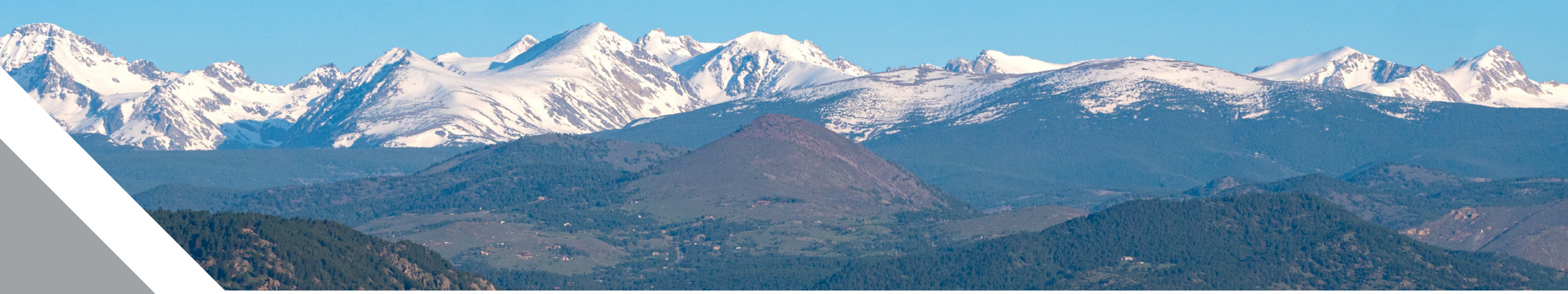
University of Colorado **Boulder**

CLIMATE ACTION PLAN



CONTENTS

ALL APPENDICES HAVE BEEN PROVIDED IN A SEPARATE DOCUMENT. THESE INCLUDE:

FROM THE CHANCELLOR

As science continues to offer greater clarity around climate change, the University of Colorado Boulder has a responsibility to be a leader in climate action. The Boulder campus has a long history of environmental action, including the milestone moment in 2007 when former Chancellor Bud Peterson signed the American College and University Presidents' Climate Commitment.

As chancellor of the University of Colorado Boulder, it is my duty to ensure that the campus aligns its policies and procedures to uphold this Climate Commitment. Our collective goal is to build a culture around concern for our climate by making decisions that support our mission - to shape tomorrow's leaders, be the top university for innovation, and to positively impact humanity - and also empower staff, faculty, and students to live out that mission.

Therefore, I am honored to present the following 2024 Climate Action Plan. This plan's core focus is to drive down emissions to align with the Paris Agreement to limit global temperature increases to 1.5 degrees Celsius. Our plan calls for a 50% reduction in campus emissions by 2030, followed by a linear reduction to zero emissions no later than 2050.

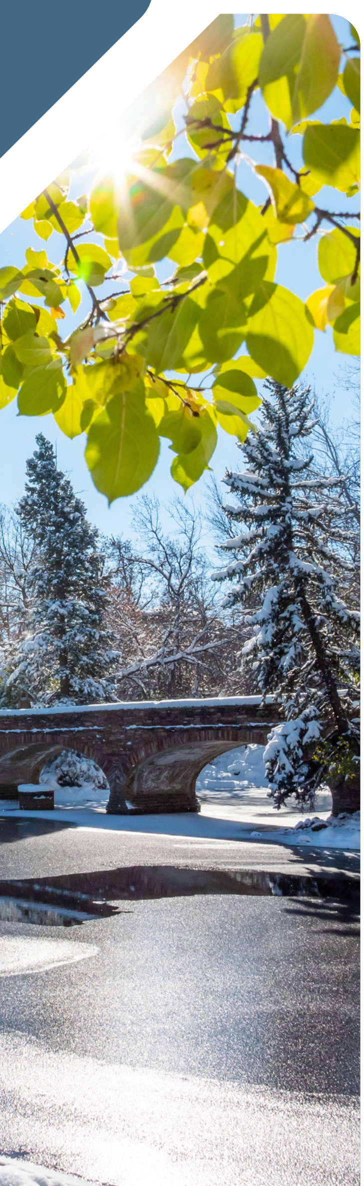
We also recognize the potential for climate action to create community benefits such as improved air quality and transportation access, to address environmental justice issues in our state, to increase the level of transparency and engagement with the campus community, and to promote equity through the implementation of specific strategies.

The next few years are incredibly important in limiting global temperature increases to 1.5 degrees Celsius. It is our duty to pursue emissions reductions that are consistent with that goal.

The university's goals are ambitious. For our aims to be realized, we need to approach them with thought and intention. We must act collectively to support these efforts, ensuring that the proper resources are committed and that our entire community is included in this endeavor. By applying our technical expertise and research to our internal operations, we can make a bold commitment to advancing environmental sustainability at CU Boulder.

Sincerely,

Philip P. DiStefano, Chancellor



FROM THE CAP STEERING
COMMITTEE

As staff, faculty and students[1] who were recruited by Infrastructure & Sustainability Leadership to serve on the Steering Committee to oversee the update of CU Boulder's Climate Action Plan, we worked hand-in-hand with a consulting team hired by CU Boulder[2] to create a set of prioritized actions that will help meet the campus greenhouse gas (GHG) reduction goals. The goal of including all emissions sources (Scopes 1-3), and the aim of a 50% reduction by 2030 was an important and constant focus, as was the linear reduction to zero emissions, by 2050, without the purchase of unbundled Renewable Energy Certificates (REC) or offsets.

For each of the recommended actions, four important considerations were made, in addition to the fundamental aim of GHG reductions: community health, equity and social justice, resilience, and financial feasibility. Any plan that didn't deliver the necessary emissions reductions would be fundamentally inadequate. But also, a plan that didn't consider the intersecting issues associated with campus energy systems, transportation, procurement, food, etc., would be equally short sighted.

We recognize that energy systems are a significant cause of environmental justice issues: neighborhoods near refineries, power plants, heavy industry, and highways bear the brunt of environmental impact in very tangible ways. In addition, climate change disproportionately affects disadvantaged and vulnerable populations, both locally and globally. Therefore, each strategy within this plan, which focuses on greenhouse gas reduction measures, is also assessed according to its impact on the ability to deliver co-benefits, including social justice and equity.

We are confident that the goals outlined in this plan are technically and economically feasible. By implementing actions with the tools that we have, we will advance and improve our campus, contributing to better air quality, sustainable mobility and efficiency, operability, well-being, and reputation.

The Climate Action Plan is an intentional "living document" that will be continually monitored and evaluated through an on-line platform accessible to everyone who has interest. The campus-wide Sustainability Councils are charged with monitoring the implementation of this plan. Regular reports on progress or status of the projects will be an essential component so that course corrections can be made as needed (see Governance chapter below).

We commend the Board of Regents for having originally adopted the GHG emission reduction commitments that guided this plan and commend the Chancellor for updating and aligning the campus climate goals to be Paris-aligned. It will take the support of the entire campus to reach our collective goals, and we look forward to successful implementation of this plan in service to creating a more sustainable and environmentally just CU Boulder.

Sincerely,

The CAP Steering Committee

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[1] The Steering Committee is composed of three types of members: (1) the Vice Chancellors, (2) central administrators other than Vice Chancellors, and (3) independent members such as faculty, students, or research associates.

[2] Blue Strike Environmental.

LAND ACKNOWLEDGMENT

CU Boulder recognizes that Indigenous peoples are the original stewards of the land on which the University now stands. As the **University's Land Acknowledgment** states, our campus is committed to "educating, conducting research, supporting student success and integrating Indigenous knowledge" into our campus and its activities. This knowledge can provide crucial understanding for addressing the impacts of climate change on our region and globally.

In the development of the Climate Action Plan (CAP), the steering committee and equity subcommittee met with the CU Boulder Center for Native American and Indigenous Studies (CNAIS) to begin to identify intersections and specific strategies that enable the CAP to honor the University's commitment to Indigenous communities while reducing greenhouse gas emissions. Given the scope of the CAP and its emphasis on infrastructure and operations, this plan is limited in its capacity to directly support the goals of CU Boulder's Land Acknowledgment. However, attention to equity in implementing the plan and ongoing collaboration with CNAIS, the Associate Vice Chancellor for Native American Affairs, and Indigenous communities on and off campus provides opportunities to advance these efforts in the future. This can be done by increasing support of the **Tribal Climate Leaders Program**, increasing Indigenous leadership on campus by recruiting and retaining more Indigenous students, faculty, and staff, and by creating more opportunities for learning and training around the intersections of climate action and Indigenous history, knowledge, and experiences, thereby increasing our collective capacity to achieve the goals of the CU Land Acknowledgment.

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[3] **CU Land Acknowledgment**

ACKNOWLEDGEMENTS

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CAP IMAGE CREDITS

University of Colorado Boulder Photo Staff

[4] Two student members (Michael Borkan and Brigid Mark) joined the Steering Committee in May of 2023, while the other members of the Steering Committee have been part of the process since October 2022.

[5] In addition to serving on the Steering Committee, Karen Bailey also led the Equity Subcommittee and Brigid Mark served on this subcommittee.

[6] Hired by CU Boulder in August 2022 in response to a Request for Proposals.

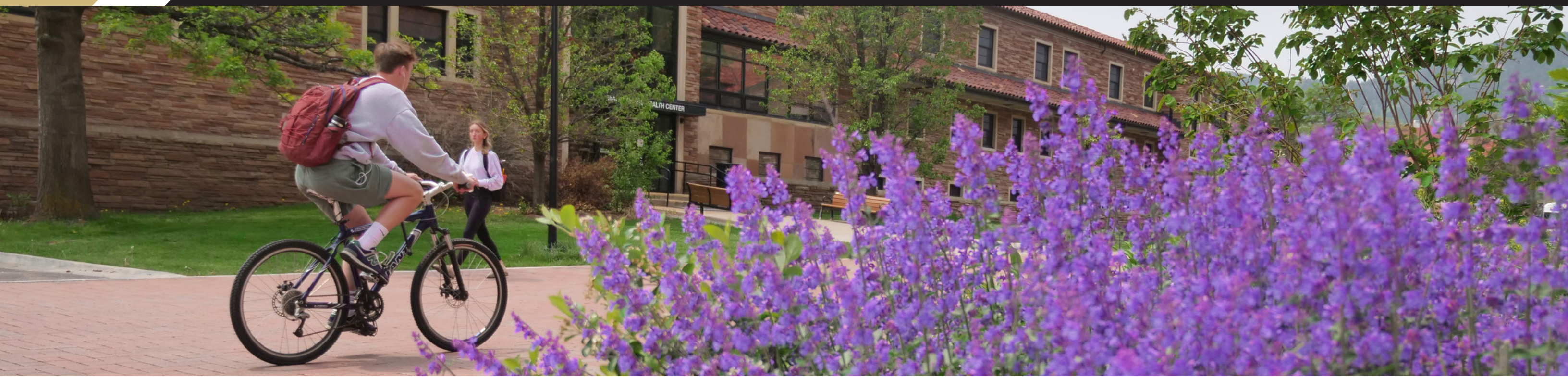
EXECUTIVE SUMMARY

Call to Action

Actions taken during the next few years will be vital to limiting global temperature rise to 1.5°C and to mitigating the most severe impacts of climate change. According to the Paris Agreement, global GHG emissions need to be reduced 50% by 2030, with a linear reduction to 100% by 2050. This Climate Action Plan (CAP) establishes a course for the University of Colorado's Boulder campus (CU Boulder) to achieve these targets for its own emissions. CO2 equivalent Greenhouse Gas (GHG) emissions are cumulative, meaning that the sooner reductions are made, the greater the impact and the less difficult it is to make reductions in the future.

The CU Boulder campus seeks to be a leader in pursuing climate action. With the signing of the "American College & Universities Presidents Climate Commitment" (ACUPCC) in 2007, CU Boulder began assembling a formal vision and structure for sustainability governance, one that prioritizes reducing greenhouse gas emissions to net zero as soon as possible. In 2009, the campus published the "Conceptual Plan for Carbon Neutrality" (CPCN); and, though not fully implemented, this document served as an underlying framework for this 2024 Climate Action Plan (CAP). Most recently, the Chancellor has published a ***Call to Climate Action***, committing the campus to carbon neutrality by 2050, among other environmental goals.

CU Boulder aspires to be a global leader in advancing human rights as we address the climate crisis. Climate change and the actions we take to mitigate the climate crisis have direct connections to and impacts on inequality, inequity, and injustice, locally and globally. A fair and just transition to a more sustainable CU Boulder demands that we consider how individuals and communities are disproportionately impacted by CU Boulder's operations and the climate crisis more broadly. Reflecting the campus **Diversity, Equity, and Inclusion (DEI)** values, one goal of the CAP is to assess and mitigate the impact of its climate goals and strategies on inequity. This approach allows us to advance climate action while also acknowledging how climate change and climate change mitigation differentially impact individuals and communities based on socio-economic status, race and ethnicity, ability, gender, sexual identity, nationality, geographic location, and a host of other factors. Equity refers to fairness and justice in the distribution of resources, opportunities, and benefits, as well as the distribution of impacts. We view equity as both a benefit of inclusive climate action and a framework through which climate action can be evaluated. By assessing the impact of the CAP on equity, the campus acknowledges systemic injustices and endeavors to make our efforts more inclusive. Our vision is to ensure that the climate action plan does not worsen inequity and that we prioritize actions that both mitigate the climate crisis while advancing the University's equity goals.



Core Goals

This 2024 CAP is organized around **five Core Goals**, reflecting the Chancellor's Call to Action, and intended to strengthen CU Boulder's commitment to climate action.

1. **Achieve 50% reduction in Scope 1 and 2 emissions (see Table 1) by 2030, from the baseline year of 2019, with a linear reduction to zero emissions by no later than 2050.** Do so without the use of purchased offsets or unbundled Renewable Energy Certificates (RECs).[7,8]

2. **Achieve a 50% reduction from 2019 by 2030 for those Scope 3 emissions where accurate estimates can be established and which are within the University's influence and control. Further reduce these emissions to zero by 2050.** The CAP begins the process of developing a Scope 3 inventory and then developing the strategies to achieve reductions in indirect emissions. It is anticipated that the quality of the inventory and the robustness of the reduction strategies will increase over time now that inclusion of Scope 3 emissions in the CAP is established.

3. **Use climate action to deliver to the CU Boulder community the co-benefits of equity, health, and resilience.** As the opportunity to connect climate action to these co-benefits becomes increasingly apparent, we anticipate additional strategies to be included in subsequent CAPs to do so.

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[7] RECs are used to track and assign ownership to renewable electricity generation and use. Unbundled REC means the non-physical REC has been separated from the physical electricity and sold to a party other than that which is purchasing, contracting, or subscribing to the source of energy. When a REC is unbundled, it may lack the same credibility as a bundled REC.

[8] CU Boulder CAP implementers are in agreement that the intent is for decarbonization to happen more quickly and steps are being taken to seek out resources and coordinate the logistics to potentially accelerate the timeline.

4. **Strengthen internal and external management and accountability structures to ensure the campus achieves the goals outlined in the plan.** An implementation plan that includes governance solutions and accountability structures is also included in this CAP.

5. **Build a Community Engagement Strategy to integrate communication, feedback, and reporting and increase transparency with campus and the broader community.** The implementation plan also includes communication, engagement, and reporting mechanisms in support of campus operations and emission reduction strategies.

The CU Boulder Climate Action Plan is a strategy document that outlines a pathway to achieve these stated goals. It begins with an inventory of GHG emissions which establishes a baseline from which to measure and forecast future GHG reductions. It then assesses strategies to achieve emission reductions on campus (Scopes 1 and 2) and through relevant Scope 3 categories. In addition to reducing emissions, these strategies have the potential to achieve certain co-benefits. Therefore, strategies have been identified and prioritized to enhance these complementary aspects, and to protect against possible negative outcomes (e.g., excluding some members of the community from engaging in climate action programs or incentives). Finally, implementation recommendations are included that address governance, communication and financing strategies to help ensure the Plan's execution.

TABLE 1: Working definition of three emission scopes

SCOPE 1	Carbon emissions resulting directly from fuel combustion on campus, primarily natural gas for heating or CU Boulder-owned vehicles.
SCOPE 2	Carbon emissions associated with energy purchased by CU Boulder and generated elsewhere, primarily grid electricity used on campus.
SCOPE 3	Carbon emissions resulting indirectly from CU Boulder operations, either from upstream activities, such as purchases of goods and services, or downstream activities, such as students and faculty commuting to and from campus. The University does not have direct control over these emissions, though it can exert influence over its operations, procurement and other activities to reduce them.

GHG Baseline, Forecasts and Targets

CU Boulder has created an inventory of its Scopes 1 and 2 emissions, and set targets for reductions in those emissions by 2030 and further linearly reducing to zero emissions by 2050. The Campus has also conducted its first ever Scope 3 emissions inventory, covering eight of the fifteen[9] Scope 3 categories.[10] It set targets in seven of those categories (purchased goods and services, capital goods, fuel and energy related activities, waste from operations, upstream leases, business travel, employee commuting), with suggestions for expanded reporting for any remaining categories in the future.

[9] Categories including Category 10 (Processing of sold products) and Category 11 (Use of goods and services sold), do not apply to the Campus value chain since CU Boulder does not sell intermediary products used in manufacturing, nor are there *necessarily* emissions associated with using one's college degree. Emissions from Category 4 (Upstream transportation and distribution) are currently included in Category 1, which uses a full life cycle emission factor, but will be specifically addressed in future CAP updates. Appendix C, entitled, "Scope 3 Annex", details the methodology CU Boulder has taken to measure Scope 3 emissions, and lists plans for measuring the remaining categories. The categories included in this CAP align with the campus' core goal of achieving 50% GHG emission reduction in certain Scope 3 emissions by 2030 and 100% by 2050, from a 2019 baseline.

[10] Emissions from "Investments" have also been estimated as a ninth stand alone category, due to the fact that investment decisions are handled at the University System level and not the campus level. An estimate of these emissions can be found in the Scope 3 Appendix.

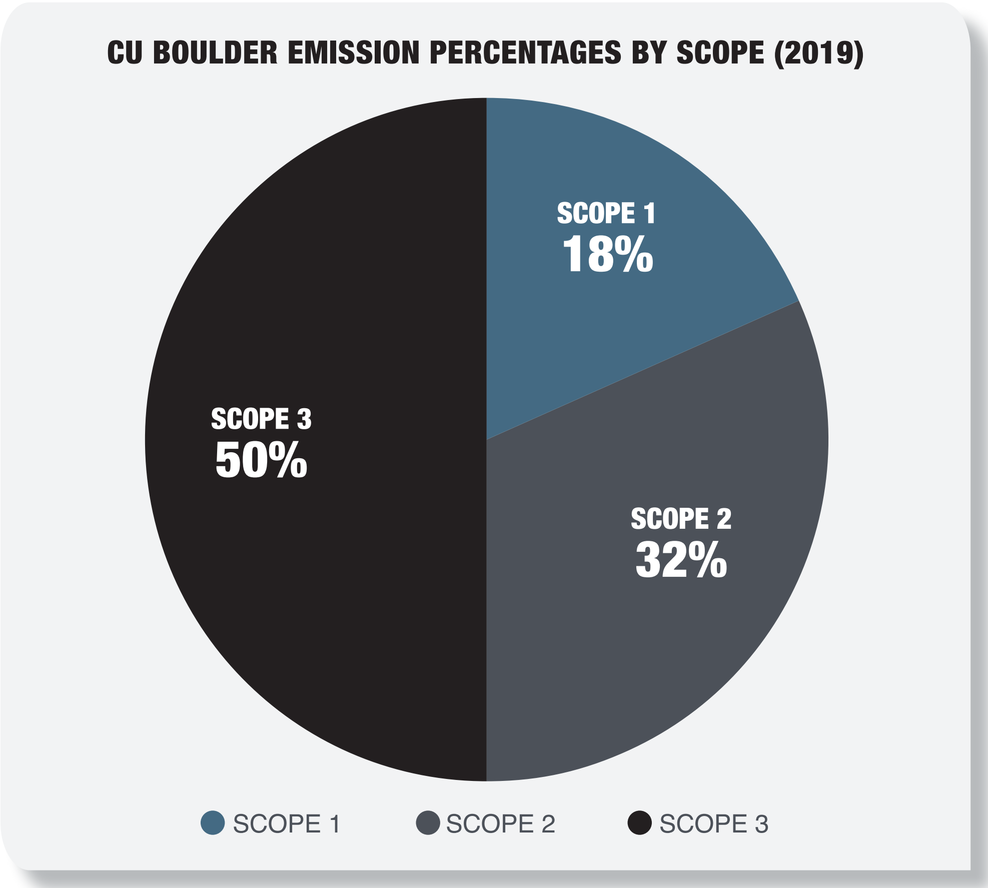
BASELINE. In 2019, the University produced 130,741 metric tons of carbon dioxide equivalent (MTCO2e) from its scope 1 and 2 activities.[11] Adding initial Scope 3 emission estimates creates an additional 129,625 MTCO2e. Table 2 and Figure 1 summarize CU Boulder's total emissions.

TABLE 2: Summary of emission totals from Scopes 1, 2, 3 in 2019.

CATEGORY	MTCO2e
SCOPE 1	**48,213**
Natural gas	45,097
Total Fleet	1,841
Fugitive Emissions, Fertilizer Usage, Refrigerant Leakage	1,275
SCOPE 2	**82,528**
Purchased electricity	82,528
SCOPE 3	**129,625**
Category 1: Purchasing	12,216
Category 2: Capital Goods	20,944
Category 3: Fuel and Energy Related Activities	21,782
Category 5: Waste Generated in operations	2,595
Category 6: Business Travel	19,954
Category 7: Employee and Student Commuting	16,407
Category 8: Upstream Leased Assets	538
Category 9: Downstream Transportation and Distribution	35,189

[11] This figure may differ slightly from other reported estimates of campus emissions, including Campus Sustainability Indicator Management & Analysis Platform (SIMAP) reports. The reason is slightly different reported use data or emission factors. The figure here was created by a proprietary software called Climate and Energy Scenario Analysis, or CESA. CU Boulder will retain the CESA model that has been specifically designed for the campus.

FIGURE 1: CU Boulder Emission Percentages by Scope



SCOPE 3 consists of 15 distinct categories of emissions as defined by the GHG Protocol. Eight of the categories have been included in CU Boulder's first Scope 3 inventory, some using significant assumptions given the lack of available data. Seven of the categories have reduction targets. The other categories were either not applicable to CU Boulder's operations or fell outside the direct control of CU Boulder. In particular, investments, which are managed at a system (not campus) level are estimated but not included in formal inventory or targets at this time.

TABLE 3: Summary of Scope 3 Categories that are included in the inventory and for which targets are set.

#	CATEGORY	INVENTORY	TARGET SET
1	Purchased goods and services	Y	✔
2	Capital goods	Y	✔
3	Fuel and energy related activities (FERA)	Y	✔
4	Upstream transportation and distribution	Included in Category 1[12]	
5	Waste generated in operations	Y	✔
6	Business travel	Y	✔
7	Commuting	Y	✔
8	Upstream leased assets	Y	✔
9	Downstream transportation and distribution	Y	
10	Processing of sold products	N/A	
11	Use of goods and services sold	N/A	
12	End-of-life treatment of sold products	N/A	
13	Downstream leased assets	N/A	
14	Franchises	Not currently included	
15	Investments	Out of CU Boulder direct Scope/Control. See Scope 3 Annex for an estimate.	

[12] These are emissions associated with the transportation and distribution of goods and services (e.g. food, merchandise, etc.) supplied to the university. For this inaugural iteration of a Scope 3 inventory, a life-cycle emissions factor that considers all emissions from upstream products, has been used for Category 1 meaning emissions for category 4 would be included. This will not be the most accurate way of measuring Category 4 emissions, and other strategies will be employed for future CAP updates.

Reducing Scope 1 and 2 Emissions

Several foundational strategies were developed and evaluated to reduce emissions from Scopes 1 and 2.[13] CU Boulder's 2022 Energy Master Plan[14] was used as a guide for many strategies, while their GHG impact, and various financial performance indicators were evaluated in an Excel-based software model called the Climate and Energy Scenario Analysis tool (CESA).[15] Projects were identified under four primary categories: building efficiency and electrification, decarbonization of the campus heating system, onsite and offsite renewable energy, and fleet conversion to electric vehicles. Then, using the CESA model, the CAP Steering Committee developed three carbon reduction scenarios to create a roadmap to meet the established Science Based Targets for CU Boulder.

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[13] Scope 2 emissions are not technically produced on campus, but at the source of electricity generation. Still, they can be directly controlled on campus by reducing electricity use. Further, as generation sources become less carbon intensive, emissions from all electricity consumption will fall.

[14] CU Boulder Energy Master Plan 2022.

[15] CESA is a proprietary tool of Blue Strike Environmental, a private consultancy. Blue Strike performed the tool customization and has delivered the completed tool to the Boulder Campus. CESA is a comprehensive techno-economic model that helps decision-makers understand the financial, environmental, and energy impacts of a suite of climate and energy mitigation measures. The tool has been designed to reflect the University's energy profile and facilities design, and is used to evaluate multiple strategies to achieve zero GHG emissions.

FIGURE 2: Scenario GHG Reduction Pathways for Scope 1 and 2 Emissions

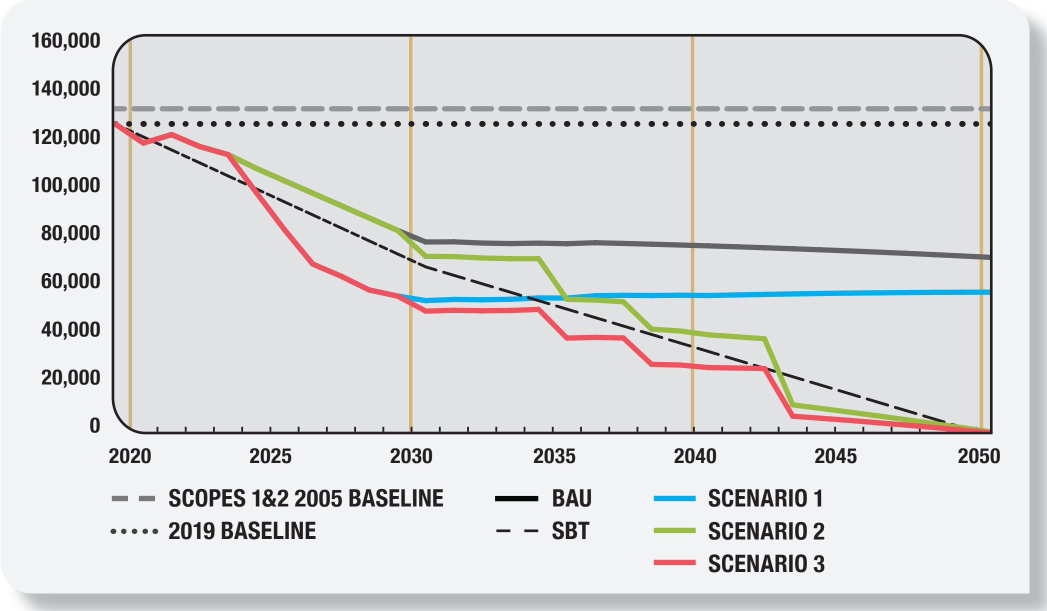


Figure 2 provides a depiction of each scenario's GHG reduction pathway to 2050. The dotted line represents the 2019 baseline, while a gray dashed line shows the 2005 baseline for comparison. The solid black line is a business-as-usual scenario in which utility-sourced electricity gradually decarbonizes. The black dashed line represents CU Boulder's science based emissions target (SBT).[16] Finally, the colored lines are the three scenarios. The three scenarios are as follows:

SCENARIO 1 (BLUE LINE): Energy efficiency (EE), renewable energy (RE), and Fleet replacement. This Scenario considers over 300 energy efficiency projects (lighting, controls, envelope & HVAC), 7 MW of renewable energy installations, and the replacement of approximately 365 internal combustion campus fleet vehicles with electric vehicles. This combination of projects allows CU Boulder to achieve its short-term goals, but not its long-term goals.

SCENARIO 2 (GREEN LINE): Heating system upgrade (HSU); this is the phased conversion of Central Campus heating to an electrified, lower temperature hot water system. This complex series of projects is currently being studied; results, including project schedule and costs, are expected in 2024. Decarbonizing the campus heating system is expected to contribute significant emission savings, but will not achieve CU Boulder's annual targets on its own.

SCENARIO 3 (RED LINE): Combines all energy efficiency projects with all heating system upgrades. This combination of projects will achieve CU Boulder's short and long term goals, of 50% reduction by 2030 and 100% by 2050.

[16] A Science Based Target (SBT) refers to the emissions pathway for an entity such that it plays its part in keeping global temperature rise below 1.5°C. A SBT for a university such as CU Boulder, can be calculated using a downloadable calculator available from the Science Based Target Initiative (SBTi).

The CAP recommends that Scenario 3, pictured with the red line, be pursued as the selected pathway to meet the zero emission science based target. This option accelerates short-term emissions reductions through building efficiency, renewable energy, and fleet decarbonization and would reduce Scope 1 and 2 emissions significantly below the science-based target. Scenario 3 saves 1,201,910 MTCO2e between now and 2050. Table 4 outlines the implementation timeline and carbon savings for this scenario, while Figure 3 shows the GHG reductions expected by decade, along with Figure 4 that visualizes the initial costs associated with implementation.

TABLE 4: Implementation timeline and carbon savings by strategy[17]

STRATEGY/DECADE	YEARS 2024–2030	2031–2040	2041–2050
Building Efficiency	197,629 MTCO2e	2,781 MTCO2e	No projects
Renewable Energy	20,066 MTCO2e	No projects	No projects
Fleet Replacement	5,273 MTCO2e	5,434 MTCO2e	2,825 MTCO2e
Heating System Upgrades	138,348 MTCO2e	256,118 MTCO2e	462,928 MTCO2e

ZERO EMISSIONS DEFINITION

Zero emissions means that there are no greenhouse gas emissions produced from a particular source or activity. It indicates a complete elimination of carbon dioxide (CO2) and other greenhouse gas emissions.

Carbon neutrality means that the net greenhouse gas emissions produced by a source or activity are balanced by an equivalent amount of emissions removed from the atmosphere or offset through various measures.

[17] Savings of MTCO2e calculated in CESA Model. Savings include all emission reductions for projects started in a selected decade.

FIGURE 3: Emission Reductions by Decade (MT CO2e)

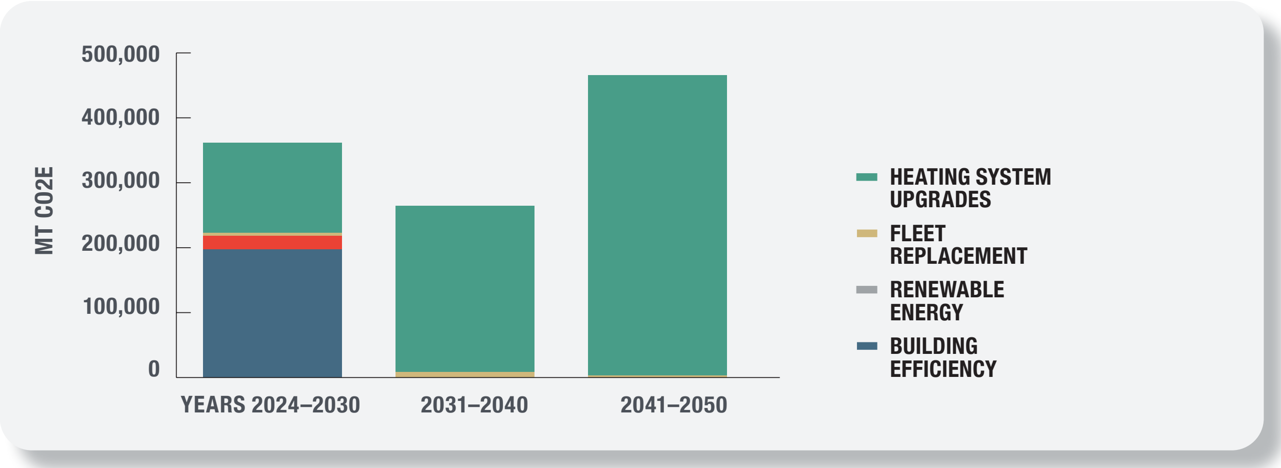
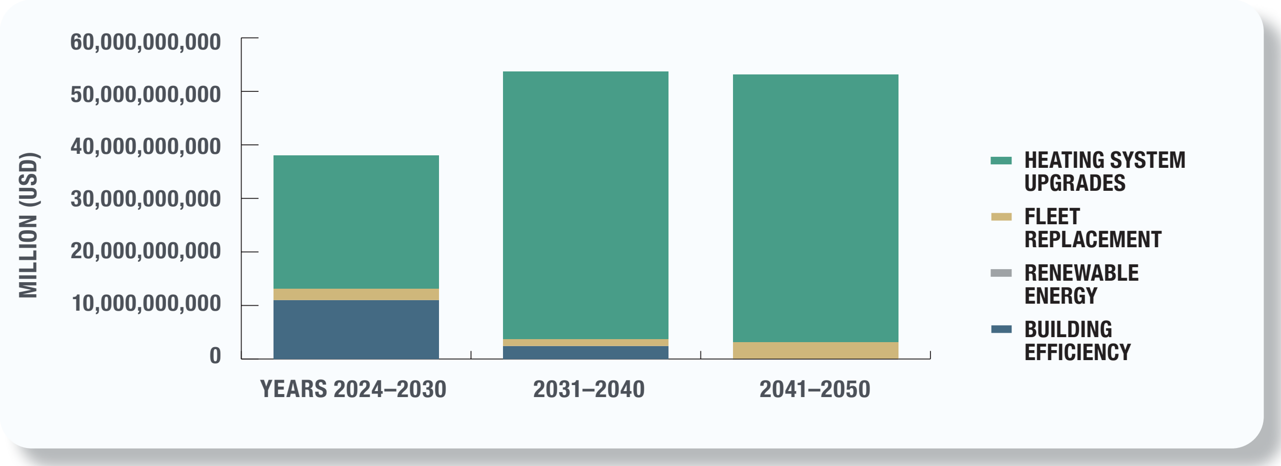


FIGURE 4: Total Investment by Decade (Million USD)



Often a net present value (NPV) is used to provide comparative evaluations of projects. NPVs include investment costs, ongoing operational and maintenance costs, but also cost savings benefits from many of the projects. Other benefits can be estimated by placing a value on the future carbon savings; this is called the social cost of carbon, and has been included in the evaluation to reflect this long-term benefit. Due to the uncertainties about costs, especially for heating system upgrades, NPV values are estimates and primarily useful as comparisons. Table 5 shows the NPVs of the strategies by decade.[18]

TABLE 5: Implementation timeline and net present value[19] by strategy in millions of dollars

STRATEGY/DECADE	PROJECTS INITIATED IN YEARS 2024–2030	PROJECTS INITIATED IN YEARS 2031–2040	PROJECTS INITIATED IN YEARS 2041–2050
Building Efficiency	36.7	-10.4	No projects
Renewable Energy	-3.0	No projects	No projects
Fleet Replacement	-16.2	-6.2	-11.9
Heating System Upgrades	-173.2	-265.1	-188

[18] Negative NPVs are often typical of a public institution, which seeks to deliver services and not a return on investment. NPVs compare costs to benefits, and many of the benefits delivered by public bodies are difficult to quantify and therefore absent from the numerical calculations. As a result, NPVs are often used as comparative indicators to differentiate the value of competing projects.

[19] The net present values of the building efficiency projects are only counting electricity savings as benefits, not natural gas. Natural gas savings accrue to the central utility plant, which is counted under the heating system upgrades.

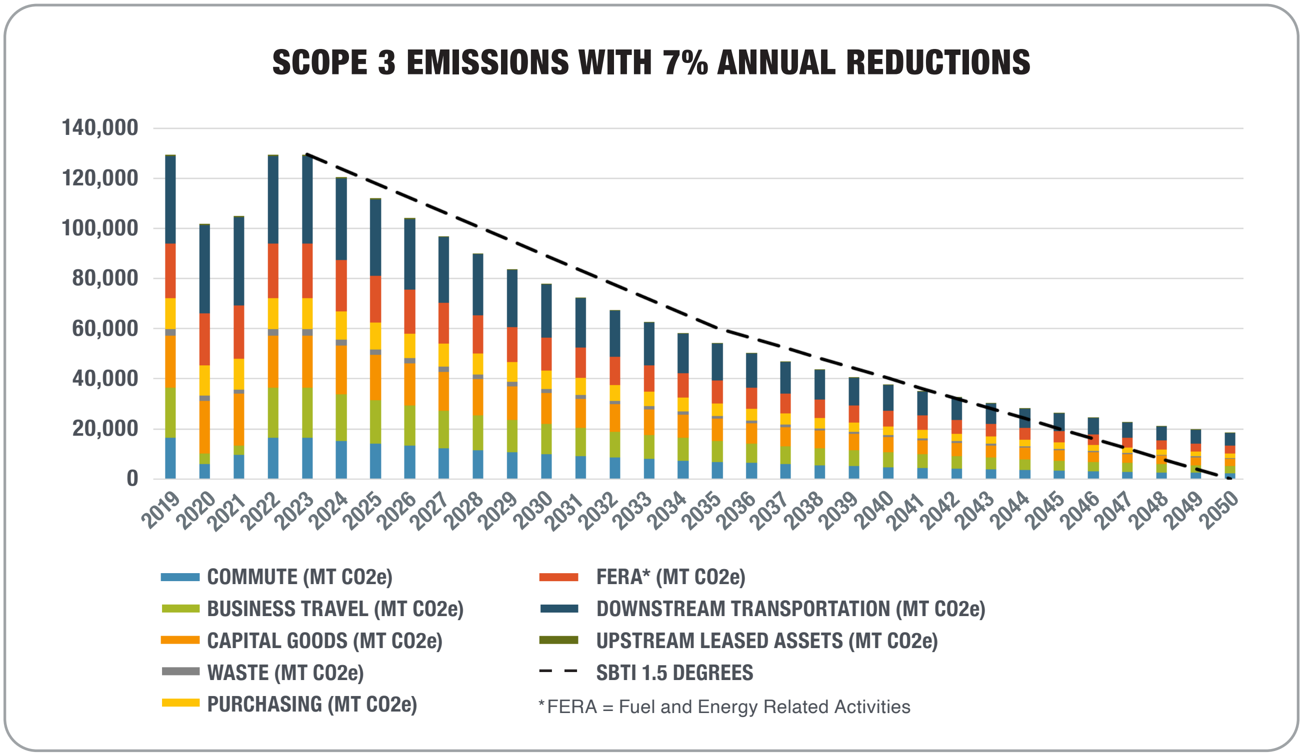
Reducing Scope 3 Emissions

Scope 3 emissions, which are sometimes called value-chain emissions, are produced through the upstream and downstream activities of CU Boulder's operations. While they are "owned" by others (generally, they are others' Scopes 1 and 2 emissions), CU can influence Scope 3 by establishing policies and programs that address the supply chain (e.g., food, building materials, services, or purchased goods), and foster lower impact transportation options (commuting and CU Boulder-related air travel).

For this CAP, strategies for reducing Scope 3 emissions are described at a high level, and are more directional than specific. Many of the specifics will be developed in the detailed planning work to follow, such as in the development of a Transportation Demand Management plan, a campus EV charging plan, and a new construction policy. In other areas, additional benchmarking and engagement are required to develop more detailed strategies, such as with Category One emissions (e.g. food purchases). The following figure shows what a 7% annual reduction would look like spread evenly across the various categories as an illustration of meeting CU Boulders' goal. In reality, the reductions will take place in proportion to where CU Boulder has the most leverage in the short, medium, and longer term.

To achieve campus goals for Scope 3 reductions will require three significant steps: 1) a more thorough and consistent data collection process to establish a baseline and monitor progress, 2) stakeholder engagement to collaborate on solutions, and 3) the design and execution of specific plans, policies, and strategies. These steps are currently being organized and taken by the University.

FIGURE 5: Selected Scope 3 Categories and Targets (shows 7% annual reductions)



Co-Benefits

In this Climate Action Plan, “co-benefits” refer to positive outcomes that arise alongside efforts to reduce emissions. Co-benefits are expected from strategies in this plan, and some can be associated with particular strategies. While there are many reasons to take climate action, the CAP focuses especially on the co-benefits of equity, health, and campus resilience outcomes.

EQUITY: Implementing climate action measures at CU Boulder addresses not only the pressing environmental challenges, but can also serve as a catalyst for promoting equity within the university community. Climate action initiatives offer several equity co-benefits across key sectors. Recognizing the disproportionate effects of climate change on some communities, this CAP seeks to promote equity through the selected strategies. For example, transportation and mobility improvements can provide heightened access to underserved students; residential housing efficiency and electrification improve on-campus living space; and improving electricity resiliency with solar photovoltaic (PV) strengthens reliability for on-campus residents. With effort, initiatives can include members of the CU Boulder community that may otherwise be excluded from participation and the associated benefits. Our process has begun to seek out those voices to increase participation and feedback.

HEALTH: Central to the CAP is a reduction in the use of combustible fuels. This will produce benefits in air quality, from reduced particulate matter, nitrogen oxides (NOx) emissions, and smog formation. Furthermore, the production and refining of fossil fuels causes direct impact to Colorado communities who have been historically and currently burdened by these operations. While the conversion from a diesel to an electric bus might have limited overall GHG emissions benefits, the impact to air quality, water quality, and noise are significant, and therefore this measure remains a high priority in the CAP.

RESILIENCE: Many of the strategies will improve campus climate resilience, while also reducing emissions. However, many aspects of resiliency will require further investigation. Building efficiency will reduce loads on the electrical system, increase comfort in a warming environment, and provide improved operability and controllability. The conversion of fleet and building operations to electricity insulates the campus from the volatility of fossil fuel markets and can reduce certain operating costs. On the other hand, the central plant has the capability to provide gas-fired electricity to power the campus through a grid outage. It also plays an important role for the local utility in keeping high-emitting peaking plants off line. It is therefore critical that campus resilience and climate goals are considered in tandem.

There are other co-benefits as well. Several of the strategies will save the campus financial resources, when compared to a baseline. These include many of the energy efficiency projects that have been recommended. Additionally, the campus' reputation as an environmentally conscious university will be accelerated through sustainability successes. As an example, CU Boulder currently enjoys Gold Status in the STARS Certification program, but many initiatives will help it reach Platinum Status, which is the highest level, and a significant achievement. Still more benefits, such as research opportunities and educational possibilities have not been tracked in the CAP.

Implementation: Governance, Communication and Finance

Each strategy within this CAP is prioritized into three Tiers: Foundational (Tier 1), Supportive (Tier 2) and Complementary (Tier 3). Foundational strategies are those that directly reduce emissions and are drawn out as immediate priorities. Supportive strategies are ranked next and indicate strategies that have less of a direct GHG reduction potential but are still critical elements in reducing climate impacts. Complementary strategies are focused on educational and engagement areas that create durability and wider-reaching impact.

The implementation and progress of the CAP will be overseen by the Sustainability Executive Council, which is appointed by the Chancellor and composed of staff, faculty, and students. The day to day implementation of the CAP will be driven by the department managers, subject matter experts, and campus leadership. The following strategies in the areas of governance, communication and finance have been developed to help ensure success over time:

1. **GOVERNANCE:** Regular reporting of key metrics and progress to the Sustainability Council, which will offer formal reports to the Sustainability Executive Council and to the campus community two times per year. Those metrics and progress will be evident throughout the year on the CAP dashboard for any and all to access. Specific outreach to campus governance groups will be undertaken to report progress, and/or course corrections needed.

2. **ENGAGEMENT:** Successful implementation of the CAP will include an increasingly informed and engaged campus that understands how climate action is taking place and how they can participate and provide input and suggestions moving forward. The engagement goal for the CAP is to create regular communications and accessible points of connection with all parts of the campus community who wish to be engaged with this process. The communications and engagement working group of the Sustainability Executive Council will be the lead on organizing all engagement.

3. **FINANCE:** Developing cost effective and economically viable financing pathways that address both one-time and ongoing costs, and that achieve the maximum benefits has been a key consideration of this CAP. Financing a CAP requires a variety of strategies and sources of funds, including internal funds, grants from government and other organizations, debt and possibly public-private partnerships (PPP). The 2022 Inflation Reduction Act (IRA) has also provided an unprecedented source of funds that is available to public entities. All of these and other financing strategies will support CAP implementation. As a possible example of a capital expenditure plan, Table 6 outlines the planned investment totals required in the next ten years (2024-2034).

TABLE 6: 10-year estimated investment costs (in $ millions) associated with achieving Core Goal 1[20]

YEAR	TOTAL ESTIMATE	LIGHTING	ENVELOPE	RCX	HVAC	FLEET & CHARGING	SOLAR	HSU
10-year Totals	$374	$34	$7	$4	$59	$20	$0	$250

Lighting = replacing lights and fixtures with high efficiency alternatives;

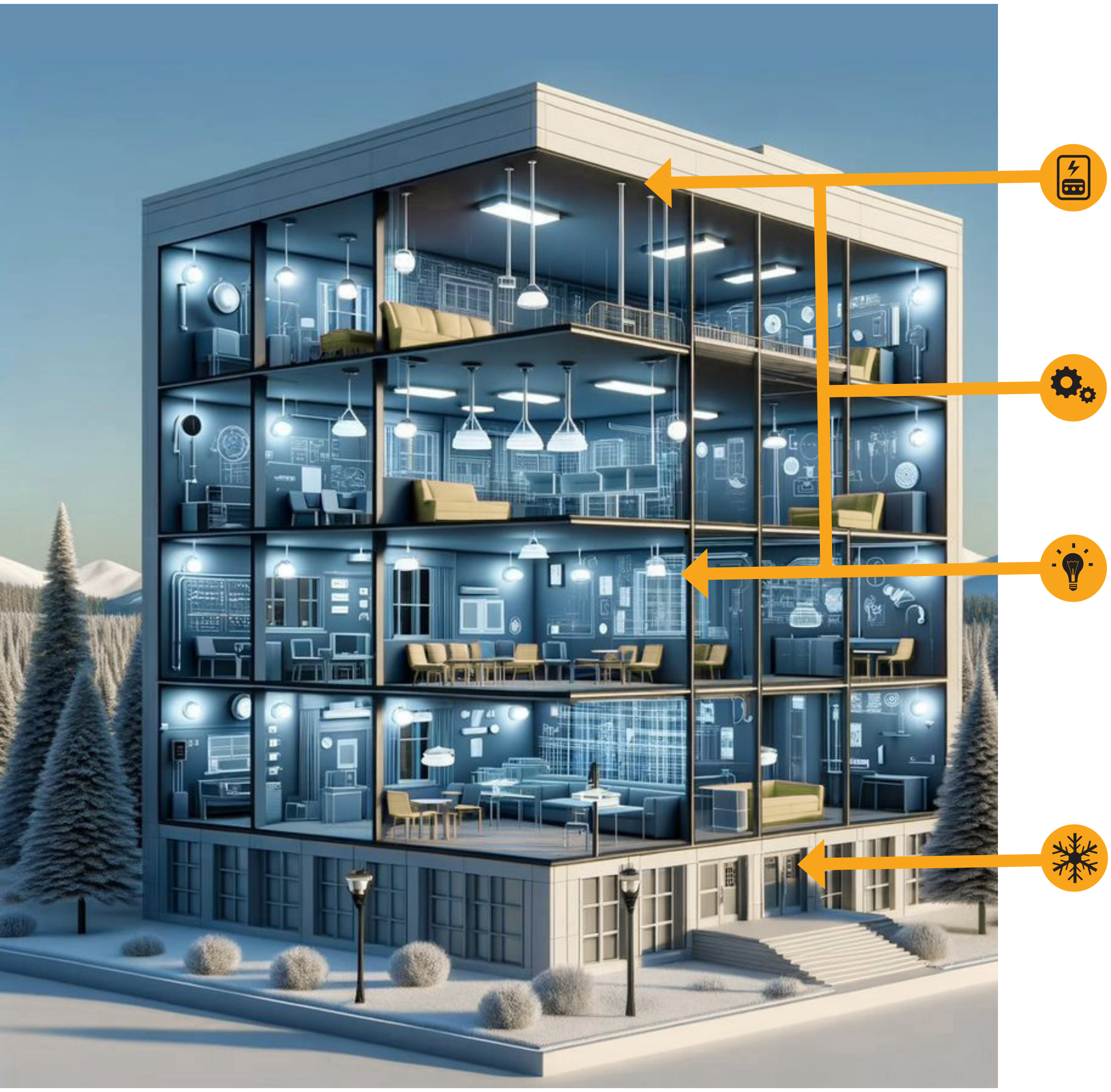
RCx = Building recommissioning: testing and optimizing system performance;

HVAC = heating, ventilation, and air conditioning;

HSU = Heating System Upgrades: replacing gas boilers with electric & transitioning central campus district energy system to a low-temp hot water system.

[20] Cost estimates for lighting, Envelop, RCx, and HVAC are from Consultant. Cost estimates for fleet, charging and solar are from Optony, Inc. and costs for HSU are internal CU estimates.

Building Projects

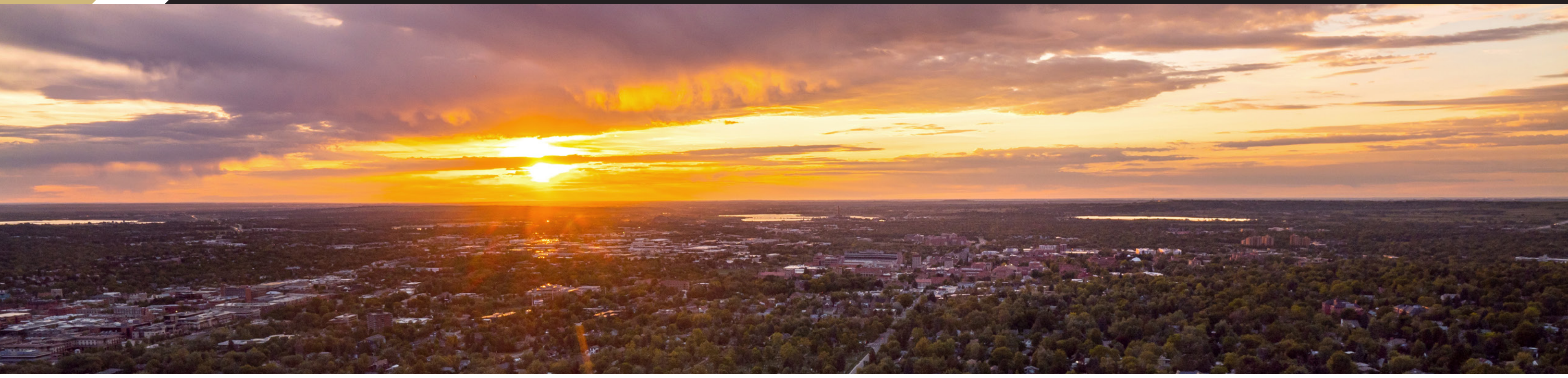


HVAC UPGRADES
Involves upgrading energy recovery, ventilation upgrades, HVAC Control Upgrades, piping and equipment insulation, temperature setbacks.

COMMISSIONING
Identifying and fixing building performance problems that have developed over time, optimizing systems, and ensuring energy efficiency goals are met.

LIGHTING UPGRADES
Involves: 1) replacing lamps and fixtures with energy efficient LED lighting, and 2) daylight controls and operating sensors

ENVELOPE UPGRADES
Includes weatherization and window upgrades.



Conclusion

Achieving climate goals and the associated benefits is considered vital to the University. It will require significant upfront investment, robust annual funding, and a re-evaluation of many of the business-as-usual modes of campus management. The projects and timelines throughout this report draw from Scenario 3, summarized above. Future investment decisions about all the projects associated with climate action activity are subject to currently unknown factors including available funding, emerging technologies, the findings of new studies, and the perspective of future stakeholders.

TABLE 7: Summary of All Strategies

TIER	SCOPE	SCOPE 3 CATEGORY	STRATEGIES	CO-BENEFITS
1	1+2	NA	Re-commissioning projects	Health, Resilience, STARS Platinum, Cost Savings
1	1+2	NA	HVAC system retrofits	Health, Resilience, STARS Platinum, Cost Savings
1	1+2	NA	Envelope improvements	Health, Resilience, STARS Platinum, Cost Savings
1	1+2	NA	New Building Efficiency Design Standards	Health, Resilience, STARS Platinum, Cost Savings
1	1	NA	Main campus heating system upgrade	Health, Resilience, STARS Platinum
1	2	NA	Lighting retrofits	Health, Resilience, STARS Platinum, Cost Savings
1	2	NA	On-campus solar PV	Health, Resilience, STARS Platinum, Cost Savings
1	3	2	Update building materials standards for new construction and major renovations	Health, Resilience, STARS Platinum
1	3	7	Institute a Transportation Demand Management Plan encouraging mode shifting	Equity, Health, Resilience, STARS Platinum
1	3	7	Develop an affordable community EV Charging plan	Equity, Health, Resilience, STARS Platinum
1	1	NA	Electrify campus vehicle fleet	Health
2	3	1	Identify opportunities to assess & implement carbon reduction with suppliers	STARS Platinum
2	3	2	Reduce embodied carbon by >10% and target 20% for new construction and major renovation projects; align with Buy Clean CO	STARS Platinum
2	3	5	Institute a construction waste diversion policy	STARS Platinum
2	3	6	Facilitate discussion on options to reduce business travel emissions	STARS Platinum
2	3	6	Incentivize use of airlines that promote sustainable fuel use, but not purchased carbon offsets	STARS Platinum
2	3	7	Develop a community shared EV program	Equity, STARS Platinum
2	1+2	NA	Optimize Existing Building Space	Equity, STARS Platinum, Cost Savings
2	3	3	Reduce upstream gas leakage (will result from decreased gas use)	STARS Platinum
3	3	1	Establish a food recovery program on campus for all catering and culinary events	Equity, STARS Platinum
3	3	1	Increase percentage of locally-grown foods purchased and plant-based meals served	Equity, Health, Resilience, STARS Platinum
3	3	5	Eliminate purchase of disposable or single-use plastics for nonessential uses	STARS Platinum
3	3	5	Establish a campus reuse center (clothes, furniture, etc.), and online reuse platform	Equity
3	3	5	Write a Zero Waste plan to address construction and demolition, and strategies around compostables and food recovery efforts	STARS Platinum
3	3	5	Translate the results of a pre- and post-waste audit into an actionable waste diversion roadmap with expected annual reporting metrics	STARS Platinum
3	3	7	Host engagement sessions with the campus community to determine best incentives for the use of electric vehicles and e-bikes. Consider distributing e-bikes to low-income students/staff through a sponsorship program.	Equity
3	3	7	Improve the VMT estimation process to ensure accuracy and replicability of the VMT number annually for sustainability reporting and program analysis	
3	3	7	Expand staff vanpools to make them available to more low-income staff	
3	3	9	Initiate surveys to measure student travel during breaks and family visit air travel	
3	3	9	Educate students and parents on emissions from air travel	
3	3	9	Explore options, along with CU system partners, to reduce travel related emissions during holiday breaks	

CO-BENEFITS KEY

- EQUITY
- HEALTH
- RESILIENCE
- STARS PLATINUM
- COST SAVINGS

1. INTRODUCTION

Background

With the signing of the "American College & Universities Presidents Climate Commitment" (ACUPCC) in 2007, CU Boulder began assembling a formal vision and structure for sustainability governance, one that prioritizes reducing greenhouse gas emissions to net zero as soon as possible. The campus began benchmarking progress using the Sustainability Tracking Assessment and Reporting System (STARS), the de facto national standard for sustainability reporting. In 2009, per the requirements of CU's commitment to the ACUPCC, the campus published the "Conceptual Plan for Carbon Neutrality" (CPCN) which serves as an underlying framework for this 2024 Climate Action Plan (CAP). The 2009 CPCN was compiled by CU staff, faculty and students, reviewed and approved by NREL, and then approved by the CU Board of Regents who directed CU to implement it and report on implementation progress every three years. There was a 2014 Progress Report submitted to the Board of Regents.

CU Boulder is part of a university system in a state that has also been a climate leader. In 2004, Colorado residents were the first in the country to put a renewable energy standard on the ballot. Amendment 37, approved by voters, required state utilities to provide 10% of their electricity from renewable sources by 2010. That standard was doubled and then tripled. By 2019, Colorado established itself as a national climate leader by becoming the first state in the U.S. to put into statute both short- and long-term goals for cutting climate pollution. The state set targets to reduce greenhouse gas (GHG) emissions (from 2005 levels) by at least 26% by 2025, 50% by 2030, and 90% by 2050. Following the enactment of this statute, the state strengthened its 2050 target by further committing to achieve net-zero GHG emissions by 2050. To support these targets, the state has established five year performance metrics to ensure ongoing progress. CU Boulder is using the State of Colorado's guidance to adopt similar reduction goals.

The 2024 CAP is written in response to the 2021 "Call to Climate Action'' issued by Philip DiStefano, the University's Chancellor. This "Call to Climate Action" directly re-commits the campus to reach carbon neutrality by no later than 2050, determine what's required to achieve a Platinum STARS rating, advance campus as a living-learning laboratory for innovations in sustainability, and create a framework to hold the campus accountable to these commitments. CU Boulder has also joined global and national alliances committed to reducing emissions, including the Second Nature's Climate Leadership Network and the International Sustainable Campus Network, and the American College & University Presidents' Climate Commitment. The latter is a pledge by over 700 colleges and universities to achieve carbon neutrality by 2050 or sooner.

These commitments, and the specific actions that follow, are based on the recognition of the following guidance, acknowledged by the CAP Steering Committee:

- Given the pressing nature of the climate crisis, there is a growing recognition of the moral imperative for all sectors of society, including higher education, to reduce their environmental impact and foster sustainability.
- The Campus did not reach its 2020 emission reduction targets by 4.4% (out of 20%) of total emissions.[21]
- As educational and research institutions, universities have a responsibility to lead by example. By setting emission targets, they demonstrate a commitment to tackling climate change and environmental stewardship.
- Having concrete emission targets helps to integrate sustainability into the curriculum and campus operations, providing a living laboratory for students to learn about and engage with sustainability practices. Further, by pursuing aggressive emissions targets, they can drive advancements in sustainable technologies and practices, potentially contributing solutions that can be adopted by other sectors.
- Many prospective students and employees are attracted to institutions that demonstrate a commitment to sustainability; actions taken to meet sustainability goals can enhance a university's reputation and make it more competitive.

[21] The target was 108,487.53 MTCO2e against a 2005 baseline of 135,609 MT. 2020 emissions were 114,450.48 MT, according to CU's Second Nature's submission. Subtracting 114,450.48 from 135,609.41 equals 21,158.93, which is a 15.6% reduction, 4.4% short of the 20% target.

- Setting and working towards emissions targets can help universities anticipate and adapt to the physical and regulatory risks associated with climate change and future legislation on carbon emissions.
- Institutions that show leadership in sustainability often find it easier to establish partnerships with government bodies, NGOs, and the private sector, which can lead to new funding opportunities for research and development.

With these acknowledgments as a foundation, the CAP Steering Committee ratified the following **guiding aims** at the outset of this initiative:

1. Develop a GHG inventory inclusive of Scopes 1, 2, and 3, and a reduction strategy that could meet Science-Based Targets consistent with UN targets.
2. Ensure that community health, equity, and resilience are an important lens through which recommendations made in the CAP can be evaluated.
3. Focus on reducing emissions (a) target 50% reduction in Scopes 1 and 2 by 2030 against 2019 baseline, (b) a similar 50% reduction in measurable subset of Scope 3 emissions by 2030, and (c) a clear path to a zero emissions target for all categories by no later than 2050.
4. Meet Scope 1 and 2 goals without the use of unbundled RECs or offsets.[22]
5. The University is a customer of Colorado's largest investor-owned utility, Xcel Energy. Given that Xcel's goal is to achieve 80% to 85% clean energy (from 2005 baseline) by 2030,[23] part of the goal will be to evaluate and implement electrification strategies that fully take advantage of this transition and include consideration of on- and off-site renewable electricity generation and the time of use impact of use and generation.
6. Find cost-effective and economically attractive pathways that address both one-time and ongoing costs, and that achieve the maximum benefits (including health, equity, resilience, life cycle, and local economic development) for the campus and its stakeholders in realizing its goals.

SET TARGETS

The targets set forth in this CAP are ambitious, but are based on a confidence that these goals are technically and economically viable. They build from of a series of past activities and current efforts including:

- **Bus and fleet electrification**
- **A preliminary study of options for heating system decarbonization**
- **Investigation into additional onsite solar options**
- **Development of up to 5.9MW offsite solar array as part of the state's new Virtual Net Metering Program (VNEM)**
- **Renovation of buildings to be compatible with a future low temperature hot water system (e.g. Hellems)**
- **Design of RES1 to be combustion free and low temperature compatible**
- **The funding of energy efficiency projects in 18 buildings.**
- **Started phase 1 of the steam to low temperature hot water conversion for the Williams Village campus**
- **Pursuing two grant applications through the Colorado Energy Office to investigate viability of geothermal on CU Boulder campus**

[22] See Footnote 7.

[23] See Xcel Energy: Clean Energy Plan at: https://www.xcelenergy.com/company/rates_and_regulations/resource_plans/clean_energy_plan.

Core Goals and Guiding Principles

The CAP is organized around five Core Goals, based on the background and motivation stated above:

1. **Achieve 50% reduction in Scope 1 and 2 emissions by 2030, from the baseline year of 2019, with a linear reduction to zero emissions no later than 2050.** Do so without the use of purchased offsets or unbundled RECs (renewable energy certificates). CU Boulder CAP implementers are in agreement that the intent is for decarbonization to happen more quickly and steps are being taken to seek out resources and coordinate the logistics to potentially accelerate the timeline.
2. **Achieve a 50% reduction of Scope 3 emissions by 2030** from the current baseline where accurate estimates can be established and which are within the University's influence and control. **Further reduce these emissions to zero by 2050.** The CAP begins the process of developing a Scope 3 inventory and then developing the strategies to achieve reductions in indirect emissions. It is anticipated that the quality of the inventory and the robustness of the reduction strategies will increase over time now that inclusion of Scope 3 emissions in the CAP is established.
3. Utilize climate action to **deliver to the CU Boulder community the co-benefits of health, equity, and resilience.** As the opportunity to connect climate action to other co-benefits becomes increasingly apparent, we anticipate additional strategies to be included in subsequent CAPs to do so.
4. Strengthen internal and external **management and accountability structures** to ensure the campus achieves the goals outlined in the plan. An implementation plan that includes governance and accountability structures is included in this CAP.
5. Build a **Community Engagement Strategy** to integrate communication, feedback, and reporting and achieve an increasing level of transparency with campus and the Boulder community. The implementation plan also includes communication, engagement, and reporting mechanisms, in support of campus operations and emission reduction strategies.
6. Maintain an affordable education, in the face of the campus' competing investment needs.

Approach

The update of the campus CAP began, in part, with the formation of a CAP Steering Committee composed of faculty, staff and students[24] which has subsequently guided the strategy development process outlined in this plan. The Steering Committee oversaw all steps to support the creation of this CAP. Moving forward, the Sustainability Council will be charged with monitoring the implementation of the CAP and informing the Sustainability Executive Council of progress and recommending revised actions as needed.

Within the CAP Steering Committee, an Equity Subcommittee was formed to ensure equity and social justice were incorporated into the analysis. This subcommittee has authored the Equity Section found in Chapter 5. For climate action strategies specifically, this subcommittee reflected on campus Diversity, Equity, and Inclusion goals as well as requirements for recognitional, distributional, procedural, and structural justice, to provide prioritized strategies with strong equity co-benefits (see call out boxes throughout the plan), and guidelines for implementing the CAP in an equitable fashion (see Chapter 5). More broadly, the goals of the equity subcommittee for this CAP included raising awareness around the intersection of climate change and social justice; supporting the creation of economic opportunities for marginalized[25] and frontline communities[26] around climate action strategies; and promoting diversity, equity, and inclusion in all climate action efforts including CAP decision-making.

1. The first step was to perform an inventory of CU Boulder's current level of greenhouse gas (GHG) emissions, including Scopes 1, 2, and 3 sources. The inventory was performed using 2019 data, and established a baseline, against which to measure candidate carbon reduction strategies.

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[24] https://www.colorado.edu/sustainability/programs/climate-action-plan.

[25] Marginalized includes, but is not limited to people with disabilities, low-income, disabled, LGBTQIA+ communities, Black, Indigenous, and People of Color, including Asian and Asian Americans, Native Hawaiian and Pacific Islanders, multiracial individuals, and Hispanic and Latinos , and other communities that may be disproportionately impacted and/or historically excluded.

[26] Frontline communities refer to those who experience environmental and climate costs (or hazards or problems) first and worst, and lack access to environmental benefits, who tend to be marginalized by systems of oppression.

2. The second step was to develop a series of strategies that have the ability to reduce emissions over time.[27]

3. The third step was to prioritize all the strategies into an executable timeline that would be able to consistently achieve the SBT goal between 2030 and 2050, and to clearly identify the bundle of strategies needed to achieve these goals. In some cases, certain strategies were prioritized because of the co-benefits they included (e.g. bus electrification) – such as equity, community health, or resilience – in addition to their GHG emissions impact.

4. The fourth step was to perform a benefit-cost analysis to estimate the first costs of implementation and the life-cycle impacts of operational costs. To integrate externalities associated with Climate Change, a "Social Cost of Carbon" was included to show how a given measure's net present value would change as a result.[28]

TABLE 8: Co-Benefit Summary

CO-BENEFIT	SYMBOL
Promotes / Strengthens Climate Equity and Justice	
Increases Campus Resilience (infrastructure, operations, programs, people) to Climate Events	
Improves Community Health	
Augments STARS Rating	
Saves money against a baseline	

5. The fifth and final step was to develop an implementation plan for the recommended steps. This step included developing governance and communication structures to ensure CAP success. One such communication piece is the CAP Dashboard, an online tracking tool that monitors the progress that has been made.

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[27] The CAP focuses on engineering solutions to emissions reduction. While it recognizes the importance of behavioral approaches, there are relatively few included. While necessary, influencing individual behaviors can be challenging and inconsistent, whereas engineering solutions provide tangible, scalable impacts on reduction goals.

[28] The social cost of carbon is an estimate of the economic damages associated with a small increase in carbon dioxide emissions, conventionally one metric ton, in a given year. This metric is intended to provide a comprehensive measure of the value of the impacts of climate change, including, but not limited to, changes in net agricultural productivity, human health, property damages from increased flood risk, and changes in energy system costs, such as reduced costs for heating and increased costs for air conditioning.

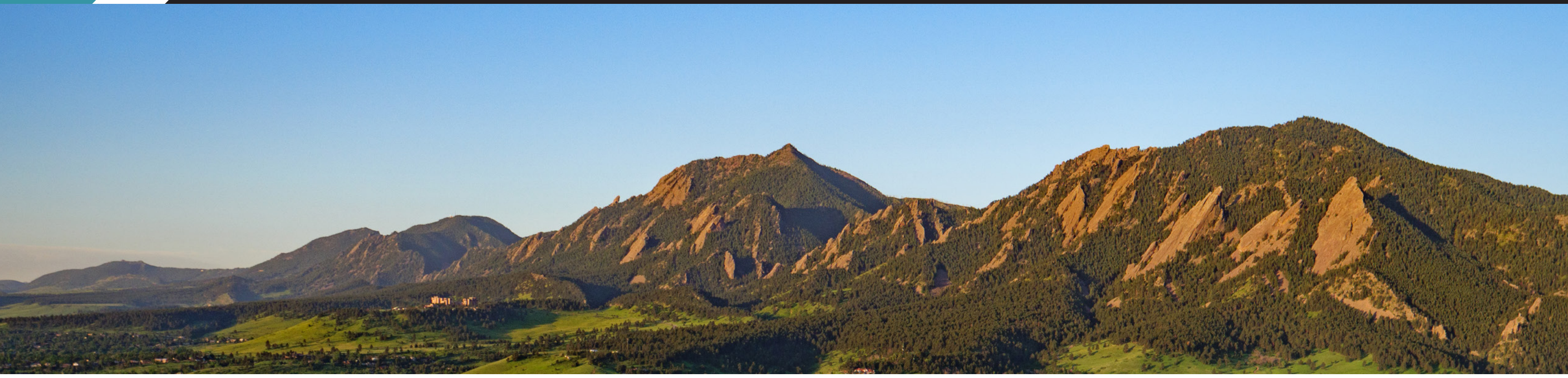
What Can You Do?

This CAP focuses on engineered changes to campus operational systems. However, everyone can contribute to mitigating climate change through individual actions that reduce emissions in major sectors such as energy, transportation, and waste, both on campus and off. To reduce the carbon impact of energy consumption on campus, better utilization of our current buildings should be a first step so we aren't heating, cooling, and lighting buildings that are mostly empty. Turning off or turning down lights and equipment in places that individuals control, such as dorm rooms, is another. Off campus, people can work towards making their homes (current or future) more efficient and switch to electricity for heating, hot water, and cooking.

Transportation emissions can be reduced by using public transportation, and shifting to electric or human powered mobility. To reduce emissions associated with purchased goods, shifting purchasing to emphasize circularity and reuse, as well as wasting less of what we purchase (e.g. food), and using only materials that can be diverted for recycling or composting will reduce both upstream and downstream emissions. Lastly, personal decisions such as shifting to an increasingly plant-based diet or reducing unnecessary flights can also have an impact.

Waste reductions can be achieved through recycling, composting, and reuse programs. Engaging in educational programs and advocacy for environmental issues can also raise awareness and drive action towards a more sustainable future. These efforts, while individually small, can collectively make a significant impact on reducing the campus's carbon footprint.

2. BASELINE, FORECASTS AND TARGETS

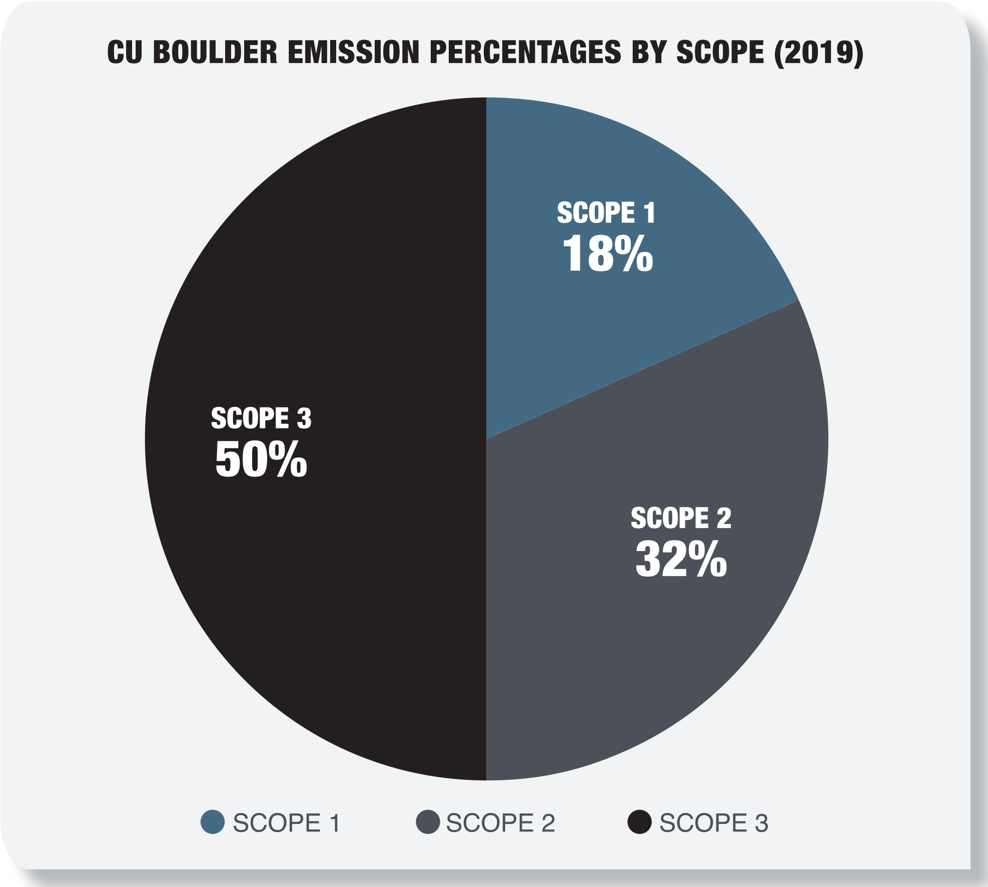


As noted, the first step in the planning process was to undertake a GHG inventory. For the purpose of carbon accounting, emissions can be divided into three areas known as Scope 1, Scope 2, and Scope 3. Emissions from Scopes 1 and 2 can be calculated using energy consumption data, while Scope 3 emissions generally require activity data to estimate a GHG impact, Figure 6 shows the breakdown of emissions, by percentage, for each Scope. This CAP represents the first time that CU Boulder has included Scope 3 emissions in their GHG inventory.

TABLE 9: Working definition of three emission Scopes

SCOPE 1	Carbon emissions resulting directly from fuel combustion on campus, primarily natural gas for heating or CU Boulder-owned vehicles.
SCOPE 2	Carbon emissions associated with energy purchased by CU Boulder and generated elsewhere, primarily grid electricity used on campus.
SCOPE 3	Carbon emissions resulting indirectly from CU Boulder operations, either from upstream activities, such as purchases of goods and services, or downstream activities, such as students and faculty commuting to and from campus. The University does not have direct control over these emissions, though it can exert influence over its operations, procurement and other activities to reduce them.

FIGURE 6: Breakdown of CU emissions by Scope.[29]



[29] For Scope 3 inclusions and rationale, see Appendix D.

Inventory

SCOPES 1 AND 2

Total Scope 1 and 2 2019 baseline emissions for CU Boulder was 130,741 MTCO2e.[30] The year 2019 was used as the baseline for the analysis due to incomplete data for 2022, and to avoid the effects of COVID-19 experienced in 2020 and 2021.

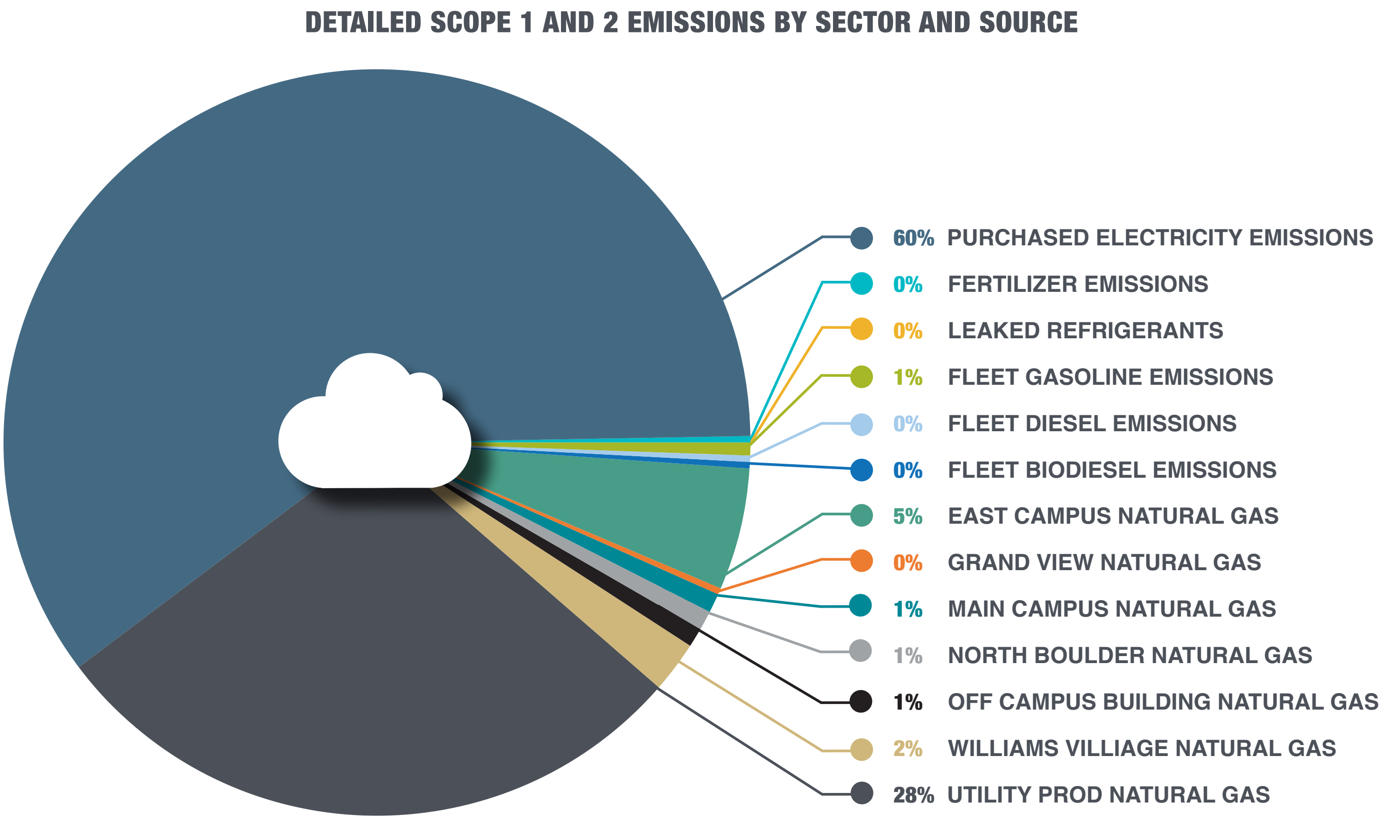
The analysis began with an inventory of historical and current emissions from Scopes 1 and 2. The inventory was conducted in an Excel-based model called the Climate and Energy Scenario Analysis tool (CESA).[31] CESA's inputs are the "drivers" of emissions, including on campus fuel use for heating and vehicle fleet and purchased electricity. Within the tool, drivers are assessed an emission factor, which is a scientifically measured quantity of CO2e[32] per unit of energy source (e.g., therms of natural gas, kWh of electricity, or gallons of gasoline or diesel), or proxy data (e.g. tons of fertilizer used, tons of waste sent to the landfill, etc.). Figure 7 shows a detailed breakdown in emissions sources from Scopes 1 and 2. The majority of CU Boulder's Scope 1 and 2 baseline emissions—about 60%—are from purchased electricity (Scope 2). An additional 38% is from natural gas use on campus. The remainder is from fleet fuels, fertilizer use, and leaked refrigerants, which together account for about 2% of campus emissions.

[30] This figure deviates slightly from emission totals submitted to STARS in the same year. The reason is slight differences in use data and emission factors.

[31] CESA is a proprietary, techno-economic model that helps decision-makers understand the financial, environmental, and energy impacts of a suite of climate and energy mitigation measures.

[32] A CO2 equivalent is a measure used to compare the emissions from various greenhouse gasses on the basis of their global warming potential (GWP). It allows for the expression of emissions and reductions of different gasses in a common CO2 unit. For instance, if a gas is 25 times more effective than CO2 at trapping heat in the atmosphere, then one metric ton of that gas would be equivalent to 25 metric tons of CO2, hence its CO2 equivalent (CO2e) would be 25. This concept provides a unified framework to account for different gasses in terms of their impact on global warming.

FIGURE 7: Scope 1 and 2 Emissions Breakdown



SCOPES 3 EMISSIONS

Scope 3 consists of 15 distinct categories of emissions as defined by the GHG Protocol. Eight of the categories have been included in this first Scope 3 inventory, some using significant assumptions given the lack of available data, and seven of the categories have reduction targets. These seven categories were selected following guidance from the Science Based Targets Initiative (SBTi): *"The nature of a Scope 3 target will vary depending on the emissions source category concerned, the influence a company has over its value chain partners and the quality of data available from those partners."*[33] These two conditions were used as criteria for whether to include the category in: a) the inventory, and b) the target.[34]

The one category that was estimated and included in the baseline inventory, but excluded from the targets is category 9, which considers out of state travel for those who are "consuming" CU Boulder's services (e.g. students flying to and from campus). This exclusion is due to the need for better underlying data and the limited sphere of influence the campus has on how and when people come and go from campus, per the SBTi guidance.

[33] SBTi has been leading the way in developing guidance for institutions in setting reduction targets for Scope 3 emissions. SBTi is a partnership between the Carbon Disclosure Project (CDP), the United Nations Global Compact, the World Resources Institute (WRI), and the World Wide Fund for Nature (WWF). SBTi encourages companies and institutions to set targets for reducing greenhouse gas emissions in line with the latest climate science.

[34] Importantly, the University is not seeking to establish a science-based target at this time, nor is it seeking conformance with the GHG Protocol Scope 3 Standard. Currently, SBTi does not include universities in its validation program (https://sciencebasedtargets.org/how-it-works). We have sought guidance from the GHG Protocols and the Science Based Targets initiative (SBTi) to instruct our inventory and target setting process. This CAP is a "living document" in the sense that it will be updated regularly with more refined data, accurate forecasts, and mitigation steps. This is the first time CU Boulder has attempted a Scope 3 inventory, time will allow future iterations to be more comprehensive. Please see Appendix D for additional information.

Regarding the remainder of the categories, categories 10-14 were considered not applicable given CU Boulder's operations, since the University doesn't sell products, franchise or hold downstream leased assets.

Per the GHG Protocol, Category 15 *"includes Scope 3 emissions associated with the reporting company's investments in the reporting year, not already included in Scope 1 or Scope 2. This category is applicable to investors (e.g., companies that make an investment with the objective of making a profit) and companies that provide financial services. Investments are categorized as a downstream Scope 3 category because the provision of capital or financing is a service provided by the reporting company."*

Investments for CU take place at the university system level (not the Campus level) and are therefore not within the authority or scope of the CU Boulder Campus CAP. The CAP provides an estimate of what the emissions impact of these investments might be in the Scope 3 Annex, but does not include that figure in the formal baseline or in the reduction target setting.

The table below summarizes the emissions associated with each category.

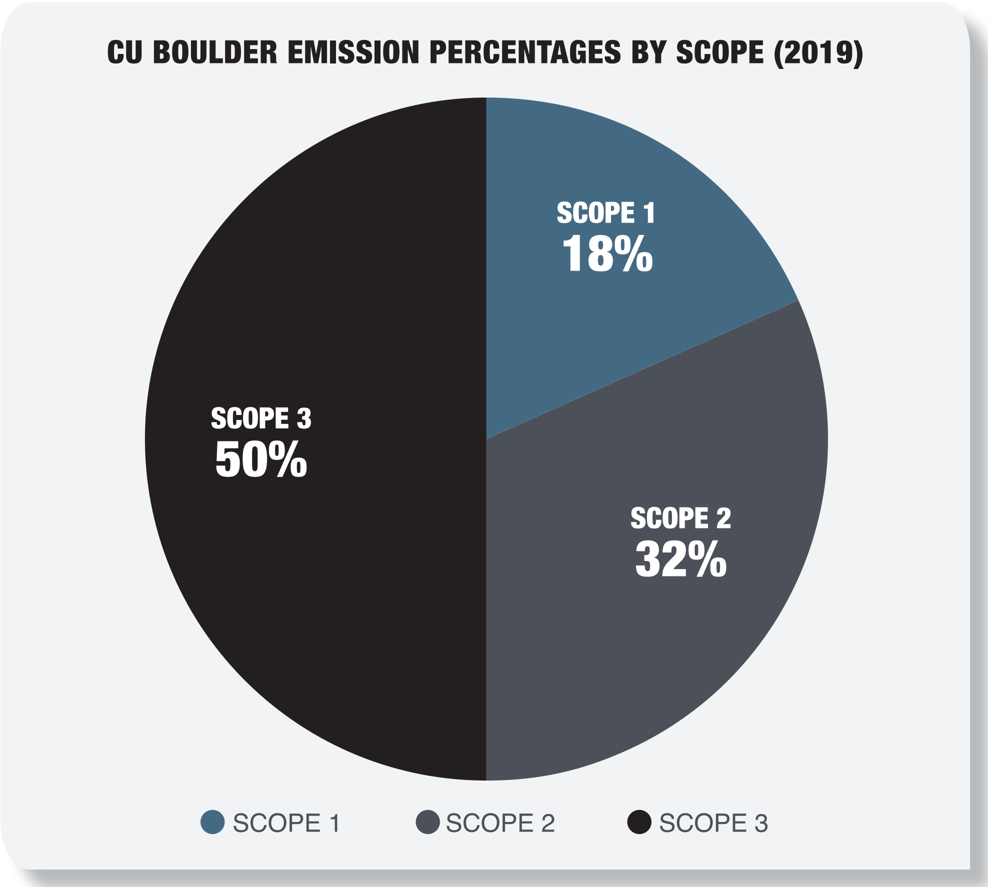
TABLE 10: Summary of Scope 3 Categories and Target

#	CATEGORY	EMISSIONS (MTCO2)	TARGET SET
1	Purchased goods and services	12,216	✔
2	Capital goods	20,944	✔
3	Fuel and energy related activities (FERA)	21,782	✔
4	Upstream transportation and distribution	Included in Category 1	
5	Waste generated in operations	2,595	✔
6	Business travel	19,954	✔
7	Commuting	16,407	✔
8	Upstream leased assets	538	✔
9	Downstream transportation and distribution	35,189	
10	Processing of sold products	N/A	
11	Use of goods and services sold	N/A	
12	End-of-life treatment of sold products	N/A	
13	Downstream leased assets	N/A	
14	Franchises	Not included	
15	Investments	See Scope 3 Annex	

TABLE 11: Inventory of all Scope Emissions

CATEGORY	MTCO2e
SCOPE 1	**48,213**
Natural gas	45,097
Total Fleet	1,841
Fugitive Emissions, Fertilizer Usage, Refrigerant Leakage	1,275
SCOPE 2	**82,528**
Purchased electricity	82,528
SCOPE 3	**129,625**
Category 1: Purchasing	12,216
Category 2: Capital Goods	20,944
Category 3: Fuel and Energy Related Activities	21,782
Category 5: Waste Generated in operations	2,595
Category 6: Business Travel	19,954
Category 7: Employee and Student Commuting	16,407
Category 8: Upstream Leased Assets	538
Category 9: Downstream Transportation and Distribution	35,189

FIGURE 8: CU Boulder Emission Percentages by Scope



Scope 1 and 2 Forecasts

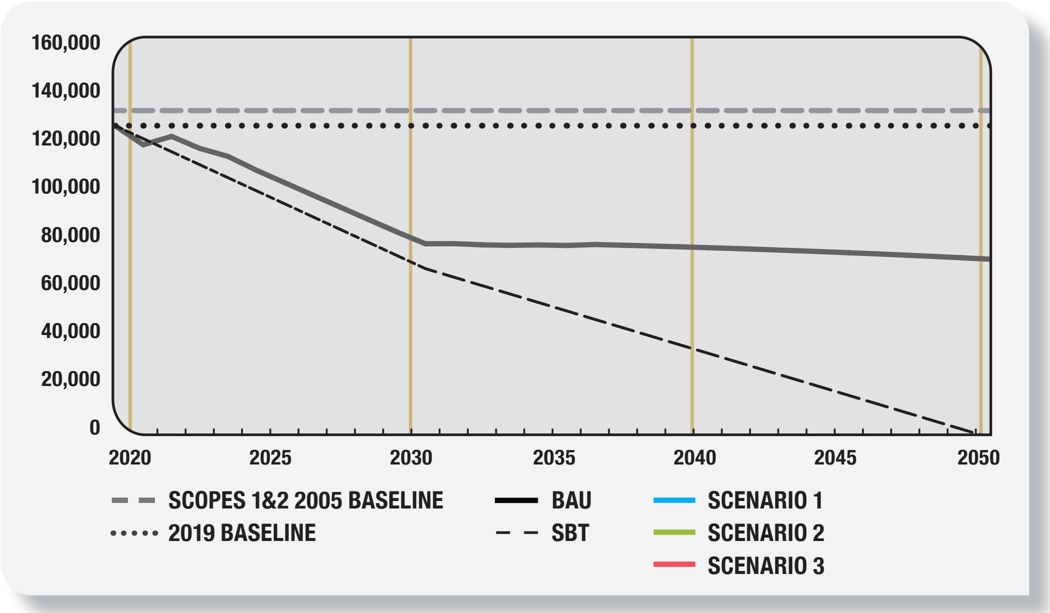
The emissions inventory provides a baseline from which to measure future reduction efforts. By contrast, a business-as-usual (BAU) emissions forecast provides a projection of the amount and sources of emissions CU Boulder would likely generate through 2050. The baseline and BAU serve as reference points for reduction targets, in addition to informing the strategy and selected actions. Under a business-as-usual scenario, which assumes that CU Boulder does not change its operations in any way, as shown by the black line in Figure 9, emissions are projected to decrease by 55,335 metric tons (MT) by 2050, largely due to decarbonizing of the grid.

The reduction is based on the anticipated reduction in electricity grid emissions over time due to the retirement of coal plants and the increase of renewable energy. This trend is driven by the fundamental economics of low cost renewable energy, incentives from the Inflation Reduction Act (IRA), and Colorado legislation requiring an 80% GHG emissions reduction by 2030, and 100% by 2050.[35] If these goals are achieved, Scope 2 emissions would be eliminated by 2050 and significantly reduced in the short term. However, Scope 1 emissions would persist, primarily due to use of natural gas by the campus central heating system and the buildings that are not connected to this system (e.g. Williams Village and East Campus).

[35] Colorado Senate Bill 19-236, Section 5.

Figure 9 also shows the SBT target line for Scopes 1 and 2, calculated for CU Boulder.

FIGURE 9: Baselines, BAU and Target for Scopes 1 and 2



THE IMPORTANCE OF THE ELECTRIC UTILITY

The majority of CU Boulder's combined Scopes 1 and 2 emissions comes from purchased electricity. The emissions come from electricity generated by burning fossil fuels such as coal, natural gas, and oil at power plants. These plants release carbon dioxide (CO2) and other greenhouse gasses into the atmosphere during the combustion process. The electricity for Boulder, CO is supplied by a mix of renewable sources (like wind, solar, and hydroelectric power) and fossil fuels. By Colorado law, the energy mix is required to be converted to greater percentages of renewable sources, and gradually become 100% renewable by 2050. In November 2004, Colorado became the first state to legislate a legislated renewable portfolio standard by popular vote (see SB 19-236). This standard, now updated, requires the utility to secure 80% of its energy from carbon-free sources by 2030, and 100% by 2050.[36]

Electricity emissions for CU Boulder are estimated through multiplying the electricity consumed by an emissions factor, which is the quantity of CO2 equivalent released into the atmosphere for every unit of electricity produced. Therefore, as the value of the emission factor falls, associated GHG emissions will also fall. This is a critical assumption in this CAP, since many of the GHG reduction strategies listed below rely on replacing equipment that currently runs on fossil fuels with alternatives that run on electricity. Figure 10 shows the expected trend of emission factor values between now and 2050 for Xcel Energy, CU Boulder's electricity provider, based on company reports.

[36] Colorado's legislative renewable portfolio standard was the first state-wide ballot initiative approved by voters as Amendment 37, in November 2004. This standard requires the utility that provides electricity to the Campus (Xcel Energy) to secure 100% of its electricity from carbon-free sources by 2050. See Colorado SB 19-236: **https://leg.colorado.gov/sites/default/files/documents/2019A/bills/2019a_236_enr.pdf**

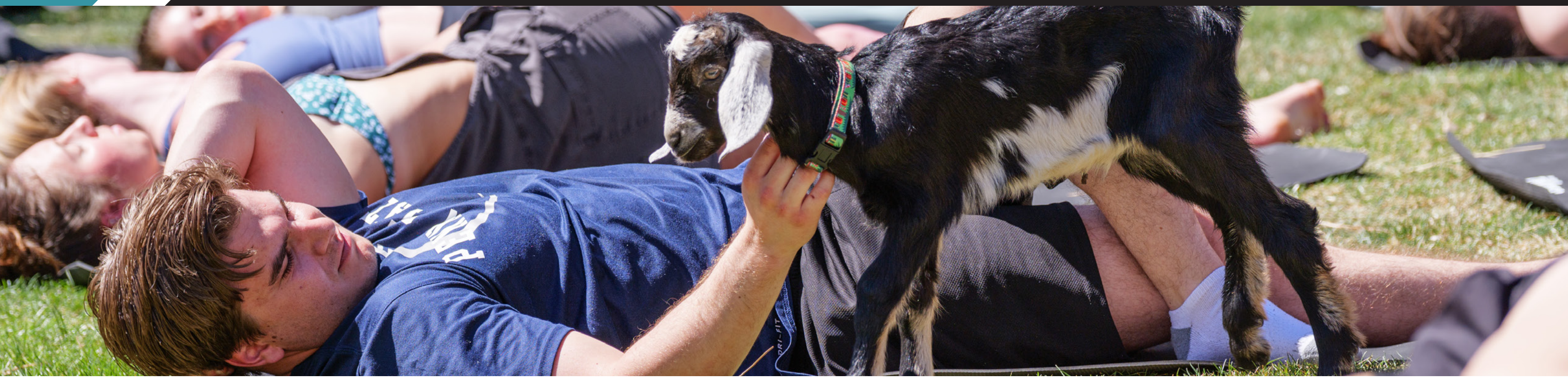
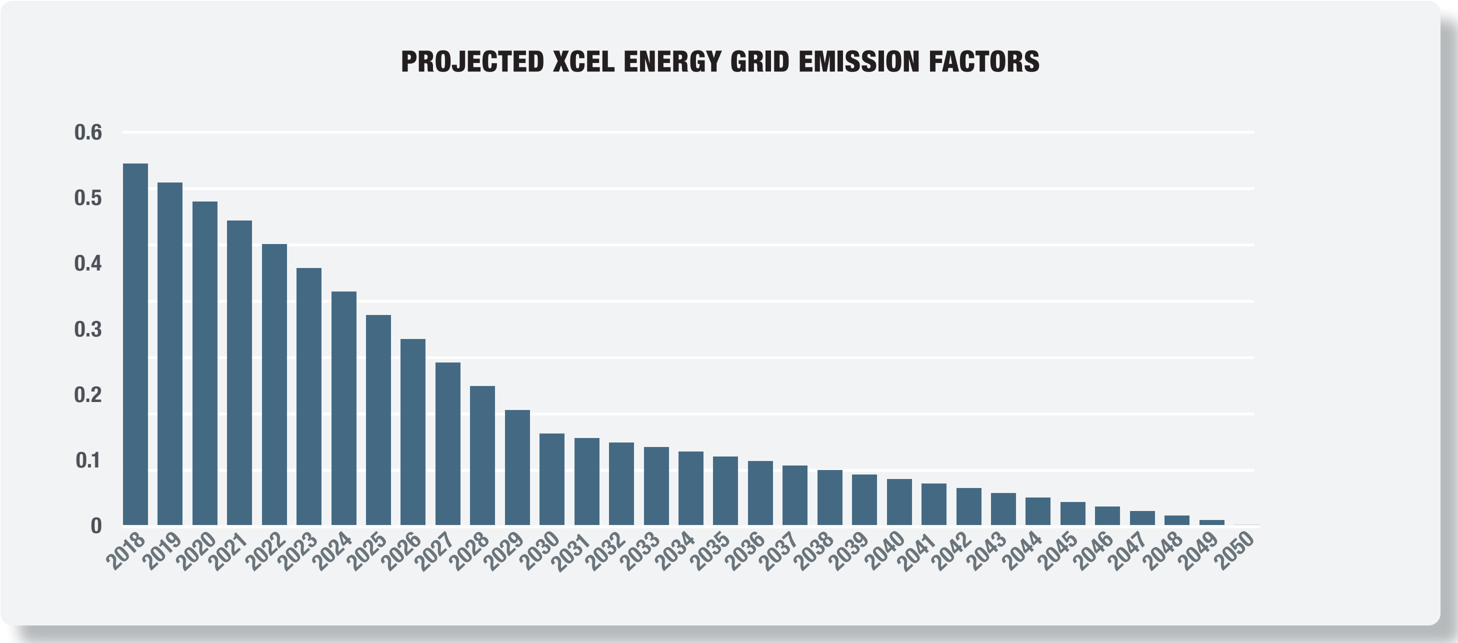
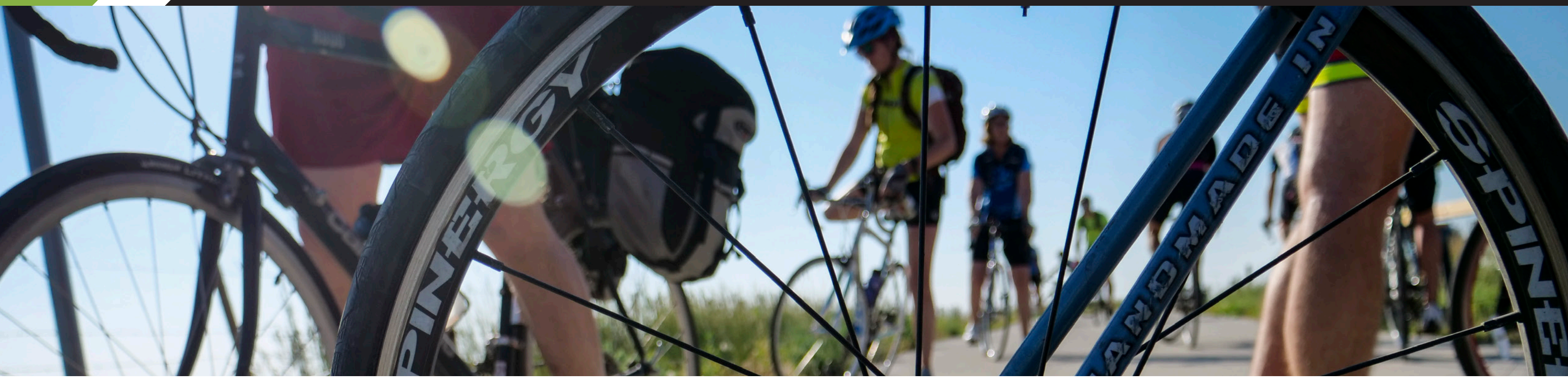


FIGURE 10: Anticipated reduction in emissions from Xcel Energy per kWh produced



3. REDUCING SCOPE 1 AND 2 EMISSIONS



CORE GOAL 1

Achieve 50% reduction in Scope 1 and 2 emissions by 2030, from the baseline year of 2019, with a linear reduction to zero emissions no later than 2050. Do so without the use of purchased offsets or unbundled RECs.

Goals in four primary areas have been established to reduce on campus emissions, on the way to achieving campus targets:

1. Buildings: Improve building performance through efficiency and electrification
2. Heating system upgrades: decarbonize the campus heating system[37] and electrify all other building heating and domestic hot water systems
3. Renewable Energy: Support Xcel's and the State's transition to a decarbonized electrical grid through the development of onsite and offsite solar projects
4. Transportation: Transition campus fleet to electric vehicles (Note: reducing campus community vehicle miles traveled (VMT) in commuting to campus and the use of electric vehicles among the CU Boulder community is addressed under Scope 3 emissions)

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[37] The projects at the central utility plant (which also cover significant infrastructure and upgrades at over 100 buildings) are part of an outside study that will not be completed in time for detailed inclusion in this CAP - it is due in 2024. Instead, estimates of carbon reduction quantities, implementation timeline and rough order of magnitude costs have been included in this analysis to show estimated timeline, costs, and benefits of GHG reductions.

Action Categories

BUILDINGS

Buildings are responsible for approximately 39% of global energy-related carbon dioxide emissions. Of this, about 28% comes from operational emissions, which include heating, cooling, lighting, and the use of appliances, and the remaining 11% came from embodied emissions associated with the construction and materials of buildings (see Scope 3). As a result, improvements in building efficiency and building electrification is one of the most cost-effective ways to reduce emissions, and a critical component of global strategies to combat climate change.

The campus will work towards upgrading existing buildings by implementing the CU Boulder Energy Master Plan. This includes lighting retrofits, envelope efficiency projects, retro-commissioning, and HVAC system upgrades. For decentralized buildings outside of the Main Campus district loop, such as East Campus, electrification of heating systems via heat pumps will be a key strategy. Optimizing space utilization can prevent energy from being wasted on empty classrooms and offices. Finally, updating new building standards will ensure that additional campus growth as described in the Campus Master Plan will have a reduced climate impact.

CO-BENEFITS

The built environment includes buildings where classes take place, where administrative offices are located, where events are held, and where students and families live. Building efficiency and electrification upgrades will support campus resilience to future climate impacts and improve overall indoor air quality and building comfort, by requiring less overall energy and reducing thermal energy sources. It has the potential to reduce energy burden (high percentage of household income going to utility bills) in housing.

Co-benefit opportunities: There is also a strong link between housing access, density, affordability, and transportation emissions. To increase the equity co-benefits related to buildings, future climate action should consider creating affordable housing access close to campus to support a higher percentage of the student body and employees who wish to live affordably and with the ability to bike, walk, and take transit for the majority of their needs. The climate action plan therefore recommends the continued development of dense, affordable, transit-oriented housing as a key emissions reduction strategy.

ANALYSIS

Building efficiency projects fall into the following categories: lighting retrofits, envelope improvements, re-commissioning, and HVAC system retrofits. Special attention was paid to laboratories, which represent 40% of the campus energy use and present special challenges. Examples of strategies include the addition of heat recovery ventilation systems, upgraded distribution or ventilation and heating and cooling, etc.

The following table illustrates the implementation timeline, first costs, first cost per building area, the life cycle cost including the social cost of carbon (SCC), measured in net present value (NPV), the GHG reduction potential, percent of emissions, and the cost per metric ton of GHG reduced (in CO2e). These measures represent the majority, but not the entirety of the measures listed in the Energy Master Plan (EMP), and the implementation and the CAP recommends the continued evaluation and implementation of all measures within the EMP.

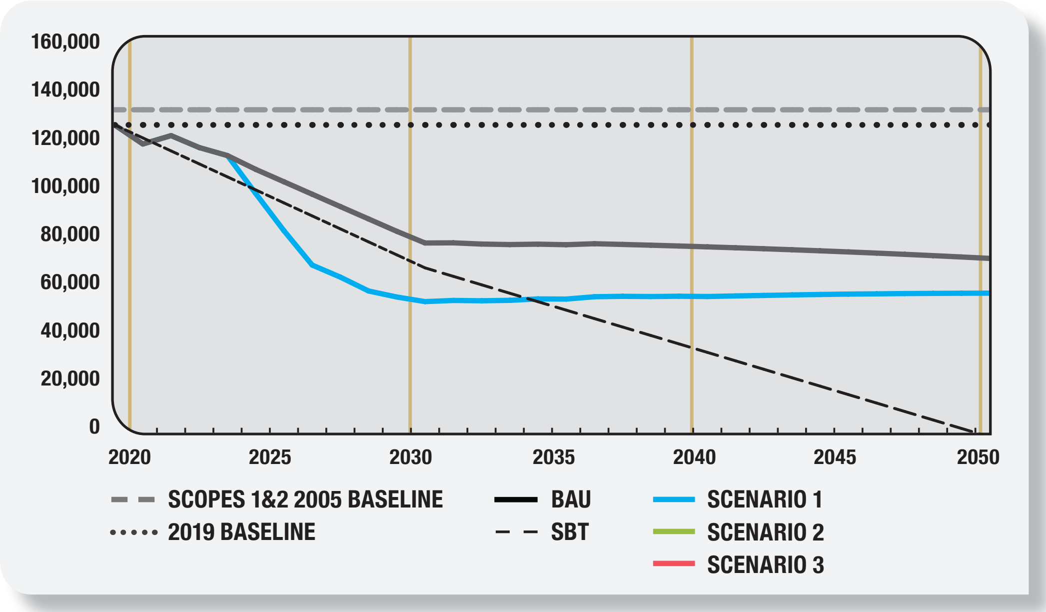
The table below also includes an indication of the co-benefits associated with each strategy; namely, does a given strategy lead to co-benefits of equity, health resilience, an improved STARS rating or cost savings? While co-benefits are expected, it should not be assumed that they will be achieved without some effort and careful planning during strategy implementation. A full discussion of co-benefits is offered in Chapter 5.

TABLE 12: Key performance metrics of selected strategies[38]

STRATEGY	IMPLEMENTATION TIMELINE	INVESTMENT AMOUNT ($M)[39]	COST/SF ($/SF)[40]	NPV ($M), INCL SCC	GHG REDUCTION (MTCO2e)	AVE $/MT REDUCED[41]	CO-BENEFITS
Lighting Retrofits	2024–2030	31.8	6.37	31.8	82,336	466	
Envelope Improvements	2024–2040	34.7	3.09	-14.3	5,750	9,148	
Re-commissioning Projects	2024–2030	3.6	0.41	13.4	22,240	329	
HVAC System Retrofits	2024–2030	58.7	6.73	16.2	90,083	1,576	

Building efficiency projects are projected to achieve CU Boulder's 2030 Scopes 1 and 2 emission targets on their own. However, without further reductions in campus natural gas consumption, the gains from building efficiency eventually level out, and by 2035 the campus will fall behind these targets.

FIGURE 11: GHG savings from Building Efficiencies compared to BAU and other benchmarks



[38] Assumptions for calculations are found in the Technical Annex.

[39] Costs estimated from Glumac, Inc. and information from the CU Energy Master Plan.

[40] CU Boulder's square footage is assumed to be 11,239,756 Outside Gross Square Feet.

[41] Average of project costs / MTCO2e saved.

NEW BUILDINGS

New construction projects such as planned residence halls as part of North Boulder Campus and proposed expansion of the Chemistry and Applied Math building would increase emissions under a BAU case. Though the building specifications are unknown, this expansion is included in the BAU case. Assuming current average energy use per square foot, these three projects would collectively add 1,955 MTCO2e in Scope 1 emissions which would persist until the decarbonization of the central plant, and 724 MTCO2e in Scope 2 during a sample year of 2035, which would decline as the grid becomes cleaner.[42] In order to ensure that these and other new buildings do not increase campus emissions, the Campus should adopt a policy of ***ZERO CARBON BUILDING DESIGN***, with the following specific requirements:

- ✔ Buildings should either be independently all-electric using heat pumps, other zero carbon technology, or should connect to the central heating system, which will be slated for decarbonization over time
- ✔ Establish an embodied carbon reduction standard (see Scope 3), targeting a 10-20% reduction (to be reevaluated for increased stringency every three years based on the development of new materials) for each building project, by procuring low carbon materials. CU adheres to the State's Buy Clean Colorado program, which will support these reductions.
- ✔ Establish low carbon refrigeration standards that align with LEED v4 Enhanced Refrigerant Management credit. This would require the use of low GWP refrigerants and / or the reduced use of refrigerants in buildings. Doing so will align with the Kigali Amendment to the Montreal Protocol.[43]
- ✔ Require energy efficiency to exceed current IECC (IECC 2021)[44] or latest ASHRAE[45] standards by an additional 20%.
- ✔ Use these certifications as a guide for sustainable building on campus:
  - ➜ Maintain the current requirement of LEED Gold Plus (which requires a 45% improvement over ASHRAE 90.1-2010), with reach goals for LEED Platinum
  - ➜ Pilot ILFI Net Zero Carbon certification and consider adopting this as the default certification instead of LEED.
  - ➜ Pilot WELL Building standard or Fitwel certification to optimize health outcomes[46]
- ✔ Prioritize (construct first) new buildings that increase affordable housing, and retrofits for departments that house underfunded disciplines and centers for protected classes
- ✔ During retrofits and construction, ensure that people with disabilities retain access to elevators and ramps

[42] These assume an emission factor from the utility that corresponds to 2035, the year all three projects are expected to be fully finished.

[43] United Nations. 2019. Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer. https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XXVII-2-f&chapter=27&clang=_en

[44] International Energy Conservation Code. 2021. https://codes.iccsafe.org/content/IECC2021P1.

[45] American Society of Heating, Refrigerating and Air-Conditioning Engineers. 2021. https://www.ashrae.org.

[46] The International WELL Building Standard (often abbreviated as the WELL Standard) is a performance-based system for measuring, certifying, and monitoring features of the built environment that impact human health and wellbeing. This standard is managed and administered by the International WELL Building Institute (IWBI).

OPTIMIZE EXISTING BUILDING SPACE UTILIZATION

To ensure that the campus utilizes the building resources it already has, the CAP recommends a campus-wide space optimization program, including labs, which are the highest energy users. This recommendation builds on work currently underway by the Office of Space Optimization (OSO). The OSO, in partnership with Planning, Design, and Construction (PD&C), ensures effective space allocation in both existing buildings and new construction, making space utilization data accessible campus-wide. This includes optimizing facilities with significant cooling and power needs by centralizing them in buildings with efficient HVAC and backup systems, reducing dispersed assets that increase costs and maintenance. Special emphasis is placed on research labs, which are high consumers of space and energy. Through CU Green Labs' collaboration with faculty, the university can continue working to optimize these spaces, improving energy resilience and supporting shared research facilities.

HEATING SYSTEM UPGRADES

CU Boulder has a centralized steam system that uses natural gas to provide heat to most buildings on Main Campus. This system can operate in cogeneration mode, producing both electricity and steam using combustion turbines, or only steam through gas-fired boilers. Buildings outside of Main Campus (Williams Village and East Campus) use gas fired boilers on a building by building basis.

Combined, the campus heating system contributes 18.8% to the total University's carbon footprint, a number that would increase over time in a do-nothing scenario, as utility electricity becomes cleaner over time. To decarbonize the heating system, CU Boulder will use a phased approach that will ultimately transition the campus to a higher performance system that will likely use electricity via heat pumps as the primary fuel.

This transition will include converting the steam generation systems to produce low-temperature hot water using heat pumps, which are more efficient and use electricity, not fossil fuel. To implement this project, approximately 5 miles of distribution pipes will also need to be replaced, along with updates to the building systems that can use hot water instead of steam. This will likely require complex arrangements of building closures and space use adjustments.

The project will provide greater efficiency, lower life-cycle costs and added resilience relative to a decentralized building electrification approach.

Currently, there is a study underway evaluating how to replace the heating system at these two plants. (Refer to the Technical Appendix for additional information.) In order to align the CAP reduction targets, this transition will need to be completed by no later than 2050, with interim phases completed as early as 2035, while early implementation is recommended to accelerate the reduction from the campus's largest source of emissions pending the availability of funding.

In addition, converting buildings outside of the Main Campus system to electricity is also recommended. Since these are decentralized with independent boilers, a conversion to heat pumps and the use of waste heat is technically feasible today and should be implemented prior to 2030. A cost-benefit analysis of these projects is recommended in the short term.

ANALYSIS

The Main Campus heating system upgrades will be the most expensive decarbonization project in the CAP, and may impact major portions of building operations across the campus. While the replacement of gas boilers with heat pumps is relatively expensive, the primary drivers of cost will be upgrades to the distribution system and the building-level modifications that need to be made in order to transition from a steam to low temperature hot water system. A rough estimate of the timing (and cost) of boiler replacement has been integrated into the analysis, but significant uncertainty will remain until the aforementioned study is completed. The following table provides an overview of the metrics associated with this project.

TABLE 13: GHG savings from building efficiencies compared to the baseline and other benchmarks

STRATEGY	IMPLEMENTATION TIMELINE	COST INVESTMENT AMOUNT* ($M)	COST/SF ($/SF)[47]	NPV ($M), INCL SCC	GHG REDUCTION (MTCO2e)[48]	$/MT REDUCED[49]	CO-BENEFITS
Main campus heating system upgrade	Phased between 2029–2050	$650–$1,250	$74.48–$143.24	-561[50]	713,099	893	
East Campus decarbonization	2030–2035	Not Yet Known	Not Yet Known	Not calculated	135,940	Not known	
Williams Village decarbonization	2030–2035	$30–$50	$41.92–$69.87	Not calculated	56,439	$886	

*CU Boulder internal estimates

47 CU Boulder's square footage is assumed to be 11,239,756 OGSF.

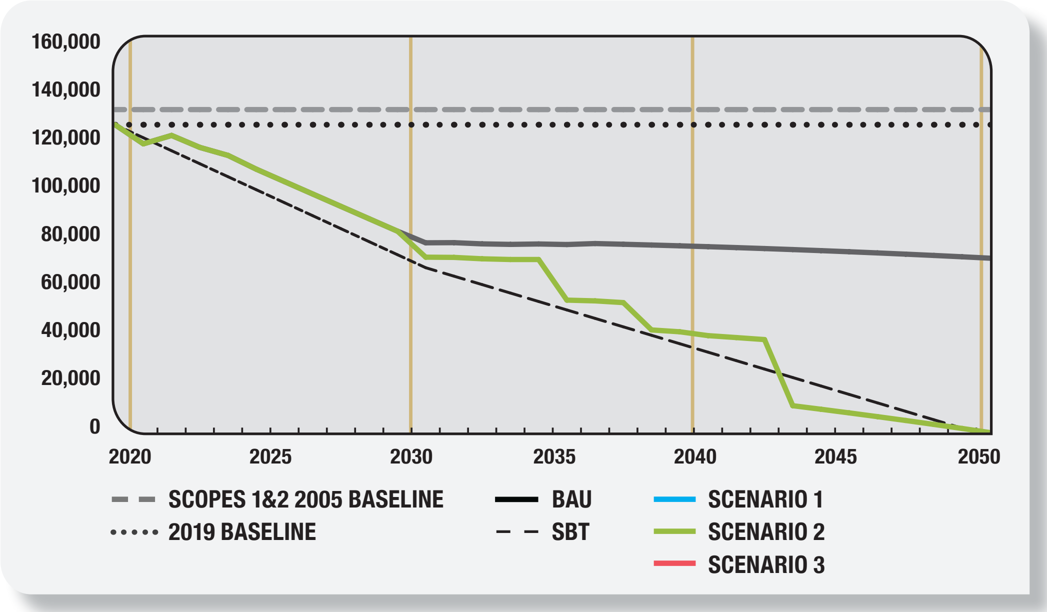
48 Cumulative over 20 years.

49 Average of: project costs / MTCO2e saved.

50 Based on higher HSU cost estimates. The NPV analysis period is through 2050.

As Figure 12 shows, the heating system upgrade alone will not enable CU Boulder to consistently achieve the necessary reductions and would need to be done in conjunction with the additional measures outlined in this CAP.

FIGURE 12: GHG savings from Main Campus Heating System Upgrade projects compared to BAU and other benchmarks



IMPLEMENTATION

The CAP recommends the following interim steps for a Scopes 1 and 2 implementation plan:

- Complete a detailed campus heating decarbonization plan for Main Campus by 2024
- Develop a district energy funding and financing plan by 2025
- Incorporate the social cost of carbon into investment decision making process
- Conduct pilot electrification projects for Williams Village and East Campus, e.g., utilizing geothermal and waste heat recovery as a strategy for electrification
- Implement the first phase of the Main Campus plan by no later than 2035.

RENEWABLE ENERGY: ON- AND OFF-CAMPUS SOLAR PV INSTALLATION

As noted above, this climate action plan is predicated on the Colorado grid decarbonizing at a rapid pace. The state has legislated this reduction and Xcel Energy has committed to delivering it. Any reductions associated with onsite or offsite PV will take place earlier in the project lifetime, since the clean energy produced early on will be offsetting high emissions electricity, but this will decrease over time. In addition, if CU Boulder participates in Xcel's Solar Rewards incentive program, which helps make commercial solar financially viable, the renewable energy certificates are transferred to Xcel so they can use them to meet their state mandated requirements. Therefore, the reductions from onsite PV wouldn't be CU's, but CU would be supporting the larger grid decarbonization effort.

In addition, CU is in the process of subscribing to an offsite renewables program as part of a new state enabled virtual net metering (VNEM) program. This will expand solar for the campus up to 5.9 MW in 2025 at no additional cost to the campus under a 20-year contract which also includes CU Boulder's ownership of the RECs.

EQUITY CONNECTION

COMMUNITY SOLAR:
Community solar gardens (CSG) are another form of offsite solar development that exists in Colorado and can be used to connect electricity users without access to or sufficient amount of roof space, to subscribe to offsite solar where they then receive a credit on their electric bill. CU Boulder could explore the possibility of developing a CSG to then support renters and lower income households in subscribing to the CSG to effectively reduce their energy bills.[51]

[51] This could not be a part of the current climate strategy due to the fact that RECs would not belong to CU Boulder.

ANALYSIS

CU currently has 2.3 MW of installed solar on campus and receives approximately 3% of its electricity from this source. A recent, high-level spatial assessment of the campus demonstrated that CU Boulder could construct up to 10 MW of additional PV generation capacity on campus.[52] Sites would include Main and East Campus roofs, carports, and open areas. In fact, the installation of additional PV will be required for the campus to achieve its 2030 target of generating 10% of its electricity from renewable on-site sources. However, installations have slowed because limits on incentive programs have made the business case for development more challenging. For this CAP the installation of 7 MW of solar PV at the most promising on-campus sites were studied. It was assumed that all installations occurred in 2025. The following table summarizes the key metrics associated with these projects:

TABLE 14: On-campus Solar Summary

STRATEGY	IMPLEMENTATION TIMELINE	INVESTMENT AMOUNT ($M)	COST/SF ($/SF)	NPV ($M), INCL SCC	GHG REDUCTION (MTCO2e)	% OF 2050 EMISSIONS	$/MT REDUCED	CO-BENEFITS
Solar PV[53]	2025	N/A	N/A	-0.79	20,066	2.3%	-$141	

[52] ECU Boulder Energy Master Plan 2022.

[53] Since the goal of the analysis focused on emissions reduction, several counterfactual assumptions were made: 1. All initial costs would be met by a developer under a power purchase agreement (PPA), and amortized in CU's electricity payments; 2. All RECs would be retained by the University (under current Xcel incentive program for net-metered solar, the utility would retain the RECs); 3. Off-campus capacity was not modeled.

FLEET ELECTRIFICATION

The CAP provides a systematic assessment of all campus operated vehicles, with the primary goals of identifying vehicle electrification opportunities, establishing an electrification timeline based on vehicle replacements, and determining the costs and emissions benefits of fleet electrification. Note that transportation emissions associated with driving to and from campus or flying for University related activities are included under Scope 3 (Chapter 4).

The fleet analysis assessed relevant vehicle data in the University's records including data provided by the University Facilities and Transportation Departments. Available data included vehicle makes, models, ages, purchase date and price, fuel type, usage and costs, and miles traveled. Quantitative data were supplemented by interviews with appropriate CU Boulder staff to better understand how vehicles are used and the anticipated future mobility needs of each department. This Assessment can be found as Appendix A and should be read in conjunction with the campus' Transportation Master Plan.

RESILIENCE CONNECTION

FUTURE MICROGRID: The Department of Energy defines microgrids as "a group of interconnected loads and distributed energy resources within clearly defined boundaries that acts as a single controllable entity with respect to the grid. A microgrid can connect and disconnect from the grid to enable it to operate in both grid-connected and island-mode." The goal of a microgrid is to provide reliability and resilience in the face of grid outages and typically has the capability to support demand-side management to help control utility costs. The campus does not currently have a microgrid, but it does have a combined heat and power plant with 30 MW of electrical generating capacity (at WDEP) to provide power to isolate the main campus and portions of the east campus from the grid and many individual buildings have diesel powered generators to support critical needs. The current systems would have minimal climate impact if they only operate during outages, which is rare, since CU Boulder is connected to the grid through three independent electrical feeders, two feeders are required to support the campus power requirements and the third is for redundancy. This means that the campus already has two levels of electric redundancy (multiple feeders, diesel generators and existing gas-fired capacity).

Explore the feasibility of future strategies that may not require fossil fuel solutions. **Microgrids typically use multiple distributed energy resources to support a group of interconnected loads. Onsite solar, other renewable or clean energy sources coupled with energy storage and advanced controls has the ability to provide additional resilience to the CU Boulder Campus. The campus could then supplement the ability to "island" or be self-sufficient for a period of time, in the event of a grid outage. A microgrid at CU Boulder would be best intended to power a subset of loads, such as a building designated as a community center or other buildings designated as critical facilities. As other distributed clean energy and storage assets become more cost effective, and as the campus updates its resilience planning, a microgrid could become an important element of such subsequent plans.**

CO-BENEFITS

Prioritizing retirement of heavy-polluting buses decreases air pollution—including particulates, NOx, and smog—on CU Boulder's campus and in the surrounding community for passengers, pedestrians, cyclists and the region at large. It should be noted that there can be environmental downsides to EV adoption, though it is generally agreed that they are outweighed by the benefits.[54] Investments in electric vehicles should aim for transparency in sourcing and should endeavor to impose environmental and labor standards throughout their supply chain.

ANALYSIS

The entirety of CU Boulder's fleet was evaluated for electrification. After accounting for non-street legal assets (trailers, generators, etc.) and vehicles that are already electric, 452 out of 454 total vehicles owned by the University were studied. Of this subset, 81% can be replaced with equivalent electric vehicles that are currently commercially available, predominantly sedans, SUVs, pickup trucks, and campus buses. Most of the remaining vehicles (14% of 452) have potential electric candidates for replacement but challenges related to cost-effectiveness or operational requirements remain. About 4% of the vehicles provided do not have a potential candidate for electrification currently available or announced in the market. The analysis was accomplished by assuming an electric vehicle would replace an internal combustion vehicle at the end of its useful life. In total, the replacement schedule saves about 7,400 MTCO2e between now and 2050. The replacement schedule and resulting emission reduction curve are presented in Annex A.

EQUITY CONNECTION

THE ROLE OF EQUITY IN FLEET ELECTRIFICATION: **The adoption of electric fleets contributes to improved air quality, particularly benefiting low-income communities often disproportionately affected by air pollution. Additionally, the reduced noise associated with electric vehicles enhances the quality of life for residents living near transportation routes. On the other hand, the production of batteries for electric vehicles also raises human rights concerns, particularly in the extraction and processing of raw materials such as cobalt and lithium. Issues include child labor, environmental degradation, health and safety risks, forced displacement, economic exploitation, resource conflicts, and a lack of supply chain transparency. This CAP acknowledges these inequities and supports international frameworks to mitigate these impacts.**

[54] Heavier electric vehicles may also create additional wear on paved streets, possibly requiring additional maintenance and paving. Further, used EV batteries, if not properly recycled, can lead to environmental harm due to the toxic materials they contain. Vehicle electrification also presents certain environmental challenges. However, when comparing the complete lifecycle emissions and the potential for future improvements in technology and infrastructure, it is generally considered a positive environmental choice, especially as part of a broader strategy to move towards a more sustainable and low-carbon future. See **The International Council on Clean Transportation.**

Figure 13 Shows the timeline of recommended vehicle replacements and the GHG emissions associated with those replacements. During the analysis, two scenarios were assessed. One used a replacement schedule that concludes in 2050, the other in 2037. The CAP recommends the 2037 replacement schedule. Buses, vans, trucks and SUVs, along with several other fleet vehicle types were included in the analysis. Recommended replacements begin immediately, gradually transitioning nearly all vehicles to electric varieties.

FIGURE 13: Shows GHG emissions by vehicle type and year

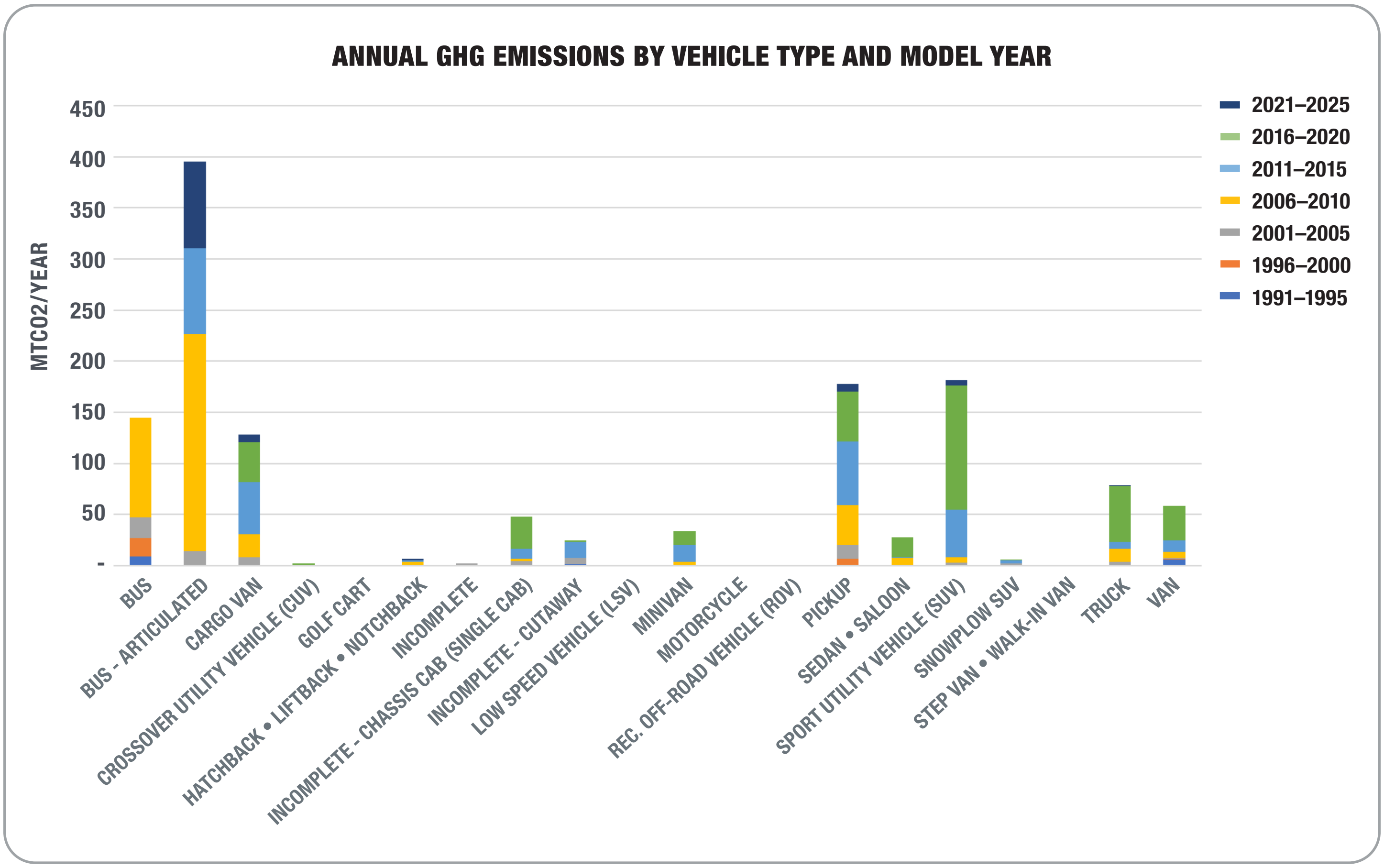
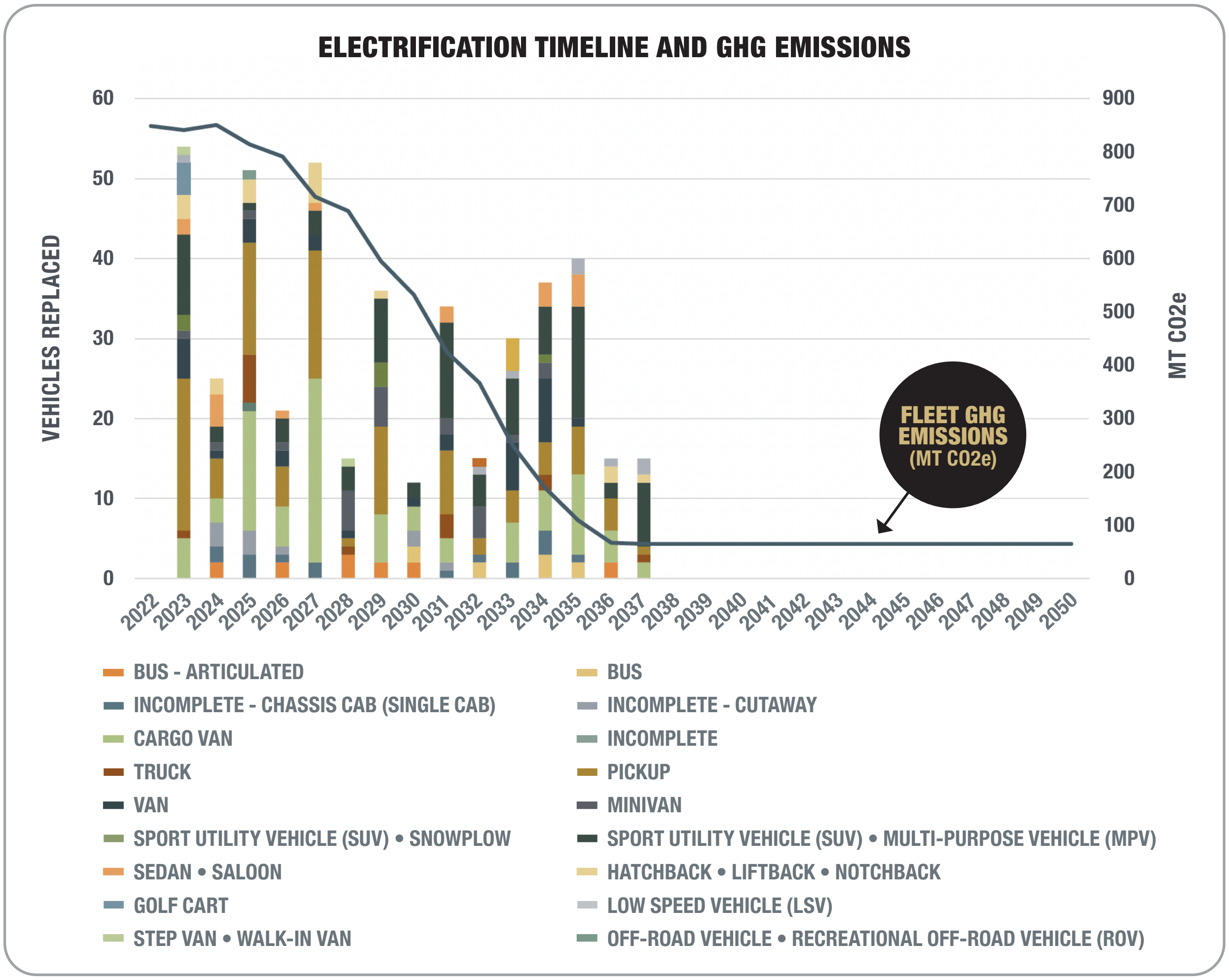


Figure 14 Shows the timeline of recommended vehicle replacements and the GHG emissions associated with those replacements.[55] Buses, vans, trucks and SUVs, along with several other fleet vehicle types were included in the analysis. Recommended replacements begin immediately, gradually transitioning nearly all vehicles to electric varieties.

FIGURE 14: Timeline of recommended vehicle replacements and the GHG reductions



[55] The CAP acknowledges supply chain issues and ordering backlogs associated with EV purchases that may present challenges.

TABLE 15: Summary of key metrics associated with the fleet electrification project:

STRATEGY	IMPLEMENTATION TIMELINE	INVESTMENT AMOUNT ($M)	COST/SF ($/SF)	NPV ($M), INCL SCC	GHG REDUCTION (MTCO2e)	% OF 2050 EMISSIONS	$/MT REDUCED	CO-BENEFITS
Electrify campus fleet	2024–2050	$42.7	N/A	-33.2	13,352	0.63%	-$6,154	

While an EV replacement strategy may not contribute significantly to overall emissions, the strategy is being prioritized based on its significant co-benefits including noise pollution reduction, air quality benefits, reduced particulate emissions, and others.

IMPLEMENTATION

To transition campus fleet vehicles to electric over time, the following implementation steps are recommended:

- Implement university-wide procurement policy requiring EVs to be prioritized when purchasing new vehicles (include landscape and other equipment as well)
- Develop a charging infrastructure plan to determine the number, capacity, and location of charging stations across the campuses for fleet vehicles, as well as to support community charging.

GHG Reduction Scenarios
(SCOPES 1 AND 2)

Following the analysis within the core areas of built environment, renewable energy, and transportation, combinations of the strategies were grouped into three scenarios based on strategy selection and timeline of implementation. The scenarios represent different strategic investment pathways toward the overall Scope 1 and 2 reduction goals. The three scenarios are summarized in Table 16.

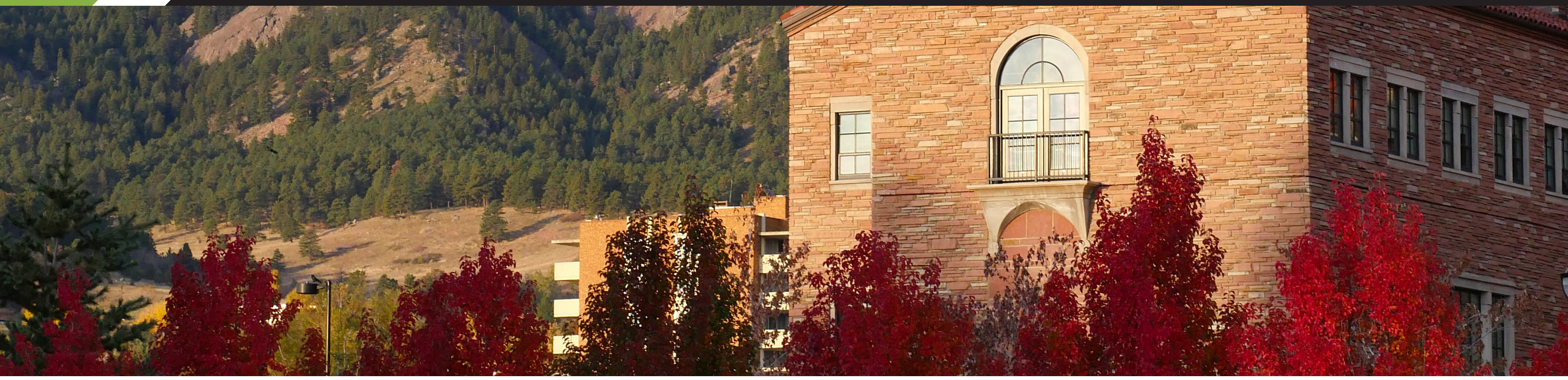


TABLE 16: Key characteristics within each of the three scenarios, considerations for implementation and resulting, cumulative GHG emission reductions.

SCENARIO NAME	KEY CHARACTERISTICS	CONSIDERATIONS	SCOPE 1 + 2 IMPACT
SCENARIO 1: Efficiency and onsite solar without heating system upgrades. 	• Building energy efficiency (EE) • 7 MW of on and offsite solar PV by 2025 • 136 EVs by 2030, 271 EVs by 2040, 432 EVs in the fleet by 2050 • No Central Utility Plant projects	• Energy efficiency projects implemented by 2030 • Solar projects initiated at one time • Fleet replacement follows retirement of ICE vehicles at the end of their planned life	• Cumulative emissions savings of 525,491 MTCO2e, and reaching 61% reduction against 2019 baseline • Achieves CU's goals of 50% reduction by 2030, but not 100% reduction by 2050.
SCENARIO 2: Heating System Upgrades (HSU) only 	• Includes HSU projects only: electrification of gas boilers, new heat distribution piping, building-level modifications and fittings	• HSU projects add considerable expense (between $650 and $1250 million) over the CAP's time horizon.* • Schedule follows phased investments of $250 m each	• Cumulative emission savings of 850,882 MTCO2e GHG, eventually reaching 100% reduction against 2019 baseline • Does not maintain CU's annual SBT emission targets
SCENARIO 3: Combines all Scenario 1 strategies with HSU 	• Includes all strategies from Scenario 1: energy efficiency, solar PV, and fleet replacement • Includes all heating system upgrade projects and campus-wide heating distribution system retrofits		• Cumulative emission savings of 1,201,910 MTCO2e • Achieves CU's 2030 target of 50% reduction • Achieves zero emission target by 2050 • Maintains SBT targets

*CU Boulder internal estimate

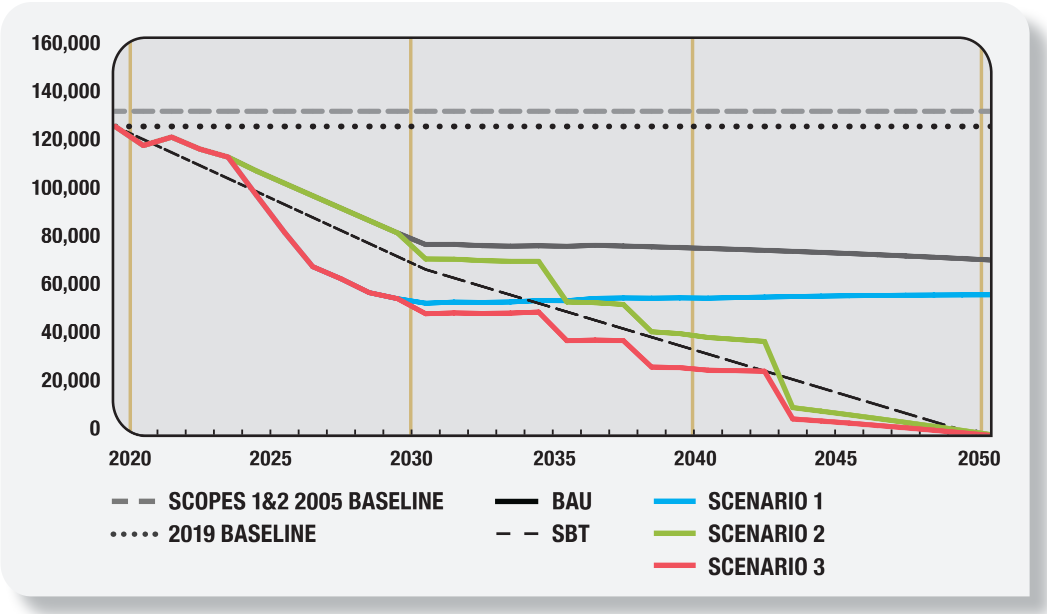
SCENARIO 1 (BLUE LINE)**:** Energy efficiency (EE), renewable energy (RE), and Fleet replacement. This Scenario considers over 300 energy efficiency projects (lighting, controls, envelope & HVAC), 7 MW of renewable energy installations, and the replacement of approximately 365 internal combustion campus fleet vehicles with electric vehicles. This combination of projects allows CU Boulder to achieve its short term goals, but not its long term goals.

SCENARIO 2 (GREEN LINE)**:** Heating system upgrade (HSU); this is the phased conversion of Campus heating to an electrified, lower temperature hot water. This complex series of projects is currently being studied; results, including project schedule and costs, are expected in 2024. Decarbonizing the campus heating system is expected to contribute significant emission savings.

SCENARIO 3 (RED LINE)**:** Combines Scenarios 1 and 2. This combination of projects will achieve CU Boulder's short and long term goals, of 50% reduction by 2030 and 100% by 2050.[56]

Figure 15 shows the investment timeline for all Scenarios. This illustrates that efficiency, onsite renewables, and steady vehicle electrification can put CU Boulder on a footing to reach the 2030 target of 50% Scope 1 + 2 emissions reduction, but that without addressing the campus central heating system, the campus would be unable to continue to meet the goals established in this CAP.

FIGURE 15: GHG savings from associated scenarios relative to the BAU, SBT, and baseline

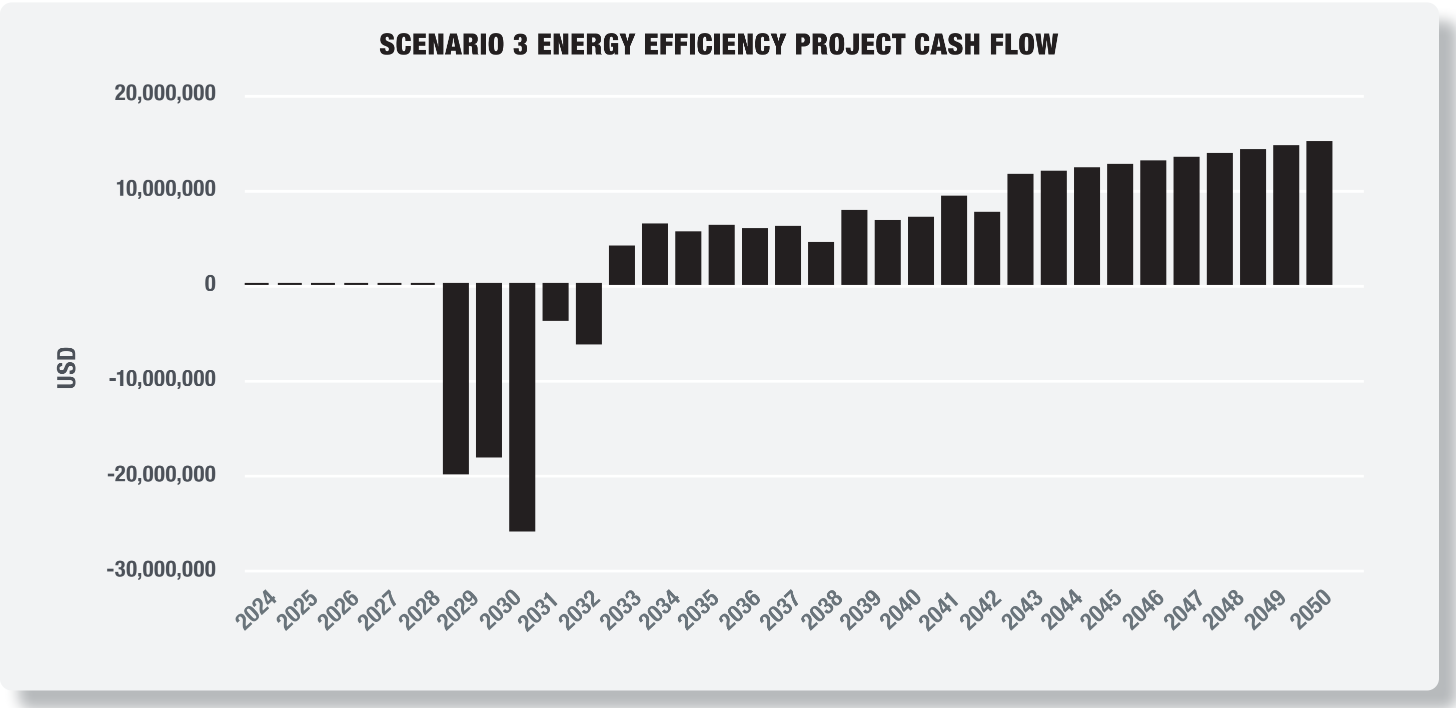


[56] There is no double counting when combining Scenarios 2 and 3. For buildings connected to the CUP all EE projects calculated savings for heating and cooling load reduction (BTU). The model then applied a CUP heating efficiency to generate hot water to avoid double counting.

COST SAVINGS

Several of the strategies recommended by the CAP may save the campus money in nominal terms (against a baseline).[57] The most likely projects to do so are the energy efficiency projects described in Chapter 3, which create efficiency gains and reduce the demand for electricity, all else being equal. Using Scenario 3 as the implementation pathway, the graphic below shows expected cash flow over time for the recommended energy efficiency measures (which include lighting, commissioning, and HVAC retrofits plus envelope projects).

FIGURE 16: Scenario 3 Energy Efficiency Project Cash Flow



[57] Other plans have also promised savings in these areas. However, increased utility rates can overcome these savings, leaving real expenses higher. This should not negate savings attributed to these projects, which is why electricity prices should be benchmarked at the time of installation.

LIFE CYCLE ANALYSIS

Table 17 shows additional metrics by which the scenarios can be compared. The first column shows cumulative saved GHG emissions in comparison to the baseline, while the second shows the capital investment cost of the scenario. The third column shows net present value (NPV)[58] of the scenario, and finally the fourth also shows the NPV but includes a value for the social cost of carbon ($185/MTCO2e).[59] The notable cost of the heating system decarbonization, which includes significant work to update campus infrastructure and buildings themselves, can be observed in the negative NPV values. It should be noted that the savings associated with this and other projects assume an energy savings in gas and a transfer of gas energy to more efficient use of electric energy, which is more expensive on a per-unit-energy basis. The life cycle cost analysis results will change if Xcel were to change their electric rate for the campus.

[58] The net present value (NPV) of a project is often used by decision makers to decide on whether to pursue a project, or in determining which project is the best from a competing list of projects. It is calculated as the sum total of expected cash flows - both incoming (positive) and outgoing (negative) - associated with the project; however, since money in the future is not as valuable as money today, future cash flows are discounted, using a discount rate.

[59] The Biden Administration has established a social cost of carbon of $51/MTCO2. However, recently the EPA has suggested an increase to $190/MTCO2, and is weighing public comments on that proposed price. (“Supplementary Material for the Regulatory Impact Analysis for the Supplemental Proposed Rulemaking, “Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review” available at: **https://www.epa.gov/system/files/documents/2022-11/epa_scghg_report_draft_0.pdf).**

The scientific basis for the $185/MTCO2e comes from Rennert in the journal *Nature*: Rennert, K., Errickson, F., Prest, B.C. et al. Comprehensive evidence implies a higher social cost of CO2. Nature 610, 687–692 (2022). **https://www.nature.com/articles/s41586-022-05224-9.**

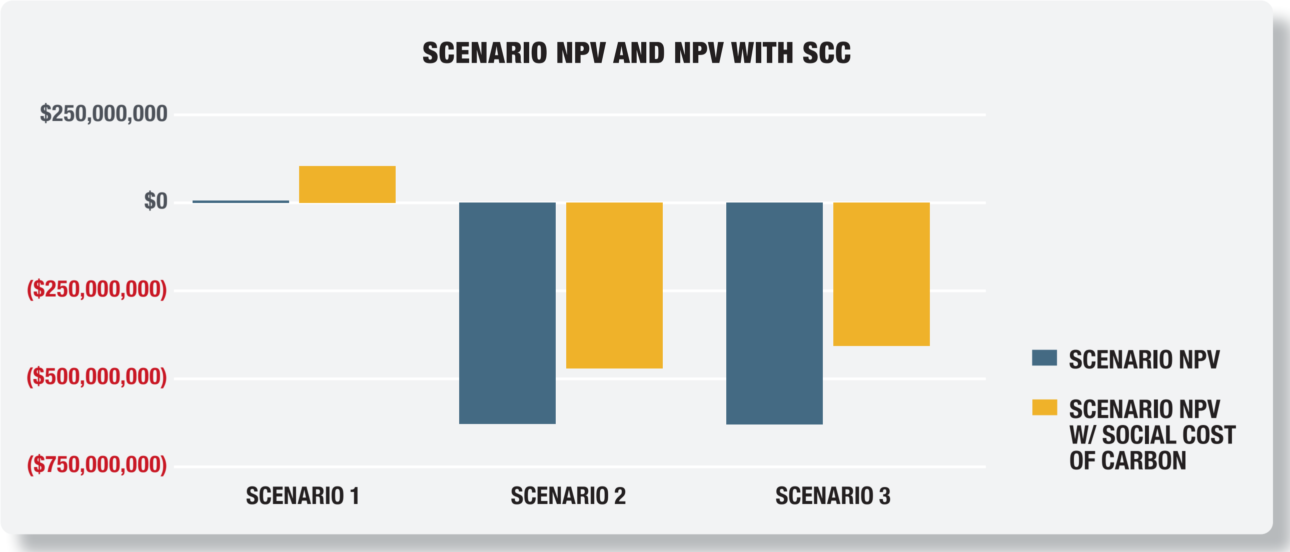
TABLE 17: Scenario Life Cycle Cost Analysis Summary

	TOTAL* MTCO2e REDUCED (2023)	INVESTMENT REQUIRED ($ MILLIONS)	SCENARIO NPV[60] ($ MILLIONS)	SCENARIO NPV W/ SOCIAL COST OF CARBON ($ MILLIONS)
SCENARIO 1	525,491	$210	$6.3	$103
SCENARIO 2	850,882	$1,250	($625.9)	($468)
SCENARIO 3	1,201,910	$1,460	($626.8)	($404)

*Between 2024-2050

As shown in Table 17, the capital costs to implement scenarios 1-3 are significant. The most significant capital outlays come from the heating system upgrade projects. The cost estimates from these projects are very rough estimates and more precise costs will come from the central plant study currently underway. Clearly, the most important aspect of this CAP is investigating a low cost pathway to implementing the central heating system projects, and identifying additional funding sources such as Federal and State incentives and grants, utility programs, and direct utility partnership.

FIGURE 17: Net Present Value by Scenario



[60] NPV uses a 4% discount rate. See technical annex for full description of costs and benefits.

TABLE 18: Summary and Timeline of Recommended Measures to Reach Scope 1 and 2 Reduction Targets

STRATEGY	IMPLEMENTATION TIMELINE	INVESTMENT AMOUNT ($M)	NPV ($M), INCL SCC	CO-BENEFITS
Lighting retrofits	2024–2030	31.8	31.8	
Envelope improvements	2024–2040	34.7	-14.2	
Re-commissioning projects	2024–2030	3.6	13.4	
HVAC system retrofits	2024–2030	58.7	16.2	
Main campus heating system upgrade	Phased, 2029–2050	650–1,250*	-561[61]	
On-campus solar PV	2024–2050	NA	-0.79	
Electrify campus fleet	2024–2050	42.7	-33.2	
New Building Design Standards	2024–2050	0	0	
Existing Building Space Optimization	2024–2030	0	0	

*CU Boulder internal estimate

[61] NPV includes the highest cost estimate.

4. REDUCING SCOPE 3 EMISSIONS

Achieve a 50% reduction from 2019 by 2030 for those Scope 3 emissions where accurate estimates can be established and which are within the University's influence and control. Further reduce these emissions to zero by 2050.

Globally, public and private entities are in the early phases of accounting for and managing Scope 3 emissions. Scope 3 consists of 15 distinct categories, and of these the campus has measured eight for this CAP. It also presents methodologies for more accurate measurement of all relevant categories in subsequent CAP updates. The campus has used documentation from the Science Based Targets Initiative (SBTi) to guide its process in evaluating Scope 3 emissions and setting targets (though it is not pursuing strict adherence to SBTi certification).

SBTi asks organizations to estimate their Scope 3 emissions, and if those emissions are greater than 40% of total emissions, the Initiative calls for reduction targets that are in line with goals to maintain a less-than 1.5°C temperature rise. CU Boulder has adopted these targets in currently measured categories and has plans to increase the number of measured categories as well as targets.

CU Boulder can influence off campus Scope 3 emissions by establishing policies and programs that help to incentivize those who sell to the university, those who are employed or attend classes, and those who otherwise partner with CU Boulder. Scope 3 emissions are those that result from activities and assets not owned or controlled by the campus, but that the campus indirectly impacts through its value chain. As with Scopes 1 and 2, the planning process begins with an inventory, then targets are established, and finally strategies are developed.

The first step in Scope 3 measurement and target setting is to take a high-level assessment of Scope 3 categories, to determine if they might contribute more than 40% of total emissions. During the process of developing emission totals for this CAP, it was determined that Campus Scope 3 emissions were contributing at least 50% to the overall total, and that a deeper accounting would be necessary. The Scope 3 inventory was presented in Chapter 2.

Scope 3 Categories

Scope 3 consists of 15 distinct categories of emissions as defined by the GHG Protocol. Eight of the categories have been included in this first Scope 3 inventory, some using significant assumptions given the lack of available data, and seven of the categories have reduction targets. These seven categories were selected following guidance from the Science Based Targets Initiative (SBTi):

"The nature of a Scope 3 target will vary depending on the emissions source category concerned, the influence a company has over its value chain partners and the quality of data available from those partners."[62]

These two conditions were used as criteria for whether to include the category in: a) the inventory, and b) the target.[63]

The one category that was estimated and included in the baseline inventory, but excluded from the targets is category 9, which considers out of state travel for those who are "consuming" CU Boulder's services (e.g. students flying to and from campus). This exclusion is due to the need for better underlying data and the limited sphere of influence the campus has on how and when people come and go from campus, per the SBTi guidance.

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[62] SBTi has been leading the way in developing guidance for institutions in setting reduction targets for Scope 3 emissions. SBTi is a partnership between the Carbon Disclosure Project (CDP), the United Nations Global Compact, the World Resources Institute (WRI), and the World Wide Fund for Nature (WWF). SBTi encourages companies and institutions to set targets for reducing greenhouse gas emissions in line with the latest climate science.

[63] Importantly, the University is not seeking to establish a science-based target at this time, nor is it seeking conformance with the GHG Protocol Scope 3 Standard. Neither are we seeking validation from SBTi on our inventory or target setting process. We have, however, sought guidance from the GHG Protocols and the Science Based Targets initiative (SBTi) to instruct our inventory and target setting process. This CAP is a "living document" in the sense that it will be updated on an annual basis with more refined data, accurate forecasts, and mitigation steps. This is the first time CU Boulder has attempted a Scope 3 inventory, time will allow future iterations to be more comprehensive. Please see Appendix D for additional information.

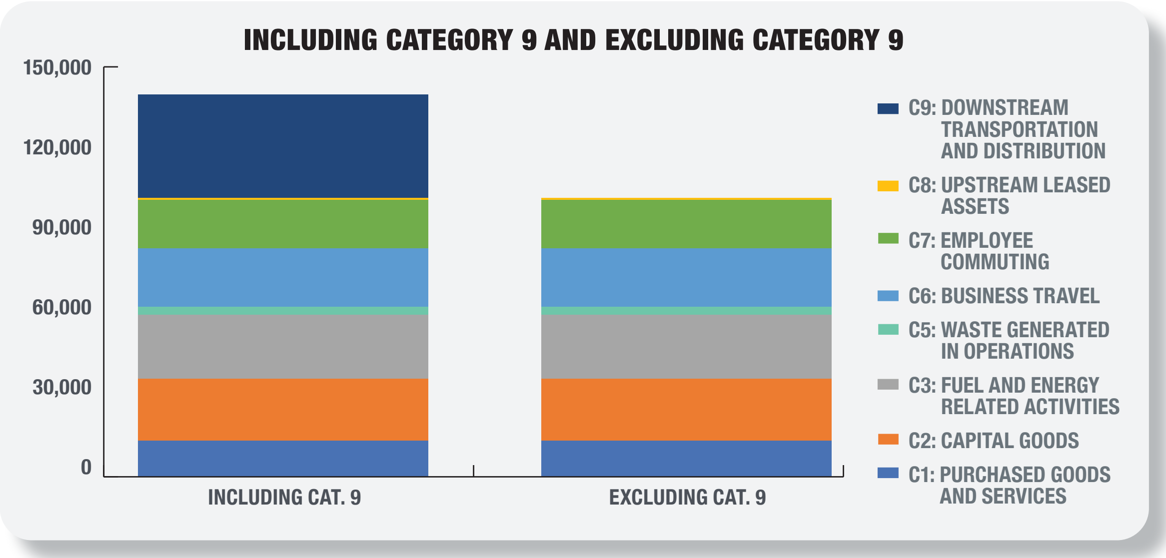
Regarding the remainder of the categories, categories 10-14 were considered not applicable given the University's operations (the University doesn't sell products, franchise or hold downstream leased assets).

Per the GHG Protocol, Category 15 *"includes Scope 3 emissions associated with the reporting company's investments in the reporting year, not already included in Scope 1 or Scope 2. This category is applicable to investors (e.g., companies that make an investment with the objective of making a profit) and companies that provide financial services. Investments are categorized as a downstream Scope 3 category because the provision of capital or financing is a service provided by the reporting company."*

Investments for CU take place at the system level (not the Campus level) and are therefore not within the scope of the CU Boulder Campus CAP. The CAP provides an estimate of what the emissions impact of these investments might be in the Scope 3 Annex, but does not include that figure in the formal baseline or in reduction target setting.

Table 1 provides a summary of Scope 3 results and the decision making process for inclusion in the inventory and target. Each of the Scope 3 categories are numbered and listed on the left; the categories reflect those found in the GHG Protocols.[64] The third column provides the estimated emissions from each category tracked for this CAP. The fourth column provides a definition of the category according to the GHG Protocol, which is then contextualized for the university. Column five provides a note on data availability and quality for that category. The final column indicates the level of influence by CU Boulder to affect category emissions, with a value of 3 meaning significant influence, 2 meaning moderate influence, and 1 meaning limited influence. All "influence-values" of 2 or 3 have been included in the target.

FIGURE 18: Scope 3 Emissions by Category



[64] GHG Protocols

TABLE 19: Scope 3 categories, emissions (in MTCO2e), definitions, data availability/quality and CU Boulder's influence over each

#	CATEGORY	EMISSIONS	DEFINITION	DATA AVAILABILITY / SOURCE	INFLUENCE
1	Purchased goods and services	12,216	Extraction, production, and transportation of goods and services purchased or acquired by the reporting company not otherwise included	Direct[65] spend data were obtained in 5 primary procurement categories	3
2	Capital goods	20,944	Extraction, production, and transportation of capital goods purchased or acquired	High-level estimates[66] of embodied carbon in buildings and fleet	3
3	Fuel and energy related activities (FERA) not included in 1,2	21,782	Extraction, production, and transportation of fuels and energy purchased or acquired by the reporting company, not already accounted for: • Upstream emissions of purchased fuels • Upstream emissions of purchased electricity • Transmission and distribution (T&D) losses • Generation of purchased electricity that is sold to customers	High-level estimates of upstream emissions from electricity and gas T&D loss assumptions for both electricity and gas delivery; CU Boulder occasionally sells a small amount of electricity to the grid, these emissions are counted in Scope 1	2
4	Upstream transportation and distribution	Included in Category 1	Of products purchased between a company's tier 1 suppliers and its own operations (in vehicles not owned by company)	Data included in Category 1	2
5	Waste generated in operations	2,595	Disposal and treatment of waste generated	Direct data obtained	3
6	Business travel	19,954	Transportation for business-related activities	High level data were available through CU travel booking partner; no survey for outside booking	3
7	Commuting	16,407	Transportation between home and work (includes daily faculty, staff and student commuting)	Survey data available, but small sample size	2
8	Upstream leased assets	532	Operation of assets leased by company (not in S1/S2)	Calculated from energy use intensity assumptions for office space	2
9	Downstream transportation and distribution	35,189	Use of "products" sold by the company between operations and the end consumer. For CU Boulder, out-of-state students and parents travel to and from campus to make use of university offerings (education, events, etc.)	High-level estimate of out-of-state student and parent travel to/from campus	1[67]
10	Processing of sold products	N/A	Processing of intermediate products by downstream companies	No raw or intermediate goods are sold by CU Boulder that enter processing	NA
11	Use of goods and services sold	N/A	End use of goods and services sold by the reporting company	There are no emissions necessarily associated with the "end use" of education	NA
12	End-of-life treatment of sold products	N/A	Waste disposal and treatment of products sold at the end of their life	Emissions calculated in Category 1[68]	NA
13	Downstream leased assets	N/A	Operation of assets owned by company, and leased to other entities, but not included in Scopes 1 and 2 of lessor (the reporting company); examples include retail entities leasing space from CU Boulder	These emissions are included in Scopes 1 and 2, or other Scope 3 categories	NA
14	Franchises	N/A	The operation of franchises, not included in S1/S2 of the lessor (applicable to operations that franchise)	CU Boulder is not a franchising entity	NA
15	Investments	See Scope 3 Annex	Operation of investments, including debt & equity, not included in S1/S2	Estimate; Data are not transparent at a University system level (University of Colorado)	1[69]

[65] Direct data are data that were obtained directly from an on or off campus source, or from a University publication.

[66] High-level estimates means that industry averages, or other heuristic methods were used in place of direct data.

[67] The academic calendar is decided at the University system level (University of Colorado), CU Boulder does not directly control the calendar.

[68] Category 1 includes lifecycle emissions of sold products, which includes end-of-life treatment.

[69] Investments are managed at the University system level (University of Colorado), which further outsources to the CU Foundation. CU Boulder does not control or advise on the investment portfolio.

CATEGORY 1: PURCHASED GOODS AND SERVICES. To calculate emissions, dollars spent on major categories of goods and services were multiplied by appropriate emissions factors. The primary categories of goods and services purchased by the campus were, 1) Computers and IT equipment, 2) Food and beverage service, 3) Paper and books, 4) Advertising and marketing, and 5) Clothing and apparel. Emission factors for these categories, and all listed below, are provided in the Scope 3 Annex.[70]

CATEGORY 2: CAPITAL GOODS. These emissions include those produced in the extraction, production, and transportation of capital goods purchased or acquired. In the absence of a thorough record of all capital goods, the analysis included construction of CU building stock and campus fleet purchases. To calculate the embodied carbon in buildings and set an emission target for future construction, the first step was to calculate an average amount of embodied carbon found in building projects over the past 17 years (this was the period with the most reliable data). This figure became the baseline for embodied carbon in buildings, under a BAU scenario.

Similarly, vehicles in the campus fleet also contain embodied carbon. The campus purchases an average of 8 vehicles per year, and currently owns about 450 vehicles. Each annual vehicle purchase was multiplied by an appropriate emission factor, to arrive at an embodied carbon baseline for vehicles. Summing embodied carbon from buildings and from vehicles yields a total baseline for embodied carbon from capital goods.

CATEGORY 3: FUEL AND ENERGY RELATED ACTIVITIES. Emissions counted under this category are those related to upstream processes from purchased electricity and purchased fuels. Emissions for generation of purchased electricity that is sold to end users isn't applicable in this case as CU operations don't include sales of electricity. Upstream emissions from purchased electricity was calculated by multiplying annual electricity consumption by 11%, and then by an emission factor.[71] Upstream emissions from purchased fuels include gasoline, diesel, and natural gas, each with a specific emission factor; these emissions include upstream natural gas leakage. As campus decarbonization efforts get underway, and fleet electrification is pursued, these emissions will eventually decline.

EQUITY CONNECTION

FOOD RECOVERY. Establish a food recovery program on campus for all catering and culinary events.

[70] The calculation of emissions from purchased goods and services should include the quantification of emissions from all upstream suppliers to CU Boulder. This CAP was able to initiate a process with the campus procurement team that is expected to grow over time. For this CAP, only five spend categories were assessed, which may result in significant under-measurement. For additional detail, see Scope 3 Annex.

[71] Disclosure by VitalMetrics https://sustainable.stanford.edu/sites/g/files/sbiybj26701/files/media/file/scope-3-emissions-from-fuel-and-energy-activities-march-2023.pdf

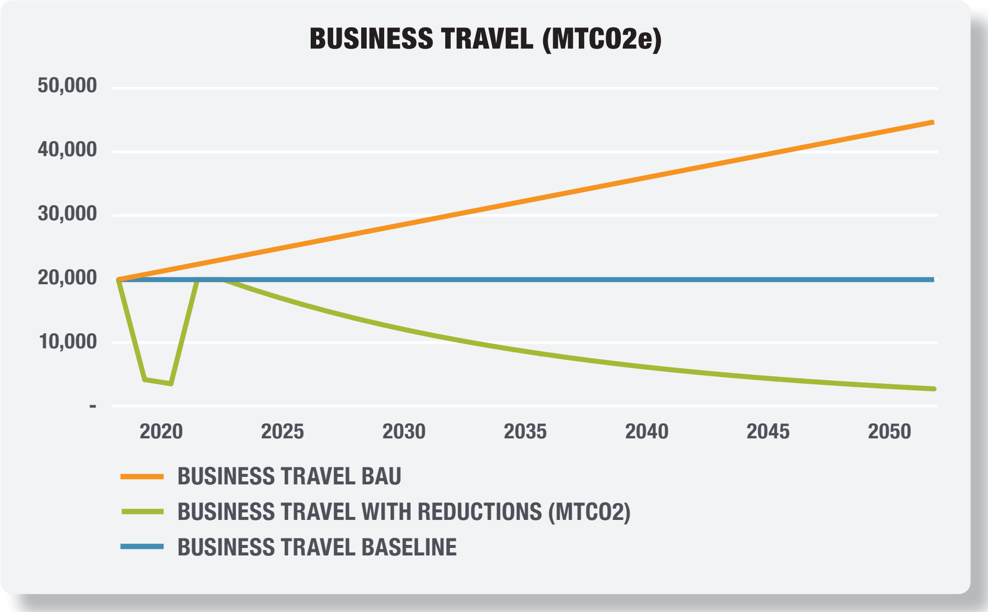
CATEGORY 5: WASTE GENERATED IN OPERATIONS. Data on two types of waste have been gathered: mixed solid waste (5,841 tons in 2019) and composted solid waste (1,265 in 2019).

CATEGORY 6: PAID BUSINESS TRAVEL. These are emissions associated with any business travel that is paid for by the university and includes student study-abroad programs. The University travel department reports that over 56.7 million miles were flown under this category in 2019. This figure is up from 36.5 million miles in 2009, which indicates an average 4% growth rate year over year. This growth rate has been added to the Business Travel BAU line below. (While this fell off considerably during COVID-19, a return to similar numbers is expected.) Air miles have an emission factor, but an additional coefficient is applied due to the fact that these emissions occur higher in the atmosphere, and therefore have a greater impact on the climate. This coefficient is called the radiative forcing index. This factor has also been applied to yield the total emission value.

EQUITY CONNECTION

INCREASE REUSE ON CAMPUS:
This CAP recommends increasing clothing, furniture and equipment reuse events, as well as an online reuse listing platform and expanded education about the CU Waste Distribution Center. Greater access to reusable items can provide quality goods to the disadvantaged.

FIGURE 19: Business Travel Projected Emissions



CATEGORY 7: EMPLOYEE & STUDENT COMMUTING. Emissions from regular trips to and from campus are a significant part of Scope 3 emissions. To calculate emissions within this category, estimates of vehicle miles traveled (VMT) are made for faculty, staff and students. The Transportation department at CU makes regular estimates of these totals from survey data and occasionally from a more thorough approach through the use of professional consultancies. In 2019, total VMT from all three categories was nearly 50 million miles (VMT has remained lower than this even after the pandemic due to work from home policies and preferences). A VMT emission factor was used to calculate the total presented above.

Reducing VMT can have a significant impact on GHG emissions in and of itself; however, it requires both the enhancement of available TDM programs and strategies as well as building out behavioral change programs in order to realize these reductions which remain paramount to the efficacy of this strategy. CU Boulder finds itself in an interesting point in transportation history where COVID demonstrated that a downward trend in campus emissions is possible thanks to the increases in remote work in combination with improvements in video conferencing. Furthermore, an expansion of transportation options like electric bikes, ride share companies and app based ride matching that didn't exist just 10 years ago have made the car-free lifestyle more viable, prompting campus to consider focusing on VMT as a viable option for achieving transportation and sustainability goals.

CO-BENEFITS. This Scope 3 category has the highest co-benefits opportunity. Housing and transportation disparities within Boulder County influence access to sustainable transportation options, which has driven the University to work with local transportation authorities to improve infrastructure, accessibility, and connectivity for all residents. At CU Boulder, many students and staff commute from nearby cities to campus each day, due in part to the high cost of living in Boulder County. This highlights the need for sustainable and accessible transportation infrastructure to support emissions reductions while minimizing pollution in local communities and decreasing costs and challenges associated with public transportation. When considering equity and justice in the transportation sector, CU Boulder is focused on increasing ridership by reducing or eliminating price and accessibility barriers to vanpools, carpools, and last mile transport to and from campus. Beyond this, more inclusive approaches to transportation can provide additional opportunities to support the needs of the campus community by, for instance, including basic needs distribution for those participating in vanpools.

EQUITY CONNECTION

EXPAND THE ECO-PASS PROGRAM.

As the university approaches fleet electrification, there is an opportunity to encourage public transportation via expanding the EcoPass program to offer non-benefit eligible employees an annual subsidy and expanding the lime scooters and B-cycle sharing programs on campus. To help further with this transition, there will also be discussions around EV adoption and determining convenient locations for public-facing EV charging stations. There is a role that CU Boulder could play in creating charging rate structures to better support CU Boulder community members who lack access to charging at home, and to ensure key locations, such as family housing and high-traffic areas on campus have accessible infrastructure. The University may also consider distributing e-bikes to low-income students/staff through a sponsorship program to increase access and adoption.

CATEGORY 8: UPSTREAM LEASES. This category includes emissions from office space that CU Boulder leases from other property owners. CU Boulder leases approximately 70,000 square feet of such space.[72] Emissions from this category have been estimated based on an assumed energy-use intensity (EUI) for office space, and that roughly 75% of energy use would be from electricity and 25% from gas. The EUI was multiplied by the square feet, in the appropriate proportions to estimate total electricity and gas use. These figures were then assigned an emission factor.

CATEGORY 9: DOWNSTREAM TRANSPORTATION AND DISTRIBUTION. Normally, this category reflects the use of products sold by the company between operations and the end consumer. For the university campus, the use of products sold can be considered the travel back and forth from campus to attend classes and other campus events. In this way students are using the product of education, while other campus visitors attend campus events such as graduation and parents' weekend. The CU campus has not monitored student and parent travel to and from the university; as a result, only very high-level estimations are available. To calculate emissions several rough estimates were made about average travel distances and frequency of trips (see scope 3 Annex).

CU ATHLETICS

For this iteration of the CAP, Scope 3 emissions of 6,474 MTCO2e[73] from Athletics have not been included in the formal inventory. Analysis on the disaggregation of these emissions into the 15 categories of Scope 3 was not completed in time for the CAP's publication, but will be a priority under subsequent Scope 3 action. Scope 3 Emissions reported by the Athletics department includes: athletes travel, waste disposal, material use, sponsorship and advertising, construction and operation, and "other" emissions. Relevant categories that are not yet included are: fan travel, shipment of goods, merchandise and equipment production, and investments.

[72] Office of Real Estate Services. 2023.

[73] CU Boulder Reporting Questionnaire to the Sports for Climate Action Framework. 2022.

Targets

CU Boulder has selected seven categories in which to set targets: Purchased goods and services, Capital goods, FERA, Waste generation, Paid business travel and Commuting. Within these categories, CU Boulder is seeking a 50% reduction by 2030, and a linear reduction to 100% by 2050.

Globally, a 7% reduction year over year, for all entities, would cut global emissions 50% by 2050.[74] The following points summarize SBTi guidance for Scope 3 target setting:

- If a company has significant Scope 3 emissions (over 40% of total Scope 1, 2 and 3 emissions), it should set a Scope 3 target.
- Scope 3 targets should be aligned with methods consistent with decarbonization required to keep global temperatures below 2 degrees Celsius.
- The Scope 3 target boundary should include the majority of value chain emissions, for example, the top three emissions source categories or two-thirds (67%) of total Scope 3 emissions. (Currently, CU Boulder targets would likely fall short of this mark since this CAP has not fully captured a baseline of Scope 3 emissions.)
- The nature of a Scope 3 target will vary depending on the emissions source category concerned, the influence a company has over its value chain partners and the quality of data available from those partners.
- SBTs should be periodically updated to reflect significant changes that would otherwise compromise their relevance and consistency.

An absolute 7% year-over-year reduction goal, from the baseline of all targeted categories, would allow the Campus to nearly reach its reduction targets of 50% by 2030 and 100% by 2050. At the end of this Chapter, a hypothetical scenario is provided, that shows the effect of this annual reduction goal on overall Scope 3 emissions.[75]

[74] SBTi. 2023. Target Validation Protocol for Near-Term Target.

[75] When setting Scope 3 targets, SBTi recommends that the targets cover two-thirds of total Scope 3 emissions. CU Boulder's targets honor this recommendation, under the current measurements. As the CAP is updated, total Scope 3 emissions will change, and likely grow. At that point, targets will need to be reassessed.

Reduction Scenarios

Strategies to achieve these targets could include a variety of measures such as encouraging more remote participation in faculty business events, promoting use of public transportation, biking, or walking over private cars for commuting, implementing sustainable procurement policies, reducing waste, and making campus construction projects less carbon intensive.

For this CAP, strategies for reducing Scope 3 emissions remain at a high level, and are more directional than specific. The reasons for this are twofold:

1. Each of the categories involves a diverse set of stakeholder partners with whom the campus should engage. From external suppliers to faculty, staff and students, partners who “own” emissions from all the categories should be included to develop specific strategies.
2. Inventories for many of the categories are estimated using highly generalized figures and are therefore not appropriate for accurate benchmarking at this time. In these cases, additional resources and processes are necessary to determine more accurate emission figures.

While additional engagement and benchmarking are required to develop specific strategies, the following scenario provides annual percentage-based targets on the way toward the University's short term and long term goals:

- In terms of procurement strategies for goods and services, the campus would engage with suppliers, and seek those who are able to supply with reduced emissions, to the extent that a 7% annual reduction would be met.
- To reduce embodied carbon, moderate expectations are that emissions could be reduced by 15% per year, by using either sustainable NRMCA[76] or ILFI ZC methodologies.[77]
- Regarding commuter mileage and associated emissions, JD Power and Associates finds that current EV adoption rates are 8.6% nationwide, and ranks Colorado in the top ten. However, EV adoption rates of new vehicles will not abate emissions from the stock of existing vehicles on the road. Instead, additional strategies will need to be developed in concert with commuters, public transit authorities, and many others. To illustrate the pathway to zero Scope 3 emissions, we have included a decrease of 7% per year in this category, though neither current nor projected adoption rates would achieve this total.
- To reduce paid air travel, some universities have adopted programs for faculty to voluntarily reduce their air miles. Leveraging this type of strategy, we have projected these emissions to fall by 7% per year as well.
- Waste makes up 4% in the baseline year and by applying the above mentioned strategies, it may be realistic to reduce these emissions also by 7% per year.
- Finally, fuel and energy related activities are also projected to fall 7% per year within the scenario, through compliance by the utility with renewable energy supply rules and the campus's own decarbonization program.

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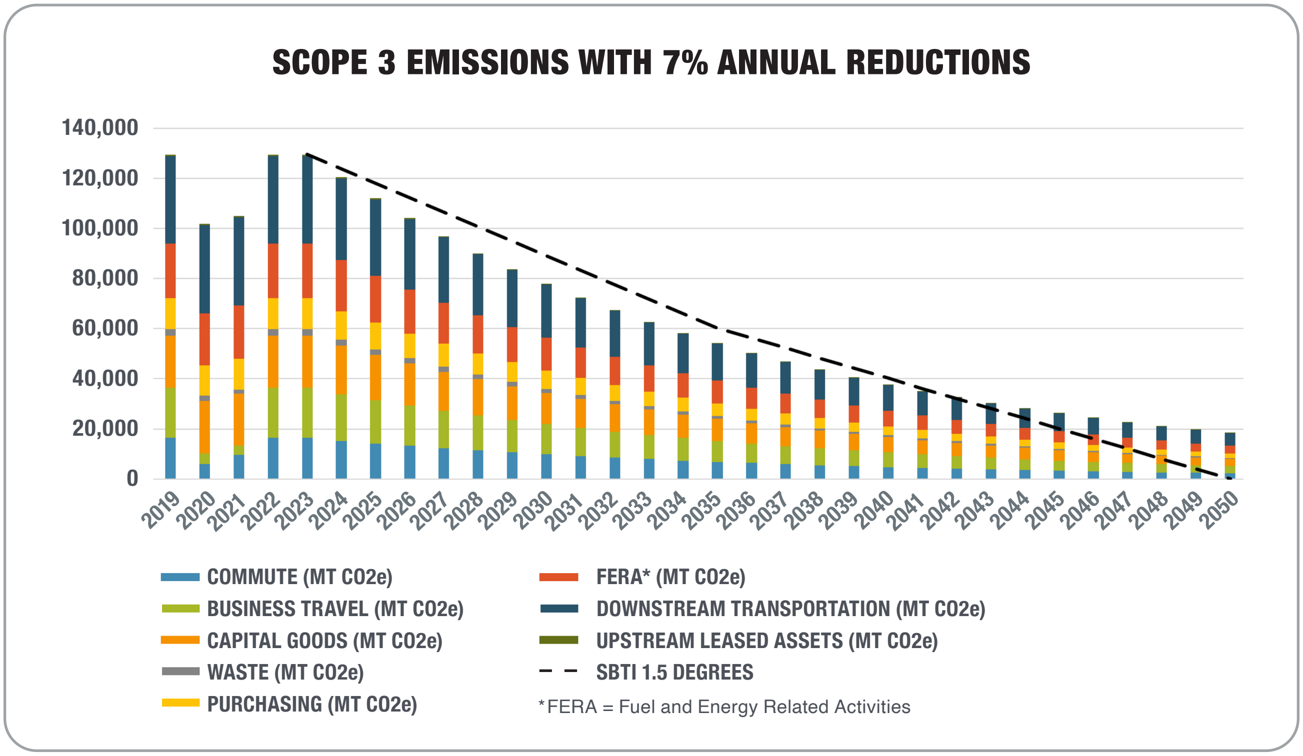
[76] The National Ready Mixed Concrete Association (NRMCA) is an organization representing the interests of companies that produce and deliver ready-mixed concrete in the United States. NRMCA advocates for several practices and initiatives to reduce embodied carbon within the concrete industry.

[77] The International Living Future Institute (ILFI) is an organization that promotes more sustainable buildings and communities. Their Zero Carbon (ZC) Certification is one of the most ambitious environmental certifications available, focusing on making buildings carbon neutral or net-zero in both operation and construction.

If these reduction assumptions were applied, emissions from the targeted categories would fall by approximately from 129,625 MT CO2e to 77,982 MT CO2e by 2030, a reduction of%. Further, they would fall to 18,267 MT CO2e by 2050. Given CU Boulder's targets of 50% reduction in feasible categories, by 2050 and 100% by 2050, a commitment to robust emissions measurement, rigorous collaboration with Scope 3 "owners", and search for appropriate incentives will be required. A consistent annual aim of 7% GHG reductions in each category would approximate CU Boulder's goals, though reductions will take place in proportion to where CU Boulder has the most leverage in the short, medium, and longer term. The following figure shows what a 7% annual reduction would look like. However, to achieve this goal will require three significant steps: 1) a more thorough and consistent data collection process to establish a baseline and monitor progress in several Scope 3 categories, 2) stakeholder engagement to design and collaborate on solutions, and 3) the development and execution of specific targets and strategies. These steps are currently being organized and taken by the University.

FIGURE 20: Selected Scope 3 Categories and Targets[78]



78 The residual emissions in the Figure show that a 7% reduction will not eliminate Scope 3 emissions.

Scope 3 Reduction Strategies

While the 15 categories above map directly to established carbon accounting protocols, it may be helpful to view strategies in a broader sense, by viewing them in the larger (and perhaps more familiar) categories of: 1) Transportation; 2) Embodied carbon; 3) Procurement, and 4) Circularity (or, waste management).

TRANSPORTATION EMISSIONS

Scope 3 transportation emissions are associated with business-related travel, commuting, and out of state student and parent trips to campus. This category is significant because these activities are critical to the mission of the university, but the emissions that result are not directly controlled by CU Boulder. Measures to reduce these emissions include engaging faculty and administration to establish and adhere to travel reduction targets, promoting the use of sustainable fuel options in business travel, and avoiding reliance on carbon offsets. For commuting, strategies involve the implementation of a comprehensive Transportation Demand Management Plan, which seeks to increase the use of environmentally friendly transit options like biking, carpooling, and electric vehicles. Additionally, efforts towards expanding and electrifying vanpool programs, developing e-bike and e-scooter strategies, and creating community shared electric vehicle (EV) programs, including EV charging plans with affordable rates. The goal is to reduce the carbon footprint associated with travel while fostering a more sustainable, efficient, and environmentally conscious approach to transportation within the organizational ecosystem.

EQUITY CONNECTION

Improved transportation services play a crucial role in creating equitable housing solutions by enhancing connectivity and accessibility. With efficient public transit options, people can live further from work or educational centers without facing prohibitive commuting costs or times. This accessibility opens up a broader range of affordable housing options, particularly in areas where housing costs are lower. Furthermore, robust transportation networks reduce the dependency on personal vehicles, which can be a significant financial burden for low-income households. By connecting more remote or less expensive areas to city centers and employment hubs, improved transportation systems can help bridge the gap between where people live and where they work or study, promoting greater social and economic mobility.

EMBODIED CARBON

Embodied carbon emissions refer to the greenhouse gasses emitted during the production and manufacturing of building materials. These encompass all the indirect emissions associated with the entire lifecycle of a building, from the extraction and processing of raw materials to the manufacturing, transportation, and eventual disposal of these materials. Addressing Scope 3 embodied carbon requires a shift towards more sustainable materials, efficient construction practices, and life-cycle analyses. This approach not only reduces the carbon footprint of new constructions and major renovations but also aligns with global efforts to combat climate change by minimizing the indirect environmental impact of built environments. Strategies such as updating building materials standards, setting goals to reduce embodied carbon by 10-20% per year, and prioritizing low-carbon construction techniques as they become available are all recommendations of this CAP.

PROCUREMENT

Scope 3 procurement emissions are those generated from the production and supply of goods and services purchased. For this CAP the category includes life-cycle emissions from food, IT equipment, merchandise, paper and books and marketing supplies. Managing these emissions requires the assessment and selection of suppliers based on their environmental performance, encouraging GHG inventories and reduction targets, and integrating sustainable procurement policies. This will require working with the Procurement Services Center to assess and implement carbon reduction strategies with suppliers, establishing a policy to screen products and vendors, favoring those with GHG inventories and reduction targets, and perhaps amending offer letters to researchers to emphasize sustainable practices. Establishing a food recovery program and increasing the plant-based food offerings over meat options can also help reduce GHG emissions.

CIRCULARITY

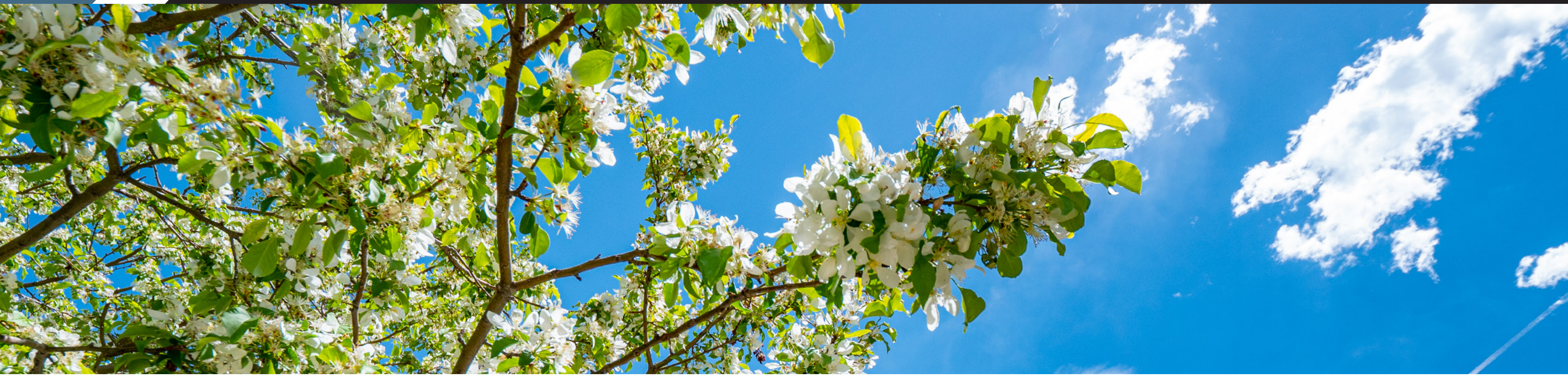
This category refers to GHG from waste generated in operations and includes emissions from the entire lifecycle of products used by the organization, from production to disposal. By focusing on circularity, CU Boulder can minimize waste and maximize the reuse, recycling, and sustainable disposal of materials. Strategies include eliminating non-essential single-use plastics, sourcing products with sustainable packaging, establishing reuse centers for items like clothing and furniture, and promoting comprehensive waste management practices. Such efforts are not only environmentally responsible but also align with the growing global emphasis on sustainable development and resource conservation.

Table 20 expands these strategic options and assigns them to the eight measured Scope 3 categories.

TABLE 20: Strategies for reducing Scope 3 emissions by category

#	CATEGORY	ESTIMATED EMISSIONS	STRATEGIES
1	**PURCHASED GOODS AND SERVICES**	12,216	• Engage with the system Procurement Services Center (PSC) to identify opportunities to assess and implement carbon reduction strategies with suppliers • Determine an emissions policy to screen products and vendors across all campus facilities (e.g., favor vendors who perform GHG inventories and set reduction targets) • Establish a food recovery program on campus for all catering and culinary events, with program information available in multiple languages and formats • Increase percentage of plant-based meals served • Change language of offer letters issued to prospective researcher to explicitly emphasize a commitment to conserving resources through methods like sharing lab equipment, reducing single-use disposables and other sustainable lab practice
2	**CAPITAL GOODS (EMBODIED CARBON)**	20,944	• Report on the adoption of Sustainable Materials Purchasing Guidelines, a list of construction materials with low embodied GHG emissions • Update building design standards for new construction and major renovations • Perform whole-building Life Cycle analyses for new construction and major renovation projects • Set official goal to reduce embodied carbon by a minimum of 10% and targeting 20% against a baseline (using either NRMCA or ILFI ZC methodologies) • Prioritize low carbon construction techniques • Align with Buy Clean Colorado
3	**FUEL AND ENERGY RELATED ACTIVITIES**	21,782	• As natural gas use is reduced and electricity sources become cleaner over time, emissions from this category will decline
5	**WASTE GENERATED IN OPERATIONS**	2,595	• Eliminate purchase of disposable or single-use plastics for nonessential uses • Further reduce package-related plastic waste by sourcing products with sustainable packaging • Establish a campus reuse center (for clothes, furniture, etc.) • Increase the number of furniture and equipment reuse events, grow the online reuse listings platform, and expand education around the CU Distribution Center • Write a Zero Waste plan to address construction and demolition, and strategies around compostables and food recovery efforts • Translate the results of a pre and post waste audit into an actionable waste diversion roadmap with expected annual reporting metrics
6	**BUSINESS TRAVEL**	19,554	• Engage a broader set of faculty and administration to establish reduction targets and develop strategies to reduce business travel • Provide incentives for traveling with airlines that promote sustainable fuel use, but not purchased carbon offsets
7	**COMMUTING**	16,407	• Institute a formal Transportation Demand Management Plan; include strategies aimed at increasing the use of transit, biking, vanpool, carpool, carshare, and micro mobility • Improve the VMT estimation process to ensure accuracy and replicability of the VMT number annually for sustainability reporting and program analysis. • Expand EcoPass program, an annual prepaid transit pass, to additional staff, and faculty that are affiliated with the University • Expand and electrify the vanpool program and explore options and innovations that will support employees working irregular schedules. • Develop a multifaceted E-Bike and E-Scooter strategy aimed at increasing mode shift and focuses on commuters living within 8-10 miles of campus • Centralize transportation services & consider aligning with Capital Improvement Budget • Follow the actions outlined in the University's Transportation Master Plan • Develop a community shared EV program • Develop a community EV Charging plan with affordable rates for off campus commuters • Host engagement sessions with campus community to determine how best to incentivize the use of electric vehicles • Create charging rate structures to better support renters and affordable charging access, who might not have access to charging at home • Ensure key locations, such as family housing and high-traffic areas on campus have accessible infrastructure. • Continue promotion of high-density affordable housing close to campus to reduce future commuting emissions.
8	**UPSTREAM LEASED ASSETS**	538	• Initiate dialogue w/ leasing agents to identify properties with Scope 1 reduction goals • Scope 2 targets will likely be met by reductions from the utility
9	**DOWNSTREAM TRANSPORTATION AND DISTRIBUTION**	35,189	• Initiate surveys to measure student travel during breaks and family visit air travel (currently this category is not well measured, and has been estimated using very high level assumptions and averages - see Annex) • Educate students and parents on emissions from air travel • Test programs that reduce the need for travel between Thanksgiving and Christmas breaks

5. CO-BENEFITS: EQUITY, HEALTH, AND RESILIENCE



Core Goal 3:

Utilize climate action to deliver to the CU Boulder community the co-benefits of equity, health, and resilience.

Co-benefits of taking climate action are positive outcomes that arise from efforts to reduce emissions. These benefits can occur across various sectors, including economic, social, and environmental. Three primary co-benefits have been identified within this CAP: Equity, health and resilience. Many of the Tier 2 and 3 strategies have been developed in support of these co-benefits.

Equity

Climate change affects people differently. Marginalized and frontline communities are disproportionately exposed to hazards from pollution, poor air quality, extreme heat, flooding, drought, and other climate-related hazards. Accordingly, advancing both climate mitigation through emissions reductions, and advancing actions that reduce this inequity are key goals of this CAP. Equity, as a co benefit, is achieved when the University's strategies to reduce greenhouse gas emissions also have direct benefits to these marginalized and frontline communities, include decision-making processes and communication strategies that prioritize the voices of marginalized and frontline communities, and/or remove historical barriers and systemic injustices that negatively affect marginalized and frontline communities. An example is air quality. Colorado has a long history of inequitable and unjust patterns of air pollution, often associated with urban and industrial activity, oil and gas production, and inequities in access to high-quality housing design and construction.[79] These histories and inequities require CU Boulder to commit to monitoring and improving air quality, implementing emission reduction strategies, and collaborating with constituents to address disparities.

Given the scope and scale of the CAP, it is difficult to meaningfully evaluate equity for each goal and emissions reduction strategy. Accordingly, the guiding principles of the plan are meant to ensure that equity is centered in decision-making during plan development and implementation. Here we provide more concrete definitions and principles for guiding climate action implementation on and off campus. In developing and implementing this plan, we rely on two key definitions related to climate and environmental justice.

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79 https://apnews.com/article/politics-colorado-climate-and-environment-us-environmental-protection-agency-pollution-04eb8c47fccbc32789c1499186651d77

In alignment with these definitions and the broader goal of increasing equity in climate action, we build on past work by other institutions, including the University of California and Second Nature's Climate Leadership Network, to provide guidance on "best practices" for understanding and addressing the equity and justice outcomes of the CAP. We encourage those responsible for implementing the CAP[81] to consider the following:

- In oversight and decision-making, ensure inclusive representation along with equitable compensation (e.g., through awards, honoraria, additional pay, adjustment of responsibilities, etc.) and recognition where possible
- When taking climate action, consider the distribution of costs and benefits and if the action may have disproportionate negative outcomes for any group, especially marginalized and frontline communities
- If a proposed action potentially worsens existing inequity or introduces inequity, consider strategies to mitigate this through, for example, compensation, increased communication and engagement, and/or alternative approaches
- Where possible, prioritize actions that have direct material benefits for marginalized and frontline communities
- Where possible, collaborate with community-based organizations, local businesses, and other external constituents to align the University's climate action with the needs and priorities of local communities, especially marginalized and frontline communities
- Throughout the process of plan implementation, ensure accessible and transparent communication and engagement, prioritizing the input of those most impacted by the University's climate actions

By consistently reflecting on the principles of equity and justice and keeping these guidelines in mind, the CAP and those responsible for implementing it, can not only address the immediate impacts of climate change but also work towards building more equitable and climate-resilient communities.

"CLIMATE JUSTICE RECOGNIZES THE DISPROPORTIONATE IMPACTS OF CLIMATE CHANGE ON LOW-INCOME COMMUNITIES AND COMMUNITIES OF COLOR AROUND THE WORLD, THE PEOPLE AND PLACES LEAST RESPONSIBLE FOR THE PROBLEM."

- UNIVERSITY OF CALIFORNIA[80]

"ENVIRONMENTAL JUSTICE IS THE FAIR TREATMENT AND MEANINGFUL INVOLVEMENT OF ALL PEOPLE REGARDLESS OF RACE, COLOR, NATIONAL ORIGIN, OR INCOME, WITH RESPECT TO THE DEVELOPMENT, IMPLEMENTATION, AND ENFORCEMENT OF ENVIRONMENTAL LAWS, REGULATIONS, AND POLICIES."

- US EPA

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[80] https://www.ucop.edu/leading-on-climate/_files/uc-framework-for-ejcj-in-climate-action_final-4.21.22.pdf

[81] Implementers of the CAP include University staff, faculty and students, and includes roles such as project decision-making, finance, evaluation, procurement, design, execution, volunteers, and more. While some projects will necessitate senior leadership decision-making, others will be decided and executed at the department level.

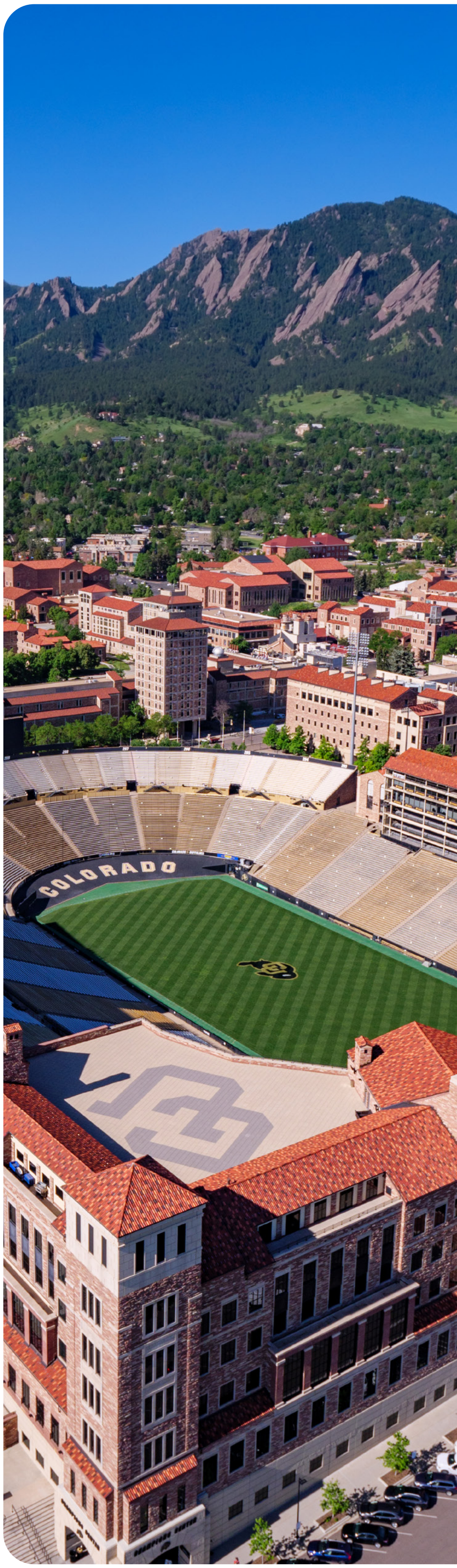
Community Health

While the focus of climate action is driven by the need to protect the planet and the health of all life supported by the planetary ecosystem, some initiatives can also improve community health for students, faculty, and staff, through better air quality, reduced particulate pollution, and the reduction of noise. CU Boulder is a large and dense hub of activity, with a significant impact on air quality. Vehicles, generators, and heating systems emit harmful pollutants, and indoor air quality may be compromised due to poor ventilation. Taking the steps outlined in this Plan to reduce emissions by investing in energy-efficient buildings and upgrading HVAC systems can significantly improve indoor air quality with a direct impact on the health and well-being of the campus community. Further, by adopting clean energy, building and transportation options, CU Boulder also improves outdoor campus and city air quality.

Reducing noise pollution is another co-benefit. Noise pollution can negatively impact concentration, academic performance, and overall well-being. However, the promotion of practices such as carpooling and encouraging the use of electric transport, can further minimize noise pollution.

The co-benefits of climate action extend beyond environmental protection and public health. By adopting sustainable practices, universities can create a more pleasant and enjoyable learning environment for students. For example, green spaces, such as gardens, courtyards, and bike paths, not only enhance the aesthetic appeal of the campus but also provide opportunities for relaxation, recreation, and stress reduction. As another example, reducing food waste through recovery programs, and providing sustainable dining options, such as locally sourced, organic food, can promote healthy eating habits among students, contributing to their overall well-being and academic performance. This is in addition to the carbon savings that can accrue to food waste programs by reducing the significant amounts of emissions associated with nitrogen fertilizer used to grow food, and fuel to transport it long distances. Finally, providing opportunities for students to engage in hands-on sustainability projects and programs can instill a sense of environmental responsibility and civic engagement.

Climate action on university campuses is not just an environmental imperative; it is also a powerful tool for improving the quality of life for students, faculty, and staff. By taking steps to reduce emissions, universities can create a healthier, more peaceful, and environmentally conscious learning environment. These co-benefits, in turn, can enhance student well-being, promote academic success, and attract top talent to the university community.



Resilience

Climate resilience is the ability of people, communities, and systems to withstand, adapt to, and recover from the impacts of climate change. It is a key component of climate action, helping to reduce the vulnerability of people and the environment.

There are many ways to build resiliency, including climate adaptation, reducing GHG emissions, and strengthening social structures. The University of Colorado is committed to all three. Many of the strategies in the CAP serve as adaptation steps, even as they also reduce emissions. It is also a priority of the University to strengthen social resilience, increasing our ability to cope with shocks and stresses. This includes CU's efforts in developing disaster preparedness plans and building social networks that can provide support during difficult times.

The following presents several ways by which CU Boulder can improve its own resilience and provide resiliency services to the community.

CLIMATE EVENT PREPAREDNESS. In the aftermath of a climate event, CU Boulder can play a vital role in helping the broader community recover. The university's resources and capabilities can be used to provide shelter, food, and other essential services to those affected by the event. CU can also provide assistance with damage assessment, recovery planning, and mental health support. By strengthening and modernizing critical energy infrastructure, diversifying the energy portfolio with renewables, and improving the resilience of the campus electric grid in the face of extreme weather events and other potential disruptions, CU Boulder can become a stronger resource to the local community in the event of such disruptions. Here are some specific examples of how CU has served as a post-event resiliency location:

- After the 2013 floods in Boulder, CU opened its facilities to displaced residents and provided food and other supplies.
- After the 2017 wildfires in Colorado, CU helped with damage assessment and recovery planning.
- After the 2021 Marshall Fire in Boulder County, CU provided shelter, food, and other essential services to those affected by the fire.

DEMAND RESPONSE. The cogeneration facility currently in operation provides another type of resiliency to the broader community. During periods of peak demand for electricity, the utility calls on CU Boulder to generate its own power, reducing the amount of utility power needed for the City of Boulder and surrounding communities. By reducing peak demand for the utility, CU Boulder is helping to reduce the need to serve that demand through power plants that are used only at peak times. These power plants - called *peakers* - are often high-emitting generators that can be turned on at short notice. By operating its cogeneration plants, CU Boulder is reducing the need for peakers and their emissions, even though it is burning natural gas to do so. The net effect may be positive emission savings if the *peakers* used produce more emissions than CU Boulder's cogen plant. CU Boulder performs this demand response about fifteen times per year. In return for taking this action, CU Boulder receives a reduction for all energy purchased, enabling it to save considerably all year round. While this CAP calls for the full electrification of the Main Campus heating system, the demand response role played by the campus is a consideration from both an emissions and financial perspective.

While this CAP calls for the full electrification of the Main Campus heating system, firm capacity for heating and power resilience needs to be maintained through the transition. Upgrades to the West District Energy Plant (WDEP) support the continuity of campus operations during the development and implementation of our emissions reduction strategies. To ensure that the combined heat and power plant does not needlessly add to campus emissions, every effort will be made to reduce carbon emissions by limiting and managing the operations of the plant. Once the grid becomes cleaner than operating the combined heat and power plant for baseload, the campus will decrease usage and shift to as needed operations. To summarize CU Boulder's commitment: we will use the plant for baseload steam and electricity until reaching parity with the grid, and for peak level heating and power resilience needs until our heating transition is complete and we have confidence the grid is stable.

Resiliency can be enhanced through implementing the strategies in this Plan. To further complement the resilience component of Core Goal 3 the following specific strategies are recommended.

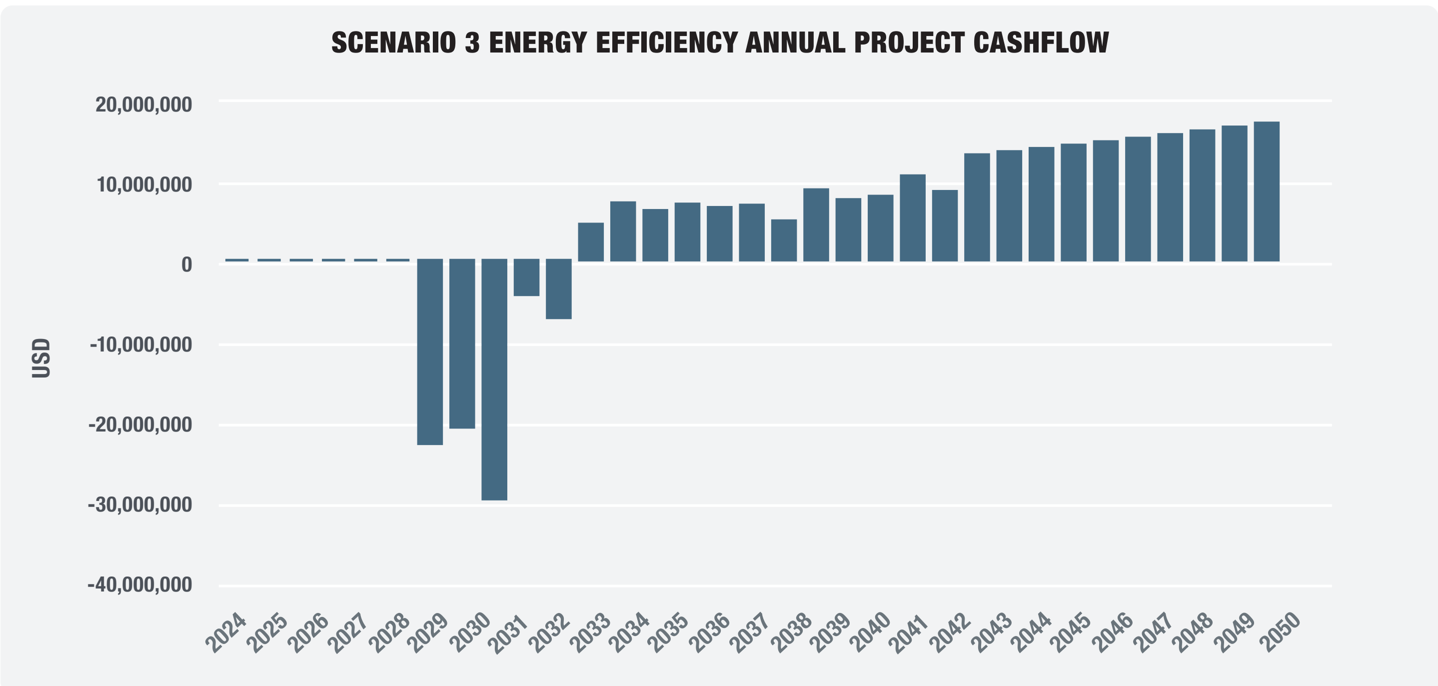
- Strengthen campus and community resilience planning, project development, funding, and operations
- Promote campus as a resilience hub in the time of climate emergencies
- Mobilize faculty, staff, students to help with recovery efforts
- Provide valuable assistance in assessing damage, developing recovery plans, and providing support to those affected by the event, using campus expertise
- Work with the surrounding community to build resilience.
- When called to deliver peak power, CU should continue to deliver to the grid.
- Increase the percent of staff, faculty and students trained in emergency preparedness to support self-efficacy when responding to an emergency situation

ADDITIONAL CO-BENEFITS MAY BE REALIZED BEYOND EQUITY, HEALTH AND RESILIENCE. Many of the climate actions recommended by this CAP will also advance CU Boulder's broader sustainability efforts and accelerate it toward a coveted Platinum STARS rating. Further, several of the energy efficiency projects have the potential to save the campus money, in comparison to a baseline of energy costs.

HELP ACHIEVE A PLATINUM STARS RATING. Implementing a climate action plan will help the university achieve a Platinum STARS rating by systematically addressing key environmental impact areas and aligning with rigorous sustainability standards set by the STARS framework. This Plan contains comprehensive strategies for reducing greenhouse gas emissions, promoting renewable energy usage, enhancing waste management protocols, and integrating sustainability into both the curriculum and campus culture. With a strong focus on measurable outcomes, it will ensure continuous monitoring and reporting of progress, providing transparent and actionable data. This approach not only aligns with the specific criteria for achieving a Platinum rating but also fosters a campus-wide ethos of environmental responsibility and innovation, setting a precedent for sustainability in higher education.

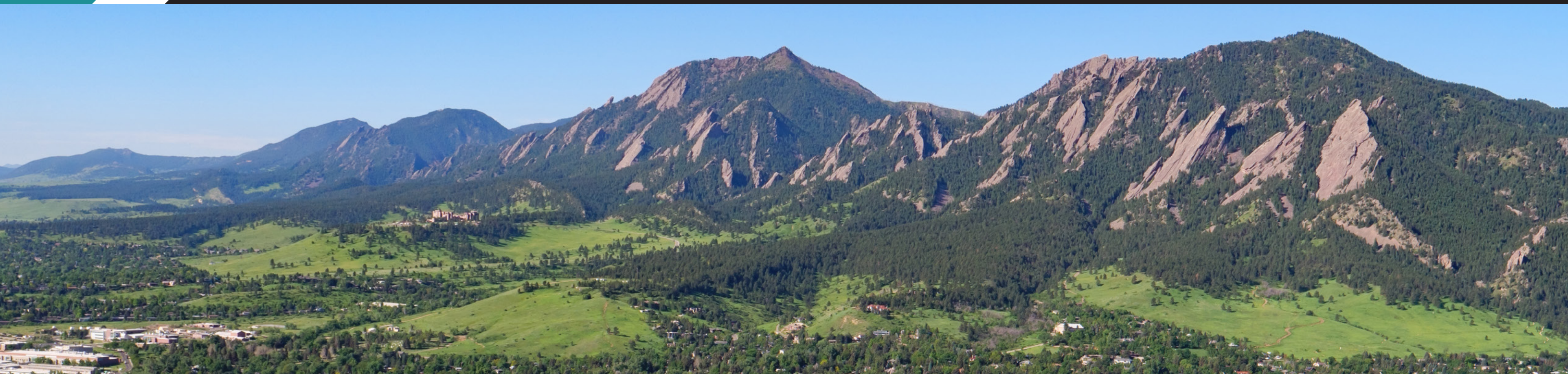
COST SAVINGS. Several of the strategies recommended by the CAP may save the campus money compared to what would have been spent without the strategies.[82] The most likely projects to do so are the energy efficiency projects described in Chapter 3, which create efficiency gains and reduce the demand for electricity, all else being equal. Using Scenario 3 as the implementation pathway, the graphic below shows estimated cash flow over time for the recommended energy efficiency measures (which include lighting, commissioning, and HVAC retrofits plus envelope projects).

FIGURE 21: Scenario 3 Energy Efficiency Project Cash Flow



[82] Other plans have also promised savings in these areas. However, increased utility rates can overtake these savings, leaving real expenses higher. This should not negate savings attributed to these projects, which is why electricity prices should be benchmarked at the time of installation.

6. IMPLEMENTATION:
GOVERNANCE, ENGAGEMENT, REPORTING AND FINANCE



Core Goal 4

Strengthen internal and external management and accountability structures to ensure the campus achieves the goals outlined in the plan.

Core Goal 5

Build a Community Engagement Strategy to integrate communication, feedback, and reporting and achieve an increasing level of transparency with campus and the Boulder community.

A CAP is only as strong as the structures that support its implementation and accountability. Inclusive and equitable governance helps to strengthen the success of a CAP by engaging a range of constituents over time, ensuring diverse representation across leadership and decision-making (along with equitable compensation, when appropriate), and establishing structures for accountability through policies, protocols and working groups. By communicating our successes and failures, the campus aims to foster trust and accountability among stakeholders and demonstrate our commitment to meaningful change.

Implementing the CAP will require CU leadership to execute the actions and report progress. Many of the actions will be dependent upon the allocation of staff time and resources, and budget prioritization.

Implementation of the CAP will be overseen by the Chancellor's appointed Sustainability Council and by an ongoing Sustainability Executive Council composed of staff, faculty, and students. The Sustainability Executive Council, established in December 2023 under the leadership of the Executive Vice Chancellor and Chief Operating Officer will also play a key role in successful CAP implementation.

Some strategies contained in the CAP have begun already and/or can start immediately, while others such as capital investments involve a long term series of steps from project scoping, fundraising and procurement, to planning, design, and construction.

Implementation will not necessarily be easy or work perfectly the first time, and perseverance will be important. It will also be important to maintain flexibility in implementing the strategies of the CAP while maintaining a clear eye on achieving the goals and targets within the CAP. As technologies, business models, and political agendas across all levels of government evolve, CU Boulder will need to remain flexible in "when" and "how" it implements the actions in this plan. As costs and feasibility change, the campus will periodically evaluate and adjust as necessary. Similarly, as progress towards key targets is tracked, CU Boulder may need to scale up or down its efforts, depending on the results observed. The campus should update the CAP every five years beginning in 2029, and report every year on greenhouse gas emissions and progress towards their goals. The campus will also remain focused on capturing GHG emissions data across all 15 categories of Scope 3.

Governance

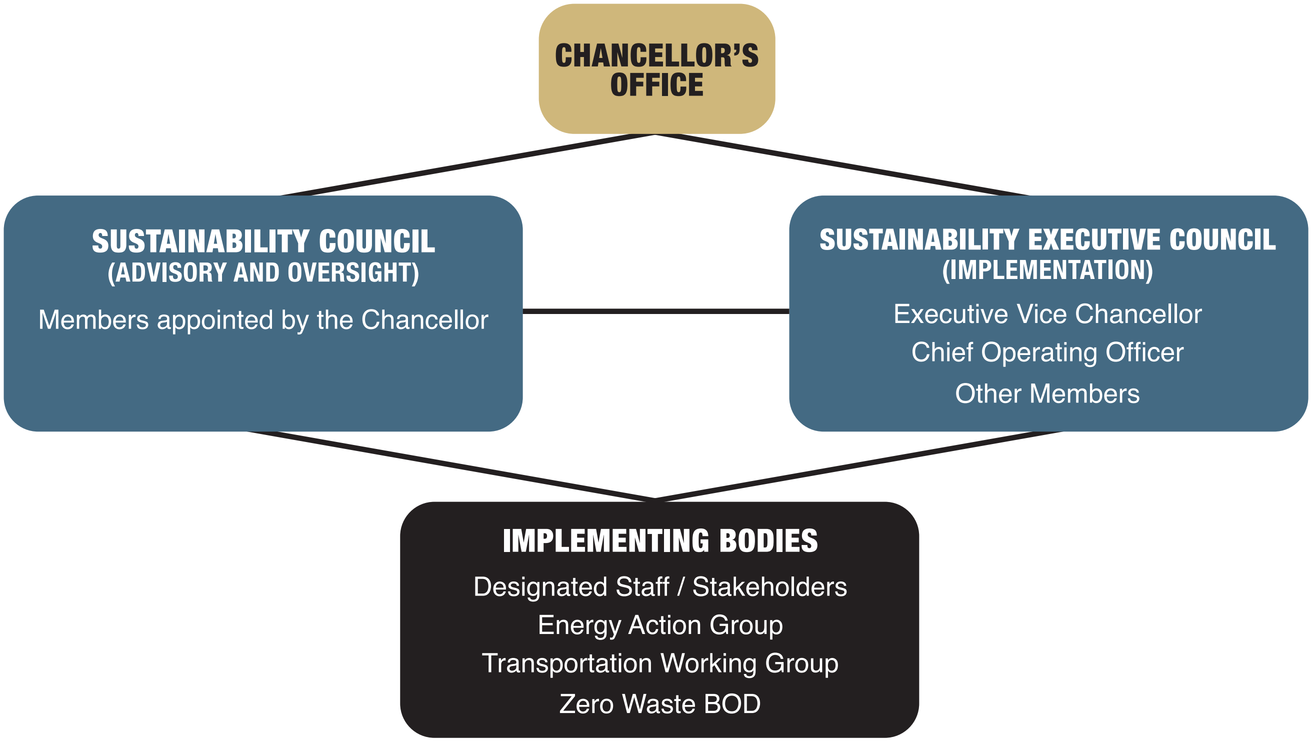
CU Boulder staff and faculty recognize that the campus has many discrete departments and stakeholders that will be required to implement various aspects of the CAP. Therefore, departments and groups will need to begin working together under a common reporting and communication structure. Oversight and monitoring of CAP implementation will reside with the Chancellor's appointed Sustainability Council, and with the Sustainability Executive Council, led by the Executive Vice Chancellor and Chief Operating Officer.

Designated staff will have specific duties regarding implementation. This will include, but not be limited to outreach and coordination with subject matter experts (SMEs) in and outside of the University; oversight and coordination of the actions, programs etc. associated with implementing the CAP; coordination of and response to the CAP Steering Committee; maintenance and updating of the dashboard; response to all inquiries; and preparation of progress reports for the leadership bodies vested with responsibility for successful implementation. All parties will be aided by the Climate Action Tracker, an updateable online list of projects used to track progress over time.

The Sustainability Council will receive a briefing two times each year, from staff on progress (or lack thereof) being made and course corrections that should be considered. The Sustainability Council will then have the option of making course correction proposals to the Sustainability Executive Council or to the Chancellor's cabinet, or to both as needed.

The Sustainability Council will ratify a working plan to monitor implementation progress using implementation and monitoring tools and will report to campus leadership and to the system office on annual progress. As part of annual progress reports SMEs will be recruited to evaluate the effectiveness of each strategy to ensure that anticipated emissions reductions are occurring. In the event that reductions do not occur as expected, recommendations can be made to the Council and campus leadership via staff to modify and add policies or actions to ensure the target is achieved.

FIGURE 22: Governance Organizational Flow Chart



REPORTING AND ACCOUNTABILITY

ONGOING ENGAGEMENT: CU Boulder recognizes that the voices and perspectives of marginalized communities are often overlooked or underrepresented. Through ongoing and inclusive engagement, the University will actively seek input and feedback from these communities, ensuring that a diverse range of concerns and needs are incorporated into the decision-making process necessary for implementing the plan.

CONSTITUENTS: The CAP prioritizes the needs and well-being of all constituents, with a particular focus on marginalized and vulnerable populations. By actively involving these communities in the development and implementation of the plan, the University can ensure that their voices are heard, their experiences are considered, and action is taken to address their specific challenges. In order to realize these goals, the campus will strive to engage these stakeholders in a way that doesn't unjustly overburden them.

INFORMED DECISION-MAKING: The approach to climate action planning and implementation is rooted in data and research, and a deep understanding of the systemic inequalities present within our society. By collecting, integrating, and sharing data across a range of topics (environmental conditions, emissions targets, demographic trends, ongoing disparities, etc.), the University can make informed decisions that address injustice and inequity while mitigating the impacts of climate change.

SMART INDICATORS: The University will establish specific, measurable, achievable, relevant, and timely (SMART) indicators to track progress and hold ourselves accountable for the goals outlined in the CAP. These indicators will enable the campus to monitor the distribution of costs and benefits, and they will ensure that actions contribute to the reduction of environmental disparities. Linked with the above elements, these goals and our progress towards them should be shared across the campus community and beyond to ensure transparency.

SCOPE 3 EMISSION REPORTING: Recognizing that marginalized communities are often disproportionately affected by indirect emissions (Scope 3), the campus will enhance reporting and accounting practices to capture these impacts accurately and implement strategies accordingly. In this way, the University can contribute to broader efforts that promote a more just and sustainable future. Specific areas for improved reporting include student travel to and from campus, emissions associated with purchased goods and services, and inequitable waste management practices.

COLLABORATION WITH CURRICULUM AND FACULTY TRAINING: To promote climate and environmental justice, CU Boulder will collaborate with faculty to integrate these topics into the curriculum and provide training opportunities. By equipping students with the knowledge and skills to understand and address environmental inequities, the University can foster a future generation of change-makers committed to justice and sustainability.

REGULAR AND TRANSPARENT REPORTING: The University is committed to regular and transparent reporting on our progress, including the specific actions taken to address climate and environmental justice. By communicating our successes and failures, the campus aims to foster trust and accountability among stakeholders and demonstrate our commitment to meaningful change.

TOOLS. Several tools have been developed as part of the development of the CAP. These have been designed to facilitate ongoing and collaborative decision making among stakeholders. The first is the CESA tool, which can provide leadership with ongoing decision making analysis. The second is the Climate Action Tracker, which is designed to keep track of strategies as they are executed. The third tool is an online dashboard that has been created to serve as a public communication piece that showcases the impact of various actions on CU Boulder emissions.

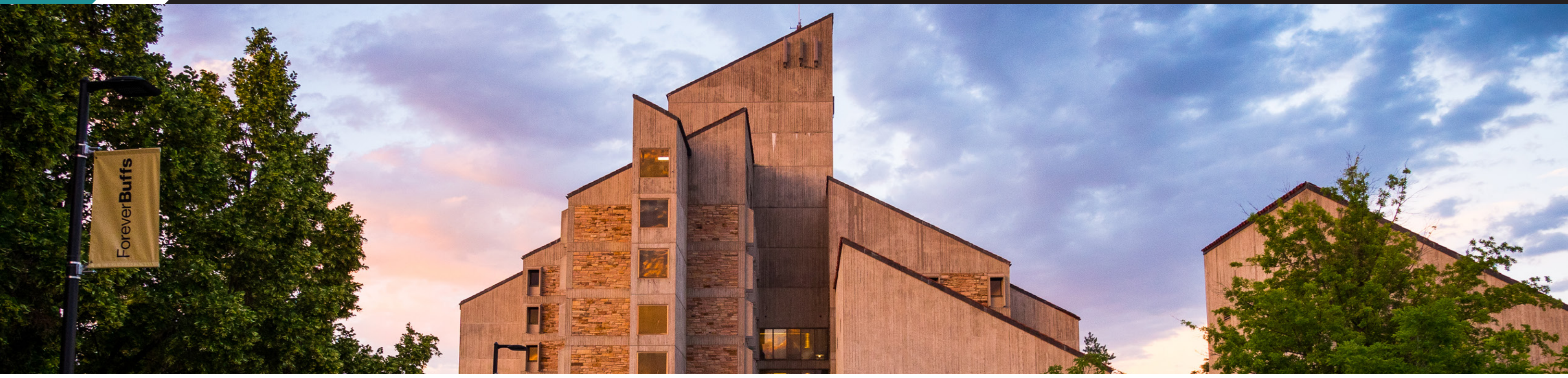
1. The **Climate and Energy Scenario Analysis (CESA) tool** can be used as a benefit-cost analyzer to track the progress of project implementation. As projects are executed, CESA keeps track of GHG reductions, costs, and can be used to re-prioritize projects if needed. CESA can also be customized to keep track of cost savings that accrue from efficiency gains. CESA is capable of creating multiple scenarios that provide visuals to do an apples-to-apples comparison over many project pipelines.

2. The **Climate Action Tracker** combines stakeholder feedback with strategy development to determine and clearly identify what additional gaps in data or funding is needed. The Tracker functions like a workbook and serves as the single point for planning, reporting and ongoing performance monitoring. The Tracker: (1) establishes a “starting point” for future comparisons; (2) tracks strategies and actions identified in the CAP; (3) records contributions and actions of multiple campus leaders; and (4) summarizes results and impacts. The Climate Action Tracker can be used to assign various action and reporting items to key departments responsible for reporting. The Tracker is additionally designed to feed information into Second Nature’s annual reporting of GHG emissions and the Sustainability Tracking Assessment & Rating System (STARS).

3. An **online dashboard** has been created that will act as a public facing online progress reporting mechanism. The dashboard provides both summary graphs of total emissions against the GHG reduction targets, as well as itemized charts where users can dive into the data in more detail. In addition to monitoring emissions, the dashboard also reports the campus energy usage and fleet electrification status. On each page of the dashboard, key performance indicators provide an overall snapshot of Boulder's performance and progress towards the emissions reduction targets.

TABLE 21: Supportive communication strategies

REPORTING AND ACCOUNTABILITY	
STRATEGY	**ACTION STEPS**
Update campus policies and expand communication to support the goals, strategies, and actions identified in this CAP.	The Sustainability Councils will be tasked with regularly reviewing and recommending policy updates or adjustments as deemed appropriate. Many system-wide policies may be out of the Council's direct control, however, the Council will monitor and advocate for policy alignment. • Review policies and procedures to ensure they are created with a lens on environmental, fiscal, and social considerations annually by the Sustainability Councils • Ensure an environmental justice lens is being used
Institute a formal training and assessment framework that will be adopted by the Sustainability Council.	The Sustainability Council will create a framework that will be approved by the Sustainability Executive Council. The Sustainability Council will help to guide and report on progress made by implementing units. This framework will be reviewed and adjusted annually as the campus moves the CAP's implementation timeline forward. • Build a Train-the-trainer model that will be implemented by the Environmental Center • Suggest a student-facing "activism" Train-the-Trainer opportunity - look at successful models on other campuses • Offer training for lab users and graduate student orientation on sustainable practices annually • Establish a Train-the-trainer model to disseminate sustainability information from department managers to specific purchasing personnel



Engagement

Engagement and regular communications about all aspects of the CAP are critical to its success. In the development of the Plan, CAP constituent engagement events have included survey reports, focus group discussions, workshops, and a town hall. A non-unanimous decision-making process decided whether participants' comments and suggestions were integrated into the plan. The feedback received has developed and refined the strategies, in addition to providing guidance on equity implication statements, climate justice projects, and new opportunities. As the CAP is implemented, collaboration between the university and campus and community constituents will remain essential. A summary of the steps taken to engage stakeholders is presented below.

To promote long-term and continued engagement, the Sustainability Council will organize ongoing meetings, surveys, and an online reporting dashboard that will allow the community to give feedback and contribute to the ongoing development of all aspects of the CAP. Climate justice projects should be kept as a primary aim. Campus leadership—working in concert with the Sustainability Council and shared governance leadership via the COO-led Sustainability Executive Council announced in December 2023—will regularly communicate and engage campus and community stakeholders on progress, synthesize feedback received, and determine what the appropriate next steps are to achieve stated goals.

STAKEHOLDER ENGAGEMENT in developing this CAP included feedback from members of the campus and Boulder community. Input was solicited through the following:

- The 2022 Annual Campus Sustainability Summit allowed participants to reflect on positive and negative experiences on campus linked to sustainability, suggestions for future action, and creative communication
- Tabling opportunity with the Latino Chamber of Boulder County
- Meetings with community groups including Boulder Housing Partners, Climate Justice Collaborative of Boulder County, and the Boulder County Latino Coalition
- A 2023 stakeholder engagement luncheon where attendees used sticky notes and pens, color-coded with university affiliation, to share feedback on the draft plan, suggest additional strategies, and identify what should be added to the plan. Resources were provided in Spanish and English, Participants also ranked which goals they would want to prioritize in the plan
- A CAP town hall in 2023, where participants reviewed prioritization and equity implication statements and provided feedback and suggestions
- A CAP Survey deployed in 2023 focused on student input. 151 responses were received and synthesized. Respondents provided feedback on the goals of the plan, equity considerations, their individual sustainability actions, and related topics
- A community-wide public comment period in early 2024 to review Final Draft of the CAP
- A CAP website both informed stakeholders of the content and progress, as well as gave all a portal through which to ask questions and make suggestions

Finance

Determining pathways for finance was a key consideration of this CAP. Outside of the CAP Steering Committee weekly meeting, the Committee met monthly with the Director of Capital Finance to review ongoing cost, implementation and financing scenarios. A goal has been to explore cost effective and economically attractive financing pathways that address both one-time and ongoing costs, and that achieve the maximum benefits (including health, equity, resilience, life cycle, local economic development).

The funds to successfully implement this Plan will be unprecedented, requiring an openness to innovation, new partnerships and dynamic leadership. Realizing these plans will mean the campus must think differently about many of its operations, behaviors and business models. Creativity and tenacity will be essential. An initial list of capital availability includes both traditional and emergent sources. For example, sources can include operating and capital budgets, as well as cash accounts that are being held for future use. Additionally, grants from government agencies, foundations and the private sector that support climate-related projects are also possible. As an important current government example, the 2022 Inflation Reduction Act (IRA) is a new federal source of funding that is unprecedented in size and will allow public entities to receive direct payments in support of certain investments in clean energy and vehicles.

Bond issuances and state-level appropriations are a traditional way that universities can fund large expenses (usually projects of $10 million or more due to the costs of securing the funds). Another funding strategy for large projects, and even multi-project programs, is through some form of public-private partnership (PPP). Through this type of strategy, the University would partner with a private sector third party to develop and help finance climate-related investments. PPPs range in complexity and focus.

For example, ESCOs tend to be narrowly focused on energy efficiency projects, such as lighting and building mechanical system upgrades, building envelope improvements and solar projects. Other privately funded alternatives can provide complex ownership arrangements, long term deals and significant amounts of up front capital that may be used for a variety of funding needs, which are then paid back over time. Finally, a special endowment fund could be pursued via fundraising. This would involve the Office of Advancement prioritizing climate when engaging donor networks to ask for contributions to establish a fund dedicated to sustainability projects. More detail on funding strategies can be found in Annex E.

FIGURE 23: Cumulative Cash Flow by Year

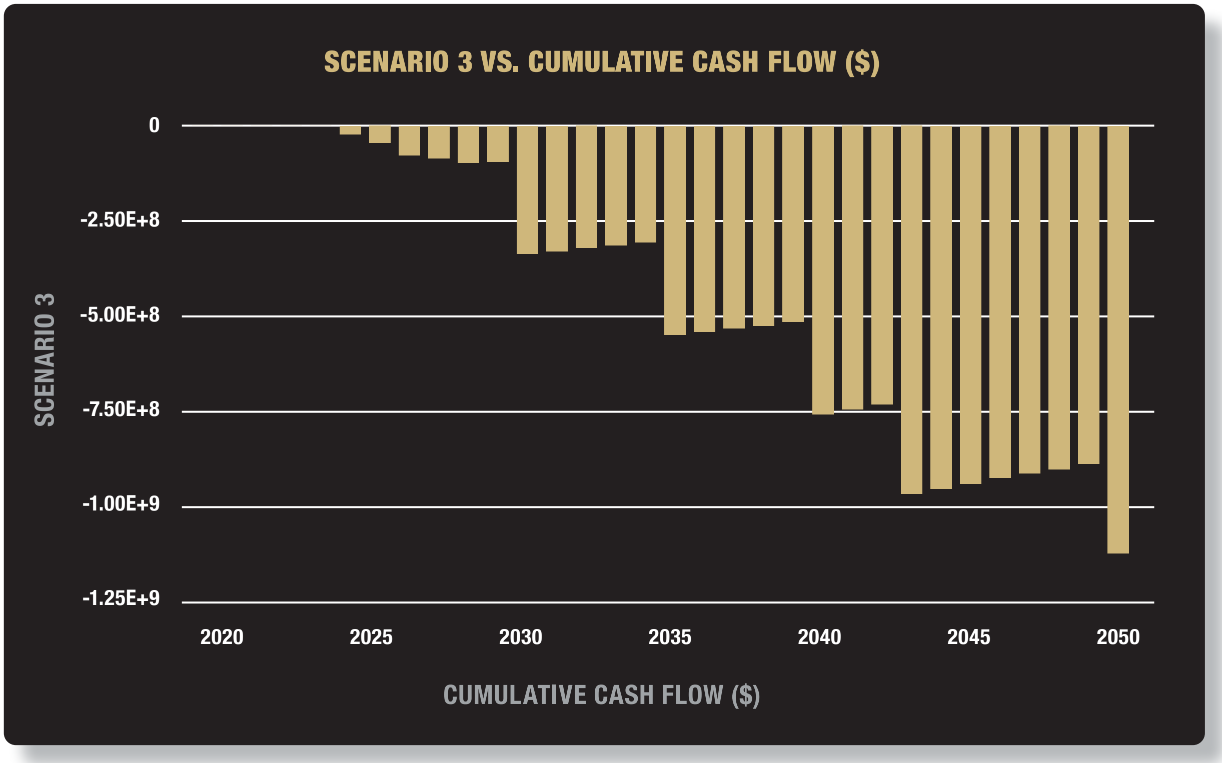


TABLE 22: Funding Suggestions per strategy[83]

FINANCE	
STRATEGY	**FUNDING SUGGESTIONS**
General	• Prioritize federal, state, and utility incentives and grants • Follow the implementation plan within the CESA tool, updating annually • Explore a more robust Green Revolving Fund, that can be partially replenished through dedicated reinvestment in the Fund from the savings derived, especially from energy efficiency projects.
Renewable energy	• The Inflation Reduction Act (IRA) allows public entities a cash reimbursement payment of up to 30% for initial investments in new RE installations. • Green bonds may be available, with extended payback times. • C-PACE. Under Colorado Revised Statutes § 32-20-104 public entities are eligible. • Third party solutions such as Energy Service Companies (ESCOs) and Infrastructure as a Service (IAAS), are also options.
Vehicle Fleet and Infrastructure	• IRA also contains a provision for a Commercial Clean Vehicle Tax Credit and charging infrastructure. • Colorado's Green Business Loan Fund offers loans ranging from $10,000 to $500,000 with interest rates typically below market rates • The Clean Fleet Vehicle Technology (state) Grant Program, offered by Clean Fleet Enterprise (CFE), is designed for eligible light-, medium-, and heavy-duty fleet vehicles. • The EPA's Clean Heavy Duty Vehicles are grants and rebates available for up to 100% of the costs associated with clean heavy-duty vehicles. • Charge Ahead Colorado, provides grant funding for community-based Level 2 (L2) and DC Fast-Charging (DCFC) electric vehicle (EV) charging stations • Colorado's Fleet Zero-Emission Resource Opportunity (Fleet-ZERO) is a grant program aimed at supporting EV charging infrastructure. • Internal campus funds may be an option, since EVs would take the place of existing vehicles at the time of end of life.
Energy Efficiency	• The Department of Energy's Renew America's Nonprofits, provides grants for developing energy efficiency projects in nonprofit buildings. • Section 179D of the U.S. tax code provides a tax deduction for implementation of energy-efficient improvements in commercial buildings. • Self-funding through cash (e.g. money currently saved for a long-term expense) or a Green Revolving Fund may be possible, if savings are captured against a baseline. • C-PACE can be used for energy efficiency projects • Colorado's Public Building Electrification Program, provides public buildings with funding to explore and implement building system electrification measures and infrastructure upgrades • Colorado's High Efficiency Electric Heating & Appliances (HEEHA) Program (May '23), supports community efforts to switch to high efficiency electric heat & appliances
Central Utility Plant	• Third party solutions may be the best alternative for financing these large and expensive projects. These arrangements may allow for financiers to own other aspects of the University's operations in order to create more positive cash flows. These include ESCOs (which would need to limit their investments to energy-related projects) IAAS, and other public-private partnerships. • Green bonds, and an • Special endowment raised specifically for this purpose.

[83] The programs listed in the Table are explained in greater detail in Annex E.

Roadmap

Table 23 provides a possible implementation roadmap for the strategies. This timeline will be revisited in an annual monitoring of the CAP. During the implementation process, dates may need to be changed due to unforeseen circumstances, and some strategies may require revisions.

TABLE 23: Strategy List with Generalized Timeline[84]

TIER	SCOPE	SCOPE 3 CATEGORY	STRATEGIES	GENERALIZED TIMELINE
1	1+2	NA	Re-commissioning projects	2024–2030
1	1+2	NA	HVAC system retrofits	2024–2030
1	1+2	NA	Envelope improvements	2024–2040
1	1+2	NA	New Building Efficiency Design Standards	2024
1	1	NA	Main campus heating system upgrade	2030–2050
1	2	NA	Lighting retrofits	2024–2030
1	2	NA	On-campus solar PV	2025–2030
1	3	2	Update building materials standards for new construction and major renovations	2024
1	3	7	Institute a Transportation Demand Management Plan encouraging mode shifting	2026
1	3	7	Develop an affordable community EV Charging plan	2030
1	1	NA	Electrify campus vehicle fleet	2024–2037
2	3	1	Identify opportunities to assess & implement carbon reduction with suppliers	2025
2	3	2	Reduce embodied carbon by >10% and target 20% for new construction and major renovation projects; align with Buy Clean CO	2024–2030
2	3	5	Institute a construction waste diversion policy	2025
2	3	6	Facilitate discussion on options to reduce business travel emissions	2025
2	3	6	Incentivize use of airlines that promote sustainable fuel use, but not purchased carbon offsets	2026
2	3	7	Develop a community shared EV program	2028
2	1+2	NA	Optimize Existing Building Space	2026
2	3	3	Reduce upstream gas leakage (will result from decreased gas use)	2024–2045
3	3	1	Establish a food recovery program on campus for all catering and culinary events	2030
3	3	1	Increase percentage of plant-based meals served	2029
3	3	5	Eliminate purchase of disposable or single-use plastics for nonessential uses	2030
3	3	5	Establish a campus reuse center (clothes, furniture, etc.), and online reuse platform	2028
3	3	5	Write a Zero Waste plan to address construction and demolition, and strategies around compostables and food recovery efforts	2030
3	3	5	Translate the results of a pre- and post-waste audit into an actionable waste diversion roadmap with expected annual reporting metrics	2032
3	3	7	Host engagement sessions with the campus community to determine best incentives for the use of electric vehicles and e-bikes. Consider distributing e-bikes to low-income students/staff through a sponsorship program.	2032
3	3	7	Improve the VMT estimation process to ensure accuracy and replicability of the VMT number annually for sustainability reporting and program analysis	2025
3	3	7	Expand staff vanpools to make them available to more low-income staff	2026
3	3	9	Initiate surveys to measure student travel during breaks and family visit air travel	2027
3	3	9	Educate students and parents on emissions from air travel	2027
3	3	9	Explore options, along with CU system partners, to reduce travel related emissions during holiday breaks	2027

[84] Each strategy within this CAP is prioritized into three Tiers: Foundational (Tier 1), Supportive (Tier 2) and Complementary (Tier 3). Foundational strategies are those that directly reduce emissions and are drawn out as immediate priorities. Supportive strategies are ranked next and indicate strategies that have less of a direct GHG reduction potential but are still critical elements in reducing climate impacts. Complementary strategies are focused on educational and engagement areas that create durability and wider-reaching impact.

CONCLUSION

Conclusion

CU Boulder's 2024 Climate Action Plan (CAP) is a blueprint for driving significant greenhouse gas emission reductions, while promoting equity, health, and resilience within the university community and beyond. It is anchored in a clear understanding of current emissions across Scopes 1, 2, and 3, and sets forth a strategic and multifaceted approach to achieve a 50% reduction in emissions by 2030 and carbon neutrality by no later than 2050. The Plan is recognized to be, however, a work in progress that must be carefully monitored and modified as merited in the course of its implementation. This is true for Scopes 1 and 2, and particularly true for Scope 3 which represents more than half and is included in the university's GHG reduction aims for the first time. The work to identify clear, plausible and affordable actions and then ensuring implementation of those actions is driven by the recognition that the sooner we can reach carbon neutrality, the better.

The Plan's acknowledgment of equity considerations sets out CU's commitment to implement a Climate Action Plan that is both environmentally sound and socially responsible. The scope and challenge of genuine and productive work on equity and climate justice is an equally important arena that will require immense diligence and commitment by a broad range of participants from across the campus for the foreseeable future. The challenges ahead are considerable, yet the CAP's combination of targeted emissions reduction strategies, focus on co-benefits, internal governance, community partnerships, and robust financial planning positions CU Boulder to meet these challenges head-on, positioning the university as a strong example in sustainable and equitable climate action.

Other Resources

1. **Boulder Racial Equity Plan**
   https://bouldercolorado.gov/media/4167/download?inline

2. **Climate, Ecosystems, and Community**
   https://bouldercolorado.gov/media/561/download?inline

3. **Colorado climate change vulnerability study**
   https://dnrweblink.state.co.us/cwcb/0/doc/202146/Electronic.aspx?searchid=f02d65b3-001a-4eb5-ae79-f08bab6ac37c

4. **A Framework for Incorporating Environmental & Climate Justice into Climate Action (University of California)**
   https://www.ucop.edu/leading-on-climate/_files/uc-framework-for-ejcj-in-climate-action_final-4.21.22.pdf

5. **ICLEI: Equity first steps guide**
   https://icleiusa.org/wp-content/uploads/2022/09/Equity_-First-Steps-Guide.pdf

6. **Climate equity indicators**
   https://www.cincinnati-oh.gov/sites/oes/assets/File/Climate%20Equity%20Indicators%20Report_2021.pdf

7. **Equity indicators**
   https://www.equitymap.org/_files/ugd/4aef44_048801f07d164e0c82d10290afadf27d.pdf?index=true

Acronyms

APUPCC	American College & Universities Presidents Climate Commitment
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
BAU	Business as Usual
BIPOC	Black, Indigenous, and People of Color
Btu	British thermal unit
CAP	Climate Action Plan
CDP	Carbon Disclosure Project
C&D	Construction and Demolition
CESA	Climate and Energy Scenario Analysis tool
CFE	Clean Fleet Enterprise
CNAIS	Center for Native American and Indigenous Studies
CO	Colorado
COVID	Coronavirus Disease 2019
CO2	Carbon Dioxide
CSG	Community Solar Garden
CP	Capital Projects
C-PACE	Colorado Commercial Property Assessed Clean Energy
CPCN	Conceptual Plan for Carbon Neutrality
CU Boulder	University of Colorado Boulder
CUP	Central Utility Plant
DCFC	DC Fast Charging
DEI	Diversity, Equity, and Inclusion
EE	Energy Efficiency
EMP	Energy Master Plan
EPA	Environmental Protection Agency
EPR	Extended Producer Responsibility
ESCOs	Energy Service Companies
ESG	Environmental, Social, and Governance
EUI	Energy Use Intensity
e-bikes	Electric Bikes
e-scooters	Electric Scooters
EV	Electric Vehicle
FEMA	Federal Emergency Management Agency
FERA	Fuel and Energy Related Activities
Fleet-ZERO	Fleet Zero-Emission Resource Opportunity

Acronyms

FLOWS	Foundation for Leaders Organizing for Water and Sustainability
GHG	Greenhouse Gas
GWP	Gross Warming Potential
HEEHA	High Efficiency Electric Heating & Appliances
HSU	Heating System Upgrade
HVAC	Heating, Ventilation and Air Conditioning
IAAS	Infrastructure as a Service
ICE vehicles	Internal Combustion Engine Vehicle
IECC	International Energy Conservation Code
ILFI ZC methodology	International Living Future Institute's Zero Carbon Methodology
IRA	Inflation Reduction Act
kW	kilowatt
kWh	kilowatt Hours
LED	Light Emitting Diode
LEED	Leadership in Energy & Environmental Design
M&E	Monitoring and Evaluation
MPV	Multi-purpose Vehicle
MRF	Materials Recovery Facility
MT	Metric Tons
MTCO2e	Metric Tons of Carbon Dioxide Equivalent
MW	Megawatt
MWh	Megawatt Hours
NGO	Non-government Organization
NOx	Nitrous Oxide
NPV	Net Present Value
NREL	National Renewable Energy Laboratory
NRMCA	National Ready Mixed Concrete Association
LSV	Low Speed Vehicle
OGSF	Outside Gross Square Feet
OSO	Office of Space Optimization
PD&C	Planning, Design, and Construction
PPP	Public-private Partnership
PSC	Procurement Services Center
Solar PV	Photovoltaic Solar
RAPT	Resilience Analysis and Planning
RCx	Retro Commissioning

Acronyms

RE	Renewable Energy
RES1	New Residence Hall
RECs	Renewable Energy Certificates
ROV	Recreational Off-road Vehicle
RPS	Renewable Portfolio Standards
SBT	Science Based Targets
SBTi	Science Based Targets Initiative
SCC	Social Cost of Carbon
sf	Square Feet
SMART	Specific, Measurable, Achievable, Relevant, and Timely
SMEs	Subject Matter Experts
STARS	Sustainability Tracking Assessment and Reporting System
SUV	Sport Utility Vehicle
TDM	Transportation Demand Management
TRN	Transportation
UN	United Nations
UMC	University Memorial Center
VMT	Vehicle Miles Traveled
VNEM	Virtual Net Metering
WDEP	West District Energy Plant
WRI	World Resources Institute
WWF	World Wide Fund for Nature
ZC	Zero Carbon

Tools

FEMA NATIONAL RISK INDEX

https://hazards.fema.gov/nri/map

ENERGY ACCESS

LEAD

Climate and economic justice screening tool

Egrid power profile (clean energy access)

PUBLIC HEALTH

Tree equity score

Parkserve

INFRASTRUCTURE

RAPT (resilience analysis and planning)

EPAs smart location mapping

All transit

ECONOMIC PROSPERITY

US Census

EPA EJ screen tool

CO environmental justice mapping tool