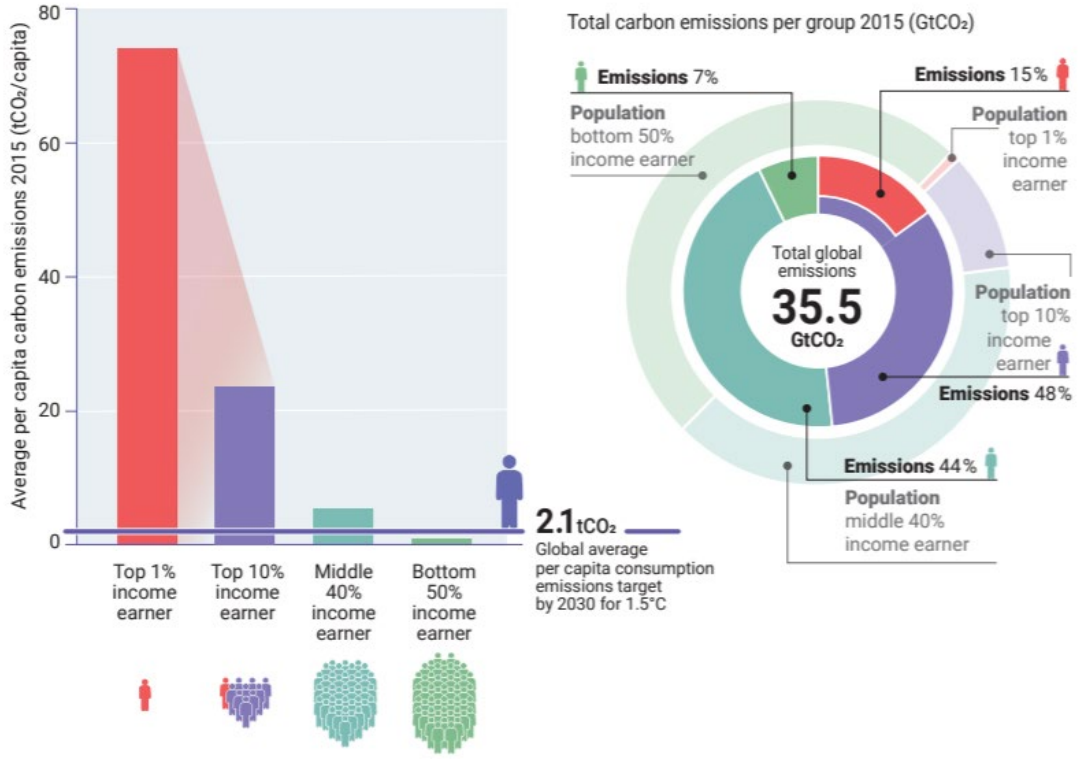
Given this boundary and the requirements for BASIC level reporting, the GPC does not require incorporation of emissions from other trans-boundary activities such as purchases of goods and materials or food choices — consumption-based emissions. Yet, when examining the overall emissions footprint of a typical city, adding **consumption-based emissions may more than double Boulder's currently reported emissions.**[10]

According to a 2020 Emissions Gap Report from the United Nations, lifestyle changes were noted as a prerequisite for sustaining reductions in GHG emissions and for bridging the emissions gap. Around two thirds of global emissions are linked to private household activities. Reducing emissions through lifestyle changes requires changing both broader systemic

[10] https://www.c40.org/researches/consumption-based-emissions

conditions and individual actions. Further, accounting for consumption-based emissions addresses the equity gap, as the emissions of the richest 1% of the global population account for more than twice the combined share of the poorest 50%.[11] Global emissions per capita are shown graphically in *Figure 2* below:

Figure 2: Global Emissions Per Capita[12]



To adequately assess and address the full scope of our community impact, staff recognizes the need to start to account for and take responsibility for consumption-based emissions in addition to the emissions produced within our geographic boundary. By targeting the systems behind both sources of GHG emissions, the city will make more headway toward systemic change that incorporates not just our energy, transportation, and waste systems — but also how the community spends its money, and the consumption chains the community can influence.

The city will produce a first draft consumption-based inventory in 2022 (using 2021 data) to set a new emissions baseline. With this added focus on driving down emissions associated with the purchase of food, goods, and materials in the community, the city intends to further its goal of creating a circular materials economy. These efforts focus on emissions reductions well beyond our geographical and political boundaries by becoming more engaged in how the world

[11] https://www.unep.org/emissions-gap-report-2020
[12] https://wedocs.unep.org/bitstream/handle/20.500.11822/34438/EGR20ESE.pdf?sequence=25

consumes and manages natural resources such as fossil fuels, plastics, metals, minerals and biomass to produce goods and services.

Proposed updated goals and targets

Overarching mitigation and resilience goals

Staff proposes overarching goals and targets in the core pillars of climate stabilization (mitigation) and climate change resilience (adaptation), which are integrated with core equity principals. Based on council's feedback, staff proposes returning to council with a resolution to formally adopt these overarching goals, shown in *Figure 1*, page 8.

In addition, staff proposes specific goals, targets, and progress measures in the focus areas of energy systems, circular materials economy and regenerative ecosystems that are intended to roll up towards these larger goals. These will be developed for the remaining focus areas of land use and financial systems after greater community input and feedback. It is important to note, that within the framework staff is proposing, meeting the goals, targets, and progress measures cannot solely fall into the purview of the city organization. A discussion following this section on the role of cities outlines the philosophy in which the city's climate action work will be implemented.

Core equity design principals

The core equity principals that guided the development of goals and targets and will continue to guide the Climate Initiatives Department strategic planning are:

- All stakeholders are involved from the beginning, and culturally appropriate outreach methods are offered, to provide inclusive representation for all programs/policies, from concept to design, through implementation.
- The results of all programs/policies have an equitable distribution of benefits and burdens across the community.
- Institutional funding allocation corrects for historically advantaged groups and accounts for disadvantaged or historically excluded groups.
- Potential burden that could be imposed on future generations is evaluated to ensure that no such burden is inflicted by the effort.

Integrating equity into Boulder's climate activities is discussed in greater detail in Section E on page 24, and in **Attachment C: Climate justice and equity.**

Mitigation targets to be society-wide, with localized community benefits

As the city must continue to assess and prepare for increasing climate change impacts, the proposed framework for climate action aims to mitigate emissions at the largest scale possible while developing localized resilience and adaptation plans that prepare the community for climate change and its impacts.

While climate stabilization must take place at the more regional, national and international scales, adaptation and resilience are dependent on coordinated and sustained local efforts to build

resilience. Intersectional solutions are key in these efforts. The targets and measures that are proposed for the community are focused on opportunities to improve the well-being of the community while also enhancing its resilience to the increasing frequency and intensity of climate change anticipated. Properly designed, intersectional climate actions can move us away from fossil fuels, foster enhanced natural climate solutions and reduce material consumption while also improving racial, gender, and economic equity and making Boulder more resilient against a changing climate.

For example, energy efficiency assistance to low-income communities can improve health and provide an equitable solution to energy insecurity. Tree planting programs not only reduce energy needs for cooling, but also have proven to improve mental health and community trust.[13] As we emerge from the COVID-19 crisis, we are facing numerous long-standing systems risks. In our rebuilding efforts, as we work to tackle climate change and avert a climate crisis, we aim to do so with resilience, mitigation, and social justice as the core pillars to guide our new set of goals, targets, and progress measures.

Outlined below are the proposed objectives and targets for our energy systems, circular materials economy and regenerative ecosystems focus areas. Staff has also developed a detailed set of progress measures for each target that can be found in **Attachment D, Focus area objectives, targets and progress measures**[14].

Energy systems

Objectives	Targets
Ensure equitable and affordable access to energy.	100% of our community members will have unburdened[15] access to basic heating, cooling and energy needs by 2035.
Establish a safe, healthy, and resilient fossil-fuel-free energy system.	Our energy system will deliver 100% renewable electricity by 2030 and strive to meet the resiliency and reliability needs of the community.
Eliminate operational carbon from our existing building stock.	Our existing building stock will promote health and wellbeing of occupants and have zero operational emissions by 2040.
Achieve Net Zero carbon in new construction.	Achieve zero operational emissions in all new buildings with a 40% reduction in embodied emissions by 2031.

[13] https://www.weforum.org/agenda/2021/04/city-trees-reduce-stress-and-anxiety/
[14] These progress measures are intended to contain a mixture of qualitative and quantitative steps and measures that must be achieved in the next one-to-five years to show significant progress words the longer-term targets and goals.
[15] Energy burden refers to strain on household budgets resulting from energy bills.

Provide clean mobility solutions that meet community needs.	Clean mobility options will be culturally, geographically, and economically diverse by 2035.
	30% vehicle miles travelled in Boulder will be electric by 2030.

Circular Materials Economy

Objectives	Targets
Minimize waste production per capita and maximize diversion from landfills.	Become a zero-waste city by 2025.
	Optimize organic waste to promote soil health in our community by 2030.
Reduce the carbon footprint of production cycles we have the greatest ability to affect.	Reduce community consumption-based emissions 50% by 2030 against a 2019 baseline.
Employ circular principals in building construction and demolition.	Design buildings such that 25% of high-emission-intensity materials may be captured and reused by 2030.
Enable repair, reuse and remanufacturing of components and materials.	Materials and products are designed to last with the ability to recycle, reuse, repair or remanufacture at the end of product life by 2030.
	Increase participation in sharing platforms 30% over a 2020 baseline to foster equitable access to goods and services over ownership by 2030.
Establish an economic basis for circular entrepreneurship and innovation.	Foster community and entrepreneurial partnerships and platforms to promote repair and reuse by 2030.

Regenerative Ecosystems

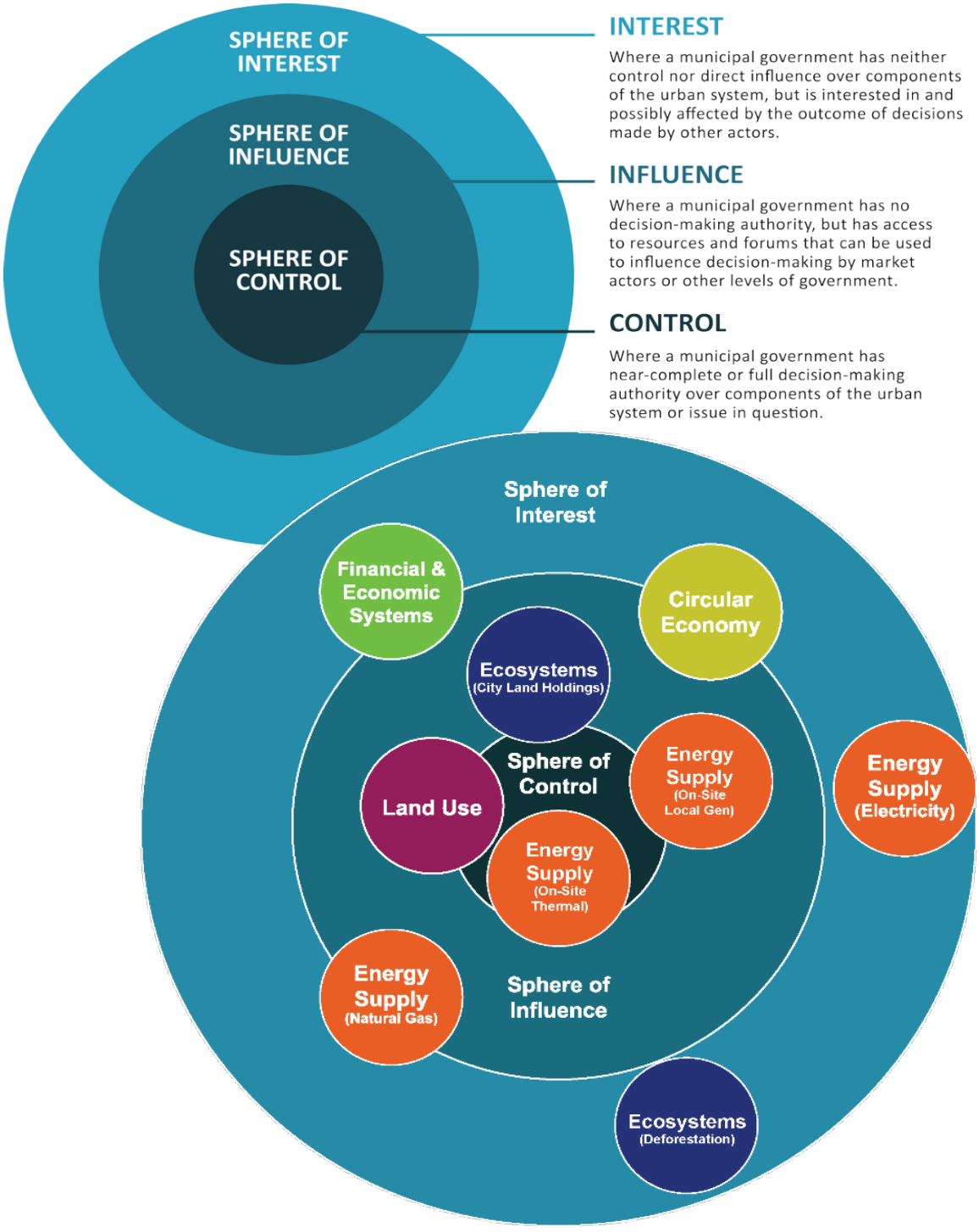
Objectives	Targets
Increase natural carbon sequestration within and beyond our boundaries.	After prioritizing GHG reductions, remove 50,000 tons of CO2 annually by 2030 through forest, urban tree, and soil landscape restoration.
Advance the field of natural climate solutions beyond Boulder.	Develop globally accessible tools for carbon management and optimal ecosystem services planning by 2025.
Design actions to maximize equitable ecosystem benefits.	Reach 20% tree canopy by 2035, targeting growth of canopy cover in areas of greatest need.
	Reduce urban heat island in energy burdened neighborhoods 1°C by 2030 from a 2015 baseline.
Foster community resilience through carbon enhanced ecosystems.	Create a closed loop system that reduces fire risk in our community, converts biomass to biochar and generates clean energy to fuel buildings by 2030.
Support the growth of economic sectors that sustain critical ecosystem services.	Strive towards 40% of new employment to equity-based opportunities to participate in "green" sector jobs.

As the city works through formalizing the proposed goals and targets, a deep dive into the changing role of cities in climate action is taking place. As the city and community move to clearly define our roles in meeting these goals, it is important to reiterate that the city cannot hold the primary responsibility for meeting all the goals and targets. As the strategic planning for Climate Initiatives progresses, an outcome is to define areas related to the goals and targets where the city has control, influence or interest, and areas where other actors and collaborators can be leaders. The next section provides a more detailed overview of key features of a systems-based approach to climate action and the move to define the role of cities.

C. The role of cities in systems-change based climate action

The preceding sections have described the increasingly urgent need to evolve the role that cities and other local jurisdictions can play in addressing climate change. An important starting point in this process is to reconsider what aspects of the forces driving climate change cities control, what aspects they have direct influence over and what aspects cities currently have neither control nor influence over but have substantial interest in. This "sphere of influence" assessment is depicted below in *Figure 3.*

Figure 3: Sphere of Influence Map



This approach was originally developed to assess the city's most effective role in addressing energy systems change. As noted in *Figure 3* grid-scale electricity supply was originally outside both the city's zone of control or influence. Municipalization was viewed as a way to pull this sector directly into the "sphere of control." While the city has, for the time being, suspended this strategy, the establishment of the new partnership with Xcel can be seen as moving this issue more squarely into the city's zone of "influence."

One of the important insights resulting from this "sphere of influence mapping" exercise is the realization that cities do not control or substantively influence enough of the factors necessary to achieve — on their own — the scale of emissions reduction now called for by the most recent climate science. Cities do not control major factors that are determinant of overall emissions — the carbon intensity of the larger grid, the availability of affordable electric vehicles, the availability of market ready alternatives to natural gas appliances or systems.

We now also understand that climate change is driven by additional factors not originally included in our energy system-focused GHG inventories —factors such as land management, carbon intensity of consumer goods etc. — cities must now consider and measure a broader range of factors in determining where they can have the greatest impact. The implications of this realization for the city's goal and target setting are addressed in the next section.

When this sphere of influence analysis was originally conducted (2016), emissions reduction, and therefore energy systems change, was viewed as the predominant focus for climate action. With the recognition that cities must now rapidly prepare for escalating climate change, cities must now also "map" their zones of control, influence, and interest for both resilience and equity as part of their climate strategies. This work is just beginning in Boulder and in other communities around the country. A preliminary attempt to incorporate the new focus areas around circular economy, ecosystems, land use and financial systems are portrayed in *Figure 3* above.

<u>A new paradigm for city-based climate action</u>

This intersection of expanded climate action scope — mitigation, adaptation (resilience), equity — and city-scale zone of influence/control mapping is the new frontier of climate action planning. Over the past three years, the city has been a core participant in an USDN working group on the nexus of mitigation/adaptation/equity. This spring, Boulder initiated a dialogue within USDN and dozens of other leading climate action cities about what the appropriate role of cities should be in driving system level climate action. Boulder will be an active participant in these discussions as it is simultaneously working across city departments to refine our organizational understanding of the city's most effective role in supporting high impact climate action — mitigation, adaptation (resilience) and equity — and fostering similar explorations locally, regionally, and nationally.

D. Systems change in the climate action focus areas

As the city moves through the strategic planning process to orient our work to new goals and targets, it is important to look at how systems change is reflected in these areas of work.

Energy systems

Energy is fundamental to the health and well-being of humans. Whether it is heating and cooling for our buildings, transporting people and goods, or manufacturing the things we rely on in our daily lives, energy is core to life as we know it. As engrained as energy is in our lives, energy-related activities remain the largest source of greenhouse gas emissions.

Today our energy systems are reliant on the burning of fossil fuels – coal, gas and liquid fuels. These systems must be transitioned rapidly to clean sources of energy if we are to avoid catastrophic changes to our planet. In the face of climate change, energy becomes even more critical: as temperatures rise, extreme weather events increase, air quality and other environmental factors are impacted, livable buildings and reliable transportation powered by dependable sources of clean energy will be increasingly essential.

In recognition of this reality, reducing energy emissions through shifting energy generation from fossil fuels to renewables, electrifying transportation, and making buildings more efficient, has long been central to the city's strategies to mitigate the climate crisis. At a high level, the categories of the city's work focused on systems change in the energy sector are:

- High-performance buildings (e.g., energy efficiency and electrification)
- Clean mobility (e.g., electrified transportation, transit, VMT reduction)
- Clean energy sources (e.g., local renewable generation, municipalization, Xcel Energy Partnership)

In recent years, Boulder's work on systems change in the energy sector has focused significantly on clean energy sources. Electricity generation has consistently comprised more than half of Boulder's emissions, making it a key target for climate action. Between 2010 and 2020, the city's primary strategy to change how the community's energy was generated was to bring local control of electricity to the community through municipalization.

On Nov. 3, 2020, the community voted to enter a new franchise with Xcel Energy, with negotiated settlement, partnership, and interconnection agreements and, additionally, to repurpose and extend the Utility Occupation Tax to fund the partnership efforts. Core to the new relationship between Boulder and Xcel Energy is the energy partnership, which lays out the city's and Xcel Energy's mutual commitment to achieving the community's clean energy goals, including its goal of achieving 100% renewable electricity by 2030. More details on the partnership can be found in the Feb. 23, 2021 study session memo.

Circular materials economy

Going beyond waste diversion: From a linear economy to a circular economy

As the city continues to work toward the goal of diverting the maximum amount of waste from the landfill, a deeper understanding of the impacts of material manufacturing, use and disposal is needed. This recognition is guiding the city's efforts beyond simply focusing on waste diversion to an approach that focuses on moving from a linear to a circular material economy.

The city's previous Climate Commitment (2016) explained that the widely accepted and used protocol for measuring and reporting a city's emissions *excludes* emissions associated with the use of materials other than landfill-related emissions, assuming that these emissions will be reported and mitigated by the communities where those goods are manufactured. The flaw in this approach is that it does not recognize and properly allocate responsibility for the role local demand for goods and services contributes to emissions globally. A March 2018 report from C40 Cities investigated the consumption-based emissions from 79 cities, focusing on the goods and services (such as food, clothing, electronics, etc.) consumed by residents of a city. This study found that total consumption-based emissions were approximately 60% higher than the traditional energy sector-based inventories[16]. This clearly illustrates that the current established methodology for municipal emissions accounting used by the city does not adequately account for a municipality's contribution to global climate change.

The Boulder community must address its impact beyond the emissions we traditionally account for because cities are consumption centers — they account for 85% of global GDP generation and are very large collectors of materials and nutrients, accounting for 75% of natural resource consumption[17].

The emerging economic model that has developed to encompass this needed transition is the idea of a "circular economy." While the first step for establishing a zero-waste community focuses on what to do with material after it has been consumed and waste has been created, a true zero waste economy must transition from what it is today — linear — to circular: where waste and pollution are designed out; communities keep products and materials in use as long as possible and extract the maximum value from them; and natural systems are regenerated.

The current linear economic system of taking resources from the ground to make products that are thrown away is no longer working for businesses, communities, or the environment. This linear economy assumes an infinite supply of natural resources and has devastating impacts to our ecosystems and communities. The collection of raw materials alone requires large amounts of energy and water, disrupts natural ecosystems such as forests and lakes, has an immense human cost and emits toxic substances — in addition to all the impacts of production and

[16] C40 Cities "Consumption-Based GHG Emissions of C40 Cities": https://www.c40.org/researches/consumption-based-emissions

[17] Ellen Macarthur Foundation: https://www.ellenmacarthurfoundation.org/explore/cities-and-the-circular-economy

disposal. Finally, linear business practices are leading to real business risks associated with the reliance on scarce and non-renewable resources.

Because of this, the Boulder community's work on materials management is transitioning beyond traditional zero waste goals of diverting waste for recycling to a broader set of actions that change the system of consumption. Strategies to reduce the embodied emissions associated with the goods and services society uses, as well as reducing the overall materials consumed, are critical to stabilizing the climate.

One of the most important findings from the Metabolic study (see page 17) was the true size of the embodied emissions of what we consume in Boulder — meaning the emissions associated with the whole lifecycle of products we purchase and use, from production to disposal. Embodied emissions are not currently included in our emissions inventory. Metabolic found that **the size of embodied emissions is larger than all local sources of emissions put together**. This means that even a small change in circularity and reducing consumption can have an enormous effect on overall impact.

Ecosystems

Building on the city's legacy as a leader in open space and environmental protection, the city's climate action program has also been a leader in advancing and mainstreaming ecosystems as a core focus area for climate action. As a relatively new area of city climate action, a short description of some of the city's recent efforts over the past two years advancing this approach are described below.

Soil-based sequestration — In 2017, the city began collaborations with Boulder County in which each jurisdiction initiated similar but distinct soil carbon sequestration pilot projects on agricultural lands. These initiatives were among the first active initiatives by local governments to develop natural climate solutions (NCS) based carbon drawdown strategies. During the last two years, Climate Initiatives and OSMP staff have continued soil sequestration pilot projects initiated in 2018 and are now expanding some of the techniques for soil health improvement and sequestration to other parcels. The city is now reviewing best available systems for standardizing soil carbon monitoring across city projects.

Urban forest/landscape sequestration — Over the past two years, Climate Initiatives and City Planning staff have been working with a broad consortium of partners to explore strategies for managing urban landscapes to both capture carbon and to enhance urban ecosystem services — shade, storm water infiltration, air quality, biodiversity. The city is working with CU researchers to develop an ecosystem services modeling system to identify and assist with prioritizing urban carbon drawdown efforts that can maximize these ecosystem services benefits.

Bioenergy-Biochar with the Carbon Neutral Cities Alliance (CNCA) — Boulder has lead efforts within the Carbon Neutral Cities Alliance (CNCA) to incorporate natural climate solutions and carbon drawdown as part of its priorities. Boulder convened a working group with

Stockholm, Helsinki and Minneapolis to assess and develop opportunities in bioenergy-biochar as a carbon drawdown strategy. Boulder was recently invited to submit a $100,000 grant proposal on behalf of this group for funding from the newly created Carbon Drawdown section of CNCA's "Game Changers" Initiative. Boulder has also been invited to submit a full proposal around its bioenergy-biochar efforts to the Bloomberg Philanthropies' Mayors Challenge fund.

Scaling up carbon drawdown to other cities — The city has also been a leader in pushing for greater awareness and adoption of these efforts at both the national and international levels. Boulder and San Francisco pioneered discussions of NCS strategies within the Urban Sustainability Directors Network (USDN). Initially there were only a handful of cities interested in this topic. By 2020, the city had successfully grown sufficient interest in the topic that USDN agreed to sponsor a monthly working group on this topic. Over 50 cities and counties signed up to participate — one of the highest initial sign-ups in USDN history. This group — co-lead by Boulder, Cleveland and Fayetteville, AK — was recently renewed with more than 60 cities and counties participating.

Urban Drawdown Initiative (UDI) — Recognizing the potential importance of urban landscapes as a part of natural climate solutions, Boulder convened national and international leaders in 2019 to discuss this topic. As a result of this convergence, the UDI was established as a joint initiative of the City of Boulder and the Urban Sustainability Director's Network (USDN) to accelerate the involvement of urban climate action initiatives in the development of natural climate solutions. The focus is on efforts that remove carbon from the atmosphere (sequestration) and direct it into urban landscapes in ways that significantly improve the health and resilience of urban communities and urban environments (referred to as "ecosystem services").

UDI is working with cities across the US to advance a variety of knowledge/technology development, innovation pilots, and dissemination and scale-up mechanisms that are both disseminating innovations being pioneered in Boulder, as well as introducing to Boulder new systems being supported elsewhere. A full overview of the Urban Drawdown Initiative and its work is available online.

E. Integrating new focus areas and climate justice

During the Climate Mobilization Action Planning (CMAP) community engagement process, two new action areas were identified — economy/financial systems and land use. The following section describes actions the city has taken over the past two years to integrate the new focus areas and guiding pillars of equity and resilience into the city's climate action strategy.

Focus area: Financial and economic systems

One of the emerging areas of climate action globally has been efforts to direct investment away from fossil fuels and into renewable energy-based systems. Advocacy groups and concerned stockholders have been increasingly successful in getting major institutions to divest funds from fossil fuel companies. This area of activism has recently also targeted financial services firms that have a significant role in providing financial services to the fossil fuel industry. While the

city does not have funds directly invested in fossil fuel companies, some community members wanted to focus attention on the city's relationship with large financial services companies with close ties to fossil fuel industries.

Through discussions over nearly a year, the Climate Initiatives department proposed including these issues as well as broadening the focus of this area to address the larger issue of the role of the economy in driving climate change. As a new emerging area, the city is just beginning engagement to better understand the goals, targets, and strategies that the community should adopt as part of the climate action plan.

As a first step, the city and several partners have developed the May through October Boulder Forum on Economy, Climate and Community to start the conversation. The six-part forum will host some of the world's leading thinkers and actors in the field of applied economics. Speakers include Dr. Jeffrey Sachs, a leader in the UN's Sustainable Development Goals; Oxford University's Kate Raworth, a leader in the field of distributive and regenerative economies; John Liu, Ecosystems Ambassador for the Commonland Foundation in Amsterdam; and Boulder's own Congressman Joe Neguse, who will speak to efforts in Congress to create new economic policy. Community feedback will be gathered through a variety of methods, including live discussions, online surveys, and direct outreach. This feedback will be synthesized and presented to community as part of the climate action strategy. A variety of organizations have agreed to cosponsor the forum including: USDN, CNCA, the University of Colorado Conference on World Affairs and Boulder County.

Focus area: Land use

The second issue identified by community members as an area for city climate action focus is the connection between land use and climate change. There are numerous ways land use impacts climate and climate change preparedness, including the design of transportation systems, level of density of development, regulations around land use and land management, designation of flood and fire zones, and other factors. In Boulder, land use is shaped and guided by an interconnected set of policies ranging from the Boulder Valley Comprehensive Plan down to local codes and ordinances. Land use in Boulder is also shaped by a number of significant historical actions ranging from establishment of the "Blue Line," to land use requirements guiding uses of the city's Open Space as stipulated in the Open Space and Mountain Parks Charter. Any significant changes to the city's land use systems will need to be coordinated with and integrated into these existing planning policies, starting with the Comprehensive Plan.

The staff is working to create a process for assessing opportunities to leverage land use management systems to address climate objectives — both emissions management and climate change resilience. An intended outcome of this process will be to identify what actions can be taken in the near term without major policy changes, and which actions may require an update to the Comprehensive Plan during the next Major Update (2025), to be fully implemented.

Design principle: Climate justice and equity

The city's efforts to incorporate equity into our climate work have been ramping up over the last five years, beginning with the recognition of the need to make a just transition to a low-carbon future in the 2016 update to the Climate Commitment. The Just Transition section describes why the community needed to make equity a core consideration in climate action planning: "The transition to a low-carbon future will affect every member of our community. There are, however, multiple pathways, each with different costs and benefits. Some of these pathways could significantly improve the well-being, security, and shared prosperity of the community. **Other pathways could result in significant unintended impacts, particularly to the most vulnerable in the community."**

The city worked with the community and partnered with CU's Just Transition Collaborative to develop a set of principles and objectives for this work, including:

- Build community capabilities and leadership
- Promote equity in energy resource costs and ownership
- Generate socially just economic employment opportunities.

Building on these efforts, city staff outlined, in a 2019 council memo, the necessity of centering equity and resilience in climate work, saying: "**Many in our community are at a disproportionately greater risk to the effects of climate change**. Seniors, children, people of color and people with lower incomes are particularly impacted by the cost of recovering from events, declining air quality and rising energy and food costs. As a community, we need to ensure that all our buildings and systems remain resilient as the climate continues to change; that every community member is able to prosper, remains healthy and can enjoy a good quality of life; and that our economy remains strong. **Equity and resilience must be the foundation of any program and strategy that moves forward.**"

Staff reiterated the city's commitment to addressing systemic racism through climate action in a June 2020 guest opinion in the Daily Camera, saying: "As we plan for the future — a future in which our weather is more unpredictable, threats of flooding and fires rise, and hot summer days occur more frequently — equity must be at the core of all our efforts to reduce our climate impact and work to adapt to a changing climate… At the center of our climate work, we acknowledge that while we strive for equity, inclusion and social resilience, we have a long way to go to address racism and bias. **Our climate crisis is intertwined with our racial inequity crisis**. If we don't work on both, we will succeed at neither."

Most recently, in February 2021, City Council unanimously adopted the city's first Racial Equity Plan, which will also be the guide in advancing racial equity through the community and city's climate action work. Read about the city's efforts to bring climate action into alignment with the city's Racial Equity Plan in **ATTACHMENT C: Climate justice and equity.**

V. NEXT STEPS

A. Climate resilience

We must now prepare for both increasing stresses (increasing heat, drought, and erratic precipitation), and disruptive shocks (floods, fire, air quality impacts, heat extremes) that will take place as a result of climate change. The proposed goals and targets are rooted in adaption to change and resilience to disruption. The city has a number of ongoing efforts, such as updates to drought plans and Parks and Recreation Master Plan that will seek to strengthen climate resilience. Staff will also be organizing a cross-departmental task force to identify existing gaps and opportunities. Boulder continues to coordinate much of its climate resilience efforts with through regional collaboratives (see below) and national efforts such as the Resilient Communities Network.

B. Action coordination with regional, state and federal initiatives

The scale and urgency of the climate crisis requires that each level of government — federal, state and local — fully bring their strengths to the table. Actions at every level should promote equitable and healthier outcomes for all Americans, especially disproportionately harmed communities of color and low-income communities. As Boulder has continued to pursue its locally-based climate activities, it's become clear that federal, state, and local energy and environmental policies do not occur in isolation. Instead, they frequently involve the sharing of responsibility.

At the federal level, the Biden administration has committed to a historically ambitious climate agenda. We can expect a profound shift in U.S. federal climate policy, which is critical, as it is not possible to address the climate challenge without federal leadership.
At the same time, state-level and regional climate action will remain essential. History has shown that even an engaged U.S. federal government faces real obstacles to progressive regulatory and legislative action. In the face of federal gridlock and inaction, state and local governments have played a crucial role in advancing climate action, reducing greenhouse gas emissions and supporting the continued maturation of key low-carbon technologies such as wind and solar generation as well as electric vehicles.

Specific to Colorado, On January 14, 2021, the state released its Greenhouse Gas Pollution Reduction Roadmap. The Roadmap represents the most action-oriented, ambitious, and substantive planning process that Colorado has ever undertaken on climate leadership, pollution reduction and a clean energy transition. It lays out an achievable pathway to meet the state's science-based climate targets of 26% by 2025, 50% by 2030 and 90% by 2050 from 2005 levels that were part of House Bill 19-1261 *Climate Action Plan to Reduce Pollution*. The release of the Roadmap in Colorado recognizes that rather than taking a backseat, state leadership must continue alongside a more supportive federal government, allowing the United States to achieve deeper emissions reductions through a framework that leverages comparative strengths at different levels of governance.

Boulder has also helped stimulate new opportunities for regional climate efforts. In addition to co-creating CC4CA, Boulder coordinates regularly with regional governments on climate, resilience, equity, and sustainability-related efforts. These regional efforts are an efficient means for adjoining local governments to collaboratively extend beyond their respective boundaries by working together to share best practices, resources, and information; align their respective initiatives and efforts; and co-produce assessments, public policy interventions, and other materials beyond the scope of any one single partner. Regional collaboratives will continue to be a critical element of Boulder's climate work.

C. Goal adoption and progress report

Based on feedback from council, staff proposes to return with a resolution to adopt the high-level goals and framework for climate action. Following this, staff will be releasing a progress report on the recent accomplishments of the city's climate action work.

D. Strategic planning and investments

The city has long helped advance the community's climate action efforts through implementation of programs, policy development, regional collaboration and advocacy. Staff is currently engaged in a strategic planning process which centers on the core issues raised in this memo: the changing role of city governments in climate action, setting new goals and targets, incorporating mitigation and adaptions with equity as a design principle, and fostering system change thinking to drive these efforts. Staff is planning on releasing the climate action strategies that result from the work this year and returning to council in December 2021 for a conversation on the associated budgets and resource needs. As the CAP tax moves towards its next sunset date, staff will be exploring the investment strategy for the work in Climate Initiatives and present analysis to start the conversation for a potential 2022 ballot item.

Planning for climate action efforts will be iterative and dynamic and staff's approach to developing work plans will be in response to this quickly changing world in which we find ourselves. Because of the rapidly change in both climate and the many factors affecting our ability to respond to climate change—environmental, social and political—staff anticipates having to develop a much more iterative and adaptive approach to climate action planning and implementation.

E. Engagement and communication

The Boulder community is an essential partner in achieving the city's climate goals, and the city anticipates offering several engagement and communication opportunities to ensure that the community's voice is reflected in the city's efforts and there is a shared understanding of the city's new approach to climate action.

Much of the city's communication and engagement work will be ongoing and flexible, reflecting the need for continuous refinement of the city's climate action priorities and strategies. Some engagement, however, will be more targeted. In addition to ongoing communication and engagement, the city will offer to discrete engagement and communication windows in 2021:

Communication and Engagement Phase 1: June through August 2021
Key milestone: Council adoption of goals and targets in August 2021

Engage topics: Updated goals and targets

Inform topics: Systems change; Centering equity and resilience

Key deliverables: Periodic virtual engagement events, public project updates, activation of Be Heard Boulder page.

- Be Heard Boulder: The city will leverage its web-based engagement platform to create an online community forum to collect feedback on updated climate goals and targets.
- Monthly energy blog on city newsroom: The city's online newsroom provides an opportunity to publish blog-style posts that are easy to share via social media and email newsletters. Topics may include an introduction to systems change, information on climate justice, scientific reasoning behind new goals, etc. *Once per month, based on calendar.*
- Public presentations: The city commits to holding virtual public updates and presentations a few times per year. These meetings will include key updates and may incorporate engagement and feedback opportunities in addition to information sharing. *As needed.*
- Launch of climate pages on new city website: The city's website is the centerpiece for nearly all communication with the community. Staff will support the design of new project home pages, update and clarify web copy, develop visual content for the web and improve navigation through connected pages. *July 2021 and as needed.*
- Small group and neighborhood meetings: The city will connect with established community groups, such as the Rotary Club, Boulder Chamber, co-op communities, advocacy groups, book clubs, manufactured home communities, and offer to provide personalized project information sessions at existing virtual group meetings. *Monthly reminders of this opportunity via the newsletter and social media; meetings as requested.*
- Economy and climate forums: The city, in partnership with Bioneers, is offering a six-part series of virtual forums to explore how we can create an economy in service of an equitable, livable and sustainable world. Drawing on leaders in fields of energy systems, material economy/consumption, ecosystems and biodiversity, the webinars will underscore the role of the economy in driving these crises as well as its potential role in cultivating their solutions. These forums will also provide the foundation for the eventual creation of goals, targets and key performance indicators for the Financial and Economic Systems focus area. *May through October 2021.*
- Energy working groups: The city is fortunate to have many energy experts in the community who have historically been willing to provide advice and assistance in

charting the community's energy future. The city plans to stand up a series of working groups as the city enters its new partnership with Xcel Energy. The topics and scope of the working groups is still in development. *As needed.*

Communication and Engagement Phase 2: September through November 2021

The plan for phase two will be shaped by the learnings from window one. Staff anticipates the second engagement window will include:

Key milestone: December City Council discussion (proposed city organization climate action and funding strategies)

Engage Topics: Actions and strategies for each focus area; Prioritization of actions and strategies

Key deliverables: Periodic virtual engagement events, activation, and maintenance of Be Heard Boulder pages.

- Be Heard Boulder: The city will leverage its web-based engagement platform to create an online community forum for collecting feedback on updated climate goals and targets. The city will also create new pages to solicit feedback on prioritization of actions and strategies. *Ongoing through November.*
- Energy working groups: The city is fortunate to have many energy experts in the community who have historically been willing to provide advice and assistance in charting the community's energy future. The city plans to stand up a series of working groups as the city enters its new partnership with Xcel Energy. The topics and scope of the working groups are still in development. *As needed.*
- Community meetings and discussion: The city will host periodic events to elicit feedback on the updated goals, action strategies and priorities. *As needed.*
- Climate Justice Collaborative: Working with other local governments who are also centering racial equity in their climate action work; Boulder County and Longmont, together with Philanthropiece and individual community organizers and social and climate justice advocates representing historically exempted community members. The city will continue to build relationships, leadership capacity and feedback loops to ensure the city can lift up voices to provide feedback on climate action.

ATTACHMENTS

Attachment A: Overview of a systems change approach to climate action
Attachment B: Science-based methodology for setting mitigation targets
Attachment C: Climate justice and equity
Attachment D: Focus area goals, targets, and progress measures

Overview of a systems change approach to climate action

The foundation — Interconnectedness of problems and solutions

The starting point for a systems-based climate action approach is the recognition of the intersecting and interdependent relationships across a range of current crises — climate, biodiversity, public health, equity/social justice. Climate change is most usefully understood not as a problem itself, but a symptom or manifestation of underlying systems that are now incompatible with maintaining stable, flourishing planetary systems—environmental, social or economic.

Because climate change is inter-related in this way, effective analysis of the underlying causes and conditions driving climate change also provides an entry point to identify system-changing strategies that can simultaneously address other crises. For example, rapidly replacing the outdated methane (natural) gas infrastructure in cities with high efficiency electricity systems powered by renewable energy will not only significantly reduce carbon emissions, but it will also eliminate significant public health risks, create new mechanisms to balance renewable energy grids and create millions of new living wage jobs vital to the current economic crisis. Similarly, dramatically increasing the funding to support equity-based urban forestry development can create hundreds of thousands of high-dignity living wage jobs, improve public health and climate resilience outcomes in front-line communities[1], and add significant carbon sequestration capacity to support climate stabilization.

Shared understanding of the problem

A critical starting point in the development of a systems-change-oriented climate action strategy is precise identification of the problem being addressed. To date, climate change is framed as the problem, and carbon as the cause—human societies do things that produce too much carbon, this carbon causes global warming. This is reflected in terms like “decarbonization” or “carbon emissions reduction”. While accurate in pointing to the consequences of excess carbon in the atmosphere, this approach has inadvertently reinforced a false notion that carbon is generally bad and that it is the source of the problem. Efforts like the “Post Carbon Institute” or books like “Life After Carbon” imply that the desired future is one with little or no carbon.

In reality, carbon is one of the most fundamental and essential elements for life on the planet. All living beings are made up of carbon, and most depend primarily on simple carbon chain

[1] Through its involvement with Urban Drawdown Initiative, Boulder has helped launch a national campaign to dramatically increase federal funding directed to urban forestry with a substantial focus on creating new employment and business opportunities in underserved communities. More information about this campaign, including the Mayor’s sign on letter signed by Mayor Sam Weaver can be found here.

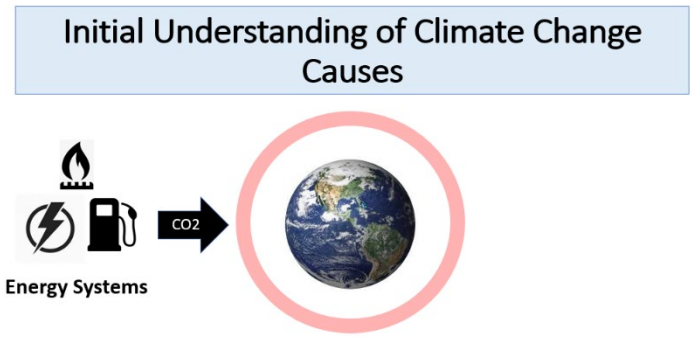
compounds — sugars and carbohydrates — as one of their primary organic energy sources. Human society's current challenge is its reliance on the concentrated forms of carbon found in fossil fuels, rather than "current" forms of energy—either directly captured from solar and earth-based energies or derived from carbon captured in living systems.

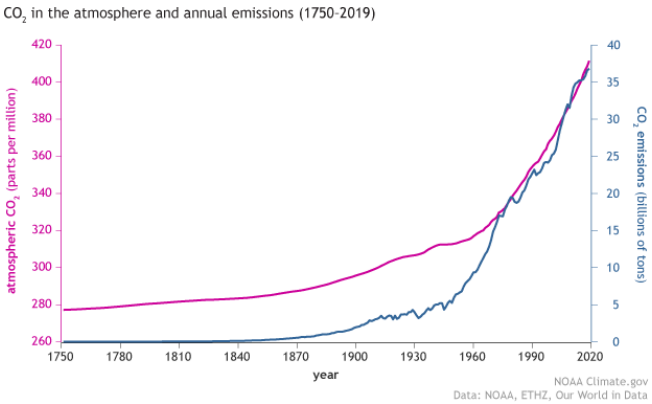
Carbon captured by living systems — both land-based plant-soil systems and aquatic algal/vegetative systems — can be used by these systems to dramatically enhance their biological productivity and resilience. These enhanced biological systems are then capable of capturing even more carbon. These dynamic forms the basis for the rapidly developing field of "natural climate solutions." The resulting living systems are also capable of producing enhanced levels of critical "ecosystem services" — more shade, increased soil water retention capacities, enhanced air and water filtration and increased nutrient density in foods.

The starting point for a transformative climate action strategy is a realization that the problem we need to solve for is how we have designed a system that turns one of the most essential elements of life —carbon — into a toxic pollutant that now threatens the viability of life on much of the planet. A starting point in this process is the identification of key causal factors that are helping to drive the symptoms of systems failure, most notably global warming and climate destabilization.

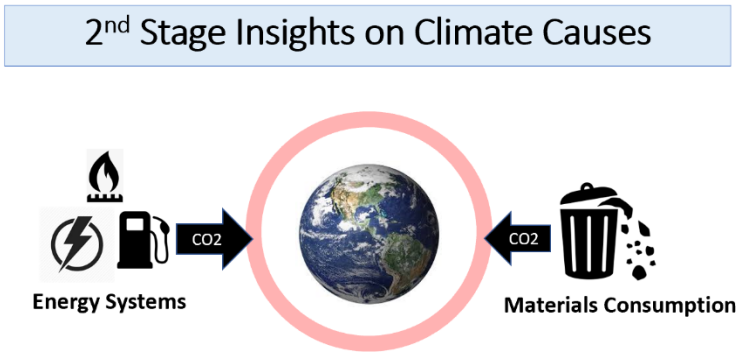
Evolving insights regarding the causes of climate change

Climate change and fossil fuels —The relationship between burning fossil fuels and potential climate change was recognized as early as the 1800s. The advent of the industrial age drove massive increases in highly visible emissions. The demand for higher density fuels like coal for manufacturing dramatically increased both coal use and related pollution. The industrialization of oil and gas extraction in the 1900s then enabled the explosion of fossil fuel-burning transportation and other uses for internal combustion engines. The potential consequences of an exponentially growing population and associated demands for these powerful but, in many ways, polluting energy sources began to be noted. This relationship between fossil fuel use and climate change is often validated by showing the striking similarity between atmospheric carbon and fossil fuel emissions.

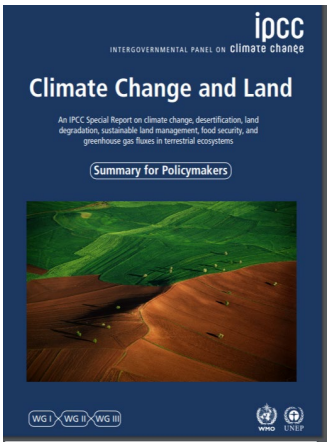




As human societies started to recognize and take seriously the potential dangers of climate change in the late 1970s and 1980s, the initial area of focus were emissions generated in the production of electricity — given the substantial reliance on coal for this process. It was also a relatively easy sector in which to estimate emissions because of the relatively small number of energy generation facilities in operation. Transportation-based emissions were also an easily recognized and relatively easily quantified emissions source. Energy use in buildings became a third primary focus. These three sectors became the primary locus of climate action focus for the first 20 years of conventional climate action efforts.

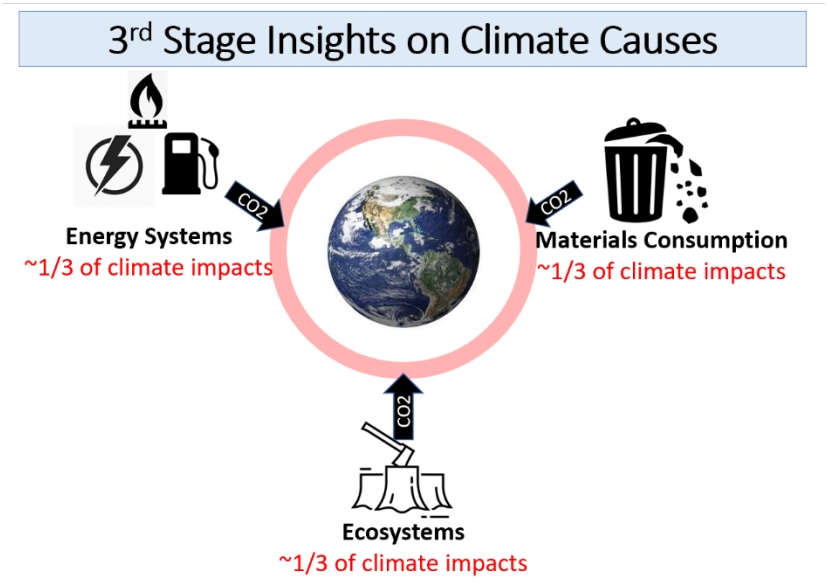


Fossil fuels and material consumption — By the early 2000s, an increasing number of climate activists began demanding greater attention to the role of the consumption-based, growth-oriented economy that was rapidly becoming the dominant economic system throughout the world. A growing number of assessments began to suggest that "consumption-based emissions" could represent as much as 40% of the emissions driving climate change. Leading climate action cities like Portland, Oregon and Washington, DC began developing consumption-based emissions accounting that indicated that, when these "scope 3 (see p. 12)" emissions are taken into account, urban areas were responsible for a much larger share of emissions than when only considering direct fossil fuel combustion. Preliminary estimates of Boulder's consumption-based emissions indicate that fully accounting for these emissions could increase Boulder's actual emissions from approximately 1.4M tons of CO2 to more than 2.2M tons of CO2 — a 40% increase in Boulder's actual emissions responsibilities.



Ecosystem impacts – By 2016 or so, an additional area of atmospheric impacts was beginning to be recognized. Parallel to the industrialization of urban life and material culture, the dramatic expansion in the use of machines in agriculture, forestry and livestock management dramatically changed the scale of human impact on the now nearly 5 billion acres of land being managed for agriculture and forestry. Following a curve almost identical to the use of fossil fuels was the expansion in land management practices that stripped off living vegetation, exposing billions of tons of carbon to oxidation and release into the atmosphere. These impacts have been further magnified by the industrialization of food production such as feedlots and confined animal feeding operations (CAFOs) that also produce huge quantities of methane from animal waste. As the 2019 IPCC report "Climate Change and Land" reported *"If emissions associated with pre-and post-production activities in the global food system are included, (agriculture, forestry and other land use)* ***are estimated to be 21-37% of total net anthropogenic GHG*** *emissions."*

Together, these new realizations point to three primary systems driving the carbon cycle in ways that are destabilizing climate. Each — energy systems, material economy/consumption, and ecosystem management — are likely contributing roughly a third of the emissions driving climate change.



System "pillars"

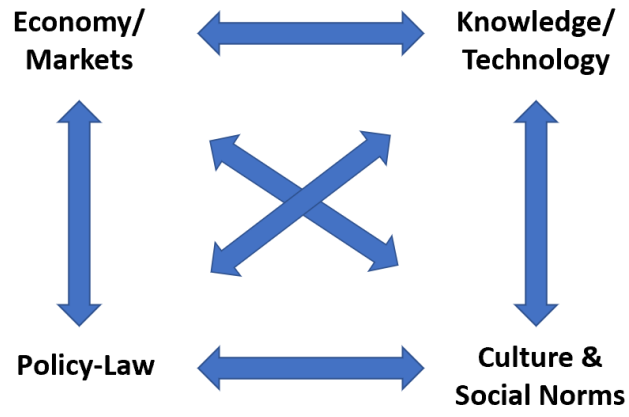
How, then, are we to change these three primary sources of emissions? As noted earlier, much of urban climate action to date has been focused on trying to change individual behavior. This approach is based on a theory of change that believes that once individuals — or cities — demonstrate that a more "sustainable" lifestyle is possible, it will serve as a compelling example that will result in many other individuals (or cities) taking up similar behaviors/practices.

The 2019 staff memo to city council documents the growing body of evidence indicating that this theory is incorrect. The climate damaging behaviors of individuals (and communities) are encouraged, supported and in some ways almost required given current policy/law and market signals. While it would be ideal if all individuals rode to work in electric mass transit, were housed and clothed in completely recycled materials produced or maintained by 100% renewable energy, and ate food produced by regenerative agricultural practices, most of these actions or life choices are currently more expensive, more time consuming, less aesthetically pleasing and or simply unavailable. We are not experiencing a mass movement to more climate compatible lifestyles because our current system incentives the exact opposite. Until and unless we change the underlying systems to make the "right" choice (most climate friendly, biodiversity compatible, equity/justice supporting) the easy (or only) choice, we will not have the broad scale change now essential to stabilizing climate and retaining a livable world.

What then drives how the overall system functions and how it enables or disables "sustainable" choices?

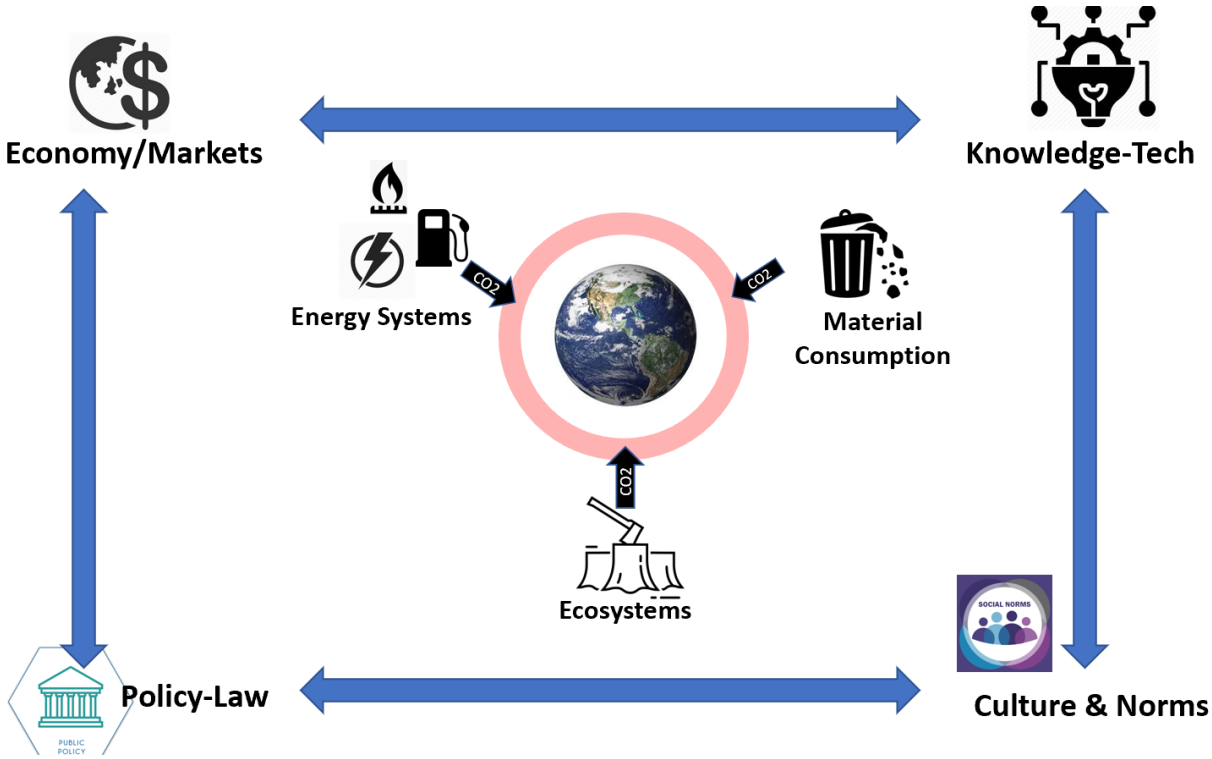
The field of systems change frequently identifies four primary forces that shape the larger context within which individuals and communities make choices: the social rules (policy, law), the market (economic structure and policies), the state of knowledge and technology, and social norms and culture.

Four Primary System "Pillars"



As the arrows indicate, each of these forces is itself a system that is in dynamic relationship with the others. Policy and law sets the boundaries for what is allowed or disallowed in markets. Social norms and culture shape what types of laws are created or maintained. The existing state of knowledge and technology shape options and capabilities, and markets — and the marketing systems created to support them — can in turn shape public perspectives and preferences in ways that lead to changes in the rules governing the markets. Therefore, to make fundamental systemic change to the factors currently driving climate change, we will need to focus society's attention

on changing the underlying rules, market dynamics, available knowledge and technology, and social norms and larger culture that ultimately enable or disable climate stabilizing actions. Since these are in many cases the same factors driving other crises we face—social inequity, biodiversity, public health—this systems approach has the potential to be an intersectional solution to multiple social challenges.



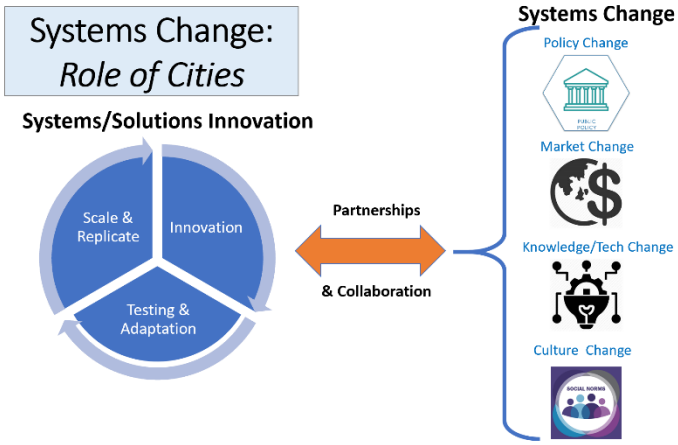
The integration of the both the causal factors identified earlier and the system pillars just described can then be portrayed in this way:

Together, the system pillars and their subsidiary human systems (energy, ecosystems, material flows) give rise to climate change and other crises. By creating this systems map, we can start to see the "where" and begin planning transformative intervening actions.

The underlying theory of change driving this climate action strategy is that climate stabilization — and addressing a number of other emerging existential crises (biodiversity/extinction, equity/social justice, toxics escalation) — depends on changing the underlying system pillars in ways that drive subsidiary systems to produce the outcomes we want. For example, non-recyclable plastics must become expensive to produce or illegal to use. Food and other products produced through regenerative, carbon capturing practices should become less expensive than those from conventional practices as the full costs of these unsustainable practices are brought into their product prices. Electric-based transportation must become the cheapest, most readily available, and highly appealing transportation options, while fossil fuel-based systems must pay an increasing tax for their continued use.

Innovation to drive change

In many cases, this means dramatically accelerating the development cycle of new approaches in each of the three major emissions sources. Boulder, and other well-resourced communities, can play an important role in leading in the innovation around new approaches.



Changing law/policy (the "rules")

These innovations then provide the basis for changing underlying policy/laws that provide the appropriate incentives for accelerating their adoption through compatible market signals (prices, fees, etc.). Boulder and Boulder County's work with the Colorado Communities for Climate Action (CC4CA) is an example of this sort of innovation-to-policy pathway. Many of the significant policy initiatives that CC4CA has helped champion adoption for at the state level have grown out of early-stage innovations developed by the city, county and other early innovators.

Changing markets

We live in a society largely driven by the signals we receive from the market — what something costs, how easy/hard it is to access, whether its use/consumption is supported by available services etc. These market signals and choices are largely determined by the rules (law/policy) that ultimately shape the costs of production and distribution of these products and services.

Fossil fuels are cheap because the current policies and laws enable the many externalities their continued production and use create can be avoided by those who produce and distribute them. Plastics are the norm in packaging because their many long-term impacts have not been accounted for. Food production dependent on the widespread use of toxic chemicals in agriculture continues because the rules both allow it, and in many cases, almost require it.

Changing the causal factors of climate change — fossil-based energy systems, consumption-based material use, ecological degradation — will require new market signals that are, in turn, created by establishing different rules within which the economy must operate. Examples of local jurisdiction market impacts include large scale multi-government EV purchasing, solar procurements, and energy services contracting. When exercised in consortiums of other local jurisdictions, joint local governments procurements have potentially significant abilities to shape both product availability and specifications.

Changing knowledge and technology

Cities and other local jurisdictions can often play a significant role in developing and testing new approaches that build critical knowledge and, in some cases, pioneer the use of new

technologies. During the 2008 economic crisis and associated economic stimulus funding, cities and counties we significant players in the development of new knowledge and technology deployment associated with energy efficiency. The market for these technologies and services was substantially transformed by both the early-stage piloting and later coordinated market demand for a wide range of both residential and commercial energy efficiency. Boulder has again been a pioneer in this approach using strategies like its "Boulder Energy Challenge" and other mechanisms to catalyze technology and services development that are now being deployed in many other places around the Country.

Changing norms

Changing systems will also require the public sector to engage in even more vigorous and robust efforts to initiate the social dialogue that begins to influence broader cultural and social norms. If the innovations and new behaviors that must be adopted to stabilize climate (and address a host of other system-induced breakdowns) are not widely understood, embraced and accepted, the social resolve to adopt and maintain the policy that drives markets will not be sustained.

Systems change is a community-wide opportunity

A key distinction from past climate action approaches is the shift from focusing on expecting individuals to assume these new practices or behaviors and instead recognizing that large-scale adoption will require more fundamental changes to the forces shaping individual (and community) choices and behaviors: law/policy, markets, availability of knowledge and technology, and norms and culture. While local governments have a unique and potentially powerful role to play in shaping systems, there are equally important roles for the other major sectors of our local community. *Table 1*, below, illustrates opportunities for system change actions across a range of community sectors — individuals, businesses, academic/educational institutions, and non-governmental organizations.

The development of a systems-change-oriented climate action strategy arises from the increasingly obvious failure of past approaches to stabilizing climate. It is clear that a new approach is needed to avert increasingly catastrophic climate change impacts. At the same time, we are at the very beginning stages of trying to understand and articulate this new approach. There remains a huge amount of both strategic and practical work to build on the systemic approaches already emerging and begin to codify and expand their application. Boulder is once again on the leading edge of this work, particularly in recognizing that this is work that must be done in coordination and alliance with many other actors — other local jurisdictions, state and federal agencies, the business community, and our academic and non-profit partners. It is our community's foresight and appetite for bold initiatives that will enable us to engage in what must become a system transforming field of action.

Table 1: Opportunities for system change actions across sectors

	SYSTEMIC CHANGE ACTIONS MATRIX				
	PUBLIC SECTOR	**PRIVATE SECTOR**	**NGO**	**ACADEMIC**	**PERSONAL**
Public Policy	• Local codes-ordinances • State and federal legislative advocacy	• Collaborative policy development • Advocacy for even playing field policy change e.g., carbon tax	Policy engagement • Analysis and education • Policy development • Monitoring and reporting	• Policy analysis • Data gathering/analysis	• Participate in policy development • Communicate with other residents • Vote • Participate in movement organizing and political campaigns, and demonstrations
Financial Systems	• Investments (municipal, employee pension) • Procurement • Financial services (who we do business with) • Funding innovation	• Investments (municipal, employee pension) • Procurement • Financial services (who we do business with)	• Investments (municipal, employee pension) • Procurement • Financial services (who we do business with)	• Investments (municipal, employee pension) • Procurement • Financial services (who we do business with)	• Investments (municipal, employee pension) • Values-based purchasing • Financial services (who we do business with)
Culture Story Beliefs/values	• Public education • Facilitation of dialogue	• Communicate values	• Create cultural programing	• Create educational programing • Research social values & narratives	• Communicate values through media engagement • Support initiatives aligned with cultural change
Innovation	• Pilots • Ongoing programs • Funding of innovative startup business, specifically in the phases of ideation and concepting	• Implement climate “smart” internal policies e.g., efficiency, energy sources etc. • Research and development (product materials, manufacturing processes, etc.)	Program implementation • Design • Management • Evaluation	• R&D around technology or services • Pilot project development	• Communicate with fellow residents • Participate in pilots/actions • Serve as an early adopter of new technologies

Science-based methodology for setting mitigation target

Methodology owner: World Wildlife Fund (WWF)

Description: WWF's One Planet City Challenge (OPCC) has developed a methodology based on the latest data from IPCC's Special Report on Global Warming of 1.5°C; this new approach builds upon the Deadline 2020 methodology of C40, integrating new considerations of fair emission budgets allocation compatible with the 1.5°C goal. The methodology is suitable for any city that reports in line with the reporting requirements of the Global Covenant of Mayors.

Data Points Required:

- City-wide Human Development Index Score
- City-wide emissions baseline as close to 2018 as possible.

How to Set the Interim Target for 2030:

1. Gather 2018 Scope 1 and Scope 2 city-wide GHG emissions and divide by the 2018 population to obtain baseline per capita emissions.

City of Boulder 2018 Scope 1 Emissions: 768,759 mt CO2e
City of Boulder 2018 Scope 2 Emissions: 722,735 mt CO2e
City of Boulder 2018 population: 108,507
2018 Emissions per capita: 14 mt CO2e/capita

2. Use the Human Development Index (HDI) to estimate a reduction target, from 2018 levels, that reflect a fair share of the 50% global emissions reduction by 2030 identified by the IPCC Special Report on Global Warming of 1.5°C. Use the following formula:

$$\text{reduction target} = 0.5 \times (\text{HDI correction factor})$$
$$\text{where HDI correction factor} = 1 - ((\text{HDI}_{\text{Country where city is located}} - \text{HDI}_{\text{Global average}}) / \text{HDI}_{\text{Global average}})$$

HDI for USA in 2018: 0.926
Global average HDI in 2018: 0.737

HDI Correction Factor: 1 – ((0.926 – 0.737)/0.737) = 0.74
Reduction Target: 1 – (0.5 x 0.74) = 0.63

3. Translate the 2030 target to a reduced per capita emissions value. Multiply 1- the reduction target (step 2) by the baseline per capita emissions value (step 1). That is: baseline per capita emissions x (1 – reduction target).

14 mt CO2e/capita x (1- 0.63) = 5.2 mt CO2e/capita by 2030

4. Translate the 2030 reduced per capita emissions value to an absolute emissions value. Multiply the 2030 reduced per capita emissions (step 3) by the forecasted 2030 population of the city.

City of Boulder forecasted population by 2030: 115,000
115,000 population x 5.2 mt CO2e per capita = 598,000 mt CO2e
This represents about a 60% reduction from our 2018 baseline.

However, given that the City of Boulder maintains a high GHG emissions per capita, a high GDP per capita, and a highly climate-engaged community – staff are striving for a more ambitious target of a 70% emissions reduction against our 2018 baseline by 2030. Staff have consulted with ICLEI to confirm our methodology and they have approved of our net zero and associated 2030 interim targets as being aligned with the global Race to Zero initiative. Further, this 70% reduction is in alignment with the C40 recommendations using emissions and GDP per capita standings to determine city-based emission reduction targets for 2030.

GHG/capita	City GDP/ capita (USD $)	Indicative city target reduction for 2030 per capita emissions (% change from 2015 levels)*	Example cities that match this profile
High (>5.1 tCO_2e/capita)	High (>$15,000/capita)	-70% to -75%	Toronto Melbourne New York City Yokohama Heidelberg Wroclaw
	Low (<$15,000/capita)	-10% to -15%	Cape Town eThekwini Tshwete Rio Grande São José dos Campos

Climate Justice and Equity

Bringing climate action into alignment with the city's Racial Equity Plan
Over the past several years, the city has worked to advance equity and, specifically, racial justice across the entire organization, including Climate Initiatives. In February 2021, City Council unanimously adopted the city's first Racial Equity Plan. During the plan's development, City of Boulder employees and leadership worked to understand the role institutional racism has played in perpetuating current racial inequities and to develop a vision to advance racial equity through education, programs, policies and budget decisions. There are many intersections between the city's Racial Equity Plan and its climate work, including:

- **The city's climate action plans must now be aligned with the Racial Equity Plan:** The Racial Equity Plan, like the Sustainability and Resilience Framework and the Boulder Valley Comprehensive Plan, guides department master plans as well as existing and future city projects, programs, plans and policies. The Climate Initiatives Department will incorporate this guidance into future updates of the city's climate action plans.
- **Reconsideration of climate and energy targets' unintended impact on equity:** The Racial Equity Plan states, "Anecdotally, Boulder's high design expectations, energy efficiency and climate goals, limited vacant land for development, high proportion of jobs to homes, and numerous other polices all have an indirect impact on housing costs. Combined with the historic federal policies and the lack of opportunity to build generational wealth, high housing costs continue to impact who can afford to live in Boulder." The Climate Initiatives team is exploring opportunities to bring into balance community values of environmental protection, quality of life and racial and socioeconomic equity.
- **Staff training:** All city staff are participating in Bias and Microaggression trainings, and the Climate Initiatives Department is committed to ensuring all staff also take part in the Advancing Racial Equity: The Role of Government and Racial Equity Instrument Trainings to better incorporate racial equity into climate work. The Climate Initiatives Department is also building its capacity in this space by reading the 2020 One Book One Boulder selection, *So You Want to Talk About Race*, by Ijeoma Oluo.
- **Environmental Advisory Board (EAB) training:** Like all city boards and commissions, the EAB will also take part in Bias and Microaggression trainings. This step will be completed by the end of 2021.
- **Creation of a department racial equity team:** The Climate Initiatives Department has initiated a racial equity team and will develop department-specific plans to analyze, enact and assess pathways to advance racial equity through climate work. This group is also responsible for ensuring that staff utilize the racial equity instrument in key decisions, integrating racial equity into the department's strategic plans and creating inclusive decision-making processes.

Recent activities
Under the guidance of the city's commitment to advancing racial equity, other work items to support equity through climate work include:

- **Accelerate Neighborhood Climate Action (ANCA) pilot:** The city is working with five pilot neighborhoods to support the development of community-scale climate action plans. The ANCA program brings community members together to design a climate action forum, create a climate action plan and connect to build a more resilient neighborhood. Three forums took place in April (Martin Acres, Goss Grove and Sundance), and two forums will take place in June (HyView and Melody Catalpa).
- **Climate Justice Collaborative in Boulder County:** The city, in partnership with Boulder County, the City of Longmont and Philanthropiece, has applied for a two-year grant with the goal of standing up a county-wide Climate Justice Collaborative. As the city prioritizes racial equity, climate adaption and mitigation, it is critical to work with other local governments and non-profit partners to prepare all community members for climate change. The collaborative will engage underrepresented and underserved county-wide community members in social and climate justice action with the intent to achieve more community-driven solutions to climate mitigation and adaptation.
- **FLOWS (Foundations for Leaders Organizing for Waster and Sustainability):** FLOWS is a program out of CU's Environmental Center that primarily serves low-income communities designed to engage and increase community members' leadership capacity around sustainability and climate issues. The city supports FLOWS in assisting its ongoing climate mobilization engagement to advance racial equity and social and climate justice, with historically oppressed immigrant, Black, Indigenous, People of Color and LGBTQ+ communities. The work entails creating safe spaces to discuss, share, learn and develop skills that builds climate leadership.
- **Learning from other cities:** The city is engaged in opportunities to learn from other cities that share Boulder's vision to better incorporate equity into climate action work. One of the highlights from this shared learning came in 2020 when the city and Boulder County hosted representatives from Providence, Rhode Island to share their experience and insights from their process to create a Climate Justice Plan. The Providence process was particularly innovative because the primary decision-makers were those who have been historically marginalized and most impacted by pollution, waste and toxicity where they live and work. As a result, the interventions and solutions proposed by the Climate Justice Plan tackles climate change by addressing its root causes: structural racism, economic inequality and our extractive economy.
- **Manufactured Housing Strategy intersections:** As part of the climate mobilization action plan's community engagement, in 2020 the city worked with local non-profit, Eco-Arts Connection to engage manufactured home community (MHC) members in a series of online meetings and activities. This work focused on the Latinx, Spanish-speaking residents in six MHCs, that came together to express their needs and desires to be involved, participate and build leadership in the city's climate efforts. The residents expressed their interest in learning, participating and contributing to the community's

goals and build their capacity to lead on climate and other issues. The activities involved do-it-yourself energy efficiency measures and Clean Air as a Right workshops that helped residents understand the efficiency measures that they can perform in their manufactured home and the critical importance of good indoor and outdoor air quality in reducing health risks. Many of the recommendations that the MHC members provided to the city also help achieve some of the Manufactured Home Strategy work managed by the Housing and Human Services Department.

- **Reducing energy burden through access to local solar gardens:** In Boulder, community members with low incomes often spend more than 8% of their incomes on energy to heat their homes and provide electricity to their households. The City of Boulder and partners are developing solutions for income-qualified participants to bring down energy costs through subscriptions to community solar gardens. The city is building a community solar garden dedicated to income-qualified customers of Xcel Energy who reside in Ponderosa Manufactured Home Community. The program will subscribe participants in the solar garden, free of charge. As a result, participants will receive discounts each month on their electric bills. The city's Energy Impact Offset Fund is providing funding for this project. In addition to this city-owned garden, the city is also making investments in other local solar gardens to expand these benefits to other low-income community members throughout Boulder.

Focus area objectives, targets and progress measures

For each focus area, we have established a set of goals, targets and progress measures as described below.

Measurement term	Definition
Objectives	High-level statement of ambition.
Targets	More specific quantitative and time-bound objectives, preferably with defined measurement.
Progress measures	A combination of qualitative and quantitative metrics by which progress towards targets can be measured.

Energy systems

Objectives:
- Establish a safe, healthy and resilient fossil-fuel-free energy system.
- Ensure equitable and affordable access to energy.
- Eliminate operational carbon from our existing building stock.
- Achieve Net Zero carbon in new construction.
- Provide clean mobility solutions that meet community needs.

Targets	Progress measures
100% of our community members will have unburdened access necessary to meet basic heating, cooling and energy needs by 2035.	By 2022, develop a resilience strategy to meet heating and cooling needs of frontline communities.
	By 2023, provide new opportunities for low-income households to engage in efficiency or electrification solutions.
	By 2025, no member of our community will meet the definition of energy impoverished (10%+ of income spent on energy needs).
Our energy system will deliver 100% renewable electricity by 2030 and will strive to meet the resiliency and reliability needs of the community.	By 2021, develop a community informed strategic roadmap toward achieving 100% renewable energy supply and identify interim targets.
	By 2023, develop a strategic framework detailing the amount, placement, and pairing of local generation and storage to optimize resilience and demand management.
Our existing building stock will promote health and wellbeing of occupants and will have zero operational emissions by 2040.	By 2022, advocate for state level science-based indoor air quality guidelines for combustion appliances that protect the safety of sensitive populations.
	By 2023, eliminate natural gas from all new residential construction.
	By 2023, aggressive air filtration requirements will be incorporated into building codes.
	By 2025, eliminate natural gas from 15% of existing residential building stock and 5% of existing commercial buildings.
	By 2025, all commercial buildings larger than 20,000 sq. ft. will be engaged in performance-based standards such that the Energy Use Intensity (EUI) of our building stock is reduced 20% against a 2015 baseline.
Achieve zero operational emissions in all new buildings with a 40% reduction in embodied emissions by 2031.	By 2023, all new residential and commercial construction will be built electric ready.
	By 2023, require all new construction to conduct an analysis of embodied energy of the project, providing subsidies to offset the costs.
	By 2024, stand up a regional embodied energy roundtable of developers, architects, and contractors.
	By 2026, average EUI of commercial construction will be reduced 60% compared to a 2016 baseline.
	By 2026, partner with other communities and community stakeholders to collaborate on purchasing low carbon building materials for all future city operations.
Clean mobility options will be culturally, geographically, and economically diverse by 2035.	By 2023, identify neighborhoods in greatest need of transportation solutions and define opportunities for electric car-sharing and micro-transit platforms in targeted areas
	By 2025, all residents will have access to convenient, accessible, and affordable charging infrastructure.
	By 2025, 50% of shared fleets such as taxis, rideshare, and carshare companies in Boulder will be electric.
	Work with Via Mobility Services, Boulder Valley School District, and the University of Colorado to develop a roadmap to zero-emissions electrification of all new transit and school buses by 2030.

30% of vehicle miles travelled in Boulder will be electric by 2030.	By 2023, all EV owners will be engaged in charging management programs.
	By 2025, 40% of new vehicles purchased in Boulder will be electric.
	By 2025, reduce annual average Air Quality Index to 25 or lower, with a particular focus on transportation corridors and burdened communities.

Circular materials economy

Objectives: Minimize waste production per capita and maximize diversion from landfills.
- Reduce the carbon footprint of production cycles we have the greatest ability to affect.
- Employ circular principals in building construction and demolition.
- Enable repair, reuse and remanufacturing of components and materials.
- Establish an economic basis for circular entrepreneurship and innovation.

Targets	Progress measures
Become a zero-waste city by 2025.	By 2023, reduce waste per capita 10% against a 2015 baseline.
	By 2023, make the recycling and reuse of materials accessible and affordable for all.
	By 2025, divert 85% of waste from landfills.
	By 2026, all food waste will be eliminated from landfills and will instead go toward feeding people, animals and soils.
Reduce consumption-based emissions 50% by 2030.	By 2022, complete a consumption-based inventory to understand the product chains our community has the greatest ability to impact.
	By 2023, host multiple annual education outreach events to inform community on how they can reduce consumption-based emissions.
	By 2025, inform large actors in our community on implementing low carbon procurement strategies and policies.
Design buildings such that 25% of high emission intensity materials may be captured and reused by 2030.	By 2022, 75% of deconstruction waste will be recycled or reused.
	By 2023, require a building materials inventory for all new construction.
	By 2025, develop a plan and location for storing recovered building materials for reuse.
	By 2026, require new residential and commercial construction to use non-toxic recyclable and recycled products in the selection of construction materials.
Materials and products are designed to last with the ability to recycle, reuse, repair or remanufacture at the end of product life by 2030.	By 2023, 50% restaurants in Boulder adopt use of reusable take out containers.
	By 2025, fund and fuel development of reusable e-commerce and consumer good packaging solutions.
	By 2025, eliminate use of single use plastics.
Foster community and entrepreneurial partnerships and platforms to promote repair and reuse by 2030.	By 2023, develop a network of online resources that facilitate the market for reusable or shareable goods such as catalog of items at thrift stores, tool libraries, etc.
	By 2024, initiate a funding structure to support circular business platforms.
	By 2028, establish a community innovation park.
Increase participation in sharing platforms 30% over a 2020 baseline to foster equitable access to goods and services over ownership by 2030.	By 2022, complete analysis determining areas and neighborhoods with gaps in access to essential goods and services.
	By 2025, increase sharing economy platform use 30% from 2020 baseline, targeting neighborhoods and resources in greatest need.
Optimize organic waste to promote soil health in our community by 2030.	By 2025, 20% of collected biomass will be converted to biochar and applied to land.
	By 2025, 100% of compost produced in our community will be used within our community.

Regenerative ecosystems

Objectives:
- Increase natural carbon sequestration within and beyond our boundaries.
- Advance the field of natural climate solutions beyond Boulder.
- Foster community resilience through carbon enhanced ecosystems.
- Design actions to maximize equitable ecosystem benefits.
- Support the growth of economic sectors that sustain critical ecosystem services.

Targets	Progress Measures
After prioritizing GHG reductions, remove 50,000 tons of CO2 annually by 2030 through forest, urban tree and soil landscape restoration.	By 2027, 100% tons of organics captured and reapplied in city boundaries.
	By 2025, have 1,500 acres of agricultural lands in carbon management.
	By 2025, increase soil organic carbon by 25% in lands managed through restoration and regeneration practices.
Develop globally accessible tools for carbon management and optimal ecosystem services planning by 2025.	By 2023, develop tools that are accessible to communities worldwide.
	By 2023, use tools and systems to coordinate local planting or soil regeneration efforts across both public and private lands with the ability to measure and report MTCO2e sequestered locally and globally.
	By 2025, develop the capability to value and monitor ecosystem services for City of Boulder and broader community activities.
Reach 20% tree canopy by 2035, targeting growth of canopy cover in areas of greatest need.	By 2022, determine planting plan to maximize tree canopy and ecosystem service benefits to the community across both public and private lands.
	By 2025, increase planting on private lands by 50% over 2020 baseline.
	By 2027 implement additional tree protection measures
Reduce urban heat island in energy burdened neighborhoods 1°C by 2030 from a 2015 baseline.	By 2022, identify neighborhoods vulnerable to urban heat island effect and energy burden.
	By 2025, reach annual targeted plantings in all vulnerable neighborhoods as identified by analysis.
Create a closed loop system that reduces fire risk in our community, converts biomass to biochar and generates clean energy to fuel buildings by 2030.	By 2022, complete a city biomass assessment.
	By 2025, 20% of biomass collected in community to be converted to compost or biochar.
	By 2025, bioenergy is derived from locally sourced “waste”; biomass is used to displace methane (natural gas) at 10 locations.
	By 2025, wildland urban interface thinning materials are integrated into bioenergy-biochar systems.
Strive to ensure 40% of new employment comprises equity-based green sector jobs.	By 2023, provide training and outreach that engage BIPOC in urban forestry opportunities.
	By 2025, increase the number of BIPOC operators engaging in land management/stewardship leases/contracts with the city by 20%.
	By 2025, work with BIPOC landscape contractors to promote offering of organic or other sustainable landscape services by 20%.