



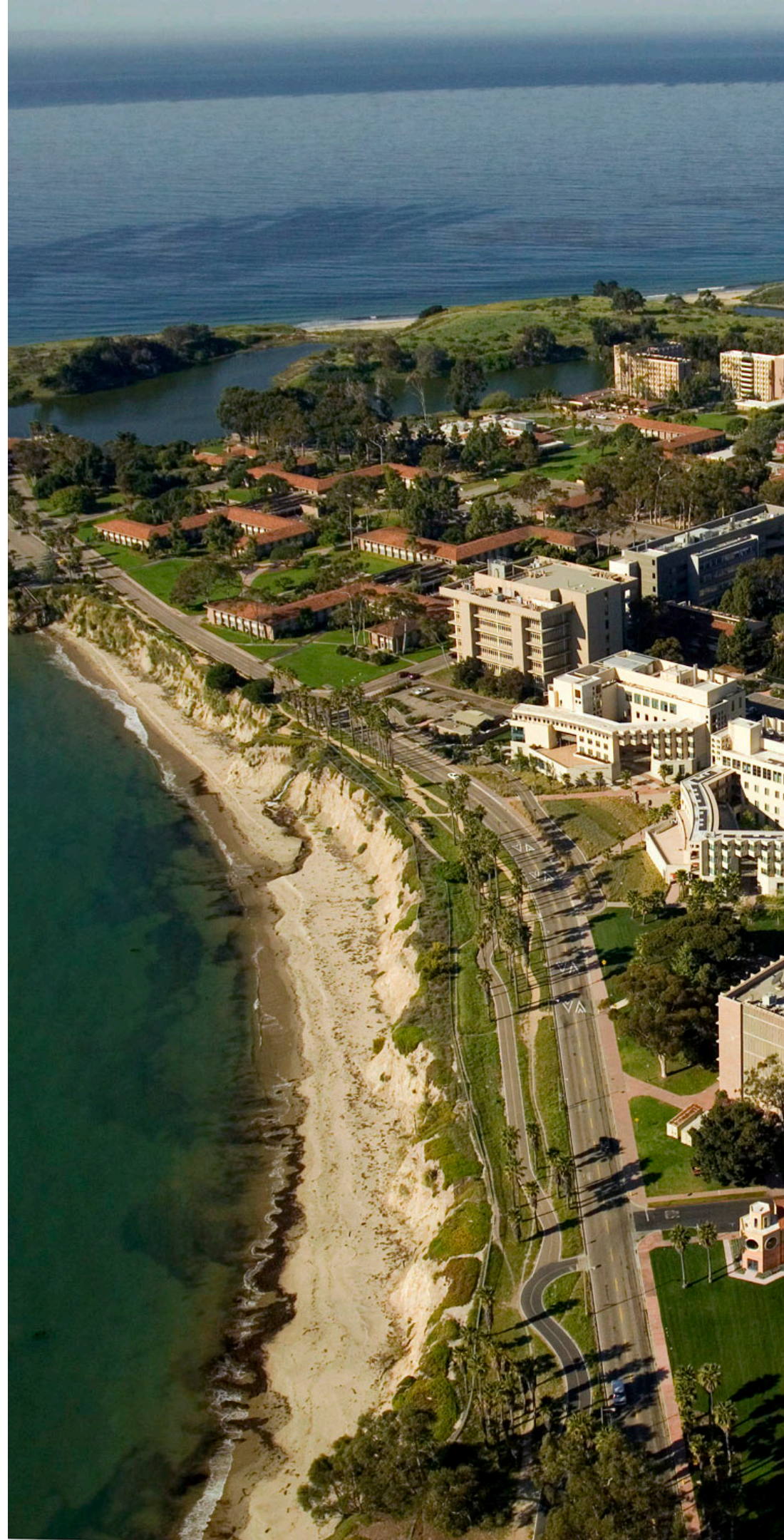
2025

CLIMATE ACTION PLAN

Climate Mitigation &
Preparedness

UC Santa Barbara

TABLE OF CONTENTS



1. [Acknowledgements](#)
2. [Executive Summary](#)
3. [Introduction](#)
4. [Background](#)
5. [2025 Update](#)
 - a. [Greenhouse Gas Emissions Inventory](#)
 - b. [Scope of Emissions](#)
 - c. [Historical Emissions](#)
 - d. [Current Emissions](#)
 - e. [Projected Emissions and Campus Growth](#)
 - f. [Emission Baseline & Reduction Targets](#)
6. [Mitigation & Strategies](#)
 - a. [Scope 1 Emissions](#)
 - b. [Scope 2 Emissions](#)
 - c. [Scope 3 Emissions](#)
 - d. [Energy Conservation and Behavioral Change Program](#)
 - e. [Campus as a Living Lab](#)
 - f. [Landscape and vegetation](#)
7. [Climate Resilience and Adaptation](#)
8. [Procurement of Goods and Services](#)
9. [Conclusion & Next Steps](#)
10. [Appendices](#)
 - a. [Greenhouse Gas Calculations of Commuting and Business Travel](#)
 - b. [Greenhouse Gas Calculations of Procurement of Goods and Services](#)

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GLOSSARY

BAU - Business as Usual

Campus Fleet - University-owned or operated vehicles and mobility equipment (e.g., passenger vehicles, trucks, vans, shuttles, agricultural vehicles, marine equipment, etc.).

Equity - As defined in the UC Sustainable Practices policy "Creation and assurance of opportunities for equitable access and success for historically underrepresented populations, such as racial and ethnic minority and low-income communities, in three main areas: representational equity- proportional participation at all levels of an institution; resource equity- the distribution of resources to close equity gaps; and equity-mindedness- the demonstration of an awareness of and willingness to address equity issues among institutional leaders, staff and all community members. A principle of fairness, with freedom from bias. Equity contends that people have different access to resources because of systems of oppression and privilege."

Environmental Justice - As defined in the UC Sustainable Practices policy, "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 (USEPA); All people and communities have the right to equal environmental protection under the law, and the right to live, work and play in communities that are safe, healthy and free of life-threatening conditions (Principles of Environmental Justice, 1991)."



GHG - Greenhouse Gases

HDAE - Housing, Dining, & Auxiliary Services

kWh - kilowatt hour

LCA - Life Cycle Assessment

MT CO₂e - Metric tons of carbon dioxide equivalent, a standardized unit used to express the warming effect of different greenhouse gases in terms of the amount of carbon dioxide (CO₂) that would have the same impact.

OGSF - Outside Gross Square Feet. OGSF is calculated as the sum of a building's Basic Gross Area and its Covered Unenclosed Area

Scope 1 – Direct Emissions: on-site natural gas, diesel, and propane combustion; campus fleet emissions; marine vessel emissions; and fugitive emissions.

Scope 2 – Indirect Emissions: purchased electricity.

Scope 3 – Indirect Emissions (Other): University-funded business air and car travel, student, staff, and faculty commuting, and the disposal and treatment of waste.

UCOP - University of California, Office of the President

UCSB - University of California, Santa Barbara

ZEV - Zero-Emissions Vehicle, as defined by the California Air Resources Board (CARB) ZEV program standards, is a vehicle that emits no tailpipe pollutants (e.g., criteria air pollutants, precursors, or greenhouse gases) from the onboard source of power under any possible operational modes or conditions.



DISCLAIMERS

The UC Santa Barbara Climate Action Plan (CAP), prepared consistent with the UC Sustainable Practices Policy, and the associated Clean Energy Master Plan are not legally binding and do not commit the University to the implementation of any specific greenhouse gas (GHG) reduction measure or related development project, and as such are not “projects” as defined under the California Environmental Quality Act (CEQA). To the extent such studies and plans could be construed as a “project” under CEQA, they are exempt from CEQA as planning and feasibility studies. In addition to facilitating the reduction of UC-related GHGs, CAPs are intended to serve as a guide to achieving the campus’s broad climate goals, including in the areas of resilience, transportation, and diversity, equity, and inclusion.

Long Range Development Plans (LRDPs) are comprehensive land use plans that guide the siting and development of buildings and infrastructure needed to support projected campus population levels through a defined horizon year. Under CEQA Statute 21080.09, Environmental Impact Reports are prepared to evaluate the environmental effects of LRDPs and thereby satisfy the requirements of CEQA for general development and population growth of a particular campus or medical center. The specific GHG reduction measures and the environmental effects of related projects identified in CAPs are generally incorporated into LRDP EIRs and any subsequent tiered document pursuant to CEQA. All University projects, whether or not they are evaluated in a LRDP EIR, remain subject to environmental review pursuant to CEQA at the time of project approval.



LAND ACKNOWLEDGEMENT

As a land grant institution, UC Santa Barbara acknowledges the Chumash peoples as the traditional land caretakers of the unceded territory where the campus is located.

UC Santa Barbara acknowledges our presence on the traditional, ancestral, and unceded territory of the Chumash peoples.

UC Santa Barbara acknowledges the Chumash peoples as the traditional caretakers of Santa Barbara County.

As a land grant institution, we pay our respects to the ancestors, elders, and relatives past, present, and emerging.

EXECUTIVE SUMMARY

The Climate Action Plan (CAP) outlines a comprehensive strategy to mitigate climate change, enhance resilience, and achieve sustainability goals. This plan outlines actionable projects, policies, and community-driven initiatives designed to reduce greenhouse gas (GHG) emissions, enhance climate resilience, and promote environmental justice.

Key Objectives and Strategies included in the plan:

- **Reduce Carbon Emissions:** Implement aggressive strategies to cut GHG emissions at UCSB on a path to achieve a 90% reduction in total GHG emissions by 2045.
- **Eliminate Scope 1 natural gas emissions** by at least 90% through building electrification.
- **Sustainable Transportation:** Invest in public transit, active transportation infrastructure, and electric vehicles.
- **Business Travel:** Implement policies and programs to reduce GHG emissions from business car and air travel.
- **Community Engagement & Equity:** Prioritizing overburdened and under-resourced communities in climate action, and fostering public participation.
- **Adaptation & Resilience:** Strengthen disaster preparedness and address climate-related health risks.

The combined strategies, if funded, are projected to achieve an ~87% reduction in GHG emissions by 2045, relative to 2019 baseline levels.

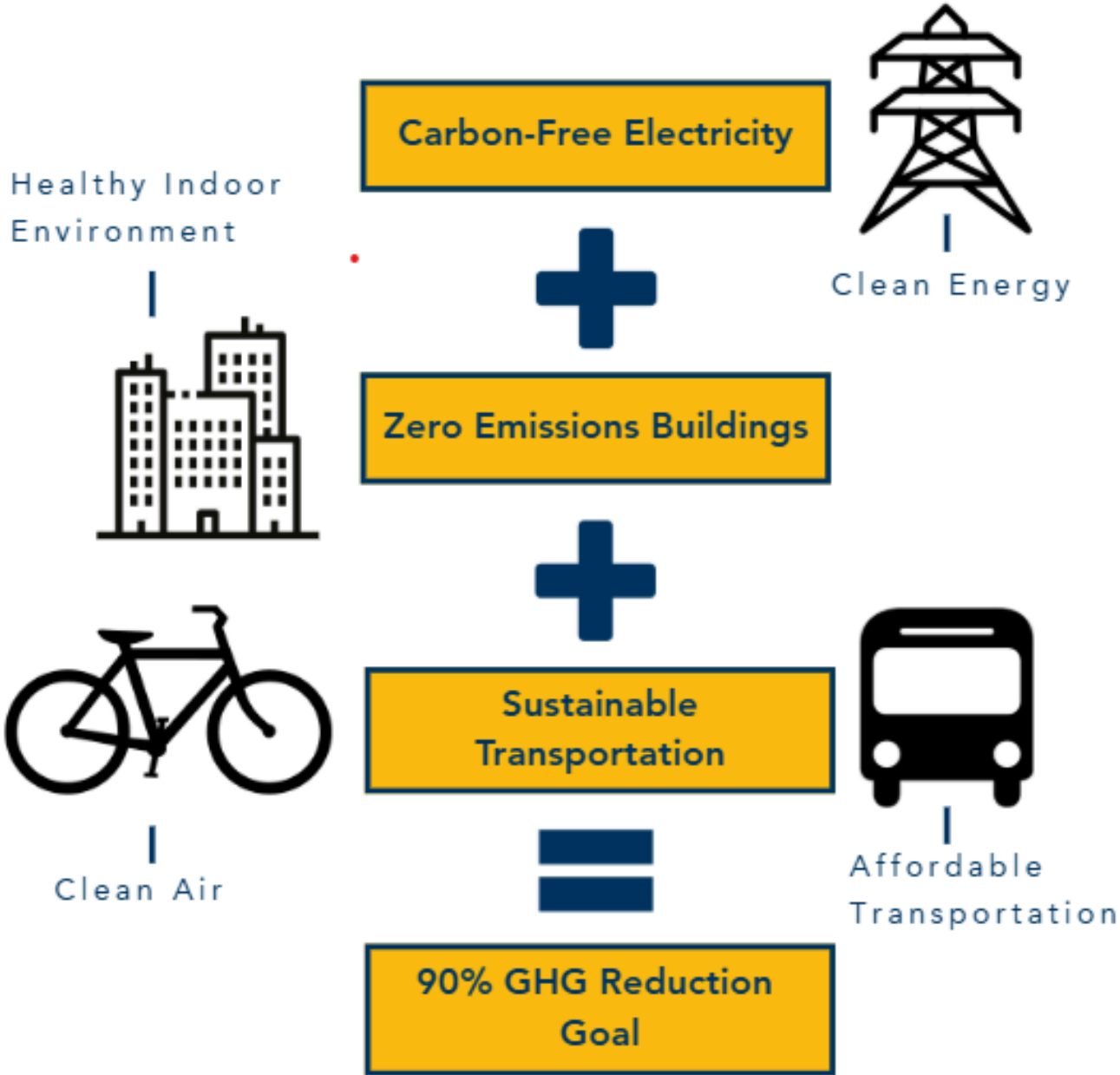
GHG Emission Scope and Source	2019 (MTCO _{2e})	2023 (MTCO _{2e})	Mitigation Strategies	Reduction
Scope 1 - Stationary Combustion	19,598	17,253	16,977	94%
Scope 1 - Mobile Combustion	1,379	1,148	846	78%
Scope 1 - Fugitive Emissions	281	323	0	0%
Scope 2 - Purchased Electricity	20,104	215	215	100%
Scope 3 - Business Travel	4,921	4,630	104	8%
Scope 3 - Commuting	11,207	10,195	9,084	90%
Scope 3 - Waste	1,145	948	573	50%
Total	58,635	34,712	27,496	87%

EXECUTIVE SUMMARY

UCSB has already nearly eliminated Scope 2 emissions by purchasing clean electricity, and overall GHG emissions have fallen by over 40%. With the recent decline in Scope 2 emissions, Scope 1 emissions from natural gas have become the largest source, accounting for 50% of our total emissions. With the recent completion of the Clean Energy Master Plan and a Detailed Project Program, UCSB has a clear, cost-effective strategy to eliminate Scope 1 emissions through a new Central Utility Plant equipped with Air-Source Heat Pumps and Thermal Storage. The 45-year cost of ownership is ~\$2.25 billion for the new centralized utility plant and ~\$3.04 billion for the business-as-usual scenario. These estimates are subject to change and are still being refined for the Detailed Project Program.

The remaining GHG emissions are primarily a result of commuting and business travel, which are the primary focus of the CAP, along with Adaptation and Resilience. Scope 3 emissions reduction strategies are estimated to cost \$50,000 - \$500,000, with significant financial savings for programs that reduce business travel, given the departmental cost savings. For every MT CO_{2e} of air travel emissions reduced, UCSB saves ~\$975 on air travel costs alone. While there are no significant cost savings associated with commuter emissions reductions, there are several co-benefits, including improved public health and reduced traffic congestion. UCSB is much like a small city and has a substantial impact on the social and economic life of the surrounding communities.

This CAP serves as a roadmap for long-term sustainability, aligning with global climate commitments while ensuring local economic and social benefits. The success of this plan depends on collaborative efforts from local and federal government agencies, businesses, and communities working together to create a sustainable future.





INTRODUCTION

Background

The University of California, Santa Barbara (UCSB) has long been a leader in the advancement of environmental protection, education, and research. In 1990, then-Chancellor Barbara Uehling was one of the first chancellors in the US to sign the Talloires Declaration. This document, originally signed by 22 university presidents, declares that institutions of higher learning will be world leaders in developing, creating, supporting, and maintaining sustainability on their campuses. In September 2006, Governor Arnold Schwarzenegger signed into law AB 32 – the Global Warming Solutions Act of 2006. In June 2004, the University of California's then-President Robert Dynes approved the Policy on Sustainable Practices guidelines for the UC system to minimize its environmental impact and decrease its dependence on non-renewable energy. In 2007, a section on Climate Protection Practices was added that mandates each campus develop, by December 2008, a long-term plan for (1) achieving 2000 emissions levels by 2014, (2) achieving 1990 levels by 2020, and (3) eventual carbon neutrality. In 2007, then-President Robert Dynes also signed the American College and University Presidents' Climate Commitment (ACUPCC), and UCSB Chancellor Henry T. Yang was appointed to the ACUPCC advisory board. As part of this commitment and ongoing development of sustainability initiatives, in October 2008, Chancellor Yang appointed a high-level campus-wide sustainability committee consisting of faculty, staff, and students. This committee reviews and prioritizes sustainability projects and initiatives and submits recommendations to the Chancellor for approval and funding. In November 2013, UC President Janet Napolitano announced an initiative to achieve complete carbon neutrality in University of California operations (Scope 1 and 2) by 2025. In 2014, the UC Global Climate Leadership Council (GCLC) was formed by President Napolitano to advise UC leadership on achieving carbon neutrality by 2025. In May of 2013, the Academic Senate voted in favor of divesting from the 200 most polluting fossil fuel companies. In August of 2014, the Chancellor's Sustainability Committee called upon Chancellor Yang to endorse the ongoing campaign at the UC to divest its endowment from the 200 most polluting fossil fuel companies. In September 2015, the UC divested from coal and tar sands companies. While the Climate Action Plan does not directly focus on the issue of divestment, UCSB recognizes student, faculty, and staff commitment to fossil fuel divestment and climate justice.



INTRODUCTION

In April of 2022, the Systemwide Academic Senate voted in favor of a memorial on reducing fossil fuel combustion. The Memorial petitioned the Regents for investments in UC's infrastructure that reduce on-campus fossil fuel combustion by at least 60% of current levels by 2030 and by 95% of current levels by 2035. That same year, UC President Michael Drake launched the Pathways to a Fossil Free UC Task Force (P2FFUC) to tackle decarbonization of the campus's central energy systems by providing a framework to develop recommendations, cost estimates, and timelines to minimize the University's reliance on the onsite combustion of fossil fuels. Each location also received funding from the UC system for decarbonization planning efforts. In July of 2023, to accelerate the transition away from fossil fuels, the UC adopted a new climate policy that supersedes the 2013 Carbon Neutrality Initiative (CNI), prioritizes direct emission reductions, and limits the use of carbon offsets. The UC Sustainable Practices policy requires:

- Each location is to achieve at least a 90% direct reduction in total emissions (Scopes 1, 2, and 3) by no later than the calendar year 2045, and negate any residual emissions by carbon removal.
- Each location is to set Scope 1 GHG reduction targets for 2030, 2035, and 2040.
- Each location is to prepare an updated climate action plan (CAP) to establish and achieve the above GHG emission reduction goals that incorporates climate and environmental justice and integrate adaptation and resiliency considerations

The Climate Section of the UC Sustainable Practices policy also requires each campus to purchase 100% clean electricity beginning in 2025. Additionally, instead of purchasing voluntary offsets, UC policy requires that from 2026 to 2030, each campus allocate funds equal to \$25/MTCO₂e for all remaining Scope 1 and Scope 2 emissions to achieve direct emissions reductions.



2025 UPDATE

The 2025 CAP assesses and analyzes UCSB's current, historical, and projected emissions and evaluates the campus's progress toward meeting reduction targets. Planned and conceptual climate change mitigation strategies outlined in this document provide a potential pathway towards achieving the 90% reduction in total emissions (Scopes 1, 2, and 3) by calendar year 2045 from a 2019 baseline. The plan also addresses climate resilience and how we can prepare our campus community for future climate conditions.

The 2025 update includes:

- 2023 GHG emissions inventory methodology and results
- Mitigation strategies and projected reductions for reaching new climate goals
- Climate Resilience and Adaptation—The University of California (UC) defines climate resiliency as the ability to prepare for, recover from, and adapt to climate change events. Because climate change disproportionately affects overburdened and under-resourced communities, UCSB's climate resilience planning efforts strive to address inequities so that all communities have an opportunity to thrive.
- Just Transition and Equity in Climate Action Planning - "Climate Justice insists on a shift from a discourse on greenhouse gases and melting ice caps into a civil rights movement with the people and communities most vulnerable to climate impacts at its heart" (University of California, 2022). The Evaluation questions for all Climate Actions in the [UC Framework for Incorporating Environmental & Climate Justice into Climate Action](#) were used to evaluate proposed mitigation strategies in this plan through the lens of climate and equity.

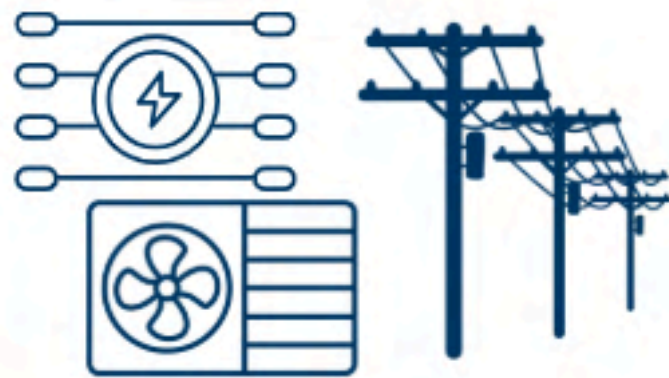
Continuing engagement and evaluation of this plan by the Chancellor's Sustainability Committee will help ensure that UCSB meets its commitments to reducing campus climate impacts. The CAP is intended to assist in this process by documenting progress, identifying unknowns, and framing next steps.

GHG EMISSIONS INVENTORY

Physical & Emissions Scope



Scope 1: Natural gas & combustion



Scope 2: Purchased Electricity



Scope 3: Indirect emissions University funded

The UCSB Campus is located in Santa Barbara County on the Pacific Coast. UCSB is made up of four principal campuses: the 422-acre Main Campus, acquired in 1948; the 184-acre Storke Campus, purchased in 1962; the 273-acre West Campus, purchased partly in 1967 and partly in 2007; and the 174-acre North Campus, purchased in 1994. The University also owns three apartment buildings in Isla Vista (El Dorado, Westgate, and Tropicana del Norte). Including all of its land holdings, UCSB currently occupies ~9 million California-Adjusted Gross Square Feet (CAGSF) of built-out space. Several for-sale housing projects for faculty and staff are not included in these projections since UCSB does not maintain operational control or ownership of these housing units.

The following summarizes UCSB's approach to inventorying emissions. UCSB's GHG emissions inventory includes emissions of the six Kyoto Protocol gases – carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆) – resulting from fossil fuel consumption and refrigerant use at facilities under operational control of the University, including the main campus, off-campus housing, and auxiliary facilities. This inventory also includes emissions associated with commuting patterns, business travel from rental and personal vehicles, and disposal and treatment of waste generated by UCSB. Each year, UCSB performs an audit of its emissions sources through the Climate Registry. UCSB's annual GHG emissions inventory quantifies emissions in three categories:

Scope 1 – Direct Emissions: on-site natural gas, diesel, and propane combustion; campus fleet emissions; marine vessel emissions; and fugitive emissions.

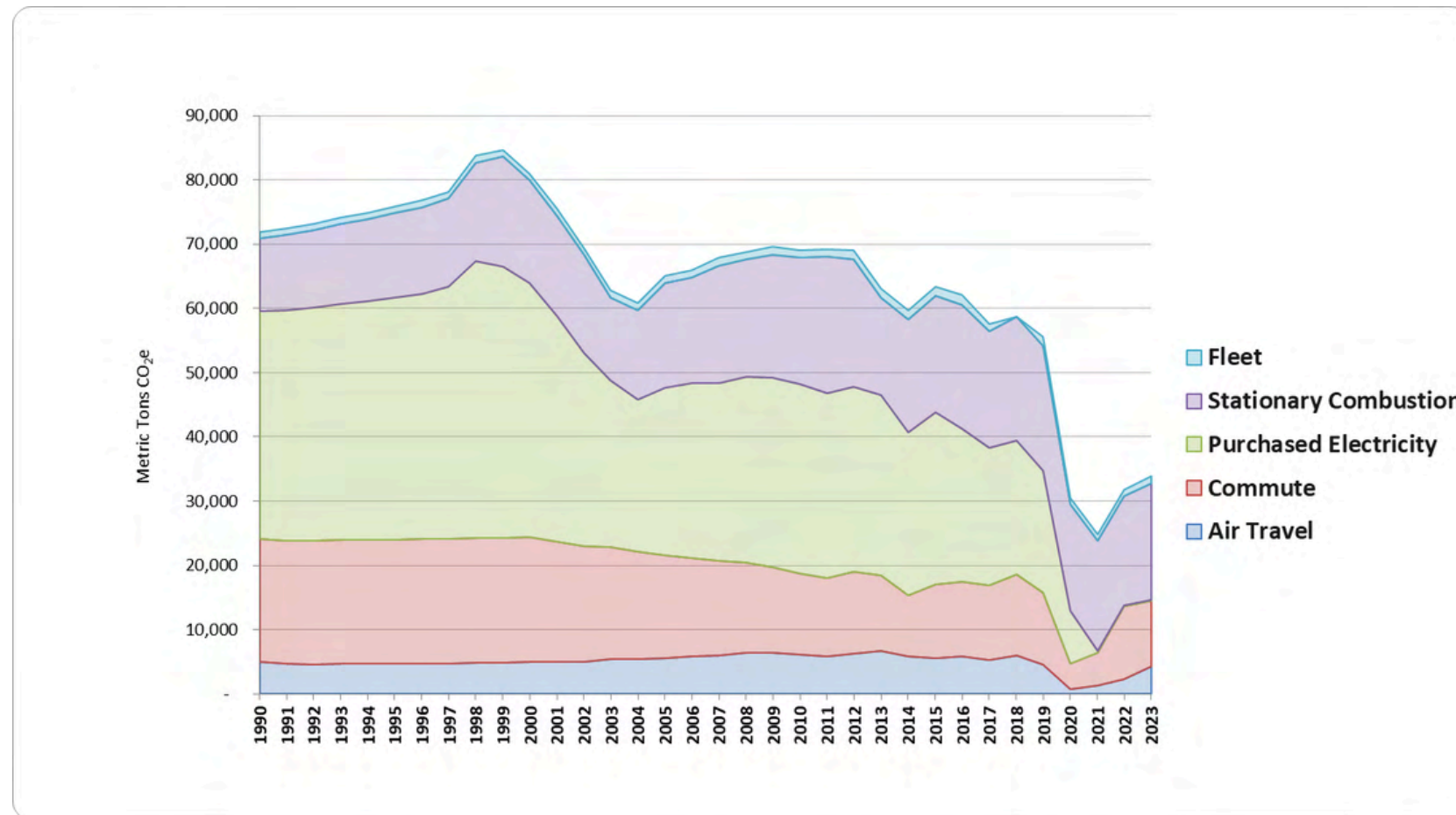
Scope 2 – Indirect Emissions: purchased electricity.

Scope 3 – Indirect Emissions (Other): University-funded business air and car travel, student, staff, and faculty commuting, and the disposal and treatment of waste. The 2023 Climate Policy update added business car travel and disposal & treatment of solid waste to the Scope 3 emissions inventory and climate goals. Previously, UCSB had only reported GHG Scope 3 emissions from business air travel and commuting.

While UCSB currently does not track Scope 3 emissions associated with purchased goods and services, the campus recognizes that the associated indirect emissions will have a significant impact on UCSB's carbon footprint.

HISTORICAL EMISSIONS

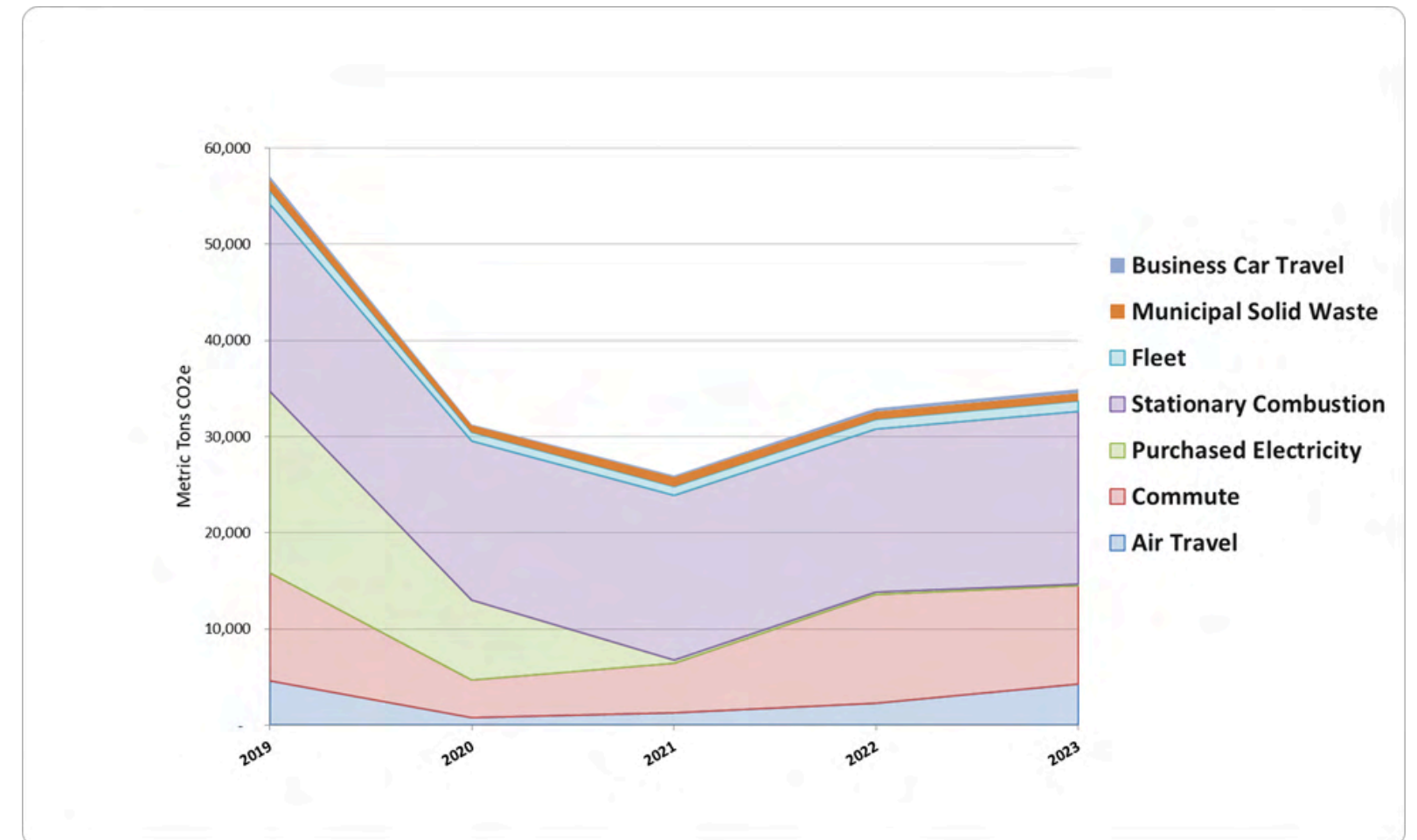
The figure below depicts the trend in CO₂e emissions levels between 1990 and 2023. While the majority of Scope 1 and 2 historical electricity and fuel consumption data is available, this analysis relies on extrapolated usage data for the years 1990-1995. Scope 3 commuter emissions are based on historical mode-split survey data and are normalized for population.



Emissions increased relatively steadily from 1990 to 1999, followed by a decline in emissions from 1999 to 2004 and an increase in emissions from 2004 to 2009. The decrease in emissions from 1998 to 2004 was due to the implementation of several energy efficiency projects, which reduced campus electricity usage intensity considerably, while the increase from 2004 to 2009 was due to the increase in square footage resulting from new building construction, and from an increase in associated natural gas consumption.

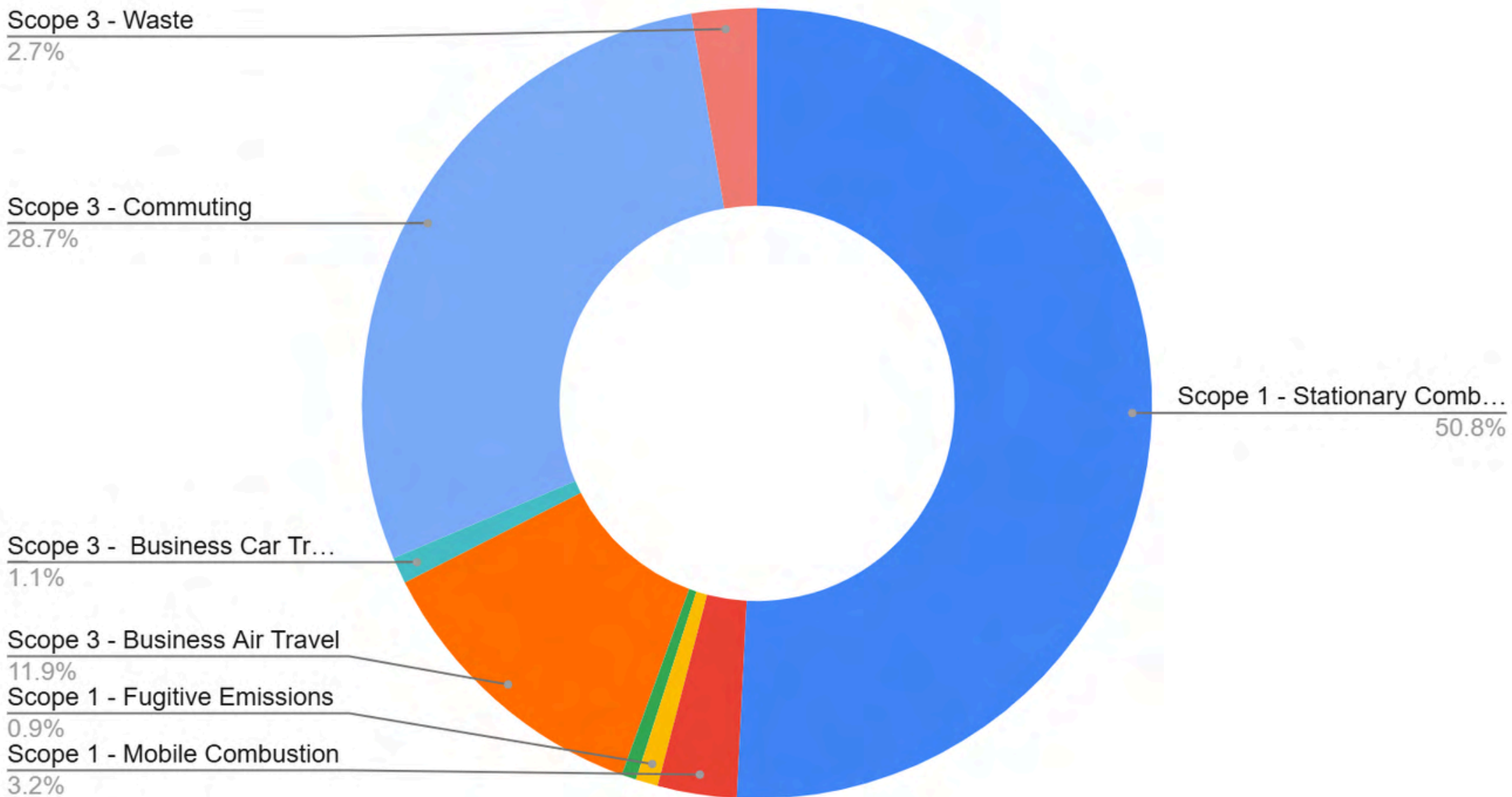
The decline in emissions from 2009 – 2013 was a result of improvements in energy efficiency. The dropoff of Scope 2 emissions was a result of UCSB joining the [UC Clean Power Program](#).

The 2023 update to the Climate Section of the Sustainable Practices Policy set a new Baseline of 2019 and expanded the Scope of GHG emissions to include business car travel (previously only included air travel) and disposal and treatment of solid waste. The figure below depicts the trend in CO₂e emissions levels going back to the baseline year of 2019 and including the new Scope 3 emissions sources.



CURRENT EMISSIONS

For 2023, UCSB reported Scope 3, in addition to Scope 1 and 2 GHG emissions, to The Climate Registry (TCR). 2023 GHG emissions and sources in Metric Tons of Carbon Dioxide Equivalent (MTCO₂e) are presented in the table and figure below.



Scope 1 emissions reported to TCR are calculated following a thorough analysis of current fuel and refrigerant consumption data for all UCSB operations and by applying fuel-specific emissions factors as prescribed by the TCR General Reporting Protocol (GRP) version 3.0.

Scope 2 emissions reported to TCR are calculated by applying the TCR Emissions Factor based on the electricity source. During the calendar year 2023, UCSB's electricity generation was provided primarily by the UC Clean Power program, and the transmission provider was Southern California Edison (SCE).

Scope 3 emissions reported to TCR include emissions resulting from University-paid business air travel, and faculty, staff, and student commuting to and from campus. Air travel emission calculations are based on mileage calculations derived from a subset of the total amount spent on air travel. The Connexus travel system tracks air miles, and from this data, a campus-specific cost factor can be applied to derive air miles traveled. Miles are converted to resultant GHG emissions using air travel emissions factors for air travel from the IPCC Version 6. For business car travel, the UC Central Travel Management System tracks rental car mileage, and for personal vehicle usage, UCSB uses campus mileage reimbursement data to estimate GHG emissions. The UC Transportation Working Group and Climate Change Working Group expect to refine and standardize this calculation method for inclusion in further iterations of UC CAPs.

Commuter emissions are based on accurate mode-split data derived from comprehensive campus surveys administered annually during spring quarter. Using methodology developed by the UC Transportation Working Group, GHG emissions for the entire population of the campus are calculated and updated annually. GHG-emitting transportation modes include single-occupancy vehicles, carpooling, vanpools, motorcycles, and bus commuting. These figures are adjusted for average ridership. Emissions from landfill waste, recycling, and composting were calculated using the Brailsford & Dunlavey (B&D) Waste Emissions Workbook. The B&D Waste Emissions Workbook utilizes California-specific emission factors (based on the WARM Tool) and allows for input of waste type data at a broad and granular level. Emission factors include the CH₄ generated at landfills and transportation to the landfill only.



PROJECTED EMISSIONS AND CAMPUS GROWTH

The 2025 CAP projections are based on the most current version of the Capital Financial Plan (CFP), and the CAP projections assume that approximately 2 million GSF will be built out by 2032 and will be within the Scope of UCSB’s GHG emissions inventory. Several for-sale housing projects for faculty and staff are not included in these projections since UCSB does not maintain operational control or ownership of these housing units. Business As Usual (BAU) emissions for future years, 2024 through 2032, are calculated based on conditions described in the current CFP, UCSB Building Energy Benchmarks Compliance targets in UC green building policy, and forecasted Renewable Portfolio Standards (RPS). UCSB Building Energy Benchmarks—Baseline for Compliance Targets.

Building Type	Annual Electricity (MWh/gsf/yr)	Annual Thermal therm/gsf/yr
Academic/ Administrative	0.011	0.19
Housing	0.008	0.28
Lab	36	1.81

The BAU emissions projects assume zero growth in campus population, as we are currently capped at a 25,000 student enrollment level, as described in the Long Range Development Plan (LRDP). Once a new LRDP is complete with population growth projections, forecasted emissions projections should be updated.

BASELINE & REDUCTION TARGETS

GHG Emission Scope and Source	2019 (MTCO ₂ e)	2023 (MTCO ₂ e)	Reduction
Scope 1 - Stationary Combustion (Note: Includes CARB Offsets)	19,598	17,253	12%
Scope 1 - Mobile Combustion	1,379	1,148	17%
Scope 1 - Fugitive Emissions	281	323	-15%
Scope 2 - Purchased Electricity	20,104	215	99%
Scope 3 - Business Air Travel	4,589	4,249	7%
Scope 3 - Business Car Travel	332	381	-15%
Scope 3 - Commuting	11,207	10,216	9%
Scope - Waste	1,149	947.6	18%
Total	58,639	34,712	40%

Each location is required to set Scope 1 GHG reduction targets for 2030, 2035, and 2040. The table below shows UCSB's target level for Scope 1 emissions and the 2045 goal for all included GHG emissions.

	2030	2035	2040	2045 (MTCO ₂ e)
Scope 1 - Stationary Combustion Target	17,500	10,330	3,580	1,093
Emissions Reduction Target (Scope 1, 2, & 3)	NA	NA	NA	5,863
Projected BAU Emissions	43,818	44,858	44,858	44,858

To achieve the 90% reduction goal, emissions will need to be cut by ~39,000 MTCO₂e compared to business as usual. Fortunately, 2023 GHG emissions fell 40% below the 2019 baseline, making the total needed reduction from 2023 levels ~29,000 MTCO₂e.




MITIGATION STRATEGIES



Scope 1 - Stationary Combustion

Approximately 50% of UCSB's GHG emissions are a result of the combustion of natural gas on campus for heating, down ~12% from the 2019 baseline. Currently, heating and hot water are provided by distributed natural gas-fired boilers located within the individual buildings, except for a small hot water distribution loop on the east campus that connects three laboratory buildings.

To help the UC campuses achieve at least a 90% reduction in total emissions, each UC location received funding for decarbonization planning efforts. UCSB used this funding to develop the [Clean Energy Master Plan](#). This section summarizes the recommendations in the Clean Energy Master Plan, which outlines a strategy for achieving a 94% reduction in GHG emissions from natural gas use by electrifying existing buildings on campus, as well as references the draft UCSB Hot Water Loop Expansion & Electrification Detailed Project Program. For additional details, please refer to the referenced documents above.



The Decarbonization Committee explored seven options for achieving the 90% reduction goal, including building-level air, geothermal, and sea-source heat pumps, heat recovery chillers, and combinations of these options with and without storage. The proposed Central Utility Plant, equipped with Air-Source Heat Pumps and Thermal Storage, was shown to have one of the lowest energy, capital, and operational costs, and was determined to be the best approach for the campus. "The core of the Hot Water Expansion and Electrification Project is a new Central Utility Plant (CUP) located at Parking Lot 16. The CUP will leverage all-electric and energy efficiency technologies, including heat recovery chillers, air-source heat pumps, and thermal energy storage (TES). New thermal utility distribution, chilled and hot water, will connect the CUP to all existing buildings on campus to provide heating and cooling" (UCSB Hot Water Loop Expansion & Electrification Detailed Project Program).

The annual electrical consumption of the air-source heat pump-based central utility plant is anticipated to be about ~13,000 MWh per year, a 17% increase over the campus's current electrical consumption. UCSB has an upgraded electrical substation that can meet the capacity of the demands of an all-electric campus.

Scope 1 - Stationary Combustion

The Clean Energy Master Plan recommends that buildings that cannot be connected to the central plant be individually electrified using air-source heat pump technology (Phase 3). Phase 3 cost estimates are significantly high per MTCO₂e offset, and more research may be needed to explore other potentially more cost-effective options.

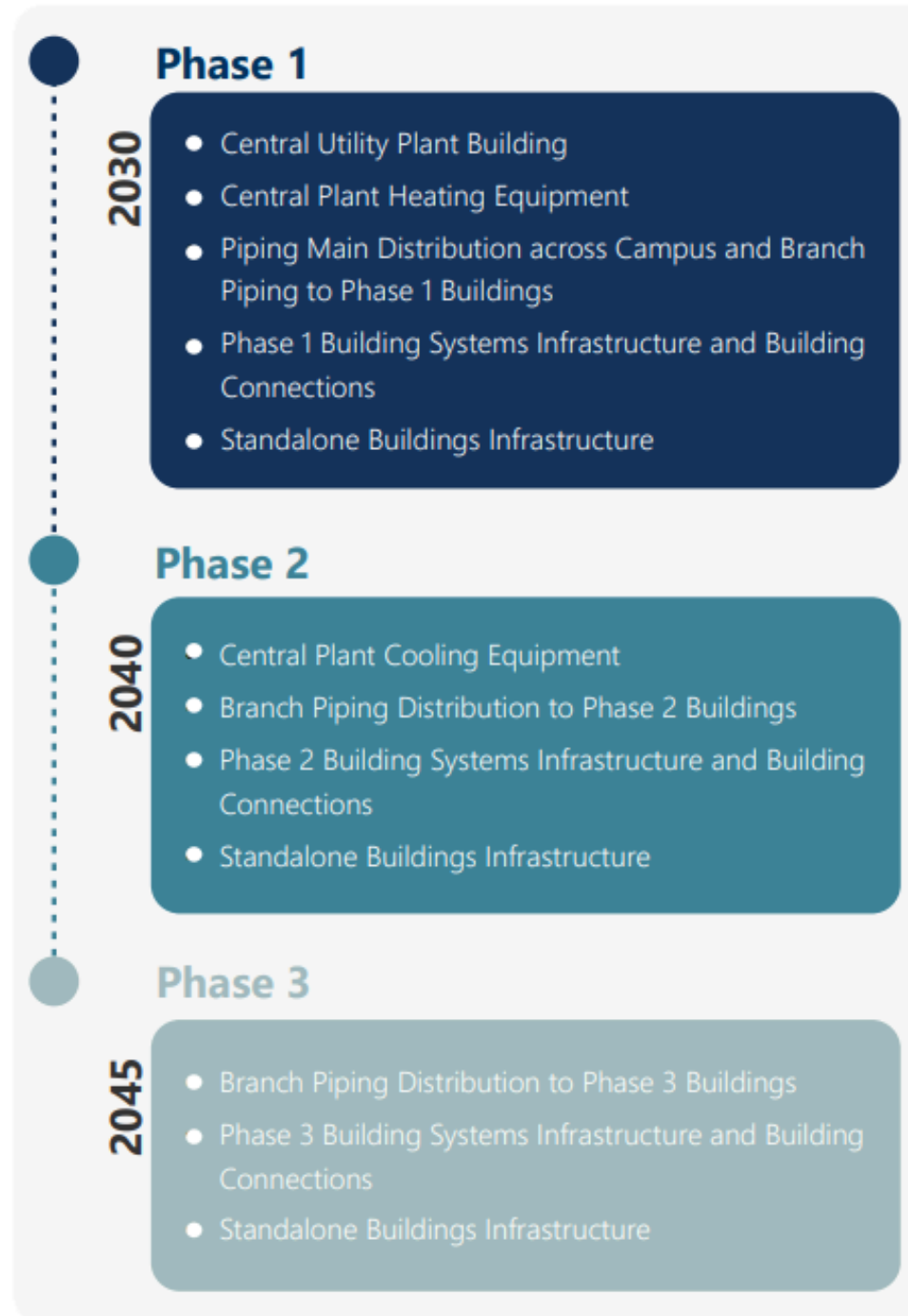
UCSB does not have backup power to its district cooling or heating systems, and building emergency generators do not offer heating or cooling systems during a power outage. With the switch from natural gas to electricity the Clean Energy Master Plan recommends providing a 700kW battery backup power system to the central plant that serves the hot and cold storage tank pumps along with the campus hot and chilled water distribution pumps as well as 70kW of battery backup for each building's pump for domestic hot water (DHW) (Page 75, UCSB, 2024). The batteries can also be used to store photovoltaic generation during peak rate times, which reduces costs and increases resiliency. "All heating and cooling equipment for the New Central Utility Plant has been sized to accommodate future growth and changes in usage," including warmer future temperatures (UCSB, 2024).

Phased Approach/Timeline

A phased approach to building electrification is recommended to "align with progressive funding opportunities, avoid high deferred maintenance costs, limit interruptions to access during construction for long periods, and allow for more efficient and sustainable staff resourcing (page 78)" (UCSB, 2024). The phased approach recommended in the figure below was developed around the following considerations:

1. Total heating and domestic hot water loads
2. Total cooling load,
3. Potential for simultaneous heating and cooling,
4. Potential to avoid deferred maintenance costs (as seen in 2024), and
5. Total absolute carbon emissions for each building. The goal would be to focus on buildings with high energy use intensities and absolute carbon emissions.

The Clean Energy Master plan estimates a 45-year cost of ownership at ~\$2.25 billion for the new centralized utility plant and ~\$3.04 billion for the business-as-usual scenario. These estimates are subject to change as they are refined.





Equity & Environmental Justice

New Buildings

UCSB adopted a “[Decarbonization Policy-Scope 1 Emissions](#)” to ensure that there are no new Scope 1 emissions from new construction and major renovation projects. The policy states that “new buildings or major renovation projects must not use onsite fossil fuel combustion.” Additionally, it states that such projects on the main campus shall connect to the all-electric campus district heating system. The policy builds upon the existing UC Sustainable Practices Policy by providing guidance and clarification for the basis of exceptions and a clear procedure for submitting requests for any such exceptions. This policy is estimated to reduce projected BAU GHG emissions by 4,695 MT CO₂e by ensuring that the ~2 million GSF of planned new buildings are all-electric and carbon-neutral in operation, effectively negating any new emissions increases from planned growth.

Next Steps

UCSB has developed a Detailed Project Program for the Hot Water Loop Expansion & Electrification, as well as completing the first conversion of an existing building, Environmental Health & Safety, to all-electric. For up-to-date information on campus decarbonization, check out the [C·CHANGE webpage](#).

The [Clean Energy Master Plan](#) recommends that equity and justice be considered and integrated at each phase of the project (planning, design, construction, operations, and end of life) and that the following equity indicators be used:

- Procedural - meaningful involvement and participation in the decision-making process
- Recognition - respecting different values, cultures, opinions, and structures within communities
- Distributive - Allocation of resources, benefits, and burdens
- Restorative - Responsive to those impacted by the transition

The plan does not include recommendations for how and who evaluates these equity indicators; it is recommended that a committee be charged with this evaluation. The committee should include graduate and undergraduate students, faculty, staff, as well as representatives from impacted and underrepresented communities.

As recommended in the Clean Energy Master Plan, qualitative and quantitative baseline equity performance metrics should be established, and at a minimum, include the quantification of building electrification impacts on outdoor and indoor air quality, thermal comfort, and accessibility. Once funding is secured for phase 1 of the project, it is also recommended that a green transition job training program be developed to minimize the displacement of current operations and maintenance jobs. The [2035 Initiative](#) at UCSB brings together “environmental policy research labs to develop actionable roadmaps for slashing climate pollution and ushering in a more equitable, resilient future.” Their current work includes building the clean energy workforce of the future. They are working locally with UCSB Community Labor Center to model fossil fuel job loss and clean energy job growth along California’s Central Coast. UCSB should explore working with the 2035 Initiative to model job changes on campus and prepare for the green job transition.



Scope 1 - Mobile Emissions from Campus Fleet

Only 3% of UCSB’s GHG emissions come from our vehicle fleet, and with the strong State of California goal of increasing alternative fuel, the GHG emissions of our campus fleet are projected to decrease. The California Advanced Clean Fleets (ACF) Regulations require that 50% of annual vehicle purchases per CY are zero-emissions, and beginning January 1, 2027, 100% of vehicle purchases are zero-emissions.

In alignment with the State of California’s goal, UCSB’s Transportation & Parking Services (TPS) has developed a fleet implementation plan that outlines the cost of transitioning the current fleet to zero-emission vehicles (ZEVs), as replacements are needed. If implemented, it would practically eliminate Scope 1 emissions from fleet vehicles. Below is a breakdown of the costs to transition the TPS vehicle fleet on campus to EVs.

Total Cost 2025 - 2029 to replace the existing fleet with EVS (Including fuel savings)				
Internal Combustion Vehicles	Alt-Fuel Vehicles Cost	Alt-Fuel Vehicles Cost Delta	Alt-Fuel Vehicles Delta %	GHG reductions MT CO _{2e}
\$7,500,000	\$8,200,000	\$700,000	109%	846

*Assumes replacing 20 internal combustion (IC) vehicles per year. Does not include cost increases due to inflation or possible future electric-vehicle price reductions.

The majority of older vehicles needing replacing (cargo vans and service-body trucks) will be replaced with Ford E-Transit cargo vans, upfitted as necessary to meet the requirements of the various trades. There are also good EV options available for sedans. TPS is still trying to determine the most suitable EV replacement for service-body trucks.

Scope 1 - Mobile Emissions from Campus Fleet

TPS vehicles account for 80% of the campus fleet, and 20% of these vehicles have already been transitioned to alternative fuels (2% CNG & 18.5% EVs). By way of BUS-8, which states that only Fleet Administration has the authority and responsibility for the acquisition of campus vehicles, TPS can also ensure proper ZEV compliance for Department-owned vehicles.



One of the main challenges to replacing department-owned vehicles with EVs is access to adequate financing mechanisms. Historically, funds from the Vehicle Replacement Reserve have been provided to finance the purchase of new vehicles. These funds are replaced by recharging the appropriate departments over 72 months. The reserve was created by the campus ~30 years ago, with \$250,000. This was a reasonable amount when service trucks were \$5,000 - \$10,000. Now that they are \$70K or more, the reserve is no longer adequate for funding the large number of replacement vehicles necessary (~20 vehicles/year). In 2016, the Green Initiative Fund (TGIF) established the Vehicle Incentive Program (VIP), which offers a \$2-5K vehicle rebate for departments that purchase an EV or PHEV option.

Transportation & Parking Services (TPS) already has a fleet implementation plan, and various options are being considered by campus leadership for financing the replacement of Department-owned vehicles with ZEVs. An EV ramp-up guide funded by the GCLC is currently under development for all UC Locations. The guide will identify examples of centralized vehicle request & approval systems, provide a catalog of electric vehicles for common use cases, provide tools for calculating total cost of ownership, and recommend funding & financing opportunities.

All Vehicles	UCSB
Total vehicles	465
Vehicles owned by TPS	373
Department-owned vehicles	92

Equity & Environmental Justice

Emissions from Internal Combustion Engine Vehicles in the Campus Fleet include harmful pollutants like nitrogen oxides (NOx), carbon monoxide, and particulate matter (PM), which are linked to various health problems. UCSB should be a leader in transitioning to a cleaner fleet to reduce the environmental health impacts that often disproportionately affect low-income communities and people of color. This includes right-sizing the fleet to reduce the total number of vehicles needed and the supply chain impacts associated with new ZEVs.



SCOPE 1 - FUGITIVE EMISSIONS

Less than 1% of UCSB's GHG emissions come from refrigerants, which primarily occur due to refrigerant leaks over the lifetime of the systems. Robust leak detection and repair measures can significantly reduce fugitive emissions. Another way to reduce fugitive emissions is through the selection of low-Global Warming Potential (GWP) refrigerants and phasing out high-GWP refrigerants. In 2023, over 70% of UCSB's refrigerant emissions came from R-404A. R-404A is a widely used HFC refrigerant blend, primarily for low and medium-temperature refrigeration, and is a replacement for R-502 and R-22. As of January 1st, 2025, California prohibited the sale and distribution of virgin R-404A refrigerant, along with other high-GWP refrigerants ([Senate Bill - 1206's HFC phase-down plan](#)). LEED also has strong requirements for enhanced refrigerant management in alignment with the State of California's requirements. The phasedown of high-GWP HFCs is also mandated by the American Innovation and Manufacturing (AIM) Act and the Kigali Amendment to the Montreal Protocol. While not quantified, UCSB anticipates that the phase-out of high-GWP refrigerants in California will drive down fugitive emissions on Campus.

Scope 2 - Purchased Electricity



Clean Electricity

UCSB's Scope 2 emissions from purchased electricity fell from ~20,000 Metric tons CO₂e in 2019 to ~200 metric tons. This drop in emissions is a result of the campus moving to Direct Access and joining the UC Clean Power Program (UCCPP) in July of 2020. UCOP initiated this program to help meet our climate goals by allowing all ten campuses and medical centers to purchase clean power. UCOP has contracts with renewable energy providers (large solar projects mostly) that provide solar power to the California electric grid. Approximately 99% of the electricity purchased is now carbon-free, with only a small number of accounts still receiving electricity from SCE. The campus plans to continue to switch remaining off-campus electricity accounts to clean energy sources whenever feasible. UCSB has also invested in on-campus renewable energy production with over 6.2 megawatts of on-site solar energy, which provides approximately 15% of UCSB's electrical demand.

Energy Efficiency

UCSB has a long history of investing in energy efficiency. In the late 1990s, UCSB began implementing aggressive energy efficiency measures such as HVAC upgrades, lighting retrofits, de-lamping, advanced controls installations, building commissioning, and the development of district energy systems. Over the last decade, UCSB Facilities Management has completed more than 100 energy efficiency projects, saving the campus \$1.25M annually in electricity and natural gas costs and reducing GHG emissions by over 500 MT CO₂e. As a result, UCSB's emissions are the lowest among UC campuses in absolute terms and when normalized for both building area and campus population.

While there are limited GHG emissions reductions associated with future energy efficiency projects, as the campus electrifies, the campus is still dedicated to reducing energy use, which decreases operating costs and the externalities associated with energy production. If funded, the existing building electrification plan outlined in the above section on Scope 1 emissions will improve energy efficiency while moving to a carbon-free energy source and will keep UCSB on track to meet the 2% annual energy use intensity reduction requirements in the UC Sustainable Practices Policy.

Equity & Environmental Justice

Coal and Natural Gas Power Plants are often located in low-income and minority communities, leading to the disproportionate burden of pollution and its associated health impacts. "Half of California's gas plants are in communities considered among the state's 25% most disadvantaged communities" (Yang, 2024).. Investing in clean energy done right and energy efficiency reduces our reliance on these gas power plants. On average, renewable energy sources like solar and wind are expected to create more jobs per unit of energy produced than fossil fuels. While less severe, there can be environmental justice impacts associated with clean energy. For example, community displacement, land use conflicts, resource extraction impacts, and inequities in access to benefits and risks. To reduce these impacts, off-campus clean energy projects, such as solar farms, should consider unintentional impacts on surrounding communities and engage residents in mitigating any potential harm. This can be done at the UC-wide level through the procurement process for the UC Clean Power Program. Energy efficiency can also contribute to environmental justice by reducing energy burdens, lowering pollution, and improving the health and well-being of disadvantaged communities.

SCOPE 3 - COMMUTING EMISSIONS

~29% of UCSB's GHG emissions come from commuting, down 9% from our 2019 baseline, due to an increase in remote work, which jumped from 4% in 2019 to ~26% for Faculty and Staff. ~83% (weighted) of faculty, staff, and students used alternative transportation to commute to campus.

Even with the progress already made, commuter emissions need to be reduced by an additional ~9,000 MT CO₂e to achieve the 90% reduction goal. The section below outlines current and proposed mitigation measures to achieve these emissions reduction targets and improve the overall quality of life. Reducing commuter GHG emissions provides several co-benefits, including improved public health, reduced traffic congestion, and economic development. UCSB is much like a small city and has a substantial impact on the social and economic life of the surrounding communities. Providing equitable and affordable commuting options should be central in any service or program designed to reduce commuter GHG emissions.



SCOPE 3 - COMMUTING EMISSIONS

Affordable Housing

The availability of affordable housing close to employment has a significant impact on commuter GHG emissions and employee well-being. Employee and student housing reduces GHG emissions by reducing commute distances, minimizing car usage, and promoting the development of denser, transit-oriented communities. As outlined in the Long Range Development Plan (LRDP), transportation emissions will be substantially reduced by housing all new student growth adjacent to campus and adding additional housing for faculty and staff nearby. UCSB has several housing projects currently under development, including San Benito, which will add 2,225 new student beds, and Ocean Road Faculty and Staff Housing, which will add 540 units.

Year Online	Building	GSF	Units	Beds
2027	San Benito Student Housing	696,000		2,225
TBD	Ocean Road Faculty and Staff Housing Phase I	401,000	180	
2028	Student Housing East Campus Infill	583,000		1,278
TBD	Ocean Road Faculty and Staff Housing phase II	401,000	360	

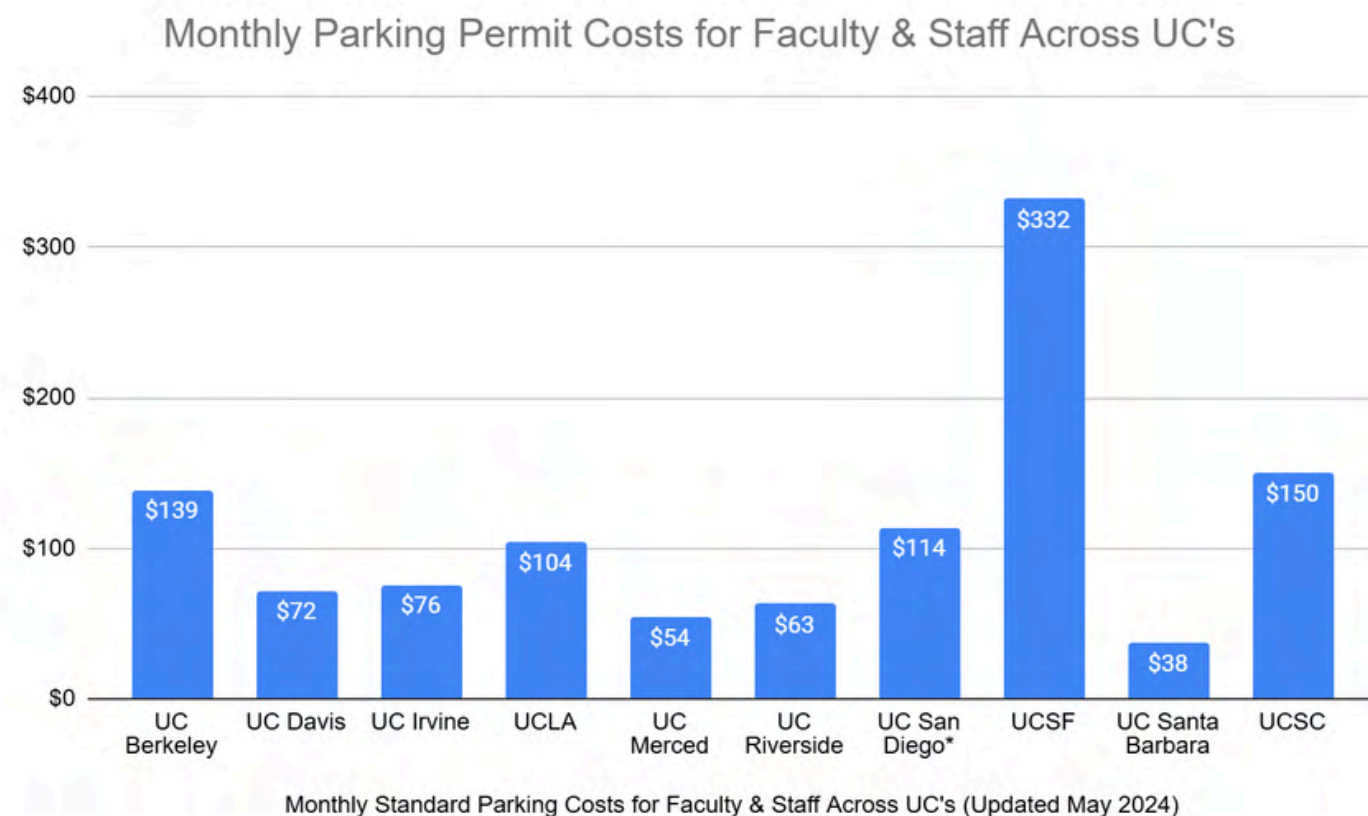


It is estimated that the planned housing projects mentioned will reduce commuter emissions by ~1,829 MT CO₂e annually. These emissions reduction estimates do not include the recent purchase of a 1.35-acre property that is home to a retail storefront on State Street, an appliance store, and a 78-unit residential building (Soltara Apartments) (UCSB, 2025). The acquisition aims to provide "economically viable" workforce rental housing for campus staff and faculty members. "Approximately 65% of the units are currently occupied, and those leases will be honored as written. The remaining units — and any that become vacant over time — will be available for rent by university faculty and staff members" (UCSB, 2025). A UCSB-supported MTD bus line (No. 24) already runs a direct route between downtown and the campus. Closing the last mile between the apartments and MTD through the State Street shuttle at operational hours, early enough to be useful, will be beneficial.

SCOPE 3 - COMMUTING EMISSIONS

Restructuring Parking Fees

UCSB has one of the lowest prices for parking in the UC System; long-term commuter parking permits have only gone up \$2.50 per month in the last 20 years. The last adjustment was made 12 years ago when the rate increased by \$1.50 per month. Exploring the adoption of a price structure for campus parking that is based on the operational necessities of the transportation system, including the costs of maintaining the system (roads, bike storage, car and bike lots, electric vehicle parking, etc), would be beneficial. Charging the true price for parking can reduce parking demand and reduce the need to build additional parking structures in the future, which can range in cost from \$100,000 to \$180,000 per spot. Parking permit revenue can also be invested in the following programs that alleviate pressure on the system and reduce our commuter GHG emissions. The campus should consider forming a Transportation and Commuting Advisory Board to explore changes to our parking fee structure that take into account the actual cost of parking, sustainable commuting, and equity.



Commuting Best Practices

Many of the recommendations in this section were developed by the UC Bonnie Reiss Leading on Climate Action Fellows, Lainey Djajakusuma and Ada Chibueze, and supervised by the Director of Student Sustainability Initiatives, Katie Maynard. These recommendations were reviewed, refined, and prioritized by the UCSB Sustainable Transportation Committee and Sustainability staff.

Behavior Change Programs

Every day, our faculty, staff, and students make decisions about how they will commute to campus. Research on behavior change, habit-forming behaviors, and motivations can help us to better understand how to influence these decisions.

Alternative Transportation Challenges - An alternative transportation challenge is a limited-duration program that rewards participants who opt to commute via low GHG modes. Typically operating on a 30 to 90-day cycle, challenges include incentives for participants, outreach to increase the visibility of services, case management support to help commuters find alternatives, and events to build community and share information on commuting options. One advantage of the short-term challenge approach is that incentives can be concentrated during a brief time, reducing costs compared to providing an ongoing incentive. Santa Barbara County Association of Governments (SBCAG) offers a 30-day challenge, CycleMAYnia, focused on commuting by bike each May. UCSB has been a partner in this challenge for many years, hosting events and encouraging the campus community to participate. SBCAG offers incentives via drawing prizes for participants. Currently, data is collected on the number of riders who participate and the number of new riders who try bike commuting through the challenge. Data is not currently collected on the long-term impact of transportation challenges on commuting shifts after the end of the challenge.

SCOPE 3 - COMMUTING EMISSIONS

Behavioral studies and habit-formation research frequently cite time as a key factor in creating lasting changes, with a longer initial acquisition phase leading to longer-lasting outcomes (Singh, 2024). While there is no set number of days at which this happens, short-term challenges aimed at this change often use 90 days as a baseline.

The Sustainability Internships and Community Resources (SICR) Department in Student Affairs applied for and received TGIF grant funding to pilot the 90-day commuter challenge during Fall 2025 and collect data on the impacts of the 30-day CycleMAYnia challenges. Data will be collected on the commuting behavior of participants at 3 months and 6 months after the end of the challenge, to determine effectiveness. The City of Santa Barbara and the County of Santa Barbara are also piloting 90-day commuter challenges in 2025. Once the challenge has been piloted and metrics are collected, we will have a better understanding of the effectiveness of Alternative Transportation Challenges and the associated GHG emissions reductions. This plan assumes that alternative transportation challenges have the potential to reduce GHG emissions up to 60 MT CO₂e annually.

Expand Trip Planning and Tracking Capabilities - A data-driven approach will help UCSB to track the effectiveness of strategies implemented, ensure incentives and commuting benefits are appropriately allocated, deter cheating of the system, and improve ride matching for carpool, vanpool, and bike pool (arranging joint bike rides) services. Automating and streamlining ride coordination would also significantly reduce the amount of staff time required to manage carpools and vanpools, freeing up resources for other transportation-related initiatives. The benefits of expanded ride tracking should be weighed with concerns related to privacy, the workload for commuters tracking trips, and the workload for campus staff reviewing trip tracking data. Further assessment will be needed to consider this.

Within UCSB’s Transportation Alternatives Program (TAP), two modes of transportation require the facilitation of travel groups: carpools and vanpools. UCSB primarily uses a Google Sheet (managed by TAP) for ride-matching; however, in addition to the sheet, SBCAG’s platform SmartRide.org by Rideamigos can assist in the process. The platform allows users to find carpool matches. One limitation of the current system is that riders cannot limit their searches for carpools to other UCSB employees; however, the campus carpool permits are only available to two or more employees carpooling together. Expanding trip planning and tracking could reduce GHG emissions by 27 to 68 MT CO₂e annually.

Promoting existing transportation options, including the Local Bus Services - Santa Barbara Metropolitan Transit District (MTD) operates local bus services across the region, from North Goleta to Carpinteria. Increasing the utilization of SB MTD’s existing services is one of the most effective and immediate strategies for reducing greenhouse gas emissions by shifting commuter behavior away from single-occupancy vehicles.

As you can see from the table below, behavioral change programs could reduce commuter GHG emissions up to 145 MT CO₂e annually.

Approach	Est Cost	MT CO ₂ e
Expanding Alternative Transportation Challenges	\$13,500 - \$54,740	17 - 60
Expand Trip Planning and Tracking Capabilities	0 - \$20,000	27 - 67
Promoting MTD	\$20,000-\$30,000	12 - 18

SCOPE 3 - COMMUTING EMISSIONS

Increasing Subsidies for Alternative Commuting Options

Financial incentives can encourage commuters to try out new commuting options, can make commuters using low GHG modes feel supported, and can shift the cost-benefit calculation for commuters comparing options. This is especially important for low GHG commuting options that may be less convenient than commuting by a single-occupancy vehicle and more challenging to utilize. Financial incentives and cost-sharing agreements can be leveraged by UCSB to advocate for services that better support our campus population and serve our low-income employees. As an example, California State University Channel Islands has extensive cost-sharing agreements with long-distance bus companies, and this has resulted in them having more influence on routes and schedules.

The Transportation Alternative Program (TAP) offers discounts on bus passes (locally and long-distance), discounted carpool parking permits, access to bike lockers, a limited number of free parking passes, and a free emergency ride home program. TAP also subsidizes vanpool services, and UCOP procurement has negotiated for a reduced cost for electric bikes to keep the costs low for riders. TAP does outreach every year to promote these programs, primarily catering to Faculty, Staff, and Graduate Student Staff. During the 2024-25 academic year, efforts included: Bike to Work Day Breakfast, MTD Bus Rider Appreciation Coffee and Donuts Event, two Learn-at-Lunch events in partnership with Santa Barbara Community Environmental Council, and two First Year Experience Presentations to incoming staff. These events focused on explaining the six commuter programs that TAP offers employees. TAP also sends out one to two emails to all Staff and Faculty every quarter, advertising current initiatives, such as vanpool seat openings and general information about the long-distance buses that serve the campus. The TAP office also tables at Open House to share information about alternative transportation options to new undergraduate students (bike, MTD bus, Amtrak, Ventura County Coastal Express).

Improving service for the following commuter options can drive GHG commuter emissions down while offering affordable and sustainable transportation options for our campus.

Improving Long-Distance Bus Service

The Clean Air Express operates commuter routes from Santa Maria, Lompoc, and Buellton to Goleta, while the Coastal Express (i.e., serviced by the VCTC/VISTA) serves commuters traveling between Oxnard/Ventura and UCSB. Pre-pandemic, the Clean Air Express had 44 UCSB riders, but that went down to nine, with a major challenge being the lack of a stop at UCSB and the current bus timing. The Coastal Express had 15 riders pre-pandemic and has the same number of riders today. Currently, this includes three staff/faculty and 12 students. The high number of student riders was in part due to a subsidy program offered by VCTC that allowed students to ride for free. That program was discontinued in 2025. Long-distance buses focus on our commuters who are traveling the furthest each day and hence have the highest impact on GHG emissions. Buses are a cost-effective way to move a large number of people at once, giving us meaningful outcomes at an affordable price. It is estimated that increasing the subsidies for long-distance buses from \$21 per month to \$100 per month could reduce commuting emissions by 29 MT CO₂e annually. However, if UCSB had additional resources (up to \$306K annually for route guarantee), seats on a route could be bought, giving the University greater control over setting the routes and timing of the bus to better serve UCSB commuters. If UCSB has better control over the routes, we would be able to address the locations of the pick-up and drop-offs for the buses. This could reduce commuter emissions up to 80 MT CO₂e annually. The cost of this would likely be decreased to \$100-\$150k annually after three years if federal transit subsidies are still available at that time. Many riders report that the difficulty in getting to and from the long-distance bus meeting location and the timing conflicting with their work schedules have a greater impact than cost on their commuting choice.

SCOPE 3 - COMMUTING EMISSIONS

Expand Vanpool Service

UCSB's Vanpool Program serves commuters from Santa Maria, Buellton, Santa Ynez, Solvang, Lompoc, and Ventura. Fifty-four employees currently utilize the vanpool service. While buses are more effective at reducing GHG emissions of expanded occupancy, they do not travel to as many cities as vanpools can reach. Vanpools also have more flexibility on departure/arrival times. Currently, UCSB offers two vanpools from Lompoc that primarily support custodial staff who work a 2 am to 10:30 am shift. One consideration is that the workload to support vanpools is higher than for carpools or buses. UCSB continues to promote the vanpool program, adding new routes as interest grows. Riders have expressed interest in commuting with a partner or roommate who is not a UCSB employee. Currently, only UCSB employees may take the vanpool. TPS is exploring the possibility of shifting the vanpool program to allow riders to work directly with Commute by Enterprise to subscribe to vanpools. This would provide riders more flexibility for vehicle types and schedules. SBCAG is exploring changes to its regional vanpool subsidy program to allow riders to receive an ongoing subsidy on their vanpool commute, paid directly to the vanpool provider. Transitioning program management from TPS to Enterprise would allow UCSB employees to take advantage of this subsidy and share vanpools with non-UCSB employees.

Subsidies for the Local Bus System

The Santa Barbara Metropolitan Transit District (SBMTD) operates local bus service between North Goleta and Carpinteria. At UCSB, the primary pick-up and drop-off location is the bus loop at the North Hall stop, which serves several key routes, including Line 11 (State/Hollister/UCSB), Line 15x (SBCC/UCSB Express), Line 24x (UCSB Express), Line 27 (Isla Vista Shuttle), and Line 28 (UCSB Shuttle). These routes provide essential transportation for students, faculty, and staff, connecting the campus to the greater Goleta and Santa Barbara region.

If funding becomes available, expanding subsidies for MTD would allow UCSB to better advocate for routes and times needed by the campus community, significantly enhance the commuter experience, and help us connect the campus to parts of the region that require transfers to reach UCSB.

Currently, MTD access is included in student fees, allowing all enrolled students to ride with an unlimited pass at no additional cost. Members of UCSB's Transportation Alternatives Program (TAP) can access an unlimited 30-day MTD bus pass at \$59 per month through pretax payroll deduction (compared to the full cost of \$80 per month). This offer through TAP is only available to Career Staff or Faculty Members on the UCSB payroll at least 45% time and at least 4 months into the future. There are no options for employees outside of the TAP Program to access subsidized bus passes. UCSB could consider options for supporting commuters who might be open to taking the bus 1-3 days a week with subsidized bus passes. Subsidy rates may also need to be considered for TAP members. The monthly cost for an annual staff parking permit is \$37.50/month. MTD rates increased in the Summer of 2025. Subsidized bus passes now cost more than a monthly parking permit.

Providing last-mile options for the Commuter Rail

MetroLink is in negotiations with AMTRAK Surfliner (LOSSAN) to operate an additional round-trip train to/from Goleta, timed to support a commuter rail approach. This may launch as early as Winter 2026. This would add a new low-GHG option to our toolbox. One challenge in ensuring the success of this pilot is that the current bus connection between the Goleta train station and campus is lengthy and often requires a bus transfer. SB MTD is launching a micro-transit service called the WAVE, which may support transportation between the Goleta train station and campus. Alternatively, UCSB could collaborate with regional partners such as SBCAG to consider options for establishing a shuttle service to support commuter rail riders, depending on the level of subsidies.



The public transportation programs could reduce commuter GHG emissions ~191 MT CO₂e annually.

Approach	Est Cost	MT CO ₂ e
Support for long-distance buses	\$23,412 - \$160,000	29 - 139
Expanded vanpool service	Increased vanpool management for TAP staff.	37 - 111
Local bus subsidies	\$10,000 - \$ 89,000	112 - 223
Last mile options for the Commuter Rail	\$0 - \$140,000 (Funding for a driver)	32 - 126

Telecommuting and Flex Work Arrangements

Another way to cut commuting emissions is to reduce the need for transportation. Currently, most UCSB departments with office-based workers allow for employees to work up to 16 hrs or 2 days of remote work each week, depending on their specific responsibilities and work duties. Employees whose work is hands-on, such as but not limited to landscape, custodial, dining, police, and parking enforcement staff, usually cannot take advantage of remote work arrangements. At UCSB, remote, hybrid, and flexwork work agreements are evaluated for each employee based on their job responsibilities with their supervisor, and, depending on the division, may also require approval at a higher level.

UCSB Procurement Services is an example of a department with established remote work practices and demonstrated success in working remotely. The department has operated almost entirely remotely since COVID and has even put some remote practices in place before COVID. They have transitioned to paperless processing tools and use a management style that is well adapted to remote supervision.

As previously mentioned, commuting emissions are down 9% (~1,000 MT CO₂e) from our 2019 baseline, largely due to an increase in remote work, which jumped from 4% in 2019 to ~25% for Faculty and Staff in 2024. Continuing to support appropriate telecommuting, hybrid work arrangements, and flexible work schedules is estimated to save an additional ~70 MT CO₂e annually.

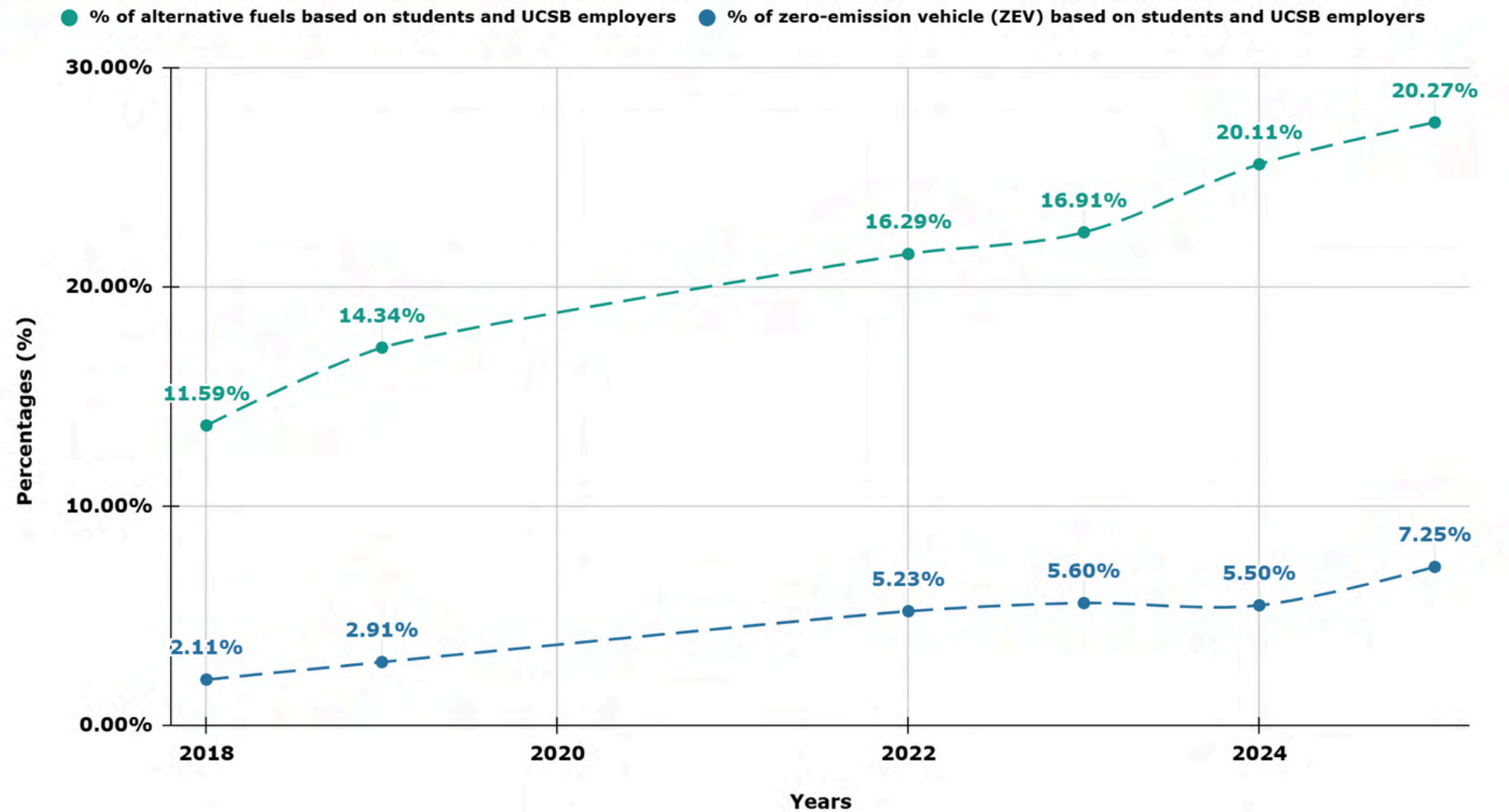
SCOPE 3 - COMMUTING EMISSIONS

Greening the Commuter Fleet

The Advanced Clean Cars II regulations required that all new passenger cars, trucks, and SUVs sold in California be zero-emission vehicles (ZEVs) by 2035. The regulation accelerated requirements that automakers deliver an increasing number of zero-emission light-duty vehicles each year beginning in model year 2026 (California Air Resources Board, 2022). Sales of new ZEVs and Plug-in Hybrid Electric Vehicles (PHEVs) were scheduled to start with 35% that year, build to 68% in 2030, and reach 100% in 2035. However, in May of 2025, the U.S. House and Senate both voted to terminate the approved waivers for California's Clean Trucks, Clean Cars II rule under the Congressional Review Act (CRA). Given the recent changes, it is fair to assume that the transition to clean cars will likely be delayed. For this reason, projections for clean vehicles were pushed out by 5 years. Even given the hurdles, clean commuter vehicles are anticipated to reduce commuter emissions by ~6,704 MT CO₂e by 2045. ZEV ownership by UCSB Faculty, Staff, and students has grown by ~30% since 2019, and alternatively fueled vehicles have almost doubled.

To support the growth of ZEVs, UCSB has already installed 105 charging ports and secured funding from the California Energy Commission for the Equitable Charging Access for Renters in the 805 region (E-CAR 805) Project to install another 28 ports at UCSB by December 2027.

ZEV and Alternative Fuel Vehicle Ownership



SCOPE 3 - COMMUTING EMISSIONS

The Equitable Charging Access for Renters in the 805 region (E-CAR 805) Project is a collaboration across three counties, San Luis Obispo, Santa Barbara, and Ventura, to expand electric vehicle charging access to low-income multifamily housing along the Central Coast. It will install 379 charging ports at 67 locations. Each charging port is estimated to cost \$28,500; this is based on the cost estimate for the E-CAR 805 project and a recognition that locations for that project were chosen based on their cost-effectiveness. The next set of locations will likely have higher costs.

The above Transportation Demand Management Programs (TDM) recommended in this plan that reduce single-occupancy vehicles (SOV) should be prioritized first. While EVs play a role in reducing transportation GHG emissions, and are an improvement compared to Internal Combustion Engine Vehicles, the negative impacts of single-occupancy EVs are well documented, including environmental justice impacts from lithium mining discussed in the later section, and increased air pollution due to tire dust, as well as increased danger to vulnerable road users because of their much greater weight and super-sizing.

Funding & Next Steps

As mentioned above, UC Bonnie Reiss Leading on Climate Action Fellows from the Sustainability Internships and Community Resources (SICR) Department in Student Affairs will develop more detailed feasibility assessments and proposals for the best practices prioritized in this section during the 2025-2026 school year. Fellows from the 2024-2025 school year applied for and received TGIF grant funding to pilot the 90-day commuter challenge and collect data on the impacts of the 30-day CycleMAYnia challenges. TPS is beginning to explore transitioning vanpool program management to Enterprise, allowing UCSB riders to take advantage of SBCAG subsidies and non-UCSB riders to participate in shared vanpools. TPS is also in discussions with regional partners on potential ways to support first-mile/last-mile transit options from the Goleta Train Station to the campus.

Mitigation Strategy	Estimated Cost	MT CO ₂ e Reduction
Providing Housing	Already Allocated	1,829
Behavior Change Programs	\$13K - \$75K	56 - 145
Improving Alternative Commuting	\$33K - \$389K	210 - 599
Telecommuting and Flex Work	\$7 - \$20k	23 - 70
Greening the Commuter Fleet	NA	6,704



Equity & Environmental Justice

Transportation emissions from commuters contribute significantly to air pollution and climate change, which disproportionately affect low-income and minority communities who are often located near highways, exposing them to higher levels of pollution. While UCSB does not have direct control over commuter emissions, we can support sustainable transportation infrastructure that increases access to public transportation, reduces the cost of commuting, and decreases the emissions disproportionately impacting these communities.

While ZEV eliminates tailpipe emissions and is less harmful than Internal Combustion Engine vehicles, it is important to acknowledge that there are still some environmental and social impacts, access to public and micro transit, and active commuting. After which, any remaining vehicle trips should transition to zero-emission vehicles. The environmental and social impacts of lithium and cobalt mining, though lower than fossil fuel production, include energy-intensive extraction methods that result in pollution, land degradation, and potential groundwater contamination. Lithium mining for battery use in ZEVs has, in some cases, displaced local communities and/or harmed their health and well-being. Many of the world's lithium reserves are in developing countries, where labor standards and environmental regulations are often weak. The increased demand for lithium is also raising concerns about potential impacts on Indigenous lands and rights in the US. According to Human Rights Watch "one study has indicated 79 percent of all known lithium reserves in the US are located within 35 miles of Tribal reservations." and "Indigenous peoples, both in the US and globally, have warned lithium mining and other transition mineral mining pose a threat to their land and rights" (Human Rights Watch, 2025).

Given the upstream supply chain impacts of ZEVs, UCSB would benefit from prioritizing strategies that reduce SOV trips and total miles traveled, such as increasing local affordable housing, increasing access to public transportation, and promoting active transportation. This will help minimize the environmental justice impacts of ZEVs and increase access to affordable and reliable transportation.

The page features three line-art illustrations: an airplane in flight at the top left, a car in profile in the middle left, and a bus in profile at the bottom left. A large, dark blue rectangular box with a white border is positioned in the upper right, containing the section title.

Scope 3 - Business Travel

Approximately 13% of UCSB's GHG emissions come from business air and car travel, down 6% from the 2019 baseline, mainly a result of the reduction in air travel during the COVID-19 pandemic. Total expenditures on air travel dropped from \$3.73 million in 2019 to \$623,000 in 2020. This does not include other travel costs (hotel, taxi, meals).

Air travel represents the lion's share of business travel emissions, and is particularly hard to tackle given the unique challenges of aircraft design and the lack of readily available low GHG fuels at scale. Additionally, reducing flights in academia is particularly difficult. It's normal and often seen as essential for career advancement to travel to attend conferences, give talks, and do field work. However, according to a recent article published in *Nature*, [An evidence-based approach to accelerate flight reduction in academia](#), "there are several papers that find no or only a small impact of air travel on scientific success as measured by the h-index, the number of citations, or academic social capital, i.e., beneficial academic relationships" (Görlinger et al., 2023, 1). "In addition, various studies in recent years have shown that flying is unevenly distributed among academic groups" (Görlinger et al., 2023, 1).

While halting air travel altogether would not be feasible, GHG emissions can be reduced by flying less. Thinking through which meetings and events need an in-person connection and which can be done virtually can also decrease inequalities, "as not everyone has the same opportunities to travel (finances, visa requirements, remote regions, caring responsibilities), negatively affecting the social dimension of sustainable development" (Görlinger et al., 2023, 2).

Travelers often rely on air travel as their primary mode of transportation to fulfill these professional obligations. However, air travel has a significantly higher per capita emissions rate, with 0.40 MT CO₂e emitted per round trip, almost twice the annual emissions produced by single-occupancy vehicle (SOV) usage. Compared to academic travelers, staff have a much smaller travel carbon footprint, emitting 0.24 MT CO₂e per round-trip flight. However, these emissions still contribute to the university's overall environmental impact. The goal of the suggested strategies is not to eliminate travel, as it can be beneficial for professional and academic development. Instead, suggested approaches are focused on ways to reduce travel where sensible.

Scope 3 - Business Travel

UC System-Wide Strategies for Reducing Business Travel Emissions

UC's Central Travel Office has been instrumental in providing data to track Business travel emissions and promote sustainable travel. The UC Travel Smarter. Travel Better. The initiative aims to reduce non-essential travel and replace it with robust virtual communication options. The [Should I Stay or Should I Go decision guide](#) helps users determine if they should attend in person vs virtually and provides sustainable travel tips. The Central Travel Office also provides resources and uses the [Connexus platform](#) to educate UC travelers and promote more sustainable booking practices.

UC Central Travel has also been working with travel suppliers, including airlines, to increase their commitment to providing more sustainable low-carbon travel options.

The Global Climate Leadership Council's focus for the 2025/26 academic year is on transportation emissions; three sprints are being sponsored, including one on business travel in the Spring of 2026. The Business travel sprint will propose new policies, programs, and best practices recommendations for reducing Business travel emissions. Once the sprint is complete, UCSB will explore the feasibility of adopting the recommendations that come out of the effort to further reduce our emissions.

UCSB Sustainable Transportation Committee and Sustainability staff also reviewed and prioritized other potential strategies listed below:

UCSB Voluntary Business Travel - PACES developed a Voluntary Business Travel Assessment and Guide for air travel requested by administrative staff. This is promoted to departments that go through the Green Office Certification as a tool to determine the most sustainable way for an employee to attend a meeting or conference. The intention is for supervisors to ask or require their staff to fill out the assessment when considering traveling for work. The Assessment is meant to be informative and encourage individuals to consider the benefits of traveling for an in-person meeting versus attending remotely. Approvals for travel requests are still up to the department. This program has minimal impact as it is only promoted to the 4 - 8 departments that go through the assessment annually. If outreach were expanded or if the Assessment were promoted at a high level, it could encourage a significant shift to remote conferencing. For example, institutionalizing it into the Concur travel request process, requiring those requesting travel to complete the form and supervisor review, could increase program impact.

Scope 3 - Business Travel

Limits on Administrative Travel Program - If implemented would enact restrictions on administrative travel for each department, wherein only special circumstances would allow for in-person attendance. Given the current UCSB budget shortfalls, we are already seeing some departments reduce travel. This measure could be expanded upon by putting restrictions on air travel within California altogether. Imperial College London has similar restrictions. Under university policy, mainland domestic flights in the UK are not permitted if the destination can be reached within five hours by train. The only exemptions are for exceptional operational or well-being reasons.

As you can see from the table, programs and restrictions that reduce Administrative travel have significant cost savings and require little to no upfront financial investment.

Supporting Sustainable Business Travel through the UC Travel Policy - UC could consider updating the Travel Policy to better support sustainable travel practices. G-28 Travel Regulations require an intermediate or lower class vehicle to be selected when choosing a rental car. There are no upgrade exemptions accepted for the selection of an electric or hybrid vehicle. Updating the regulations to allow more flexibility for the rental of Zero Emission Vehicles (ZEV) would support travel emissions reductions. While there may be some cost increases to the vehicle rental price, it can be offset by fuel cost savings. G-28 Travel Regulations also state that surface transportation costs may be chosen for travel as long as it does not exceed the cost of airfare (D. 1. e, page 13).

UCSB Voluntary Business Travel	\$0	\$2,000 - \$6,000	1.4 - 8.3
Limits on Administrative Travel	\$0	\$56,000 - \$85,870	69 - 74

Updating these regulations to offer some flexibility for selecting surface transportation options in instances where surface transportation may slightly exceed the cost of airfare but result in significantly less GHG emissions could be beneficial.

Academic Travel Grant Alternative - The Academic Senate offers domestic and international travel grants that support faculty attending conferences to present and discuss their research. The current funding matrix offers three to six times more funding for international travel compared to virtual or California-based conferences. This incentivizes faculty to prioritize international conferences, increasing Scope 3 emissions. The Academic Senate could form a working group to explore potential strategies for reducing GHG emissions from Academic travel.

While not included in emissions reduction projections, UCSB could also see some reductions in air travel emissions associated with flight electrification. According to the International Air Transport Association (IATA), Short and medium-haul flights are expected to be electrified by 2040.

Given the lack of readily available alternative fuels at scale and concerns about the efficacy of the emissions reduction claims, this Plan does not include Sustainable Aviation Fuels (SAF) recommendations. Future CAP updates can revisit technological solutions, including SAFs. UCSB



Equity & Environmental Justice

A small percentage of the global population, particularly those with higher incomes, is responsible for a significant portion of aviation emissions, but is largely insulated from the worst effects of climate change (Watts, 2023). While travel opportunities can be important for career advancement, there are also disparities in opportunities to travel. For example, those with certain health conditions, caregiving needs, visa restrictions, or resource limitations may not be able to travel. While not a direct substitute for in-person meetings, virtual conferences, trainings, and workshops are more accessible to a diverse audience than in-person and significantly reduce GHG emissions.

Next Steps

The Plan only forecasts a modest 90 - 119 MT CO₂e reduction, given that air travel GHG emissions are particularly hard to tackle. With the UC President's directive to reduce business travel where possible, the first no-cost and potentially cost-saving step is for UCSB to encourage faculty and staff to consider the need to travel. Tools like the Voluntary Business Travel Assessment form already exist and could be modified and adapted for academic travel. In 2023, UCSB spent an average of \$975 on air travel costs per MT CO₂e emitted; in other words, we could save \$975 for every MT CO₂e in air travel emissions reduced. While projected reductions through UCSB-directed actions are small, we also expect some GHG emissions reductions through industry shifts to meet net-zero commitments.



FUNDING APPROACHES FOR COMMUTING AND BUSINESS TRAVEL

UCSB has done amazing work promoting and supporting low-GHG commuting options with a limited budget. There are a variety of approaches UCSB could take to secure additional funding.

Grants can be utilized for needs assessments, planning efforts, one-time infrastructure upgrades, and short-term pilots for new initiatives. Grants typically do not support existing/ongoing efforts or maintenance. State and federal grants can sometimes cover multi-year projects (depending on the specific grant). Some grants are also structured where you can apply for a planning grant, an implementation grant, and then an expansion grant, creating a pipeline of three grants the campus could receive, each grant building off the one before. UC Santa Cruz, UC Los Angeles, and UC Davis have been successful at securing significant grants to support low-GHG commuting options. Receiving grants of this scale requires the department to be established as a department approved for grants management with the Office of Research. Staffing would need to be invested in grants management and reporting. Grant writing for these large-scale grants is also a significant undertaking. UCLA's Transportation and Parking Services Department has a dedicated grant writer. Internally, UCSB can seek funding from the Green Initiative Fund; however, these grants are typically under \$30,000 and are generally expected to be accessible to students.

Historically, UCSB has also leaned into student fees to support low-GHG transportation. Student bus passes are subsidized with student fees.

Much of the bike paths and bike infrastructure, including the building for the new Bike Shop on campus, is funded through the Associated Students lock-in fees. These fees are limited to services that support undergraduate and graduate students. These fees could not be used to support commuting services for staff and faculty. Student fees also impact affordability for low-income students.

Philanthropy is another avenue to consider. Donors tend to invest in one-time projects and innovative new technologies, not yet been tried. Projects that support populations in which donors have a specific interest, such as low-income students, veterans, etc, may also be a good option for philanthropy. Donors are also sometimes willing to support major shifts in programming that have another funding stream lined up to cover ongoing operations after a one-time infusion. Donors also tend to shy away from contributing to ongoing operations.

UCSB could also follow the model that local cities use to fund many transportation projects. When a new building is built, a transportation fee could be assessed on the building project to offset the additional transportation impacts of that building. This would create a pot of funding that could be used for the campus's highest priority transportation projects and could support projects that can not easily be supported through grants or philanthropy.

RECYCLING

RECICLAR 回收



Aluminum
Aluminio
铝制易拉罐



Glass
Vidrio
玻璃



Plastics #1-2
Plásticos #1-2
1、2号塑料



Office paper and newspaper
Papal de oficina y periódico
纸



Clean cardboard
Cartón limpio
干净的纸板

Scope 3 - Waste

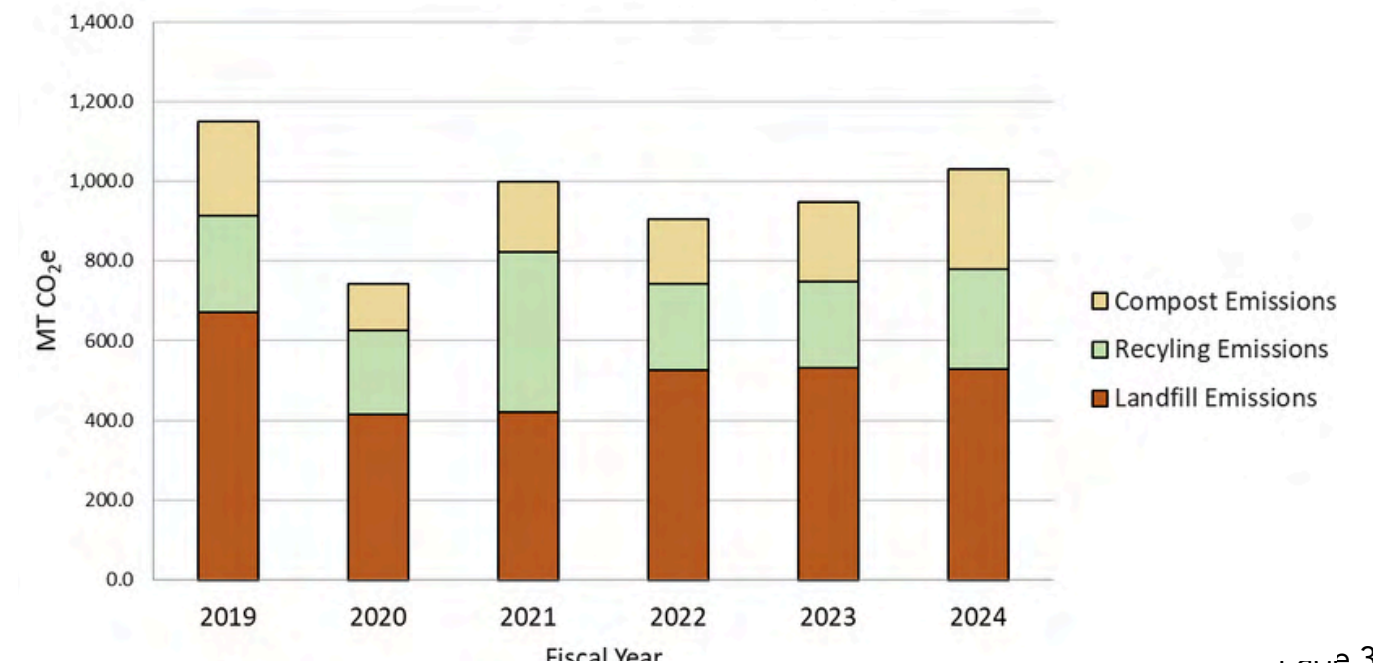
~2.7% of UCSB's GHG emissions in FY23 came from Municipal Solid Waste, down 25% from the 2019 Baseline.

The best way to reduce waste emissions is through reduction and reuse programs, including buying fewer products, choosing items made more sustainably and with fewer materials, and reusing items whenever possible. Material recovery through recycling and composting also plays an important role, **but has a smaller impact on total GHG emissions than source reduction does.**

In FY 2023/2024, UCSB diverted 63% of its waste from the landfill and averaged ~1.3 lbs/Weighted Campus User (WCU)/Day of waste generation. UCSB has been implementing waste reduction, reuse, recycling, composting, and repurposing programs and practices for the past five decades, including [organics composting](#) at all campus eating facilities, dining commons, and other outside locations; a [food recovery program](#) run through Housing Dining and Auxiliary Enterprises (HDAE); the phase out of [single use plastics](#); a [Lab Glove Recycling Pilot Program](#); and outreach and education programs run through [LabRATS](#), [PACES](#), [Zero Waste Committee](#), [AS Recycling](#), the Department of Public Worms, and [Procurement Services](#).

UC Sustainable Practices Policy requires campuses to divert 90% of municipal solid waste from landfills, and reference a baseline of FY 2015-2016 to reduce waste generation per capita by 50% by 2030. The UCSB [2020 Zero Waste Plan](#) puts forth a path for achieving these waste reduction targets. If implemented, and UCSB achieves the target, it is projected to reduce waste GHG emissions by 67%. This is an ambitious target; therefore, we are only forecasting a 50% reduction in waste GHG emissions.

GHG Emissions From Waste



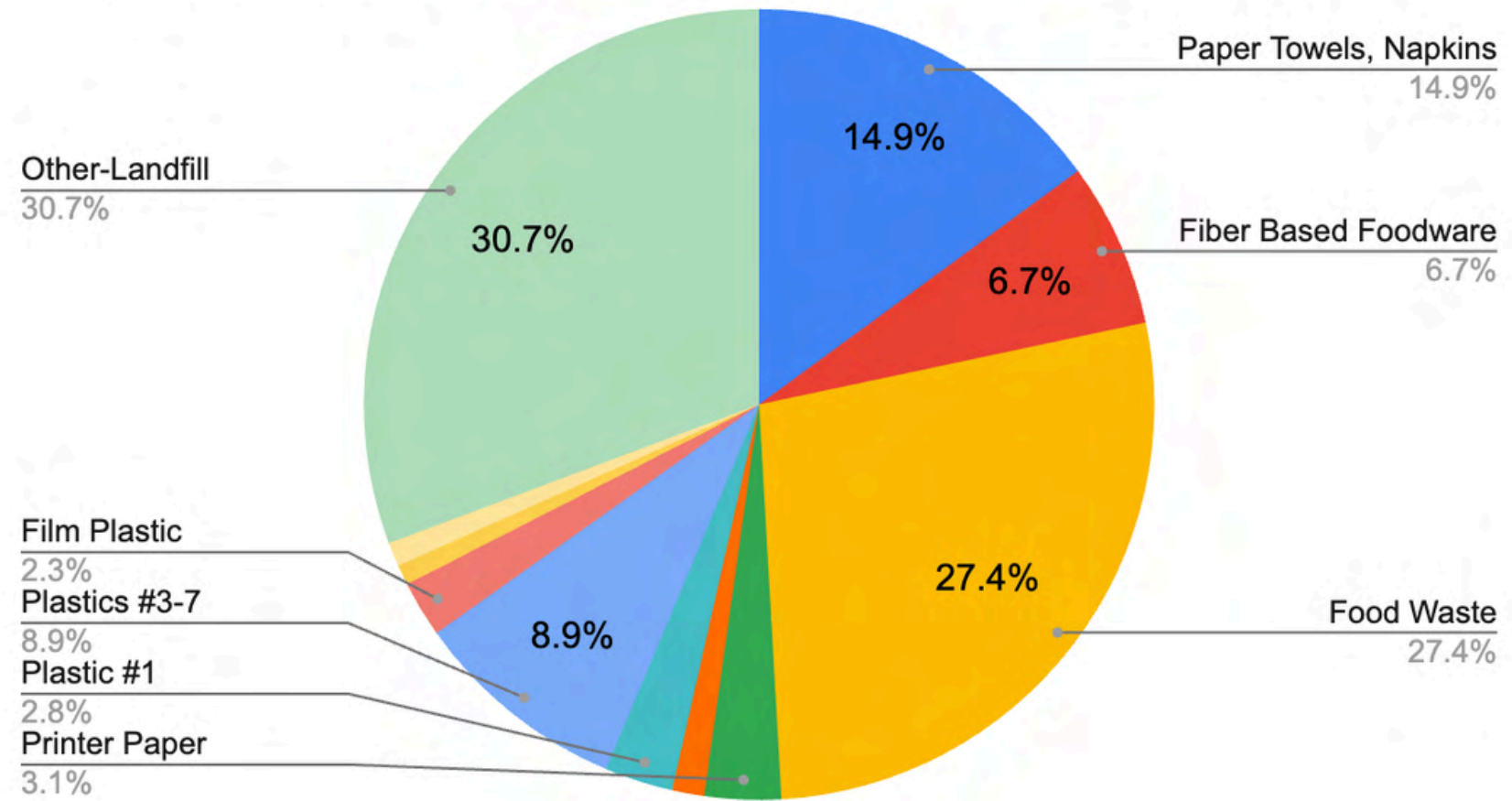
Scan me for more information



SCOPE 3 - WASTE

UCSB conducted a waste characterization study in 2017 and 2025. A waste characterization study determines the material composition of the waste stream on campus and is critical in helping to plan future waste reduction, reuse, and diversion programs and practices. For the 2025 Waste Characterization study, two buildings were selected: the Student Resource Building (SRB), the Interactive Learning Pavilion (ILP), and the Life Science Building, to represent administrative, classroom, and lab buildings. Trash and recycling were collected for two days for each building before it was sorted and weighed. The following graphs show the waste characterization for the Student Resource Building. An incomplete sample of the ILP was taken, so it has been left out of the results below.

Student Resource Building Landfill Waste Breakdown



As you can see from the graph above, ~50% of landfill waste was compostable, and 27% was food waste. Partnerships with the SRB staff to expand composting in spaces like the Multipurpose Room, which has a kitchen and frequently hosts events with food, could reduce food waste in the landfill. Additionally, a UCSB food recovery app could help reduce food waste by allowing students access to leftovers from campus events. Several campuses have food recovery apps that alert students about available food. Additionally, this plan recommends that the following programs/projects, many of which are included in the 2020 Zero Waste Plan, be implemented, expanded, or relaunched:

- **Establishing take-back programs and identifying product substitution opportunities for non-hazardous lab waste**
 - The California NanoSystems Institute (CNSI) manages a Laboratory Glove Recycling Initiative - The program collects, consolidates, packages, and ships uncontaminated nitrile, latex, and vinyl gloves for recycling.
 - Through an Environmental Leadership Incubator project, two undergraduate students, Kaili Mikami and Lauren Buyalos, advised by Jen Bowser, Sustainable Procurement Manager, launched FLOW - Facilitating Laboratory Optimization & Waste) to expand lab recycling. With funding from The Green Initiative Fund (TGIF), Office of Undergraduate Research and Creative Activities (URCA), and Facilities Management, they worked with AS Recycling, Custodial Services, Environmental Health & Safety, Distribution & Logistical Services, Sustainability, Procurement Services, and lab managers to improve lab recycling. Their efforts included providing updated laboratory-specific signage to be implemented in lab buildings across the UCSB campus and forming a no-cost partnership with Art From Scrap to divert non-recyclable materials for reuse. The UCSB Art From Scrap program will be piloted in two locations, Elings Hall and the Marine Science Building, in the summer of 2025. A.S Recycling will manage the program with plans to expand to more locations in the 2025-2026 academic year.
- **Expanding reusable packaging programs at on-campus restaurants**
 - UCSB had a Reusable Clamshell Container Program (Eco-to-Go). Students were able to purchase a reusable clamshell container for a one-time fee and use it at participating eateries like the Coral Tree Cafe and Courtyard Cafe. When returning the containers, they received a card to get a clean one for their next meal. The program ended during the COVID-19 pandemic due to safety concerns.

SCOPE 3 - WASTE

- **Expanding organic/ food waste collection**

- HDAE's food recovery program redirects and packages surplus dining commons prepared foods to offer pantry patrons fresh options that are nutritious and convenient. This helps reduce food waste and the GHG impacts associated with it while increasing food security. Reusable to-go containers from the pre-pandemic program have been repurposed to package the food for distribution. In February 2025, HDAE received a \$5,433 grant from the UC Zero Waste Working Group to purchase additional containers, supporting compliance with the UC Single-Use Plastics Policy that took effect on July 1, 2025. Expanding the supply of reusable containers increases the program's capacity, improves food safety and operational efficiency, and furthers UCSB's commitment to sustainability and waste reduction.

- **Improve the reuse and resale of surplus equipment**

- In July 2024, Distribution & Logistical Services implemented a new inventory system for Surplus Sales, significantly improving the tracking, pricing, and resale of university equipment. This system supports consistent and efficient reuse practices, while student-led initiatives have established clear protocols for assessing item value and condition. A pilot sale tied to Facilities Management's relocation demonstrated the potential of these improvements: over 750 items were inventoried, 400+ transactions completed, and 85 tons of material diverted from landfill in just 40 days. This effort also generated revenue for campus departments and strengthened collaboration with campus partners like AS Recycling and Procurement.

Next Steps

- The Waste and Procurement CSC Subcommittee plans to use the waste Characterization study to help prioritize education, outreach, and programs for the next few years.





ENERGY CONSERVATION AND BEHAVIORAL CHANGE PROGRAM

UCSB runs several ongoing programs focused on reducing GHG emissions and increasing sustainability through behavioral change that continue to support our decarbonization goals, including:

Annual Student Housing Energy Contest - HDAE, in partnership with Sustainability and the Environmental Affairs Board, holds an annual energy conservation competition that incentivizes students to reduce their energy use in student housing and encourages behavioral change.

Sustainability Internships and Community Resources (SICR) Department, Student Affairs. Student Interns from SICR, in partnership with Sustainability Staff, have worked on a variety of energy conservation and behavioral change programs. Some examples of these include:

- **LabRATS** - The Laboratory Resources, Advocates, and Teamwork for Sustainability (LabRATS) Program at UCSB assists researchers on campus in reducing their impact on the environment while also improving safety, encouraging good laboratory management practices, and promoting communication and resource sharing. LabRATS works with laboratories to promote energy-saving practices in the lab space, such as closing fume hoods when not in use, using standby modes or turning off equipment, and replacing inefficient lab instruments etc.
- **Program for the Assessment and Certification of the Environment and Sustainability (PACES)** - PACES assists departments, event coordinators, and sports teams in identifying new opportunities where they can further reduce their impact on the environment. Focusing on empowering individuals to make changes towards sustainability and engage their direct community, whether that be department members, event coordinators, and attendees, or athletic teammates, to do the same. PACES offers departments an office assessment, climate and sustainability action plan write-up, and presentation for department members. A similar consultation service is offered to athletic teams and events. Participants in the PACES assessment program or our Sustainability liaison program receive advice regarding energy usage, waste disposal/reduction practices, office health, sustainable procurement, transportation, and more. PACES also hosts several annual trainings open to the campus community.

ENERGY CONSERVATION AND BEHAVIORAL CHANGE PROGRAM

Historically, SIRC has hosted a combination of programs, including some internships based on clearly delineated one-year projects and some based on ongoing services such as LabRATS and PACES. Given a variety of factors, SIRC will be focusing more on the one-year project model moving forward. This helps us to maximize opportunities to support internships through external funding, allows us to be more flexible with limited internal resources, and ensures we can evaluate programs each year to assess the best way to be responsive to campus and community needs.

Leading on Climate, UC Bonnie Reiss Leading on Climate Action Fellowship Program

The UC Bonnie Reiss Leading on Climate Action Fellowship Program, hosted by the UC Office of the President, funds student-generated projects that support the UC system's climate action goals. This includes an engagement fellow who works with campus sustainability to communicate about campus and UC-wide sustainability goals and programs, and to engage undergraduate and graduate students in those efforts. UCSB's engagement fellows have worked with Sustainability to engage the campus community in climate action through efforts centered around behavioral change, education, and engagement.





UCSB MAKERSPACE

CAMPUS AS A LIVING LAB

UCSB strives to utilize its physical campus and operations as a real-world testing ground for research, teaching, and implementing sustainable practices. Current frameworks such as the Clean Energy Master Plan, the UC Equity-Centered Climate Resilience Initiative, and the Sustainability Internship Program provide a foundation for integrating sustainability into campus operations, while educational and research opportunities continue to expand UCSB's role as a living laboratory for climate solutions.

Our campus has several programs directly utilizing student-led research, education, and ingenuity to advance sustainability and climate action efforts. Through these initiatives, UCSB actively engages students, faculty, and the broader community in addressing critical environmental challenges. UCSB's WattsUp Electrification Study explored pathways to electrification and energy efficiency, while the Annual Housing Energy Competition encourages students to adopt energy-conscious behaviors and reduce their carbon footprint through their day-to-day activities. As mentioned above, our PACES and LabRATS programs recognize student leadership and empower them to serve as environmental consultants by assisting departments, laboratories, and event coordinators in identifying new opportunities where they can reduce their impacts on the environment.

To further strengthen climate resilience, UCSB provides students with hands-on experience in evaluating climate risks and developing adaptive strategies. This enhances UCSB's capacity to respond to climate change impacts while contributing to broader system-wide resilience planning across the University of California.

Here are some examples of how UCSB is using the campus as a living laboratory for climate action.

- The Cheadle Center for Biodiversity and Ecological Restoration (CCBER) - CCBER promotes the teaching of diverse undergraduate courses in Ecology, Evolution and Marine Biology (EEMB), Environmental Studies, and Geology. It also supports faculty, staff, and student research interests by providing field and lab-based resources. Through the ecological restoration program, the Center encourages land restoration on and near campus.

CAMPUS AS A LIVING LAB

- **Curriculum** - ~62% (~308 courses) of academic departments on campus offer sustainability courses (AASHE, STARS, AC-1).
- **UC Equity-Centered Climate Resilience Initiative** - The UC Office of the President (UCOP) started its JEDI-centered Climate Resilience Planning initiative (the "Resilience Initiative") in 2021 as a way to support all UC Locations. The Initiative, which ended in the Spring of 2025, included funding for a Resilience fellow who played an active role in the analysis, engagement, and planning.
- **Sustainability Internships and Community Resources (SICR) Department, Student Affairs** - SICR provides a support system for 60-80 students (dependent on the number of grants and amount of donor funds each year) who create lasting impacts on campus and in our community. The department works in partnership with community members, campus staff, faculty, and other students to identify community ideas, needs, and challenges. Based on this guidance, our students develop and seek feedback on proposals, develop feasibility studies, engage additional partners, and propose implementation plans. Throughout this process, students receive mentorship on how to be effective changemakers, how to build strong partnerships, and career skills.
- **UCSB Business Communication Writing Minor Capstone Project** - The Capstone project builds on the academic skills gained throughout students' undergraduate studies and the applied, professional skills gained through our client work, internship, and other work experiences. UCSB Sustainability as well as Emergency Management regularly serve as clients for the capstone student project. Students work collaboratively with staff to develop educational materials on campus sustainability issues.
- **UCSB Bren School of Environmental Science & Management Master's Group Project** - Master's group projects, which serve as a master's thesis, bring together teams of 4-5 students to solve environmental problems for real clients, including businesses, government agencies, and non-profit organizations. UCSB has served as the Client for several Master's Group projects, including the WattsUp group project, which works on an Electrification Study for Housing, Dining, & Auxiliary Enterprises (HDAE). In 2023, four master's students also did a group project with the UC Disaster Resilience Network + UCSB Natural Reserve System Collaborative as their climate plan on Automating Climate Scenario Creation for Wildfire Modeling.





CAMPUS AS A LIVING LAB

- **The Green Initiative Fund (TGIF)** - The Green Initiative Fund (TGIF) provides funding for projects that "green" our campus and reduce the University's impact on the environment. TGIF allocates funds to projects that increase the amount of renewable energy used on campus, increase energy efficiency, and reduce the amount of waste created (GHGs) by the university. Portions of the fund support education initiatives, student aid (via return to aid), and internships. TGIF is administered through a student-majority governance board, and priority is given to projects that incorporate student learning experience.
- **Institute for Energy Efficiency (IEE)** - Research at the Institute for Energy Efficiency (IEE) is organized into three interdisciplinary themes: Smart Societal Infrastructure, Energy Efficient Computing and Communications, and the Food-Energy-Water Nexus. The IEE's goals focus on enabling increasing renewable energy integration while meeting new electricity demands, reducing the energy footprints of data center computing, and prioritizing the sustainable production of food, clean water, and energy.
- **Greti U. Croft Center for Undergraduate Environmental Leadership (CUEL)** - The Croft Center for Undergraduate Environmental Leadership (CUEL) supports undergraduate students in the transition from classroom to career through training opportunities and career resources. The Environmental Leadership Incubator (ELI) Program is a nine-month program that supports student-initiated projects on and off campus that seek to implement environmental change. CUEL provides career workshops for undergraduate students to develop career readiness skills, networking opportunities through EcoGauchos, a searchable database of existing environmental jobs, and internship opportunities for the UCSB environmental community.
- **Yardi Scholars for Environmental Justice Program** - A four-year scholarship program for students from all majors who want to learn the changemaking skills needed to address complex environmental challenges and create lasting environmental solutions.
- **Library** - The Library has research support for students in the form of LibGuides that provide "How-To Guides" advising on how to begin research, conduct literature reviews, and publish findings, including one LibGuide specifically highlighting resources related to Climate Change. Professional librarians are available to assist students with their research; please request a research consultation [via Zoom or in person] or, for a quick question, please visit the [Ask-A-Librarian page](#). [The Office of Teaching & Learning's Undergraduate Research & Creative Activity \(URCA\)](#), which is located in the Library, has a Getting Started page for students to learn more about how to get involved in mentored research. URCA also has peer mentors who are available to advise students on their research projects, and research grants are available to students. The Library's Open and Affordable Course Materials (OACM) program helps instructors adopt digital and open resources that improve student success and environmental sustainability. By using e-books and [Open Educational Resources \(OERs\)](#)—which can be freely updated and reused—instructors reduce the need for physical printing and lower greenhouse gas emissions.

CAMPUS AS A LIVING LAB

UCSB's History of Living Lab

Over the years, UCSB Sustainability has piloted a variety of programs to support and encourage faculty to infuse sustainability in their teaching, research, and public service. Most of these were funded by grants and other short-term funding that could not be sustained in the long term. However, we were able to test various programs, demonstrate the effectiveness of the work, and show the broad and diverse faculty interest.

Faculty Champion Program

The Faculty Sustainability Champion Program was a grant program that awarded faculty members \$25,000 to expand their research, teaching, and public service around climate change and other sustainability issues. In order to be awarded the funding, they needed to include aspects of all three areas. They also needed to explain how their work would engage with the campus and/or local community. Dr. Simone Pulver, Environmental Studies Program, utilized this program to support the launch of the Environmental Leadership Incubator, which still operates today. Dr. Gretchen Hofmann, Ecology, Evolution, and Marine Biology, used it to expand programs around communicating climate change research to the public. Dr. Chandra Krintz, Computer Science, used the program to pilot open-source water use tracking software at the UCSB Student Farm and also this resource to small and medium-scale farms across the state. The UCSB Sustainability Program hosted this program for several years up until 2019, when the program no longer had the funding to support it. This program was led by a committee that was operating at the time called the Academic Senate Sustainability Work Group, an informal work group of the Academic Senate. The committee was chaired by the faculty co-chair of the Chancellor's Sustainability Committee and staffed by Katie Maynard, who was a Sustainability Officer at the time and is now Director of Student Sustainability Initiatives in Student Affairs. The UC Global Climate Leadership Council funded a pilot expansion of this program to all the UC campuses for one year, and this was based on the UCSB model.

Unfortunately, to our knowledge, all campuses ran into the same issue related to securing ongoing long-term funding, and so the program has not continued. UC Santa Cruz, continued it for one year past the systemwide funding with some internal financial support.

New Leaf Grant Program

The New Leaf Grant Program was a funding resource for faculty interested in infusing sustainability or climate change into an existing course. Each awarded faculty member was allocated up to \$500-\$1,000 (depending on the year) to support the modification of their course. This was sometimes used to cover software, faculty release time, some time for a teaching assistant, production costs for graphics or video, equipment for students to use in a course (like energy meters), additional course materials, film rights, or books to support the faculty in modifying their course. Some courses supported include Dr. Ken Hiltner's English Course "Climate Change: What is it and what each of us can do about it"; Dr. Brooke Smiley's Dance 165, "Embodied Anatomy" where they explored students' relationships to the environment through Dance; and Dr. Andrea Nicolaescu's course Linguistics 12, "Approaches to University Writing for Multilingual Students", where students wrote about environmental issues while practicing their language skills. The Instructional Development Department at UCSB hosted and provided staff support to the program with funding from the UCSB Sustainability Program, and selection of proposals by the Academic Senate Sustainability Work Group, an informal work group of the Academic Senate. The committee was chaired by the faculty co-chair of the Chancellor's Sustainability Committee and staffed by Katie Maynard, who was a Sustainability Officer at the time and is now Director of Student Sustainability Initiatives in Student Affairs. This operated up until 2019, when the program no longer had the funding to support it.

CAMPUS AS A LIVING LAB

Faculty Curriculum Workshops

UCSB has piloted several cohort-based models that trained and incentivized faculty to infuse sustainability into their courses. These programs were modeled after the Ponderosa and Piedmont Projects. In 1995, Dr. Geoffrey Chase, San Diego State University, Dr. Paul Rowland, Northern Arizona University, and several of their colleagues piloted a program called the Ponderosa Project. Dr. Peggy Barlett, Emory University, built on that work and launched the Piedmont Project in 2001 (PF Bartlett, GW Chase, 2012). The model traditionally starts with a workshop or workshop series where faculty from multiple disciplines share models for infusing sustainability and climate into the curriculum, as well as lesson plans. Time is dedicated in the workshop for faculty to brainstorm with each other on the best ways to infuse sustainability into specific courses and for them to connect over shared skills. A natural science faculty might offer to record a short video discussing climate change science, and a humanities faculty member may offer exercise ideas to the natural science faculty to help them add a creative element to their course. Faculty are given an initial award for attending the first workshop (usually \$500-\$1,000). The faculty are then given a quarter or two to develop a new curriculum and then receive a second award (also usually \$500-\$1,000) when they turn in a revised curriculum and let the program manager know when they plan to pilot their revised course. Participation in workshops like this at UCSB usually ranges from 10-40 faculty members in each cohort from a wide variety of disciplines. Almost all of the faculty who participated stayed in the program and changed their courses. UC Global Climate Leadership Council funded a UC Systemwide pilot of this model in 2015-2016. The lead faculty and staff implementers for this program were the same as for the New Leaf Grant Program above.

Education for Sustainable Living Program (ESLP)

Students from the UCSB Associated Students Environmental Affairs Board collaborated with students across the University of California system to launch a program called the Education for Sustainable Living Program (ESLP) in 2004.

The program included a weekly one-unit lecture series with sustainability practitioners from around the world and a series of four-unit group studies projects where students would research and develop proposals for ideas to improve the environmental impact of the campus. The student group studies projects were student-designed and led under the supervision of a faculty member. The lectures were planned by other campuses so that the speakers could do a speaking loop of several campuses in one trip. This model brought together the inspiration that comes from hearing about real-world solutions from people on the front lines of the environmental field, with an opportunity to use undergraduate research towards action right here on campus. Though the program as a whole was not able to be sustained over time, the courses laid the groundwork for what became the Sustainability Internship Program of the Sustainability Internships and Community Resources Department in Student Affairs.

Best Practices from other Universities

Our Climate Engagement Fellow utilized the [AASHE STARS](#) (The Sustainability Tracking, Assessment & Rating System), a transparent, self-reporting framework for colleges and universities to measure their sustainability performance, and a database of reports to pull Best Practices examples of climate-focused living lab programs. Below are some examples from other colleges and universities in the U.S. that may be worth exploring on our campus.

UC San Diego - Established a new, one-quarter climate change education requirement for incoming first-year students beginning fall 2024 (Jane Teranes Climate Change Education Requirement). It is designed to expand educational engagement with climate change across all departments on the campus. The UCSB Academic Senate Sustainability Work Group (a committee not currently active) developed a proposal for adding an Environmental GE Requirement at UCSB. In 2024-2025, an Environmental Leadership Incubator Student, Jenny Gibson, began building off the work completed by the previous committee and is actively working on a new proposal.

CAMPUS AS A LIVING LAB

UC Berkeley - Cal Climate Action Partnership (CalCAP) is a collaboration of faculty, administration, staff, and students working to reduce greenhouse gas emissions and achieve carbon neutrality at UC Berkeley. Its initial work led the campus to reduce its GHG emissions to 1990 levels by 2012 (two years ahead of its target schedule). This partnership has allowed the campus to conduct annual GHG emissions inventories, produce climate planning documents (such as the 2025 Carbon Neutrality Planning Framework), and engage the campus community in guiding action in climate planning through their Steering Committee. Students also play a large role in creating recommendations on campus energy planning and efficiency measures.

UC Irvine (UCI) - UCI's Campus has a Living Lab Internship, which is a hybrid (three-quarter) seminar and internship experience provided by the Center for Environmental Biology and the Global Sustainability Resource Center. This program allows students to learn valuable skills in research, project management, and grant application writing in the "green jobs" market. Some of these projects led by students include the development and implementation of the UCI Green Labs certification program, a new "Cool Block" curriculum that focuses on tangible actions students can take to reduce their carbon footprint, and a zero-waste program called TerraCycle to monitor the use of compost bins and highlight the importance of proper waste management within undergraduate startup businesses.

UC Davis - Through the Program for International Energy Technologies (PIET), UC Davis offers the Path to Zero Net Energy course in which students conduct feasibility studies on energy and climate projects for UC Davis and other clients. This course educates and engages students in energy use, demand, energy efficiency, renewable energy, and climate neutrality. In addition to the associated technical, economic, social, and political challenges.

Stanford - [Explore Energy House](#) STEM-based theme dorm. It is a vibrant, inclusive residential community that expands energy and sustainability education through interdisciplinary dialogue, exploration, and action. Residents at Explore Energy House are the first to know about sustainability and energy opportunities in technology, policy, business, and more.

University of Texas at Austin - [Climate Leaders Program \(Climate LEAP\)](#) offers a cohort of ten undergraduate interns hands-on, practical experience developing a greenhouse gas emissions reduction plan for a UT college, school, or unit. Climate LEAP is a year-long, paid internship program open to undergraduates of ALL majors. Climate Leaders work in interdisciplinary pairs, with one student acting as a Climate Data Analyst and the other as a Climate Engagement Specialist. Each pair works with a single college. Climate LEAP cohort meetings include presentations, workshops, and discussions led by experts in diverse fields, providing students with the broad knowledge base needed to be successful as future sustainability and climate professionals. Each Climate Leader earns a Carbon Footprinting Certificate from the University of New Hampshire. At the end of the program, Climate Leaders utilize all their newly developed skills to present a final emissions reduction plan to the dean or leader of their college, school, or unit.

University of Connecticut - UConn Climate Corps is a 2-part undergraduate classroom and service-learning course that consists of students learning about local impacts of, and adaptation to climate change during the first semester course, using examples at UConn's campuses, and an independent study during the second semester, in which students work with CT Extension faculty to assist Connecticut communities in adapting to climate change.

Next Steps

To build a sustainable future on our campus and beyond, it is essential to focus on proactive strategies that address climate change and prioritize our educational institutions to further research and learning. UCSB should continue to engage the campus community in climate action and resilience planning and explore opportunities to integrate it into course materials and work, for example, partnering with business and finance courses to explore financing mechanisms for UCSB's Clean Energy Master Plan and CAP. There is a wide variety of best practices and historical examples, both from UCSB and peer institutions described above, which could easily be implemented again if resources could be identified to support these efforts. If implemented, a focus on Climate Justice should be a pillar of these programs.



LANDSCAPE AND VEGETATION

UCSB owns and maintains over 300 acres of grounds on campus, including 90 acres of turf, 86 acres of irrigated vegetation, and 122 acres of unirrigated vegetation. Landscape and vegetation can be important sinks for carbon dioxide through carbon sequestration. Trees, in particular, sequester large amounts of carbon in their wood. In addition, vegetation counteracts the urban heat island effect by reducing heat-absorbing impermeable materials like concrete and asphalt and by providing cooling shade.

Subsequently, the energy use of buildings near trees and vegetation is reduced because less energy is needed for cooling. Strategic placement of trees can increase climate resiliency and reduce a building's energy needs for cooling by providing shade and for heating by blocking winter winds and insulating buildings. The vast majority of trees on the core campus lie within 60 feet of buildings and provide cooling and heating energy reduction benefits. The campus should ensure that future plantings continue this tradition. Use of landscapes for mitigation is complicated by the fact that vegetated landscapes both absorb carbon through photosynthesis and emit CO₂ through respiration and decomposition. Consequently, the sequestration potential of landscapes differs, depending on the vegetation or ecosystems present and the energy used to maintain them. Landscapes, particularly lawns and turf, can be significant sources of GHG emissions, depending on the energy and practices used to maintain them. GHG emissions related to the landscape have several sources:

- Use of lawn and garden equipment
- Water-related electricity use (pumps, etc.)
- Decomposition of plant material
- Fertilizer and irrigation practices
- Disturbance and erosion of soils
- Transportation emissions related to the vehicular travel of maintenance crews

LANDSCAPE AND VEGETATION

Current Best Practices

- The University has transitioned to primarily using battery-powered landscaping equipment for string-line trimmers, hedgers, edgers, blowers, and select lawnmowers.
- CCBER manages more than 340 acres of open space between Ellwood Mesa and Goleta Slough, which includes wetland creation and enhancement, and the implementation of sustainable stormwater management solutions. The [North Campus Open Space \(NCOS\) Restoration Project](#), managed by CCBER, restores the upper arms of Devereux Slough. The wetland restoration project significantly increases carbon sequestration by restoring the ability of wetlands to absorb and store carbon dioxide from the atmosphere, while also improving local resilience to sea level rise and storm surges. The project also included compost and biochar applications.
- UC Santa Barbara's Cheadle Center for Biodiversity and Ecological Restoration (CCBER) partners with local Chumash bands to revive traditional cultural burns on campus. This initiative integrates traditional ecological knowledge with scientific research to clear invasive grasses, restore native grasslands, and promote the growth of culturally significant plants.
- In 2019, the Grounds Teams and CCBER worked together to address concerns about the use of glyphosate as a herbicide through an integrated pest management committee (IPM). The majority of campus landscaping is now maintained without glyphosate by switching to more hand weeding or finding replacement herbicides. Training and safety have increased as a result of the initiative. The impact includes more tolerance of weeds on campus and increased labor costs. [The University of California Integrated Pest Management \(IPM\) policy](#) also requires the electronic reporting of all pesticide use by Pesticide Handlers, Certified/Licensed Pesticide Applicators, or Application Supervisors (including recording of pesticide use applied by Contractors) using the systemwide PUA Platform.
- UCSB has a robust tree replacement plan that ensures the maintenance of the campus urban forest, which serves not only as a carbon sink but also as an important mechanism for reducing the urban heat island effect and increasing climate resiliency. The removal of any ornamental tree on campus requires 1:1 replacement with a native, and the removal of any native tree or breeding/nesting tree requires 3:1 replacement with a native tree. Additionally, removal of an oak tree requires at least 10 replacement oak seedlings.





LANDSCAPE AND VEGETATION

Recommendations for reducing GHG emissions through landscape management practices:

- Afforestation - UCSB can increase carbon sequestration by continuing to plant trees in its campus urban forest. Strategically placed trees can also increase building-level energy efficiency. In summer, trees shading the east and west walls cool buildings. In winter, allowing the sun to strike the southern side of a building can warm interior spaces, whereas if southern walls are shaded by dense evergreen trees, winter heating costs could rise. A tool like MyTreeKeeper helps managers strategically plant trees for the greatest energy savings and climate resiliency. Native flora should receive special consideration when making planting recommendations and decisions.
- Explore the use of biochar as a soil amendment - If applied to campus landscapes and restoration projects, biochar can sequester carbon and increase plant productivity. Biochar production involves heating biomass in a low-oxygen environment. This process limits the combustion of biomass into CO₂, and instead converts 25 - 30% of the feedstock into a stable form of carbon that will decay to GHGs over a time frame on the order of hundreds of years. By preventing the decomposition of biomass through its natural cycle, this form of biochar production enables carbon sequestration. The current methodology for carbon accounting with biochar is detailed in the California Air Pollution Control Officers Association (CAPCOA) 2015 protocol 12 titled Biochar Production Project Reporting Protocol, GHG Emission Reduction. Biochar can also decrease the amount of fertilizer needed and increase the removal of carbon dioxide from the atmosphere by increasing plant productivity.



CLIMATE RESILIENCE AND ADAPTATION

According to the World Meteorological Organization, “the annually averaged global mean near-surface temperature for each year between 2025 and 2029 is predicted to be between 1.2°C and 1.9°C higher than the average over the years 1850-1900” (World Meteorological Organization, 2025). Even with investments in GHG mitigation efforts, climate adaptation is a necessary strategy to alleviate the effects of climate change. Through climate hazard and resilience planning efforts, we can better prepare our community for the impacts of climate change. An example of how resiliency strategies can be incorporated into GHG mitigation efforts is to ensure the proposed central energy plant is designed with equipment able to tolerate future air temperatures and power outages. Another example is to ensure that new buildings utilize passive design strategies to both reduce energy demand for mechanical cooling and enhance “passive survivability,” providing safe shelter for occupants during a power outage. We can also engage with stakeholders to identify key climate hazards, develop resilience-specific goals, and provide educational resources.

The UC Office of the President (UCOP) started its Justice, Equity, Diversity, and Inclusion (JEDI)-centered Climate Resilience Planning Initiative (the “Resilience Initiative”) in 2021 as a way to support all UC Locations with climate resilience planning. UCSB participated in the first phase of the initiative by hosting two equity-centered climate resilience workshops on our campus. Out of that, a partnership was formed between Sustainability and UCSB Emergency Management to work on integrating climate resilience into campus planning. UCSB helped develop and pilot a Climate Hazard Vulnerability Assessment for the UC system, integrated a climate resilience lens into our Campus Clean Energy Master Plan, and also completed a JEDI-Centered Climate Change Impact Assessment that incorporates feedback from subject matter experts, frontline communities, and the broader campus community.

Equity-centered climate resilience planning helps strengthen the resiliency of our campus community, not only to adapt, but to thrive in the face of extreme heat, wildfires, sea level rise, flooding, and drought. It allows campus entities to prepare for, adapt to, and recover from the impacts of a changing climate. The overarching goals of the Resilience Initiative at UCSB are to continue to nurture existing and new partnerships, educate and empower the campus community, including leadership, so that we can better prepare ourselves and our community for current and future climate hazards.

OUTREACH AND ENGAGEMENT FOR RESILIENCY

With the help of several Climate Resilience fellows over the last few years, input has been collected from our campus community through various representative surveys, interviews, and listening sessions. This included feedback from undergraduate and graduate students, the Emergency Planning Committee, faculty, and staff on past impacts and concerns about climate hazards.

Input from the engagement efforts outlined in the table and advice from specific subject matter experts, who were able to participate, were incorporated into the JEDI-Centered Climate Change Impact Assessment. Subject matter experts included the Campus Basic Needs & Rapid Rehousing Manager, the Director of Residential Operations at UCSB, Campus Industrial Hygienists, the Director of Ecosystem Management for UCSB's Cheadle Center for Biodiversity and Ecological Restoration, the Assistant Director of Grounds and Landscape Services, and more.

Date	Event	Event Description	Attendees
May 2023	Survey	Surveyed undergraduate students to collect data on their experience related to: Climate hazards impacts and vulnerability, preparedness, and resources needed.	331
June 1st, 2023	Committee Meeting	Presented Climate hazard projections to the Campus Emergency Planning Committee.	40
July 13th, 2023	Climate Conversations	Surveyed the Emergency Planning Committee to collect data on Climate hazards impacts and vulnerabilities, preparedness, and resources needed. Committee members ranked preparedness for each hazard.	40
Jan - Feb 2024	Climate Conversations	CERT class; CERT is a nationwide, FEMA program offering disaster education and preparedness training	13
Jan - Feb 2024	Climate Conversations	Interviewed undergraduate UCSB students regarding their personal experiences with climate hazards and their psychological impacts and presented interview transcripts and findings in a class presentation in an undergraduate environmental studies course	53
February 2024	Committee Meeting	Student fellow attended a committee meeting for UCSB's Public Safety Commission to collaborate on new ways to promote disaster safety in the student body	20
March 6th, 2024	Tabling	Tabling event at Pardall Center; flyers and other promotional materials distributed to the Isla Vista community to promote climate hazard preparedness and safety through the CERT program	
April 2nd, 2024	Climate Conversations	Student fellow interviewed representatives from UCSB's rapid rehousing program regarding the university resources available to undergraduate students during times of disaster	1
May 2024	Survey	Surveyed Faculty, Staff, and Graduate students through a representative sample on the impact of Climate hazards, vulnerabilities, preparedness, and resources needed	~1100
September 2024	Tabling	Flyers and other promotional materials were distributed to the student population on resiliency	>5,000
October 2nd, 2024	Community Event	We provided educational panels, hands-on activities, and resources to help residents understand and improve air quality in Isla Vista.	~40



CLIMATE CHANGE IMPACT ASSESSMENT RESULTS

UCSB's campus and local community are vulnerable to many climate hazards, some more than others. However, there are hazards we are substantially less vulnerable to, including coastal flooding and wildfires. UCSB is "fortunate that most of its built environment is on an elevated marine terrace," making it "relatively safe from flooding hazards due to rising seas and storms" (UCSB Campus Planning and Design, 2022). Being situated so close to the ocean, our campus has a unique microclimate with higher moisture levels in vegetation than the surrounding areas. "The university protrudes into the ocean, which limits the direction from which a fire can approach. And the campus is flanked to the north by the airport and surrounding wetlands, not a likely conduit for fire" (Tasoff, 2025). Despite being less vulnerable to these hazards, there are still extensive protocols and preparedness measures in place.

UCSB is vulnerable to several hazards that may be intensified by climate change, which are not equally experienced across the multitude of diverse populations that constitute UCSB. The initial results of the JEDI-Centered Climate Change Vulnerability Impact Assessment, which looks out to the year 2055, show the greatest vulnerability to high temperatures, frequent droughts, wildfire smoke exposure, and prolonged rain events. The Climate Hazard Impact Assessment tool has three scenarios: Wildfire & Wildfire Smoke, Drought & Heat, and Rain & Flood. Impact categories assessed include: People (on & off-campus), Assets (physical, natural, cultural), Services (e.g., education, research, emergency, admin), and any combination of the three. Impacts were scored on a scale from 1 to 5 (1 = lowest priority) based on potential exposure, sensitivity, and adaptive capacity.

Areas of Assessment included:

- Current Vulnerabilities
- Level of Preparedness: How effective are current controls?
- Life Safety: Physical Injuries or Fatalities
- Need for Mental Support Resources Before/After Incident
- Impact on Infrastructure
- Cost of Damage: Total cost to respond to the event and repair or replace all damaged facilities
- Impact on Continuity of Operations: Disruption to campus essential functions
- Impact on Stakeholders: Leading to a negative impact on the reputation of the campus
- Breadth of Impact
- Maximum Tolerable Downtime
- Warning Time Before Incident Occurrence

The following table shows the highest-ranked climate hazards based on exposure, sensitivity, adaptive capacity, and overall vulnerability. The full assessment can be found [here](#).

Climate Change Hazard	Impact	Exposure	Sensitivity	Adaptive Capacity	Overall Vulnerability
Wildfire Smoke	Poor air quality	3	3	1	5
Wildfire	Damage to critical infrastructure in the areas surrounding the UCSB campus.	3	3	2	4
Extreme Heat	Extreme temperatures pose risks to human health.	3	3	1	5
Extreme Heat	Increased power usage stresses the electrical grid, leading to power outages.	2	3	1	4
Extreme Heat	Heat waves threaten the operation of outdoor events on the UCSB campus.	3	3	2	4
Rain Storm	Increased rainfall intensity presents commuting challenges (bike/walk/public transport)	3	3	2	4
Rain Storm	Intense rainstorms can result in limited access to campus.	3	3	2	4
Rain Storm	Intense rainstorms can damage campus infrastructure, primarily through flooding.	3	3	2	4
Rain Storm & Coastal Flooding	Intense rainfall and coastal flooding can increase the rate of erosion along cliff sides..	3	3	2	4
Coastal Flooding	Coastal flooding can lead to road closures, reducing access to campus.	3	2	1	4
Coastal Flooding	Coastal flooding can threaten residential infrastructure on campus and in Isla Vista.	3	3	2	4

CURRENT BEST PRACTICES

UCSB Emergency Management has taken several proactive steps to increase resilience. With support from Sustainability, our Climate Resiliency Fellows, and campus leadership, we have expanded some of these efforts over the last few years. These include:

- **Community Emergency Response Team (CERT):** UCSB's Campus Emergency Manager and Climate Action Fellow relaunched the Community Emergency Response Team (CERT) program after a hiatus during the COVID-19 pandemic to equip students with essential emergency preparedness skills, promote helping the community during natural hazards, and increase climate resilience. CERT takes place in the EH&S Building, specifically the Emergency Operations Center (EOC). The Campus Emergency Manager is the program manager for the CERT class, coordinating community instructors and UCSB Student instructors to teach CERT.
 - CERT is a twenty-four-hour course taught in a 3-day training program that takes place over 2 weekends. The program teaches individuals how to assist their communities during emergencies and disasters. The training covers a wide range of essential skills, including basic disaster response, fire safety, light search and rescue, team organization, and first aid. CERT participants learn how to help themselves, their family, friends, roommates, and neighbors, and the broader community until professional first responders arrive.
 - Through hands-on exercises and UCSB student peer-to-peer classroom instruction, CERT prepares volunteers to respond effectively in the aftermath of earthquakes, fires, floods, and other crises. The goal is to build community resilience by empowering individuals with the knowledge and tools to act quickly and confidently in the face of disaster.
 - The CERT Club on campus engages directly with the campus community by advertising the free class and inviting students, and encouraging continued community engagement. It has successfully been renewed following the impacts of COVID-19, and the team of student trainers continues to grow, with 10 total new trainers in the 2024-25 school year.
- **Listos:** An 8-hour public education program that teaches emergency preparedness skills and is available in English and Spanish. It teaches life-saving techniques, how to create an emergency plan, build an emergency kit, create an evacuation route plan, sign up for and interpret local alerts, and find accessible information outlets for local government and first responders. Listos meets community members where they are at and requires no equipment or extra tools, making it especially accessible to families at home, parishes, and community groups.
- **Campus/Community Disaster Education Workshops (CDE):** The Campus Emergency Manager hosts one-hour trainings on Community Disaster Education that cover how to prepare for natural disasters like fires, floods, and earthquakes. Participants learned key steps such as creating a "go bag," setting up an emergency meeting place, and identifying an out-of-state contact. The workshop provides essential tools and knowledge to help develop a personalized disaster preparedness plan.
- **Building partnerships across campus groups and departments:** Through the Resilience Initiative, we continue to build partnerships with existing groups and organizations on campus. For example, we collaborated with Basic Needs to hold emergency tabletop exercises, ensuring current campus departments are kept up-to-date with preparedness plans for various climate hazards and events. These exercises are also extended to the basic needs program. Other collaborations exist between the Climate Action Fellow and the Rapid Rehousing Pilot Team regarding effective ways to prepare for climate hazards among students facing housing insecurity.
- **Education and Awareness:** Over the last two years, our Climate Resiliency Fellows have worked to promote awareness and increase student knowledge about climate resilience and disaster preparedness through education and outreach. Furthermore, the Fellows work to build resilience by equipping students with practical skills, such as emergency response, preparation, and ultimately improving their readiness for various hazards. Through resilience, the Fellows foster relationships and strengthen connections within the UCSB and Isla Vista communities by creating space for collaboration and shared learning.

CURRENT BEST PRACTICES

- Engagement of Campus Leadership: Over the last 2 years, the Resiliency Project has been engaging campus leadership in climate resiliency planning through the Campus Emergency Planning Committee. The Emergency Planning Committee develops, trains, and tests plans to reduce vulnerability to hazards and cope with disasters that could impact the UCSB community. The Emergency Planning Committee meets monthly at the UCSB Emergency Operations Center (EOC) to conduct exercises or review an educational topic related to safeguarding the UCSB community. The Emergency Planning Committee also serves as the core group for a UCSB EOC activation. The engagement with the Emergency Planning Committee has included:
 - Presentations on climate hazard projections
 - Survey of committee members to collect data on climate hazards impacts and vulnerabilities, preparedness, and resources needed.
 - The committee members went through an exercise to rank preparedness for identified climate hazards.
 - Emergency Planning Committee Scenario Planning and Climate Hazard tabletop exercises on heat waves, wildfire, rainstorms, and flooding.
- UCSB employees are trained on outdoor and indoor heat illness prevention measures; competencies include understanding when to take necessary rest breaks, access to shade/cool down areas, maintaining access to fresh potable water, and how to contact emergency services personnel. Also, extra procedures are in place to ensure employees are protected during heat waves.
 - The [Indoor Heat Illness Prevention Program](#) details that supervisors must develop and implement an Indoor Heat Illness Prevention Plan for workers who may be exposed to indoor temperatures equal to or greater than 82°F for more than 15 minutes during any 60 minutes or above 95°F for any period. More can be found here: [Heat Illness Prevention Program](#)
- The [UCSB Field Safety Plan](#) is also available for students and field researchers to apply to any climate hazard, documenting a hazard assessment, communication plan, emergency procedures, and training. It is designed to provide researchers and students with field first aid training and assist with preparing for work in the field. It also helps identify hazards, precautions, and actions taken to address and mitigate present hazards.
- [UCSB's Sea Level Rise Adaptation Plan](#) assesses the vulnerability of the campus's built and natural environment to erosion, flooding, and other coastal hazards, assuming as much as 2 meters (6.6 feet) of sea level rise by the year 2100. The plan includes a variety of resilience strategies, including managed retreat (relocating and adapting facilities), monitoring evolving shoreline conditions, and restoration. The plan relies on lagoon, bluff, and shoreline monitoring "to anticipate and trigger future adaptation action" (UCSB Campus Planning and Design, 2022).
- [Protection from Wildfire Smoke](#) - Cal/OSHA has established protection requirements to protect workers from hazards associated with wildfire smoke.
- Student Fee Advisory Committee's Emergency Funding Request provides access to additional funding during disasters, helping equip existing programs already serving those in need with the resources needed to expand services during a disaster.
- The campus's [Financial Crisis Response Team \(FCRT\)](#) assists students facing a financial crisis or urgent financial need. The FCRT supports undergraduate and graduate students facing significant financial difficulties that jeopardize their path to graduation through emergency funding and resource connections." The application can be utilized during climate-related emergencies for students impacted.

RECOMMENDATIONS AND NEXT STEPS

In pursuit of a sustainable future, implementing effective strategies is crucial for combating climate change and enhancing resilience. Best practices embody a collection of innovative approaches that offer opportunities to reduce carbon footprints, improve resilience, and foster sustainable development. These practices are designed to guide our campus community in adopting measures that exceed current standards of environmental stewardship.

- Continue to update HVA and Climate Impact Assessment as we experience climate hazards, to address gaps in the assessment, and lessons learned. Both assessments should be updated every two to three years and be used to inform tabletop exercises with the Emergency Planning Committee on current and future climate hazards. Since the Climate Hazard and Vulnerability Assessment was completed, the Emergency Planning Committee has run through several climate hazard scenarios, including extreme heat and rainstorms. Specific considerations should include minimizing impacts to frontline groups (i.e., DSP students, international students, unhoused students, etc.).
- Develop and maintain targeted outreach, education, and engagement programs
 - Audiences:
 - UCSB Students: Focus on undergraduate and graduate students living on campus or in Isla Vista who may be vulnerable to local hazards.
 - Community Members: Include Isla Vista residents who share resources and spaces with students.
 - Underrepresented Groups: Special attention should be given to groups with limited access to preparedness resources, including international students, transfer students, disabled students, houseless students, and low-income students.
 - Inclusivity and Accessibility:
 - Physical Accessibility: Ensure workshops are accessible to all participants, including those with mobility challenges.
 - Virtual Options: Include online participation opportunities for those unable to attend in person.
 - Inclusive Design: Involve diverse stakeholders in planning to ensure programs meet the needs of all communities.
 - Outreach, Engagement, and Education
 - Build CERT Student Trainer Team to continue equipping students in emergency preparedness and readiness.
- Designate buildings on campus available to the campus community during climate hazards or emergencies. This could include clean air buildings during smoke events, and/or heating or cooling centers. The information should be added to our existing interactive campus map.

Coordinated Response Plan

- During disasters, the emergency response team should continue to work closely with partners to expand services such as the Food Security and Basic Needs task force, the Rapid Rehousing Program, the AS Food Bank, and the Disabled Students Program, all of which are already providing support to vulnerable students, to expand services.
- Financial support during emergencies can be improved by expanding the FCRT and SFAC Emergency Funds to allow for widespread utilization across departments.

Air Quality and Wildfire Smoke Preparation

- Increase public outreach and education within the campus community on wildfire smoke and health impacts.
- Continue to implement flexible work and academic policies during extended periods of extreme poor air quality and establish designated clean air shelters on campus for students, faculty, and staff who do not have access to clean air.

RECOMMENDATIONS AND NEXT STEPS

Coastal Flooding

- Maintain and nourish existing partnerships between UCSB organizations/departments and local Indigenous communities and environmental protection groups.
- Continue to implement erosion control measures (example: vegetative stabilization on slopes) and work with City/State agencies to establish stricter building codes and land use regulations to restrict development in high-risk erosion zones (example: Del Playa). Cheadle Center and the Coastal Policy Center at UCSB secured (Jan 2025) a grant from the State Coastal Conservancy to explore nature-based solutions for addressing sea level rise, bluff erosion, and the potential failure of the berm between the lagoon and campus beach. Proposed strategies include transitioning the lagoon to a tidal system, using temporary beach nourishment like cobble to maintain the protective buffer of the beach, and studying the inland relocation of Lagoon Road and utilities to enable natural bluff retreat. Reopening the lagoon to the ocean would likely increase flooding near the commencement greens.
- Support the monitoring of sea level rise impacts on bluff erosion, the shoreline, and the lagoon as described in the Sea Level Rise Adaptation Plan.

Rain & Flooding

- Explore additional partnerships with Santa Barbara City / County to expand public transportation services and fleet capacity to accommodate increased demand, mostly from students who typically walk or bike, during rainstorm events.

Extreme Heat

- Work with Information Technology Services (ITS) to develop a plan to protect critical IT infrastructure from heat-related failures; continue to centralize cooling on campus; further develop plans for transitioning to cloud-based servers.
- Provide heat illness prevention training and education for the campus community; develop and implement comprehensive heat wave response plans for student dormitories and other residential areas. Cooling areas for students living in apartments and dormitories with natural ventilation should be identified.
- To reduce the “heat island effect,” an urban phenomenon in which the temperature is up to 10 degrees higher than in areas surrounded by vegetation on campus, it is advisable to apply building design like that utilized on the UCSB Library to other buildings. For example, the roof and paving around the library are made with light-colored materials that reflect the sun, mitigating this effect. Avoiding heat islands creates less demand for energy, lowers air-conditioning costs, and cuts air pollution and greenhouse gas emissions.

Resource Hubs and Safe Havens

- Connect students with existing resources both on campus and in Isla Vista to help ensure students, especially those under-resourced and or under-represented, have resource hubs available that can provide clean air, power, heat, and cooling.
- Expand the existing Rapid Rehousing Program (RRP) to accommodate more students during events that impact student housing in Isla Vista. The RRP frequently runs into capacity issues, and with the acceleration of cliff erosion and flooding events caused by climate change that impact student housing in Isla Vista, there is a clear need to expand this program.

Recovery

- Following climate events, redistributing recovery resources to campus communities should continue to be prioritized. Educating the campus community about Emergency Management, CERT, Basic Needs, IVCS, etc., will encourage mutual aid among community members and ultimately build a strong community and climate resilience.

RECOMMENDATIONS AND NEXT STEPS

- Also important in the disaster recovery process is to provide adequate mental health services for those impacted and involved in disaster response. Climate anxiety, eco-grief, and trauma from climate hazard-related disasters can deeply affect mental well-being, making it essential to include strategies for psychological support. This can involve providing access to trauma-informed mental health services, integrating psychological first aid into emergency response plans, and offering resilience training to equip communities with coping mechanisms. Support systems, such as community-based programs and culturally sensitive resources, can foster social cohesion and collective healing, especially for vulnerable populations like youth, elderly individuals, and marginalized groups.
- Utilizing tools like the Climate Emotions Wheel (shown below) allows individuals to take the first step towards bettering their Climate Mental Health.



- [Climate Emotions Wheel](#)
- Validating your emotional response to climate change acknowledges that these feelings are common, reducing stigma and encouraging open dialogue about mental health in climate contexts.
- By recognizing shared feelings, it strengthens social bonds, encourages open dialogue, and promotes collective action for climate resilience.
- It enables customized coping strategies, strengthens emotional and psychological adaptability, and fosters hope and agency.
- All are crucial for long-term climate action and resiliency.

RECOMMENDATIONS AND NEXT STEPS

- Additionally, addressing mental health in disaster recovery requires a long-term, integrated approach. Emergency preparedness should not only focus on physical recovery but also include strategies for psychological recovery, acknowledging that the mental health consequences of climate change can persist long after a disaster. Public education campaigns aimed at increasing mental health literacy, reducing stigma, and providing resources for eco-anxiety can help individuals seek support when needed. Finally, integrating mental health into broader health systems, monitoring climate-related mental health outcomes, and investing in research on the links between climate change and mental well-being are essential to ensuring that communities build resilience that includes emotional and psychological recovery.

Planning for climate hazards is an iterative process that involves constant engagement and continual assessment of future and current hazards. Therefore, this section of the Plan and the climate vulnerability assessment is intended to be a living document with continued Integrative planning across campus



PROCUREMENT OF GOODS AND SERVICES

UCSB's CAP does not include specific targets for Scope 3 emissions from procured goods and services. However, we recognize that this category is a significant contributor to overall GHG emissions, as research and industry reports suggest procured goods and services often make up a substantial portion of an organization's total Scope 3 emissions. Including this acknowledgment in our updated plan reflects the importance of addressing this challenge in the future, while also recognizing the complexities involved. Measuring and managing emissions in this area is particularly difficult due to the lack of standardized reporting mechanisms and the often complex and unclear supply chains associated with procured goods and services. While we are not setting targets at this time, we aim to better understand and explore strategies for reducing emissions in this critical category.

To better understand the impact of our university's procurement on GHG emissions, we looked into analyzing our annual spend data by broad industry product categories. We collected spend data at a high level from CalUSource, the eSourcing platform for the University of California. We categorized the data using campus accounting codes (such as object codes). We then explored the use of several online GHG calculators that assess GHG emissions based on broad procurement categories. Several were cost-prohibitive to pursue. We did identify some with free trials that allowed us to explore the systems and analyze some of the data. Unfortunately, after exploring several methodologies, we did not feel confident enough in the results to share those outcomes here. The accounting codes included too wide a variety of products with very different GHG impacts and were not always used consistently across campuses. The GHG estimates included more assumptions than we were comfortable with.

Over the 2024-2025 academic year, two students, Estrella Alcaraz Muñoz and Jaret Valera, were hired through the Sustainability Internships and Community Resources Department in Student Affairs to develop a way to baseline and track emissions related to the Procurement of Goods and Services. This was done with the mentorship of Jen Bowser, Jewel Persad, and Katie Maynard. As a team, we considered which product categories to focus on. We considered several factors, current data collection efforts (what we already have data on and/or report on), what products we can find emissions metrics for, what our largest areas of spend are, and where we are likely to be able to shift purchasing choices. We began the project focused on the three areas of procurement that we report on annually for the UC Policy on Sustainable Practices: Cleaning Products, Electronics, Paper, and Furniture. To date, we have completed assessments for the first three of these categories. For each of the categories, we were able to identify emissions factors for the products, and there were also clear ways to shift purchasing choices towards lower emission options.

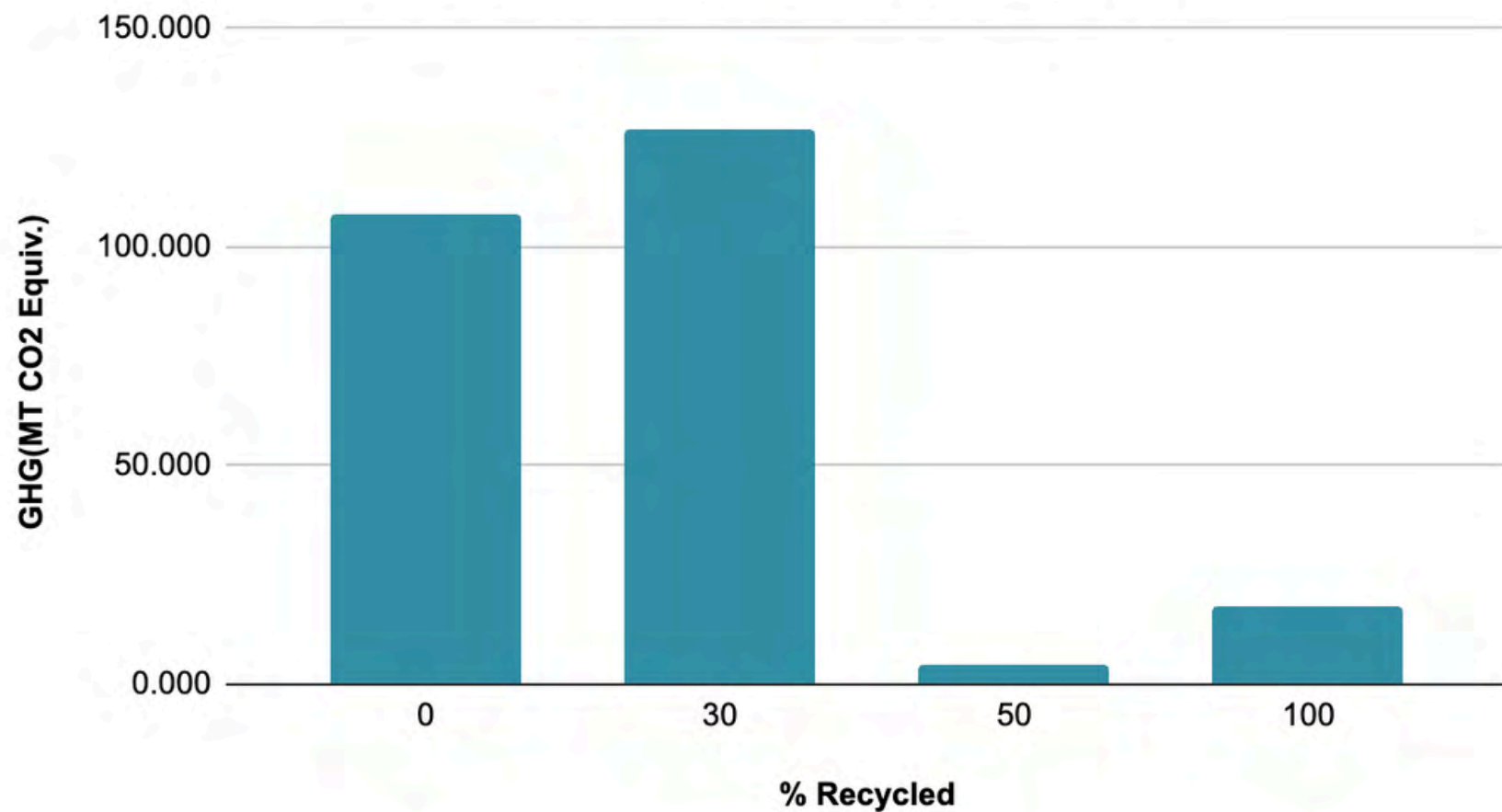


PAPER

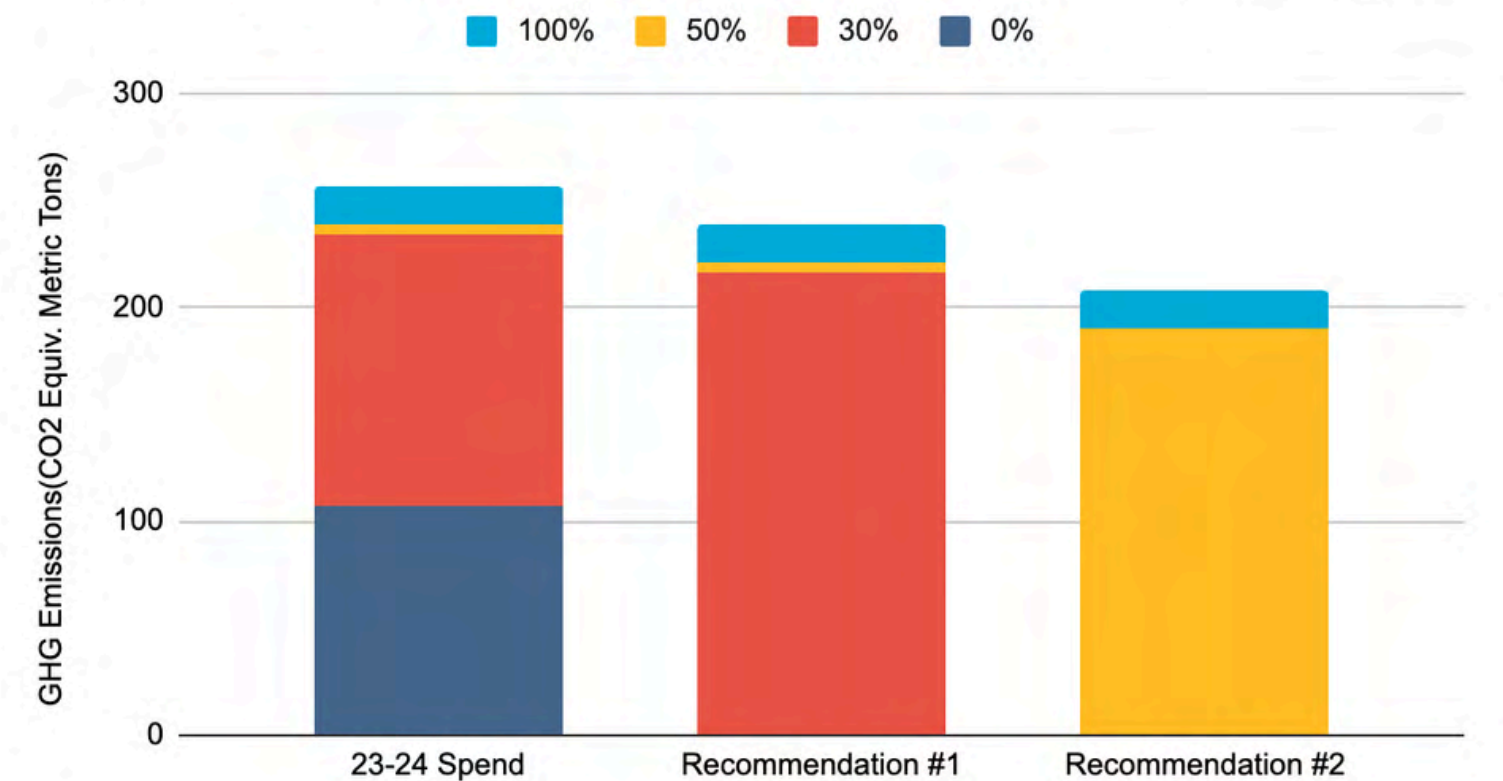
Anyone can have an impact on paper. To estimate UCSB's GHG emissions impact from paper, the Environmental Paper Network's Paper Calculator was utilized. This calculator was first created based on Brummet et al. (1995). A significant update was completed in 2018 based on more recent research, and minor revisions are made biannually. UCSB's paper purchasing in FY 23-24 resulted in ~257 MT CO₂e. There are excellent opportunities for GHG emissions reductions through the shift to recycled content paper. In FY 23-24, the majority of emissions came from virgin and 30% content recycled paper.

If UCSB were to shift all virgin paper purchases to 30% recycled content, in alignment with UC Policy on Sustainable Practices, which requires all of UC to purchase at a minimum 30% recycled content paper, paper emissions would decrease by 18 MT CO₂e. Additionally, if all Paper purchased met a minimum recycled content level of 50%, total paper emissions would decrease by 48.6 MT CO₂e compared to business as usual.

GHG Emissions FY 23-24 by Percent Recycled



Total GHG Emissions FY 23-24 UCSB Purchasing Comparison



ELECTRONICS

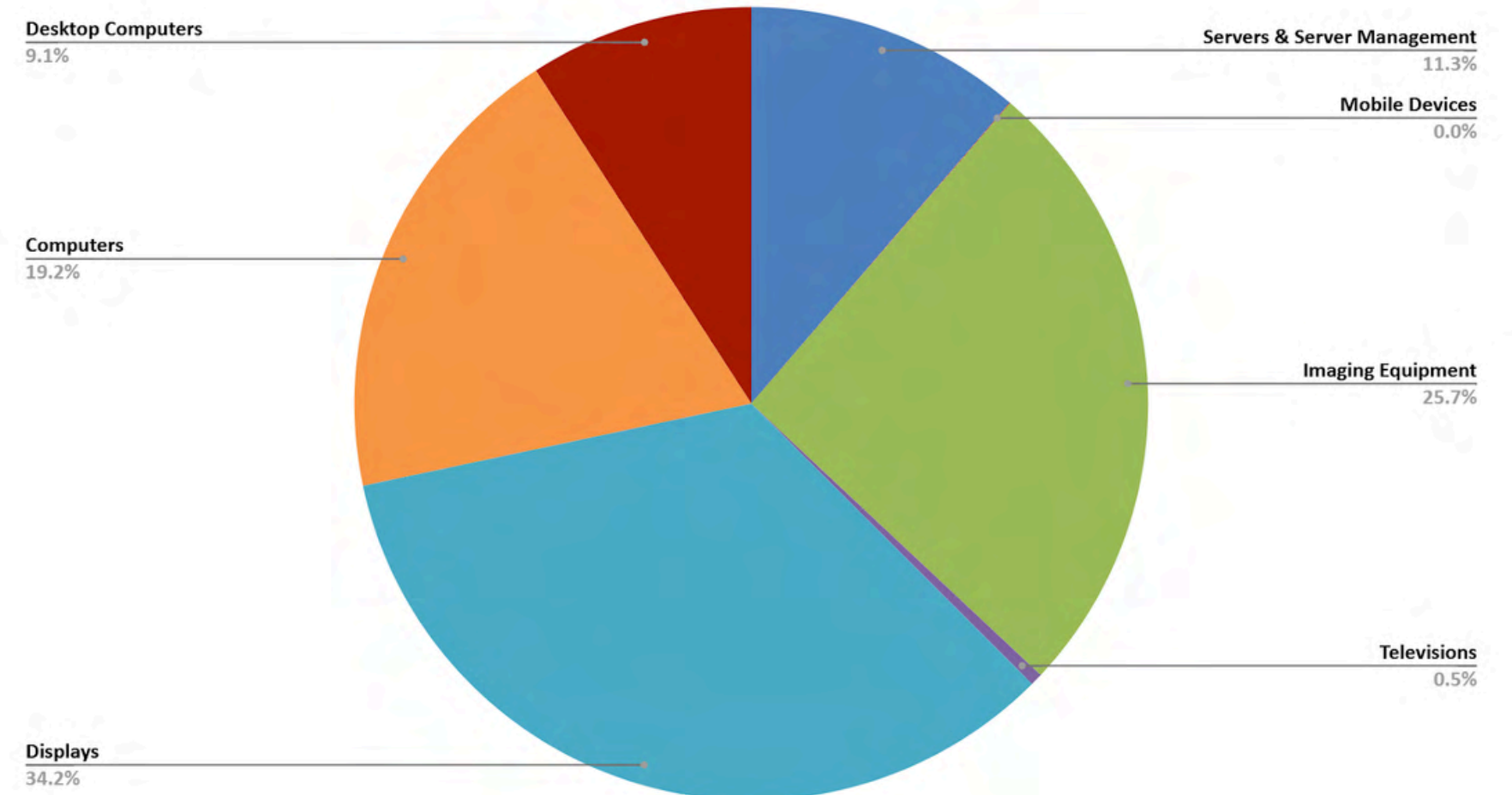
Understanding the environmental impact of electronics is essential, given their widespread use and resource-intensive manufacturing processes. Our GHG emissions assessment of electronics included desktop computers, laptops, tablets, imaging equipment, and servers. While GHG data was available for some of these products, many lacked publicly published emissions information. Product estimates were developed using assumptions or proxy data based on comparable products with GHG data. We were unable to estimate GHG emissions for some products, such as label printers and routers, due to limited data availability.

Product Carbon Footprints (PCF) measure a specific product's total GHG emissions through its entire life cycle. For products with available PCFs provided by the company, we used them to estimate GHG emissions. For products without PCFs, we used an average product type PCF to estimate GHG emissions. Please see Appendix 3: Greenhouse Gas Calculations of Procurement Goods and Services for more details on the PCFs.

The estimated total GHG emissions of all electronic purchases in Fiscal Year (FY) 22-23 were 973 MT CO₂e for \$2,660,862 in total spent on 1,638 items. GHG emissions estimates are for the lifetime of the product.

The majority of emissions in this category come from monitors and displays (34.2%), imaging equipment (25.7%), computers (19.2%), servers (11.3%), and desktop computers (9.1%). Servers only came in at 11.3%. It is worth mentioning that 14 servers accounted for 11.3% of the total spend.

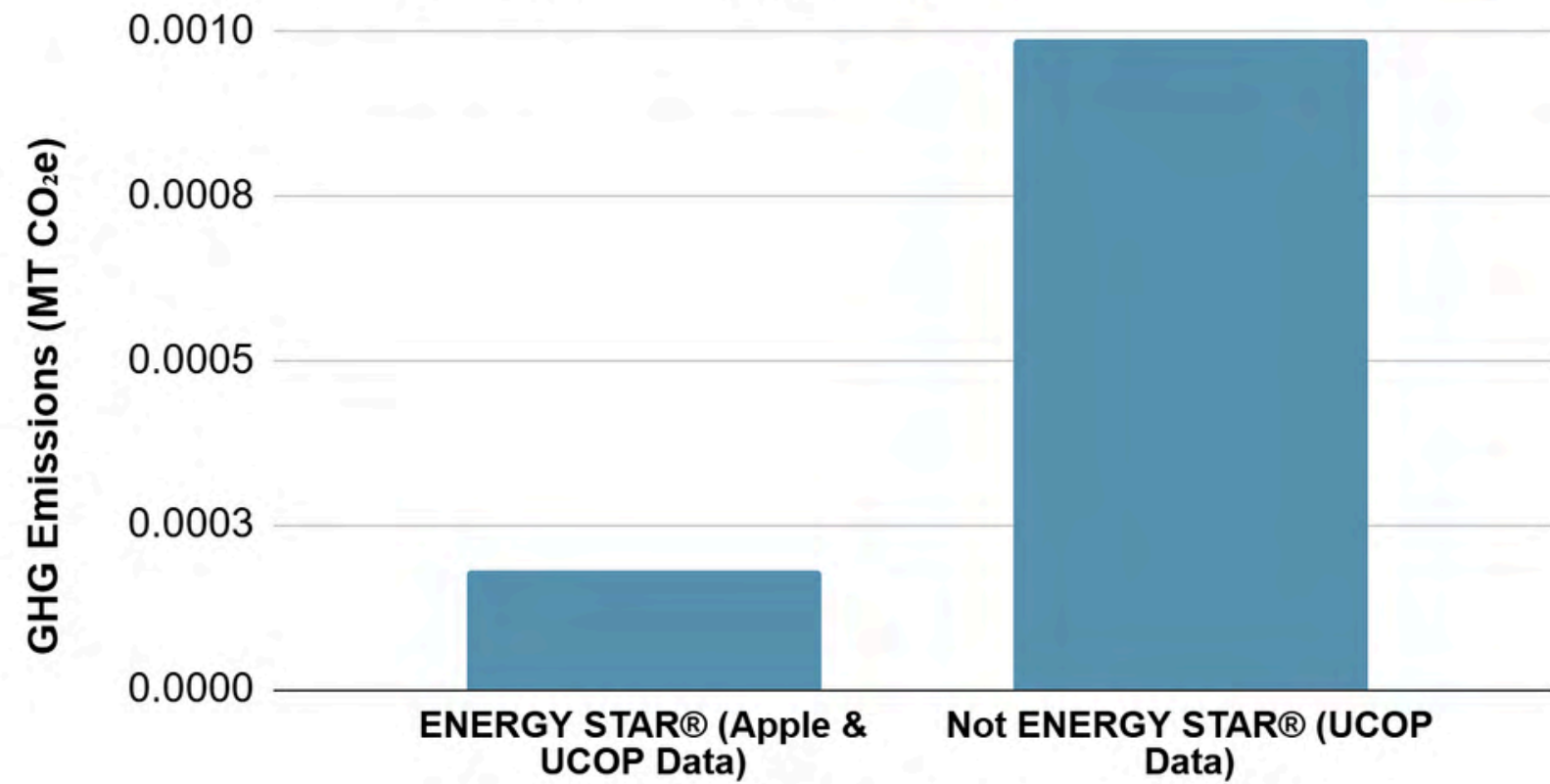
GHG Emissions of Electronic Spend By Category



76.31% of eligible electronic purchases were confirmed to be ENERGY STAR®. Emissions per dollar spent were significantly lower on ENERGY STAR® products compared to those that were not ENERGY STAR®.

ELECTRONICS

Emissions (MT CO₂e) per Dollar Spent

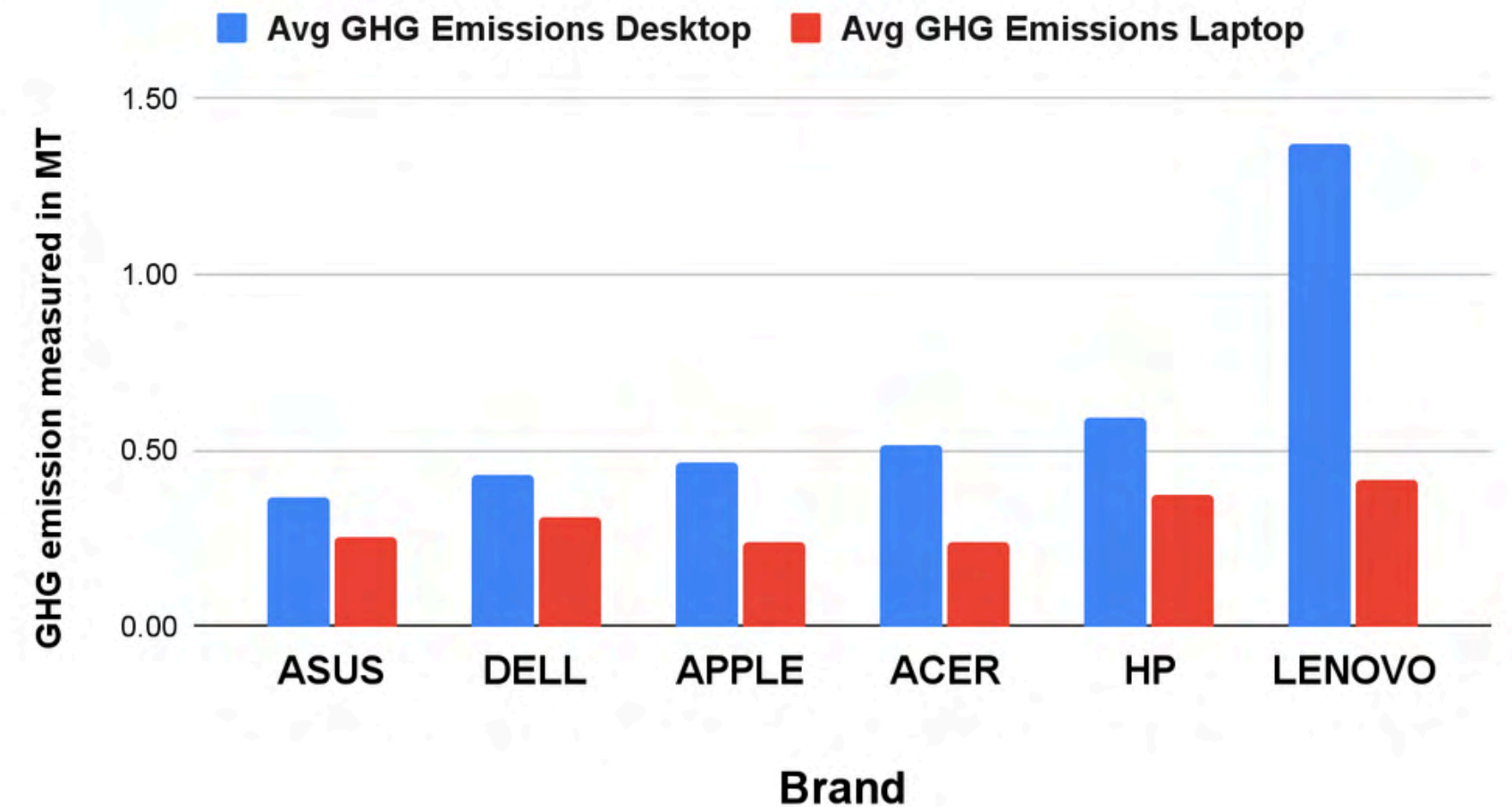


In addition to reviewing third-party certifications, evaluating the type of device, its brand, and its overall energy consumption can provide a more complete picture of its environmental impact. For example, the data shows that laptop emissions are significantly less than those of desktops. A difference in impact was also observed between different brands. Laptops have lower GHG emissions than desktops while also supporting remote work. They are easier to transport between work and home offices and can create continuity between workspaces.

The chart to the right describes the emission comparison between laptops and desktops from six different companies. Except for Lenovo, the average emissions difference between laptops and desktops is 0.19 MT CO₂e. The difference between the average GHG emissions for Lenovo laptops and desktops is 0.343 MT CO₂e.

Moving forward, it is strongly recommended to consider ENERGY STAR® certification, brand, and overall sustainability when purchasing electronics, building on the insights gathered from this project. Both consumers and purchasers alike are the direct source for leading product preferences for these electronic companies, and the consumer holds high power in affecting how sustainability is considered in the future.

Compared Averages between Laptops and Desktops



CLEANING SOLUTIONS

Cleaning solutions used in buildings can have significant impacts on the health of custodians and building occupants. Cleaning solutions that are not third-party certified to be intended to reduce toxins are often formulated with harmful solutions that could irritate the skin, eyes, nose, and throat. This section solely focuses on cleaning solutions and excludes products such as paper towels, toilet paper, urinal maintenance products, and wet wipes.

A literature review was completed to identify emissions metrics for cleaning solutions. Koehler, A., and Wildboz, C. (2009) outlined the environmental impacts of production and consumer use of several cleaning solutions. They grouped solutions into several categories of cleaning solutions and determined a cumulative energy demand (CED) for each solution. The CED energy data was converted into GHG Emissions using the 2024 EPA GHG Emissions Factors Hub. Please see Appendix 3: Greenhouse Gas Calculations of Procurement of Goods and Services for our methodology. Authors Kapur, A., Baldwin, C., Swanson, M. et al. (2012) compared the greenhouse gas (GHG) emissions of cleaning solutions for industrial and institutional use that are either certified or not certified with the Green Seal certification standard, GS-37. Green Seal is one of the certifications recognized by the UC Policy on Sustainable Practices.

This paper also compared the GHG of ready-to-use versus concentrated solutions. Ready-to-use (RTU) solutions and formulations are pre-prepared and do not require additional mixing, dilution, or preparation before use. They are designed for convenience and immediate application. Concentrated solutions have a lower volume & weight during shipping and need water to be added before use.

We encountered a set of limitations from the dataset and the peer-reviewed literature. Other than Green Seal, we do not have a GHG emission metric for the rest of the third-party certifications the UC system accepts. This led us to group other third-party certifications with conventional ones. This means that these solutions do not meet any sustainable certification standards. However, this is likely an overestimate of emissions.



CLEANING SOLUTIONS

Assessments were based on nine solution categories identified by Koehler, A., et al. (2009): kitchen, window, bathroom cleaners, liquid detergents, powder detergents, detergent booster, liquid soaps, bar soaps, and toilet-care solutions. No clear definitions for the categories were presented. As a result, the categories included were inferred based on category names.

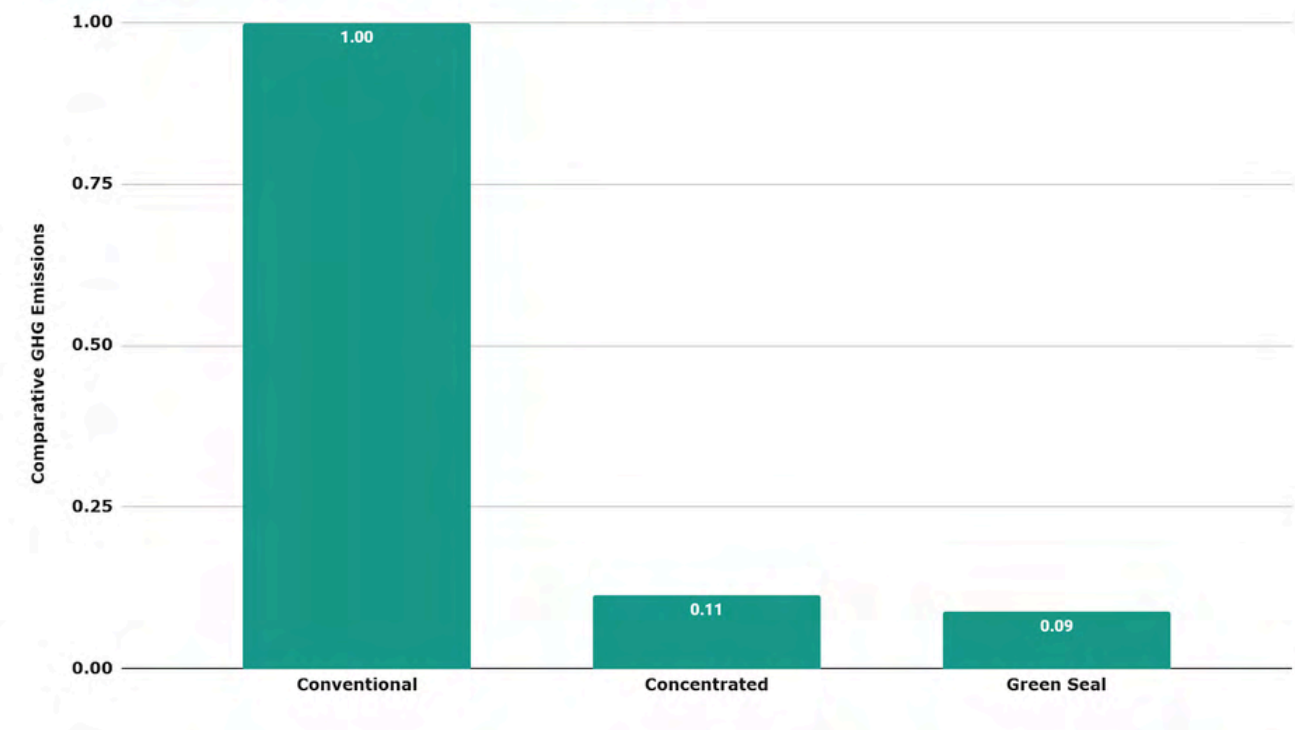
In the assessment, we calculated that the RTU solutions resulted in more GHG emissions than concentrated solutions. Based on Kapur, A et al., emissions from concentrated solutions result in 89% less emissions than those of conventional RTU solutions, and solutions that are Green Seal certified and concentrated result in 91% less emissions than conventional solutions.

In FY 2022-2023, the campus purchased \$236,783 in cleaning solutions from Ecolab, Grainger, Waxie, and Amazon. Of the \$236,783, \$13,431 was for Green Seal solutions, and \$32,220 met an alternative certification. \$191,131 in spend was found to be for a conventional solution that does not meet any low-toxicity certifications in the *UC Policy on Sustainable Practices*. The resulting GHG emissions of the conventional solution were 55 MT CO₂e. The solution category with the highest emissions is liquid soaps.

UCSB can reduce its carbon footprint from cleaning solutions by shifting to concentrated and Green Seal-certified solutions where available and feasible. In the scenario for FY 2022-2023, switching to concentrated solutions could drop emissions to 11.6 MT CO₂e, a 43.4 MT CO₂e reduction.

If we were to switch to purchasing all Green Seal-certified solutions and concentrated solutions, the emissions would be reduced to only 9.4 MT CO₂e, a 45.6 MT CO₂e reduction

Comparative GHG Emissions



While increasing the amount of Green Seal and concentrated cleaning solutions can reduce GHG emissions, these solutions represent a minuscule fraction of our total GHG emissions, making it hard to make the case based on GHG emissions alone. However, when the full impact on environmental and human health is taken into consideration, it may make sense to make the switch.

Next Steps

Some early wins have already been identified in the initial analysis. Shifting procurement to recycled content paper, concentrated (vs. ready-to-use) cleaning chemicals, GreenSeal products, and EnergySTAR products will result in reduced emissions.

UCSB Procurement Services and Sustainability should continue working with the strategically sourced suppliers and UCOP Procurement Services to improve the data available on purchases made by UCSB. This will be essential for streamlining the process of setting baseline data and tracking metrics on emissions related to the procurement of goods and services.

CONCLUSION AND NEXT STEPS

The table to the right summarizes the mitigation strategies proposed in this Plan, which, if implemented, are estimated to reduce GHG emissions by ~87% and get UCSB within reach of the 90% reduction target. The Clean Energy Master plan estimates a 45-year cost of ownership at \$2.25 billion for the new centralized utility plant and \$3.04 billion for the business-as-usual scenario. These estimates are subject to change and are still being refined. The biggest hurdle will be securing funding for the Electrification of the Main Campus and the near elimination of our Scope 1 emissions, given the current budget climate.

Scope 3 emissions reduction strategies are estimated to cost \$50,000 - \$500,000, with significant financial savings for programs that reduce business travel, given the departmental cost savings. For every MT CO₂e of air travel emissions reduced, UCSB saves ~\$975 on air travel costs alone. While there are no significant cost savings associated with commuter emissions reductions, there are several co-benefits, including improved public health, reduced traffic congestion, the need for building parking infrastructure, and economic development. UCSB is much like a small city and has a substantial impact on the social and economic life of the surrounding communities.

GHG Emission Scope and Source	2019 (MTCO ₂ e)	2023 (MTCO ₂ e)	Mitigation Strategies	Reduction
Scope 1 - Stationary Combustion	19,598	17,253	16,977	94%
Scope 1 - Mobile Combustion	1,379	1,148	846	78%
Scope 1 - Fugitive Emissions	281	323	0	0%
Scope 2 - Purchased Electricity	20,104	215	215	100%
Scope 3 - Business Travel	4,921	4,630	104	8%
Scope 3 - Commuting	11,207	10,195	9,084	90%
Scope 3 - Waste	1,145	948	573	50%
Total	58,635	34,712	27,496	87%

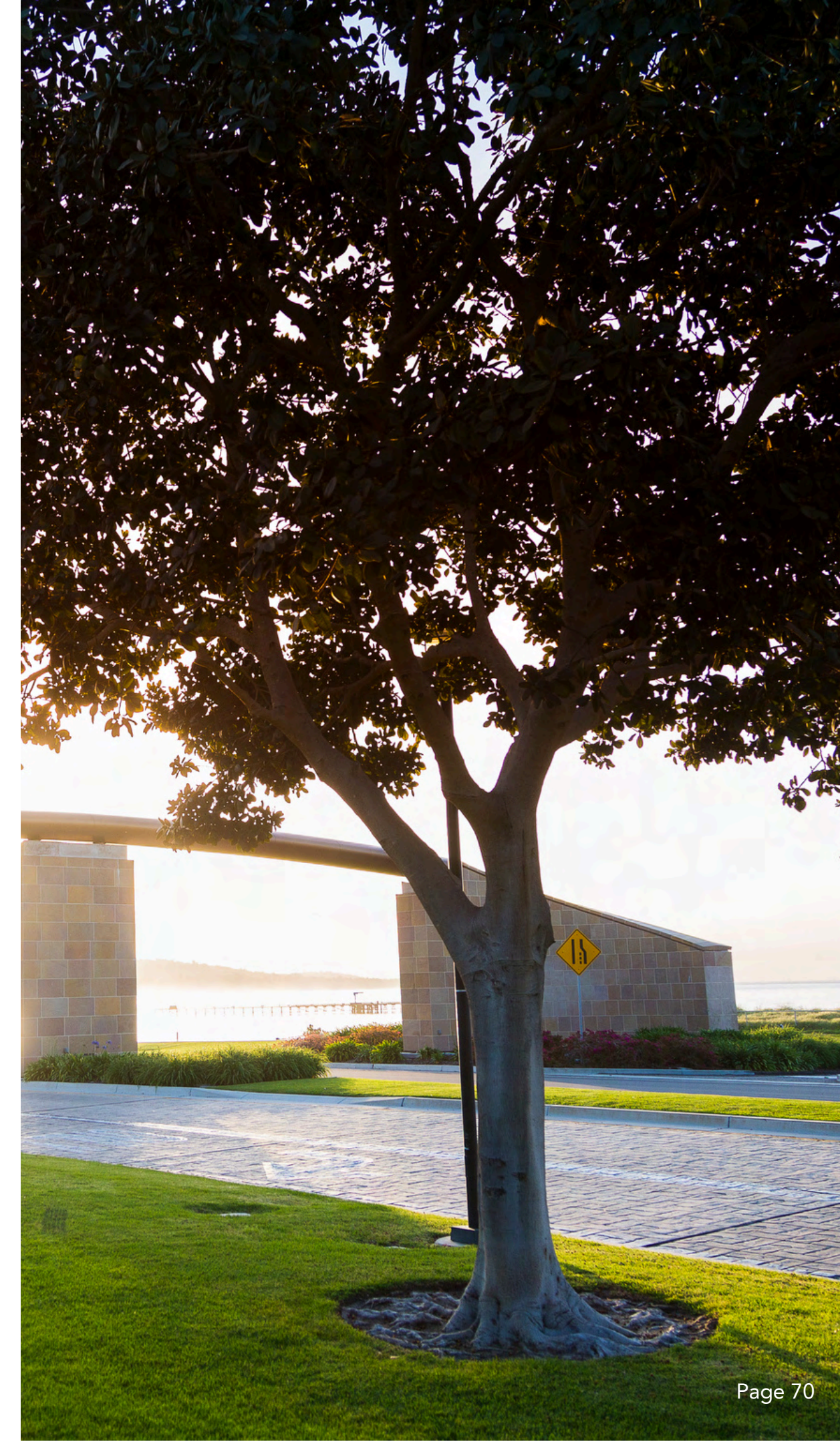
Immediate Next Steps(2025-2030)

- A Detailed Project Plan for electric heating and hot water sources of the Clean Energy Master Plan, completed with siting and sizing for an all-electric central plant and phased expansion of hot water loop.
- Secure funding to begin design for the all-electric central plant.
- Continue to transition Internal Combustion Engine vehicles owned by TPS to ZEVs and develop an adequate financing mechanism for the replacement of Department-owned vehicles with ZEVs.
- Consider forming a Transportation and Commuting Advisory Board to explore changes to our parking fee structure that take into account the actual cost of parking, sustainable commuting, and equity.
- Explore transitioning vanpool program management from TPS to Enterprise, which would allow UCSB riders to take advantage of SBCAG subsidies and non-UCSB riders to participate in shared vanpools.
- Work with regional partners on potential ways to support first-mile/last-mile transit options from the Goleta Train Station to the campus.
- Establish a faculty & Staff focus group to review emissions reduction best practices outlined in the CAP and develop a travel reduction strategy.
- Identify/and or establish one Resiliency Hub on campus with cooling, advanced air filtration, and backup power.
- Continue programs and initiatives aimed at educating and empowering our campus community about climate hazards through opportunities like CERT and Community Disaster Education Workshops.
- Continued communication and engagement with the campus and local community, especially those most impacted by climate change and any proposed mitigation strategies, to ensure equity is central to our efforts.

Long Term Opportunities(2030 and beyond):

- Revisit the proposed plan for Phase 3 of the Clean Energy Master Plan to explore if there are other, more cost-effective solutions.
- Revisit strategies for reducing business air travel emissions as new technologies are developed or become scalable.

Economic conditions will continue to fluctuate, and new solutions will continue to emerge. The University must maintain a consistent effort with the flexibility to adjust to changing conditions to achieve our emissions reduction goals. Continuing engagement and evaluation of this plan by the Chancellor's Campus Sustainability Committee will help ensure that UCSB meets its commitments to reducing campus climate impacts. The CAP is intended to assist in this process by documenting progress, identifying unknowns, and framing next steps.



APPENDICES

References

- AASHE. (n.d.). *UC Santa Barbara STARS Report*. <https://reports.aashe.org/institutions/university-of-california-santa-barbara-ca/report/2024-02-29/AC/curriculum/AC-1/>
- California Air Resource Board. (2022, April 25). California moves to accelerate to 100% new zero-emission vehicle sales by 2035. *ARB*. <https://ww2.arb.ca.gov/news/california-moves-accelerate-100-new-zero-emission-vehicle-sales-2035>
- Görlinger, S., Merrem, C., Jungmann, M., & Aeschbach, N. (2023, November 6). An evidence-based approach to accelerate flight reduction in academia. *Nature*. <https://www.nature.com/articles/s44168-023-00069-y#citeas>
- Human Rights Watch. (2025, February 6). "The Land of Our People, Forever" United States Human Rights Violations against the Numu/Nuwu and Newe in the Rush for Lithium. <https://www.hrw.org/report/2025/02/06/land-our-people-forever/united-states-human-rights-violations-against-numu/nuwu#:~:text=Indigenous%20peoples%2C%20both%20in%20the%20US%20and,a%20threat%20to%20their%20land%20and%20rights.&text=These%20concerns%20are%20>
- Tasoff, H. (2025, January 21). *UCSB is well positioned for fire preparedness*. <https://news.ucsb.edu/>. https://www.google.com/url?q=https://news.ucsb.edu/2025/021729/ucsb-well-positioned-fire-preparedness?utm_source%3Dnewsletter%26utm_medium%3Demail%26utm_content%3DRead%2520more%2520about%2520the%2520campus%25E2%2580%2599s%2520protection%2520from%2520fire%2
- UC Santa Barbara. (2024, October). *UC Santa Barbara Clean Energy Master Plan*. [Energy.ucsb.edu](https://www.energy.ucsb.edu). [https://www.energy.ucsb.edu/sites/default/files/docs/20241023%20UCSB%20Clean%20Energy%20Master%20Plan_Final%20Report%20\(1\).pdf](https://www.energy.ucsb.edu/sites/default/files/docs/20241023%20UCSB%20Clean%20Energy%20Master%20Plan_Final%20Report%20(1).pdf)
- UC Santa Barbara. (2025). *UC Santa Barbara heads to State Street*. news.ucsb.edu. <https://news.ucsb.edu/2025/021726/uc-santa-barbara-heads-state-street>
- UCSB Campus Planning and Design. (2022, October 25). *Story Map for the UCSB Sea Level Rise Adaptation Plan*. Story Map for the UCSB Sea Level Rise Adaptation Plan. <https://storymaps.arcgis.com/stories/ce1f842824c9482da5f8a3c7f4842cb4>
- University of California. (2022, April). *A Framework for Incorporating Environmental & Climate Justice into Climate Action*. https://www.ucop.edu/leading-on-climate/_files/uc-framework-for-ejcj-in-climate-action_final-4.21.22.pdf
- Watts, J. (2023, November 19). Richest 1% account for more carbon emissions than poorest 66%, report says. *The Guardian*. <https://www.theguardian.com/environment/2023/nov/20/richest-1-account-for-more-carbon-emissions-than-poorest-66-report-says>
- World Meteorological Organization. (2025). *WMO Global Annual to Decadal Climate Update 2025-2029*. https://wmo.int/sites/default/files/2025-05/WMO_GADCU_2025-2029_Final.pdf
- Yang, V. (2024, January 10). *Reliance on Gas Power Plants Fuels Inequity*. Union of Concerned Scientists - The Equation. <https://blog.ucs.org/vivian-yang/reliance-on-gas-power-plants-fuels-inequity/#:~:text=Like%20much%20polluting%20infrastructure%2C%20gas,three%20gas%20plants%20to%202026>.

GREENHOUSE GAS CALCULATIONS OF COMMUTING AND BUSINESS

General Approach

In estimating emissions for behavioral change and outreach programs, we set target numbers of participants, number of trips averted, and number of commuters that maintained the behavior after intervention based on several factors.

Interns looked at the outcomes of existing and past UCSB programs with similar goals (shifting commuting). To estimate the number of participants, the team looked at attendance and participation in events and programs run by UCSB Sustainability and the Transportation Alternatives Program. Where available, outcomes from programs at other institutions, peer-reviewed literature, and advice from subject matter experts and practitioners were also used to set informed estimates. One difficulty in estimating outcomes is that behavior change is usually a result of a holistic system with several different influences all contributing in different ways (subsidies, infrastructure, outreach, case management, programming, policy, etc.) Many campuses and institutions that we contacted for information on their services were not able to provide metrics of their success due to this complexity, or not having the time and resources to effectively track outcome data. For the number of trips averted, we also leaned towards a model where riders may ride 1 or 2 extra days a week by alternative transportation rather than fully foregoing a parking pass/ability to drive to campus. Anecdotally and based on advice from practitioners, there appears to be a significant demand for commuters who feel they need to drive some days, but would be open to a low GHG commute on other days. Overall, the team aimed to be fairly conservative in our estimations.

For estimating emissions per trip saved, better data was available. The team utilized past commuter survey data to find average distance per trip traveled and average emissions per mile based on common makes and models, as seen in the tables below. Annual commuter survey data was used to determine the make, model, and average distance assumptions.

Population	Avg Annual GHG emissions in MT CO2E
Undergraduate Students	0.03
Graduate Students	0.93
Staff/ Faculty	1.77
Avg grad/staff/faculty	1.35

Trip Metrics	Value
Average daily trips per person	0.83
Total Daily Trips	24672
Average MPG (SOV)	33.53
Average MPG (Bus)	111.5

In the future, the team will look for opportunities to run small pilot programs to test out our assumptions and inform future decision-making and prioritization of projects.



Staffing

UCSB's transportation team, with specific regard to the low GHG commuting programs and services, is understaffed relative to other campuses and universities both within and outside of the UC system. In fall 2024, 26,133 students were enrolled, and about 7,989 staff, faculty, and graduate students were employed. There is currently one Transportation Alternatives Program manager, who has support from the Senior Executive Director, Auxiliary Services. About half of this position's time goes to processing payroll deductions related to transit passes. Staffing is a crucial factor in all transportation GHG reduction efforts, with the direct impacts on increasing the number of staff difficult to directly quantify in terms of emissions saved.

To inquire about sustainable transportation staffing, levels, roles, and responsibilities at other UC campuses, a survey was sent out to the UC Sustainable Transportation Working Group. This included questions on the number of staff members in respective Transportation and Parking Services departments, the number of staff members supporting/promoting low GHG commuting options, their roles and percentage of time they work on supporting/promoting low GHG commuting options, if there are student staff and what their roles are, the presence of staff in other departments that regularly support the work in supporting/promoting low GHG commuting methods (such as through marketing, grant writing, etc), the extent of/engagement of their department in writing their campuses' CAP, the number of people enrolled in their campuses' alternative/sustainable commuting program, information on any programs launched to expand low GHG commuting where information was tracked before and after participation with a reduction in GHG emissions from the effort, annual budget, amounts received from grants or donors, and projects successfully funded from such. With this survey, three of the other nine campuses responded: UC Davis, UC Santa Cruz, and UCLA.

UC Davis's Fall 2024 enrollment was 40,065, and the number of staff, faculty, and graduate students employed was 32,595. Their team has two 2 staff members fully dedicated to sustainable transportation programming, one Transportation Demand Manager and one Active Modalities Program Manager, with support from other staff members for communications and bicycle facility design/installation.

UCLA's Fall 2024 enrollment was 47,335, with 51936 staff, faculty, and graduate students employed. They have three full-time staff members and one student staff member who dedicate 100% of their time to low GHG-emitting transportation. Additionally, they have support from the Director of Mobility Planning & Traffic Systems (80%), a Senior Traffic Planner (30%), a Principal Transportation Student Intern (67%), the Executive Director, Events & Transportation (20%), Commuter Programs Coordinator (80%), Chief Sustainability Officer (5%), and Deputy Chief Sustainability Officer (5%).

UC Santa Cruz's Fall 2024 enrollment was 19,938, with 6,347 staff, faculty, and graduate students employed. They currently have one Transportation Alternatives Program Manager fully dedicated to sustainable transportation programming who focuses on collecting commute data, marketing and communication, grant writing, and education.

Additionally, information on sustainable transportation staff from Stanford, with an enrollment of 17,000, was obtained via email and interviews. Stanford has two dedicated staff members to Transportation Demand Model (TDM) programs, and they spend approximately 35% of their time each providing one-on-one commute consultations. Additionally, they have four full-time staff who report to a Director and spend 50% of their time managing the programs and 50% on the promotion of TDM programs. Stanford has approximately 64% of their commuter population using sustainable modes, with approximately 5% of this population tied to commute consultations.

Due to the overarching reach of this proposal, there are not three levels of impacts unless tied to a specific program.

Alternative transportation challenges

We based our estimated GHG calculations around the number of potential participants in each challenge. We assumed that about one in three participants would keep the change in commuting patterns post-program. With this assumption, we aim to balance the number of expected impacted participants and the amount of one-on-one support we can provide throughout the challenge.

Following an entry-level approach, 100 participants will allow us to maintain that balance. With about 100 participants, we can estimate that about 32 will keep the change, resulting in an additional two days a week of decreased SOV use, multiplied by the average GHG emissions grad, staff, and faculty (1.35 MT CO₂E), and the average annual emissions divided by 5 (0.27 MTCO₂E). This results in about 17 MT CO₂e saved. Scaling this up to a robust level approach, if we estimate 240 participants with 80 keeping the post-program habit change, this would result in 43 MT CO₂E saved. With a large-scale, leader in the field approach, we can estimate 320 total participants, resulting in 110 keeping their new habits and about 59 MTCO₂E saved. To achieve these higher numbers, additional staffing and resources would need to be invested.

Emory University has a similar program that we looked to for best practices. In partnership with Georgia Commute Options, an organization that assists employers and universities in reducing single-occupancy vehicle use by planning commuter and incentive programs, Emory runs the program Gimme 5. This program allows employees to earn \$5 a day with a maximum reward of \$150 over a 90-day period for using alternative transportation. A tri-level rewards structure is used, with increasing rewards for increasing the number of alternative commute days. Of their entire alternative transit program, 1344 employees were involved. Stanford also had a commuter club that offered \$300 (\$25/month) before COVID. While the incentive was very effective, once the program ended, there wasn't much change in commuter behavior.

Our GHG estimates are limited in their reliance upon the assumption that about 1/3 of participants will keep the change in commuting post-program. There may be drastically more or less change in commuter habits, which we cannot know until a pilot version of this type of challenge is run.



Expand Trip Planning and Tracking Capabilities

UCSB currently has access to a ride planning platform through SBCAG (Santa Barbara County Association of Governments), run by the company RideAmigos. Increased utilization of the current platform by RideAmigos was the basis for our entry-level approach to GHG reductions. The robust approach looked into upgrading the platform to allow for customization to UCSB's needs, rather than operating under the umbrella of SBCAG. With a leader in the field approach, we looked into exploring a specialized ride tracking system for UCSB. Adding ride tracking, as opposed to just planning, adds a new layer of accountability that may be useful in seeing the results of our programming.

In order to come up with clear, simplified estimates for the GHG reductions with this approach, we based our calculations on an estimated number of new TAP members, differentiating between carpool and non-carpool members, with TAP currently having 979 members, 838 of which are in the carpool program. With an entry-level approach, we might estimate about a 2% overall increase in membership, with 15 new carpool members and 5 non-carpool members. To calculate saved emissions, these 20 new members were multiplied by the average GHG emissions for graduate students, staff, and faculty (1.35 MT CO₂E), assuming a 100% shift in commuting behavior, as required for TAP membership. This was scaled up with the increased estimated number of new TAP members for robust and leader in the field approaches: 25 carpool to 5 non-carpool, and 40 carpool to 10 non-carpool. This resulted in a range of 27 to 67 MT CO₂E saved. While these potential increases in TAP membership are likely to be significant with expanded trip planning and tracking, expanding these services and use of these platforms is beneficial to non-TAP members as well. Employees who commute via a low GHG-emitting mode on occasion can also benefit from streamlined ways to plan and track their trips, and with integration with proposed incentive programs, may even earn rewards without needing to commit to TAP membership and full-time use of alternative modes.

We found that many other universities used a similar platform by RideAmigos, such as Santa Monica College and UCLA, with customized home pages and the ability to plan and log rides in addition to earning rewards via the platform.

PROMOTING EXISTING TRANSPORTATION OPTIONS, INCLUDING THE LOCAL BUS SERVICES

There are currently 72 members of TAP's Bus program for Staff and Faculty. After discussions with professionals in the field, a 10% increase in ridership, i.e., participation in this program, is a reasonable target with an entry-level approach. This would result in approximately 12 MT CO₂E saved. With a robust level approach, estimating a 14% increase in ridership, we can save approximately 18 MT CO₂E. With a leader in the field approach, we estimate a 19% increase in ridership, and we can save approximately 25 MT CO₂E. The difference between these levels is marked by increased staff time and additional student staff support working on increasing the promotion of local bus services with outreach and education efforts. These calculations were completed by multiplying the number of new riders for each percent increase by the average annual GHG emissions in MT CO₂e for staff and faculty. These percent increases in ridership are conservative estimates of the number of people gained through promotion of SBMTD bus services and TAP alternative transit subsidies, amongst other existing local transportation options, based on our knowledge of historic transit programs and service promotion. Other UCs such as UCLA and UC Davis have transportation services with a dedicated social media presence, and while we were unable to quantify a direct link between this type of digital promotion and local ridership, creating a higher overall awareness of these services can only serve to benefit their use.

EXPAND SUBSIDIES FOR LONG-DISTANCE BUSES

Greenhouse gas (GHG) estimates were developed based on projected increases in ridership resulting from incremental expansions of subsidized bus service, compared against the annual emissions from single-occupancy vehicle (SOV) travel. These estimates used average round-trip mileage from major cities located north and south of UCSB as the baseline for calculating SOV emissions.

Annual GHG emissions from SOV travel are estimated at 2.88 metric tons of CO₂ equivalent (MTCO₂) per rider for Clean Air Express and 2.25 MTCO₂ per rider for Coastal Express. In contrast, annual emissions from bus travel are significantly lower, estimated at 0.87 MTCO₂ per rider for Clean Air Express and 0.68 MTCO₂ per rider for Coastal Express. The resulting GHG savings per rider are 2.01 MTCO₂ for Clean Air Express (2.88 – 0.87) and 1.57 MTCO₂ for Coastal Express (2.25 – 0.68). These calculations are based on UCSB's 2024 GHG Emissions Inventory, which incorporates total trips, trip length, average miles per gallon, and fuel consumption to estimate CO₂ output.

Under an entry-level scenario, an increase of 9 Clean Air Express riders and 7 Coastal Express faculty or staff riders would result in total annual GHG reductions of 18.11 MTCO₂ (9 riders × 2.01 MTCO₂ per rider) and 11.01 MTCO₂ (7 riders × 1.57 MTCO₂ per rider), respectively, for a combined savings of 29.12 MTCO₂.

A more robust scenario assumes 40 additional Clean Air Express riders, yielding a savings of 80.51 MTCO₂ (40 riders × 2.01 MTCO₂ per rider).

In a leader-in-the-field scenario, Clean Air Express ridership remains at 40 riders with the same 80.51 MTCO₂ savings, while Coastal Express ridership increases to 37 riders, resulting in a savings of 58.20 MTCO₂ (37 riders × 1.57 MTCO₂ per rider). Combined, this yields a total GHG reduction of 138.71 MTCO₂. In all scenarios, the projected increases in ridership are based on pre-pandemic levels.

Commuter Rail

We estimated greenhouse gas (GHG) savings by comparing emissions from users commuting via single-occupancy vehicles, based on average round-trip mileage from Camarillo, Oxnard, Ventura, and Carpinteria, to emissions from using last-mile connection services such as WAVE and Enterprise vans between the Goleta train station and UCSB.

Our projections suggest that expanding funding and service provision could increase ridership fourfold. Under an entry-level approach, we estimate consistent usage by 7 users. Robust and leader in the field scenarios would increase participation to 14 or even 28 users.

Usage estimates are based on the UCSB workday calendar of 261 days, assuming a daily round-trip commute to campus.

The average GHG output from a single occupancy vehicle is approximately 0.0208 MTCO₂ per round-trip for commuters traveling from north of UCSB. In contrast, last-mile connection services generate about 0.00351 MTCO₂ per round trip. These calculations are based on UCSB's 2024 GHG Emissions Inventory, which incorporates total trips, trip length, average miles per gallon, and fuel consumption to estimate CO₂ output.

If all 7 users drove alone, their total annual emissions would be approximately 37.96 MTCO₂ (7 users × 0.0208 MTCO₂/day × 261 workdays). If instead they used last-mile services, emissions would be about 6.42 MTCO₂ (7 users × 0.00351 MTCO₂/day × 261 workdays), resulting in a projected savings of 31.55 MTCO₂.

Partially subsidizing the WAVE could increase usage to 14 users. If all 14 drove alone, total emissions would reach 75.92 MTCO₂. In contrast, using the WAVE would result in just 12.83 MTCO₂, yielding a savings of 63.09 MTCO₂ for a robust approach.

If all 28 commuters were alone, total emissions would be 151.85 MTCO₂. A dedicated shuttle would emit just 25.67 MTCO₂ annually, resulting in projected savings of 126.18 MTCO₂ for the leader in the field scenario.

Departmental Approach

With the departmental approach to telecommuting, we calculated the GHG emissions saved by the number of new remote work days, based on a 261-work-day calendar. Our calculations were based upon the assumption that most people already work two days remotely (104 days). With this approach, adding three more remote days (157 days) with the switch to a fully remote workweek.

The three expected days a person would switch to remote work were multiplied by the average GHG MTCO₂ per round trip for an SOV (0.00079 × 3). This gave us a value of about 1.2 MT CO₂E per person saved, which was then multiplied by the estimated number of people impacted in each level of this approach. The entry-level approach looked at transforming a five-person department (1.22x5), which would result in 6 MT CO₂E saved. A robust approach would expand the eligible department size to ten people, potentially saving 12 MT CO₂E. This increased eligible department size is a result of higher staff time and resources allotted for the supported switch to full-time remote work. A leader in field approach would increase these with greater department identification and suitability analysis, in addition to staff support and the provision of remote tools for transition ease and success. This would allow for a department of around 30 people to be eligible, potentially resulting in 27 MT CO₂E saved.

Training & Support for Telecommuting and Hybrid Work

Our GHG calculations were based on a model that tied the number of participants (i.e. supervisors) to an increased number of employees working remotely, an additional day a week (two employees per supervisor). This was based upon consultation from professionals in the field and a 261-day workday calendar. With an entry level approach involving 20 participants and 40 employees, the number of days that would now be remote was multiplied by the GHG per round trip SOV MTCO₂ (52 people x 0.0079 MT CO₂E = 0.41), resulting in the MTCO₂ saved by one person switching 1 day a week to remote for a year. This was then multiplied by the 40 people impacted (0.41 x 40 people), resulting in an estimated 16 MT CO₂E saved. This entry-level approach focuses on providing training for supervisors on how to supervise remote/hybrid employees.

A robust approach works to encourage a hybrid option for committees and programs serving multiple departments, in addition to engaging social and professional groups to develop hybrid formats. These additions allow for an estimated additional 20 employees, and 5 of these groups are impacted. Multiplying the MTCO₂ saved by one person switching 1 day a week (0.41 MT CO₂E x 60 people = 25 MT CO₂E) gives us the estimated 25 MT CO₂E saved with this approach.

A leader in the field approach involves more advanced project management tools for hybrid/remote work performance. With these tools in addition to the support outlined in the previous levels, an estimated 30 supervisors and 80 employees may be impacted. With these different approaches, we came up with a range of about 16 to 33 MT CO₂E saved. Multiplying the MTCO₂ saved by one person switching 1 day a week (0.41 MT CO₂E x 80 people = 33 MT CO₂E) gives us the estimated 33 MT CO₂E saved with this approach.

Carbon Visibility Program

GHG calculations were based on the number of flights avoided by not attending in-person conferences. Emissions per flight were estimated based on a one-way flight from Santa Barbara to San Francisco. The average air travel GHG emissions for graduate students and faculty is 0.40 MTCO₂ per flight. The average cost per flight across all business travel during the 2023 academic year was \$193.84.

Under an entry-level approach focused strictly on passive outreach (e.g., informational newsletters), an estimated 10 flights would be avoided. This would result in GHG savings of 3.97 MTCO₂ (10 flights x 0.40 MTCO₂/flight) and cost savings of \$1,938.38 (10 flights x \$193.84/flight).

Following a leader in the field approach of the same methodology would avoid an estimated 40 flights across departments, resulting in GHG savings of 15.90 MTCO₂ and cost savings of \$7,753.52.

Many faculty members travel both domestically outside of California and internationally. These additional miles are not included in the current emissions model. As a result, the model likely underestimates total GHG savings, meaning actual savings could be higher than projected.

UCSB Voluntary Business Travel Mandate

GHG calculations were based on the number of flights avoided by not attending in-person conferences. Emissions per flight were estimated by averaging all staff flights from 2023. The average GHG emissions from air travel for staff are 0.24 MTCO₂ per flight. The average cost per flight across all business travel during the 2023 academic year was \$193.84.

Under an entry-level approach focused on promoting the mandate, an estimated 10 flights would be avoided. This would result in GHG savings of 1.44 MTCO₂ (10 flights × 0.24 MTCO₂/flight) and cost savings of \$1,938.40 (10 flights × \$193.84/flight).

Expanding the program to include case management support could lead to 30 flights avoided, resulting in GHG savings of 4.31 MTCO₂ and cost savings of \$5,815.20 (30 flights × \$193.84/flight) for a robust approach.

Requiring submission of the mandate and implementing GHG reduction strategies could result in an estimated 100 flights avoided, yielding GHG savings of 14.3 MTCO₂ and annual cost savings of \$19,383.

Many staff members travel domestically within California and across the U.S., while some take international trips. Averaging emissions across all flights does not account for higher-emission outliers from international travel. As a result, the model may overestimate GHG savings, meaning actual reductions could be lower than projected.

Limits on Administrative Travel

GHG calculations were based on the number of flights avoided by not attending in-person conferences. Emissions per flight were estimated by averaging all staff flights from 2023. The average GHG emissions from air travel for staff are 0.24 MTCO₂ per flight. The average cost per flight across all business travel during the 2023 academic year was \$193.84.

By limiting the number of staff able to travel, an estimated 310 flights would be avoided. This would result in GHG savings of 74.26 MTCO₂ (310 flights × 0.24 MTCO₂/flight) and cost savings of \$60,105.18 (310 flights × \$193.84/flight) for a robust approach.

Using the same methodology, we assessed GHG and financial savings under alternative scenarios. Expanding the program to prohibit air travel in California could lead to 443 flights avoided, resulting in GHG savings of 68.96 MTCO₂ and cost savings of \$55,815.62 under leader in the field approaches.

Many staff members travel domestically within California and across the U.S., while some take international trips. Averaging emissions across all flights does not account for higher-emission outliers from international travel. As a result, the model may overestimate GHG savings, meaning actual reductions could be lower than projected.

Expanded Vanpool Service

GHG emissions were estimated by comparing the output from participants commuting via SOV from areas such as Lompoc, Santa Maria, Buellton, Camarillo, Oxnard, Ventura, and Carpinteria, to the emissions produced using vanpool services.

The average GHG output from SOV per round trip is approximately 0.0237 MTCO₂ (i.e., averaged across GHG SOV output for Clean Air Express and Coastal Express riders). Average GHG output per vanpool rider is 0.0034 MTCO₂ round-trip (0.0237 MTCO₂/roundtrip/ 7). These calculations are based on UCSB's 2024 GHG Emissions Inventory, which incorporates total trips, trip length, average miles per gallon, and fuel consumption to estimate CO₂ output.

Participant usage patterns were based on the UCSB workday calendar of 261 days, assuming a round-trip commute to and from campus each day.

Under an entry-level approach, we estimate the addition of 7 new vanpool members. This produces 2.0490 MTCO₂ (7 users x 0.0011 MTCO₂/roundtrip x 261 days) annually. If participants use SOV to commute, this would increase to 43.27 MTCO₂ (7 users x 0.0237 MTCO₂/roundtrip x 261 days), amounting to 37.09 MTCO₂ in GHG savings annually.

The same methodology was applied across robust and leaders in the field. This drives an increase of 14 to 21 vanpool users, resulting in 74.17 to 111.26 MTCO₂ saved.

Increases in ridership across all scenarios were informed by vanpool research from the University of Colorado Boulder, which currently supports 71 vanpool participants using 13 vans.

Subsidies for the Local Bus System

The average GHG output per round trip for SOV is 0.0077 MTCO₂, while for the bus it is 0.0023 MTCO₂. These calculations are based on UCSB's 2024 GHG Emissions Inventory, which incorporates total trips, trip length, average miles per gallon, and fuel consumption to estimate CO₂ output.

GHG savings are calculated by comparing SOV emissions to bus emissions over 261 UCSB workdays.

If all 79 members drove alone, their total annual SOV-related emissions would be approximately 159.6 MTCO₂ (79 users x 0.0077 MTCO₂/roundtrip x 261 workdays). In contrast, if all 79 members used the bus, total emissions would be about 48.0 MTCO₂ (79 users x 0.0023 MTCO₂/year x 261 workdays). Overall GHG savings is projected at 111.61 MTCO₂.

We applied the same methodology to estimate outcomes under different subsidy scenarios. In the case of covering 75% of the monthly bus pass (i.e., \$38.00/month), the number of users is projected to increase to 119. This results in a total GHG savings of 167.41 MTCO₂.

Lastly when fully covering the monthly bus fee under TAP, results in 159 additional users. This yields 223.21 MTCO₂ in savings.

Affordable housing

Average daily trips, total trips, average MPG, and distance were pulled from our 2024 commuter mode split survey to estimate per-person commuter GHG emissions by group.

Total GHG emissions reductions from new student housing = beds x Annual per student MT CO₂e

Total GHG emissions reductions from Ocean Road Faculty & Staff housing = Units x Annual average MT CO₂e for faculty and staff

Commuter Emissions		Gal per SOV trip	GHG per SOV trip (MT CO ₂ e)	GHG per roundtrip SOV (MT CO ₂ e)	Annual MT CO ₂ e for SOV
Average daily trips per person	0.83				
Total Daily Trips	24672				
Average MPG (SOV)	33.53				
Average MPG (Bus)	111.5				
Average SOV Distance Traveled - Undergrad	7.98	0.24	0.0021	0.0042	0.25
Average SOV Distance Traveled - Grad	7.28	0.22	0.0019	0.0038	0.23
Average SOV Distance Traveled - Staff	14.99	0.45	0.0039	0.0079	0.85
Average SOV Distance Traveled - Faculty	14.44	0.43	0.0038	0.0076	0.82
Average Clean Air Express Rider	50.77	0.46	0.004	0.008	0.87
Average Coastal Express Rider	39.68	0.36	0.0031	0.0062	0.68
Average Clean Air Express Rider if they took an SOV	50.77	1.51	0.0133	0.0266	2.88
Average Coastal Express Rider if they took an SOV	39.68	1.18	0.0104	0.0208	2.25
Work Days	261				
Instruction Days	146				

Greening the Commuter Fleet

BRAILS FORD & DUNLAVEY, Inc (B&D), a GHG consultant working with the UC System, developed a carbon intensity index for vehicles in California based on data from the California Air Resources Board. The carbon intensity index was adjusted by UCSB to more conservatively estimate the emissions reductions from the transition to zero-emission vehicles by pushing the drop in carbon intensity out by 5 years.

Year	B&D Carbon Intensity Index with EV Adoption	B&D Carbon Intensity Index with EV Adoption (5 year delay)	BAU Commuter Emissions (MT CO2e)	Commuter Reductions (Other Mitigation Strategies) (MT CO2e)	Commuter Emissions estimates with other mitigation strategies (MT CO2e)	Greening the commuter fleet reductions (MT CO2e)
2023			10,216		10,216	
2024	0.49	0.49	10,216		10,216	
2025	0.47	0.49	10,216		10,216	
2026	0.46	0.49	10,216	109	10,107	5204
2027	0.44	0.49	10,216	219	9,997	5148
2028	0.43	0.49	10,216	328	9,888	5091
2029	0.41	0.49	10,216	438	9,778	5035
2030	0.39	0.47	10,216	547	9,669	5101
2030	0.37	0.46	10,216	657	9,559	5178
2032	0.35	0.44	10,216	766	9,450	5263
2033	0.33	0.43	10,216	875	9,341	5356
2034	0.31	0.41	10,216	985	9,231	5455
2035	0.29	0.39	10,216	1094	9,122	5559
2036	0.26	0.37	10,216	1204	9,012	5668
2037	0.24	0.35	10,216	1313	8,903	5780
2038	0.22	0.33	10,216	1422	8,794	5894
2039	0.2	0.31	10,216	1532	8,684	6010
2040	0.18	0.29	10,216	1641	8,575	6126
2041	0.16	0.26	10,216	1751	8,465	6241
2042	0.14	0.24	10,216	1860	8,356	6356
2043	0.12	0.22	10,216	1970	8,246	6456
2044	0.11	0.2	10,216	2079	8,137	6542
2045	0.1	0.18	10,216	2079	8,137	6704

GREENHOUSE GAS CALCULATIONS OF GOODS AND SERVICES

Paper

For this section, we utilized the Environmental Paper Network’s Paper Calculator. This calculator was first created based on Brummet et al. (1995). A significant update was done in 2018 based on more recent research, and smaller updates are done biennially. This website was created by the Environmental Defense Fund (EDF) in 2005, and in 2011, the paper calculator website began to operate under the ownership of the Environmental Paper Network (EPN). The EPN is made up of over 150 non-profit organizations that collaborate as an influential voice for pulp and paper sustainability issues. The Paper Calculator compares different emissions impacts through the impact of Greenhouse Gas Emissions and a variety of other indicators. These indicators include Wood, Energy, Water, Solid Waste, etc. For the purpose of this report, we will only be providing data on emissions concerning GHG emissions from campus paper purchasing for the Fiscal Year 23-24.

The Paper Calculator is based on the life cycle analysis of 1 MT of 100% recycled paper and 1 MT of virgin paper. When 1 MT of 50% recycled content paper is assessed using the calculator, it includes half the GHG impacts of each. This is known as the recycled content approach or 0-100 cut-off approach. The calculator includes in their methodology the observations they made for 14 different paper types in North America. RISI (Resource Information System, Inc.) was used to collect data on each paper type and provided the average data across all paper mills producing particular paper types for the Calculator.

Data on paper purchases for UCSB came from several different sources, and the processes changed between the two years of data collection. The below paragraph describes the sources and what data was not available.

Source	FY23	FY24
ODP Corporation (the parent company that owns Office Depot)	Data pulled by UCSB Procurement in Gateway	Provided by ODP
Amazon	Data pulled by UCSB Procurement through Amazon Dashboard	Data pulled by UCSB Procurement through Amazon Dashboard
Data not available	<ul style="list-style-type: none"> Flexcard purchases (campus credit card for goods and services) Small suppliers (over 90% of purchases were through ODP and Amazon) 	<ul style="list-style-type: none"> Flexcard purchases (campus credit card for goods and services) Small suppliers

	FY23	FY24
Data from UCOP Data provided by Strategic Sourcing Contract Suppliers to UCOP	Included: Canon, Ricoh, Dell, HP, Xerox, CDW, and EPlus	Included: Ricoh, Dell, HP, Xerox, CDW, Dasher Technologies, ODP, SHI International Corp
UCSB Gateway Data pulled by UCSB Procurement in Gateway	Apple and UCSB Campus Store	Apple and UCSB Campus Store
Amazon Data pulled by UCSB Procurement through Amazon Dashboard	Include any products purchased through Amazon	Include any products purchased through Amazon
Data not available	<ul style="list-style-type: none"> • ODP • Flexcard purchases (campus credit card for goods and services) • Non-strategically sourced suppliers in Gateway (other than Campus Store and Amazon) 	<ul style="list-style-type: none"> • Flexcard purchases (campus credit card for goods and services) • Non-strategically sourced suppliers in Gateway (other than Campus Store and Amazon)

Electronics

The analysis of electronics purchasing data was based on information collected from several sources as described in the table below. The UC Office of the President (UCOP) reached out to strategically sourced suppliers for data on electronics spend and provided that data to UCSB. UCSB Sustainable Procurement Program Manager, Jen Bowser, also collected data through the campus Procurement Department's tools. This included collecting data on Apple and UCSB Campus Store purchases via UCSB Gateway (the Campus' e-procurement system). Data was also pulled by UCSB Procurement from UCSB's Amazon Business account. Some companies did not report or have data readily available (see table below). Electronics purchased on FlexCard were also not captured in the data set, though with the launch of UCSB's Financial Management Modernization (FMM) upgrade in Summer 2025, it is possible this data could be available in future years. Lastly, data was not included for purchases made in Gateway with non-strategically sourced suppliers.

We collected product carbon footprints (PCFs) that electronic companies publicly posted on their environmental websites. PCFs were collected for 12 brands, those being: Amazon, Epson, Canon, Asus, Acer, Apple, Dell, Samsung, Lenovo, HP, Ricoh, Xerox. PCFs themselves were developed through a Life Cycle Assessment (LCA) commissioned by the companies. LCAs are the compilation and evaluation of a product or system's inputs, outputs, and potential environmental impacts throughout its life cycle, a process that follows a "cradle-to-grave" approach.* (definition by DELL) A PCF is a portion of a broader LCA that focuses on just the Greenhouse Gas Emissions of a specific product.

Of the 12 brands, six had PCFs for the majority of their products: Apple, Acer, Asus, Dell, HP, and Lenovo. There were three different life cycle assessment methodologies from the companies we collected data on. The first methodology is the Product Attribute to Impact Algorithm (PAIA), a streamlined LCA methodology that focuses only on the carbon impacts or global warming potential (GWP). GWP measures the impacts of different GHG emissions over a period of time. PAIA is a tool developed by the Materials System Laboratory at Massachusetts Institute of Technology (MIT)'s in concert with Arizona State University and the University of California at Berkeley.

The second LCA methodology is the GWP 100, a 100-year greenhouse gas assessment method that relies on the GWP. The third LCA methodology that was studied under this research is the Sphera, previously known as GaBi, by Sphera LCA assessment methodology. Sphera is a third-party system that developed its own LCA software; all three methodologies follow International Organization Standards (ISO) for environmental Management Systems (EMS). The ISO 14000 series refers to a series of voluntary standards in the environmental field. Certain brands choose to adapt particular methodologies and use the LCA methodologies to develop their own LCA types. An example can be observed with HP, HP used Sphera software LCA to develop its own Personal Systems LCA that it uses to create PCF. Dell is another special case type where they have used the PAIA LCA assessment to develop their own Dell PCF system.

Brand	Total # of original PCFs collected
Acer	136
Amazon	23
Apple	140
Asus	262
Canon	107
Dell	520
Epson	20
Hp	1062
Lenovo	958
Ricoh	67
Samsung	33
Xerox	4
Total:	3,332

Product Carbon Footprints used by Brand	Acer	Apple	Asus	Dell	Hp	Lenovo	Xerox
	GWP100/PAIA	GWP100	GWP100	PAIA/Sphera	Sphera/GWP100	PAIA	GWP100

PCF Information was collected for 3,332 electronic products from the twelve brands aforementioned. The other six had PCFs for some, but not all, products. It is important to note that data was limited on Amazon Branded, Samsung, and Xerox products. Please note that we are using the term "Amazon Branded Product" to refer to any products that are produced by Amazon, such as the Fire or Kindle. Products purchased on Amazon, but not made by Amazon, would just be called Amazon Purchases.

For products with PCFs, we used the emissions from the PCF. For products without a PCF, we used the following procedure. The emissions estimates were taken by separating each electronic product into categories; for example, laptops, desktops, monitors, etc. After having done this for every brand, the products that had over 200 PCFs were split into sub-categories. Every brand has a typical product category, such as laptops, desktops, etc. product lines are within a specific product model. For example, the electronics brand, Dell, has various models of monitors, and in each model, there exists a product line that holds multiple models with different PCFs. We categorized those product lines into sub-groups in order to allow for our averages to be as accurate as possible. After sub-categorizing, an average was estimated from the product lines, and the total averages for every sub-group under one product category were averaged out to create one final estimated GHG average for a specific electronic product. The chart in the next slide depicts the process previously described; this image is specifically for the total averages collected from the brand Dell. As you can see below, Dell itself was split into six different product lines for their monitors, six for personal computers, and five for their desktops. This is seen in the first column, in the second column we are providing the title name of the product line, the third column is the average GHG emission estimated for the specific product line after having averaged out all PCFs available under that product line.

Product Type ▲	Product Name(s)	Average(measured in Co2 Kg)
Desktop	Optiplex	524
Desktop	Presicion Fixed	246
Desktop	Inspiron	305
Desktop	Vostro	293
Desktop	Wyse	143
Monitors	E	778
Monitors	P	559
Monitors	S	656
Monitors	U	910
Monitors	C	442
Monitors	SE	176
Personal Computers	Lattitude	316
Personal Computers	Presicion	326
Personal Computers	Chromebook	372
Personal Computers	XPS	266
Personal Computers	Inspiron	302
Personal Computers	Vostro	297

The chart to the left is a visual of the averages collected from Dell Product Carbon Footprints, there are multiple sub-categories for Monitors, Personal Computers, and Desktops. The averages collected for each were then moved to a separate sheet, where total averages across all brands were collected. The chart in the next slide shows averages collected across all brands for desktops. General averages were drawn from brands, and then a final average was derived from the total averages drawn from each brand for desktops. This process was repeated for Imaging equipment, Workstations, Displays, Smartphones, Laptops, Scanners, servers, tablets, and TV's.

Product Averages for Data collected on Dell electronics

Company	Product Name ▼	Product Average
Acer	all desktops	515
HP	all desktops	593
Lenovo	Yoga Desktops/AIOs	1185
Dell	Wyse	143
Dell	Vostro	293
Lenovo	ThinkCentre Desktops/AIOs	951
Dell	Presicion Fixed	1052
Dell	Optiplex	369
Asus	Mini PC	244
Apple	Mac	465
Asus	M	370
Lenovo	Lenovo Desktops/ AIO	1003
Lenovo	Legion Desktop/AIOs	1994
Dell	Inspiron	305
Lenovo	Ideacentre Desktops/AIO	1151
Asus	Expert Center	452
Asus	E	618
Asus	Chromebox	180
Asus	A	351

Desktops compared averages, the total averages condensed into one chart with the first column depicting brand, second described model, and third is the average PCF

After having followed the previously described process, we used the averages generated to fill in missing PCFs in all FY 22-23 Electronics purchasing. For certain products purchased, we were able to fill in the GHG emissions from the data we collected on PCFs, and other products under the same fiscal year were not able to find PCFs, for we substituted the real GHG emission for the average GHG emission estimated from the product category averages created.

Our FY 22-23 purchasing was 1,638 office electronics, purchases were made through three main different suppliers previously shown in the chart above, those being Amazon, UCOP, and UCSB gateway. 388 out of 1,638 purchases were not Energy Star certified (23.69%). The main source for non-energy star purchasing came from Amazon, with the total purchasing in only this source being 618 office electronics, 362(58.58%) not being energy star, and 256 (41.42%) being energy star certified.

The overall significance of Energy Star, product type, and brand is the three main indicators to gauge more sustainable procurement practices of goods and services. Under this category of goods and services, our shift in purchasing should be towards products that fit the criteria of Energy Star certifications, product types that emit less GHG, such as the purchasing of laptops instead of desktops, and the purchasing of brands that encapsulate the previous criteria most such as Apple or Dell.

Chemicals

Undergraduate Researchers worked with UCSB Sustainable Procurement Program Manager and Small Business Officer, Jen Bowser, to collect data on purchases made in the 2022-2023 and 2023-2024 fiscal years. Data was sourced from both UCOP and UCSB data procurement datasets.

From there, researchers sought emissions factors that could help the team quantify emissions from spend data. Koehler, A., & Wildboz, C. (2009) estimated the Total Energy Footprint CED_{fossil} for a range of cleaning chemicals.

Product Category Data from Koehler & Wildbolz (2009)

Product Category	CED _{fossil} (MJ/kg)
Liquid Soap	52
Powder Detergent	33
Liquid Detergent	14.7
Detergent Booster	22.3
Toilet-Care	68.2
Bath Cleaner	14.1
Kitchen Cleaner	16.1
Window Cleaner	17

Product data provided the volume of cleaning chemicals purchased, but not the weight. In order to convert from volume to weight, we used relative densities. The relative density of the solutions was obtained from the manufacturing safety data sheets (MSDS). If the selected solution had both a minimum and maximum relative density, the average of these values was calculated. The relative density compares the weight of one gallon of a product to the weight of a gallon of water (3.78296 kg). The relative density was multiplied by the weight of a gallon of water to get the total weight. The CED_{fossil} was multiplied by the total kg of each product to obtain total megajoules (MJ) for each purchase.

The total energy footprint was converted to megawatt-hour (MWh) using the following formula: $MWh = MJ/3,600$. The total MWh value was then multiplied by 823.1 lbs of CO₂/MWh, the average GHG emissions from one MWh of purchased electricity in the US. (EPA GHG Emissions Factor Hub, 2024).

Researchers also wanted to account for whether the products were third-party certified for environmental criteria and whether they were concentrated or not.

Fig. # Total cradle-to-gate CED_{fossil} based on US production conditions was established as follows

Green Seal Data received from Kapur et al. (2012)

Unit	Glucoside-based compliant	Hydrogen peroxide-based compliant	Conventional RTU	Conventional concentrated
kg CO2eq	1.96	1.99	22.4	2.55
Average Green Seal	1.98			

Fig #. Life cycle impact assessment results of general-purpose cleaning products

Researchers surveyed peer-reviewed research to identify emissions factors that could be used for estimating GHG emissions. Kapur, A., Baldwin, C., Swanson, M. et al. (2012) conducted a life cycle assessment (LCA) to estimate the greenhouse gas emissions of cleaning products. They developed a comparison of emissions factors for products compliant with the Green Seal Standard for Cleaning Products for Industrial and Institutional Use (GS-37) and conventional (non-GS-37-compliant) products. They did not identify an emissions factor for products that met comparable third-party certifications other than GreenSeal (e.g., Ecologo and U.S. Safer Choice). The authors also determined the environmental impacts of concentrated and ready-to-use (RTU) products. RTU solutions and formulations are pre-prepared and do not require additional mixing, dilution, or preparation before use. Concentrated solutions have a lower volume & weight during shipping and need water to be added before use.

A TRUE/FALSE function determines whether a concentrated factor is applied: If the solution is concentrated, the CO2 emissions are reduced using a factor of 0.11. If the solution is not concentrated, the standard CO2 calculation applies (Kapur et al., 2012). A TRUE/FALSE function determines whether a Green Seal and concentrated factor is applied: If the solution is Green Seal certified and concentrated, the CO2 emissions are reduced using a factor of 0.09 (Kapur et al., 2012). The outputs of the factors are in lbs of CO2. To convert lbs of CO2 to metric tons (MT CO2), divide by 2205.

Emission factors by category of cleaning solutions were based on Koehler, A., et al. (2009) research. There were no clear definitions for these categories. Additionally, the authors were not available to answer questions about their paper. As a result, we had to infer the definitions of the categories from the category names (e.g., “kitchen cleaner”).

The researchers used product description, product images, e-commerce product videos, customer reviews, FAQs, AI chatbot (e.g., Amazon Rufus), similar/comparable products, and expertise of the research team to categorize the products in the respective categories. Researchers were unable to categorize some products using this assessment process and were therefore excluded. 15.4% of products were excluded

Researchers only identified emissions factors for products certified by the third-party certification, Green Seal, and for products that are conventional (not approved by a third-party for environmental standards). As a result, we used the emissions factors of conventional solutions for solutions certified with an environmental certification other than Green Seal. This calculation likely led to a slight overestimation of emissions.

The peer-reviewed articles are from more than 10 years ago (Kapur, A. (2012) & Koehler, A. (2009)). Manufacturing processes, extraction methods of source materials, transportation modes, etc., likely have advanced in their technologies in the past ten years, and in many cases, this may have resulted in reduced environmental impacts. This likely led to an overestimation of emissions.

	FY23	FY24
Data from UCOP Data provided by Strategic Sourcing Contract Suppliers to UCOP	Included: Waxie, Grainger, Ecolab	Included: Waxie, Grainger, ODP
Amazon Data pulled by UCSB Procurement through the Amazon Dashboard	Include any products purchased through Amazon	Include any products purchased through Amazon
Data not available	<ul style="list-style-type: none"> • ODP • Several products have missing MSDS and/or relative densities. 	<ul style="list-style-type: none"> • Ecolab • Several products have missing MSDS and/or relative densities.

Data on the total spend on cleaning solutions were obtained from Procurement Services (UCSB and UC Office of the President (UCOP)). We rely on suppliers to provide the purchased data, such as ODP. However, in fiscal year 2022-2023, we did not receive data from ODP. In fiscal year 2023-2024, we did not receive data from Ecolab.

For all of the products, we had to collect the MSDS to obtain the relative densities. If the product has a range of relative density (e.g., 1.040 – 1.060), then we took the average of both values and used the result for the calculation. Yet, there were some products that either did not have a relative density or an MSDS. In such instances, we resorted to similar products with MSDS and/or relative densities.

When looking for the cleaning product on the suppliers’ website, some products are no longer available to view. This resulted in the researchers looking for the product on other suppliers’ and manufacturing websites.