Cal Poly Humboldt

Climate Action Plan 2.0

Strategies to Achieve Carbon Neutrality and Climate Resilience

2021-22

Honoring the Land and its Original Inhabitants

Cal Poly Humboldt was founded on the land of the Wiyot peoples, which includes the Wiyot Tribe, Bear River Rancheria and Blue Lake Rancheria. Despite their attempted genocide, the Wiyot remain in relationship with this land, known as Goudi'ni, meaning "over in the woods" or "among the redwoods." This land is also within the home range of the Coast Redwood (voupul), Salmonberry (wutwurrulha't), Evergreen Huckleberry (vou'gulhat), Salal (viqhululhwat), American Black Bear (maqh), Wapiti (me'luqh), Mountain Lion (dutgu'shanilh) and other life forms that have persisted against the colonial and extractive pursuits of settlers.

By drawing upon local indigenous knowledge, and by embracing the biological and cultural diversity of the area, Cal Poly Humboldt strives to honor and respect the history of this land and its original inhabitants, and to inspire everyone to love and care for the place that we share and call home.

Acknowledgements

The following individuals deserve special recognition and thanks for their contributions to the development of the CAP 2.0:

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1.0 Executive Summary

Cal Poly Humboldt is signatory to the Second Nature Climate Commitment, which calls upon member institutions to set a target date for achieving carbon neutrality, to develop and then update a climate action plan every five years, and to engage in climate resilience planning. The University released its first Climate Action Plan (CAP) in 2017, which set a course for the campus to reduce greenhouse gas emissions to 1990 levels by 2020, and to become carbon neutral by 2050. Humboldt was successful in achieving the 2020 goal. This update to the CAP (CAP 2.0) provides strategies to achieve carbon neutrality by 2045, to integrate sustainability and climate action into academics and research, and to build campus community resilience to present and future climate change hazards.

What will a carbon neutral and resilient campus look like?

Our carbon neutral future is nearly free of fossil fuels. All buildings, campus vehicles and equipment are entirely powered by carbon free energy, either purchased or generated on-site. Any remaining emissions are mitigated by carbon offset purchases or projects to sequester carbon from the atmosphere. Our campus is biologically and culturally diverse, engaged and resilient. Enhancements to campus infrastructure, ecosystem services, mobility, emergency operations and social services ensure we rapidly recover from disruptive climate-change driven events (Table 1):

Table 1. Actions to Build a Carbon Neutral and Climate Resilient Cal Poly Humboldt

Buildings, Energy & Fuels	Transportation	Waste & Purchasing	Carbon Offset & Sequestration	Academics & Research	Resilience
Switch from natural gas to electricity Acquire electricity from renewable sources Implement whole-building energy performance measures Zero emission fleet vehicles Install micro-grid with solar and battery storage	Improve bike, ped and transit access to campus Expand micro-mobility and rideshare programs Adjust parking policies to incentivize smart transportation Enhance remote conferencing capabilities	Implement a Zero Waste Action Plan Implement sustainable purchasing policies Increase diversion of construction waste Reduce waste from campus housing	Calculate carbon sequestration on forested lands Business air travel carbon offset policy Voluntary commuter carbon offset program Develop urban forestry and small scale carbon offset projects	Increase number of courses with sustainability content Expand professional development opportunities Foster cross-disciplinary research Establish HSU as a center for sustainability	Address food and housing insecurity Expand emergency operations and communications Foster a prepared and engaged campus community Improve ecosystem and stormwater management

When and how we implement these actions will depend on cost, funding mechanisms, staffing requirements and other factors. Tracking and reporting on progress towards achieving targets and, ultimately, carbon neutrality, will take place on an annual basis. The plan itself will continue to be reviewed every five years, which may include the adoption of new strategies and new reduction targets.

The scale and scope of the CAP 2.0 reflect the magnitude of the climate crisis, and achieving its goals will require every bit of the ingenuity, passion and determination that define Cal Poly Humboldt. A just and equitable carbon-free future is eminently attainable if we prioritize and integrate this vision into all facets of campus life and decision-making. Humboldt has done much already, but now we must go further, to prepare our campus and our students for a climate constrained future. The CAP 2.0 provides an extraordinary starting point for the work ahead, and we look forward to the resilience and innovation that will emerge as its strategies are implemented.

2.0 Introduction

Cal Poly Humboldt has set the goal of achieving carbon neutrality no later than 2045, in alignment with the California State University Sustainability Policy and the California Governor's Executive Order B-55-18[1]. This carbon neutrality goal is the basis for the update to the Humboldt Climate Action Plan, or "CAP 2.0," which sets Cal Poly Humboldt on the path towards a sustainable, equitable, vibrant and resilient campus.

Humboldt publicly released its first Climate Action Plan in 2017, with the goal of reducing direct and indirect greenhouse gas (GHG) emissions to 1990 levels, or below, by 2020, to mitigate related emissions from solid waste, commuting and business travel, and to further integrate sustainability into academics, research and campus culture. Humboldt was successful in implementing many of the strategies in its initial CAP, and by 2020 had reduced GHG emissions by over 36% below 1990 levels, even as campus population and building footprint trended upwards during the same period.

Building upon the initial plan, the CAP 2.0 provides a roadmap for further drawing down emissions. It combines additional reduction strategies with efforts to sequester carbon and offset GHG emissions to achieve carbon neutrality by 2045. The plan also lays out actions to foster the integration of sustainability and climate action into all facets of the university. Additionally, CAP 2.0 includes strategies to ensure the campus can withstand and recover rapidly from climate change driven disruptions:

Table 2. Summary of CAP Purpose and Elements

CAP 2.0 Purpose	CAP 2.0 Elements
To better understand the scope of the challenge; To define goals and strategies to achieve equitable and meaningful reductions; To provide a roadmap for a just transition to a low carbon future, and To affirm HSU's commitment to meeting or exceeding CSU and State policy.	Target dates for achieving goals, including interim goals; An inventory of GHG emissions sources and quantities; Strategies to achieve carbon neutrality, build resilience, and integrate sustainability into academics, research and campus culture, and Implementation overview, including financing and oversight considerations.

2.1 Climate Action and Equity

The mounting effects of global climate change have exposed the intersection of inequity and the climate crisis. Indeed, those communities least responsible for contributing to climate change are often the most vulnerable to its threats of sea level rise, wildfire, drought, disease and more. Conversely, those communities contributing the most to climate change tend to have more capacity to protect themselves from its worst effects. The climate crisis is more than just an ecological

[1] Exec. Order No. B-55-18 To Achieve Carbon Neutrality (September 10, 2018).

catastrophe. It threatens human health, as well as the social and economic wellbeing of this and future generations. Low income and BIPOC communities will continue to be the most at risk unless we act now to address housing and food insecurity, racial discrimination, environmental injustice, access to education and other intersecting vulnerabilities facing these frontline communities.

Humboldt acknowledges the imperative of addressing equity as part of a holistic approach towards a just transition to a low carbon future. Wherever possible, CAP 2.0 strategies are structured to build capacity and access for individuals, communities and programs while reducing disparate and disproportionate impacts resulting from climate change.

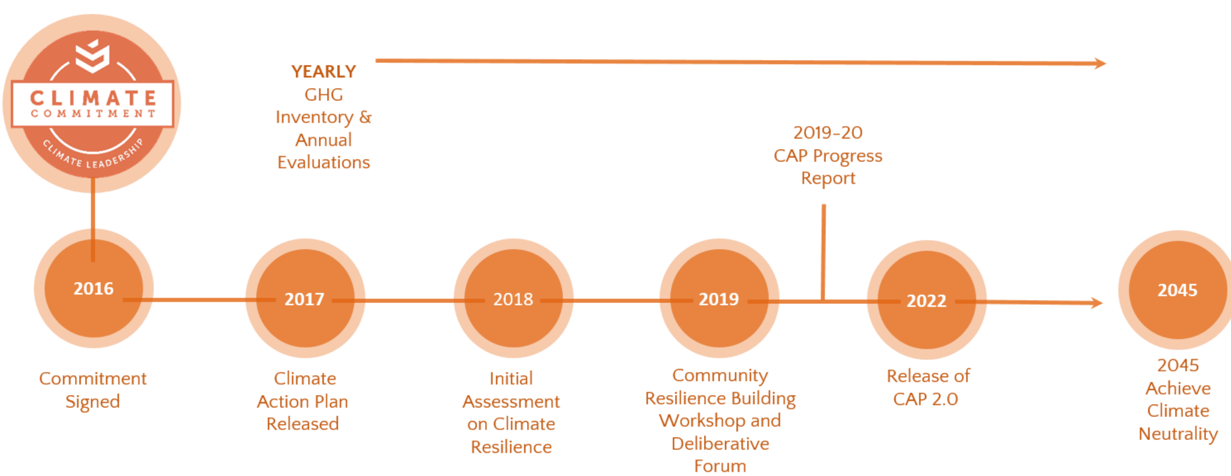
2.2 Relevant Policies and Plans

The CAP 2.0 is closely aligned with several major commitments, policies and plans. These include but are not limited to:

A. Climate Commitment

In 2016 Humboldt President Lisa Rossbacher signed the Climate Commitment, the most comprehensive of Second Nature's three Climate Leadership Commitments[2]. It calls for the publication of annual greenhouse gas (GHG) emissions inventories, setting a target date for achieving carbon neutrality, updating a Climate Action Plan five years after its adoption, and engaging campus and community stakeholders in resilience assessment and planning (Figure 1).

Figure 1. Milestones along Second Nature Climate Commitment Timeline



B. Humboldt Strategic Plan

The 2021-2026 Strategic Plan lays out vision, priorities, goals and actions to meet the University's mission now and into the future. The Strategic Plan dovetails with CAP 2.0 by laying out a framework to:

[2] Second Nature Presidents' Climate Leadership Commitments.

- Provide rich hands-on learning, and developing sustainability-focused, socially and environmentally just, and workforce ready graduates;
- Create the type of university that can adapt and thrive in the future and respond effectively to internal and external challenges and opportunities, and
- Appropriately generate, manage, and invest resources through the common lens of "student first," equity, inclusivity, and sustainability.

C. Sustainability Tracking and Rating System (STARS)

STARS is a transparent, self-reporting framework for colleges and universities to measure their sustainability performance. It does this by assessing the integration of sustainability into academics & research, engagement, operations, and planning & administration. In 2020 Humboldt received a STARS Gold rating for the second consecutive 3-year reporting cycle. The Office of Sustainability coordinates reporting and action planning for iterative, campus-wide improvements to our overall sustainability performance. STARS is a program of the Association for the Advancement of Sustainability in Higher Education (AASHE)[3].

D. CSU Sustainability Policy

This systemwide policy is designed to drive enhanced sustainability performance while furthering the CSU as a leader in quality and affordable higher education. The policy[4] calls for the CSU to:

- Reduce systemwide facility carbon emissions to 80 percent below 1990 levels by 2040 in order to achieve carbon neutrality by 2045;
- Pursue sustainable practices in all areas of campus, and
- Further integrate sustainability into the academic curriculum.

2.3 Cal Poly Humboldt and Surrounding Environs

Cal Poly Humboldt is located near Humboldt Bay, approximately 270 miles north of San Francisco. A comprehensive, residential campus of the 23 campus California State University system, Humboldt serves more than 7,700 students and offers a wide array of academic choices, with nearly 50 majors and 11 graduate programs across three Colleges. The rural, 144-acre main campus is bordered by coastal redwood forest to the north and east, and the City of Arcata to the south and west. Humboldt also owns, leases or has use agreements to facilities and properties, including a marine lab, observatory, natural history museum, research vessel, wildlife care facility, the 385 acre L.W. Schatz Demonstration Tree Farm, the 400 acre Bello forest and the 884 acre Jacoby Creek forest. Building stock comprises 114 buildings totaling 1,461,294 assignable square feet. The area experiences a mild climate, typified by a mean annual temperature of 54 degrees and average annual precipitation of 44 inches of rain per year.

[3] The Sustainability Tracking, Assessment & Rating System (STARS) is a program of the Advancement of Sustainability in Higher Education (AASHE).
[4] The CSU Sustainability Policy was updated in 2022.

Humboldt has a longstanding commitment to environmental and social responsibility, and is a leader in the integration of sustainability into all facets of the university. Many of Humboldt's operational and business activities generate greenhouse gas emissions, however, which contribute to global climate change and its associated effects on social, economic and environmental systems. The Humboldt Bay region has already been struck by climate change-driven events, and these events are only expected to intensify in frequency and duration with broad reaching consequences. Vulnerability is defined by the Intergovernmental Panel on Climate Change (IPCC) as "the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes." Vulnerability assessments conducted at Cal Poly Humboldt and within the Humboldt Bay region indicate that sea level rise, storm surges, flooding, and wildfires are but some of the climate change driven events that will continue to impact the bio-cultural and socio-economic fabric of the area for decades to come. Humboldt recognizes its responsibility to the region, to the State of California, and to the world, to curb its contributions to climate change while preparing its graduates with the skills and knowledge to be active participants in transitioning society towards a future that is resilient, just and vibrant.

3.0 Greenhouse Gas Inventory

A greenhouse gas (GHG) is generally defined as a gas that traps heat in the atmosphere. Anthropogenic GHG emissions are driving global climate change, responsible for nearly all of the increase in atmospheric GHG over the last 150+ years[5]. A greenhouse gas inventory identifies emissions sources and their overall contribution to the institution's annual carbon footprint. The inventory is also a necessary first step towards developing effective strategies to curb emissions and to mitigate climate change impacts.

Humboldt's GHG emissions are reported by organizational boundary, which includes State side as well as auxiliary operations, on the main campus and in off-site properties owned/operated by the campus. Emissions fall under four major categories, or scopes:

Table 3. Scopes

SCOPE 1	SCOPE 2	SCOPE 3	SCOPE 4
Direct Emissions	**Indirect Emissions**	**Related Emissions**	**Embodied Emissions**
Stationary Fuels **Transport Fuels** **Refrigerants**	**Purchased Electricity**	**Commuting** **Business Travel** **Solid Waste Disposal**	**Building Materials**

[5] IPCC (2007). Summary for Policymakers. In: *Climate Change 2007: The Physical Science Basis*. *Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Avery, M. Tignor and H.L. Miller (eds.). Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.].

SCOPE 1: On-site combustion of fossil fuels in equipment owned or operated by the university. Stationary fuels include natural gas for heating, cooking and laboratory use, and propane and diesel for emergency back-up generators. Transport fuels include gasoline, diesel, and biodiesel used in campus fleet vehicles and Grounds equipment. Because Humboldt's buildings require little active cooling, emissions from refrigerants (chemicals used in air conditioners, water chillers, freezers and refrigerators) leaked to the atmosphere have been determined to be *de minimis*[6].

SCOPE 2: Indirect emissions (i.e., emissions at the power plant) from purchased electricity. Over 91% of consumed electricity is purchased through a direct access agreement with Shell Energy of North America (SENA); the remainder is purchased from Pacific Gas & Electric or generated by on-site solar photovoltaic systems. As of 2019, 28% of power sold to Humboldt from SENA was derived from eligible renewable resources (the remaining 72% came from unspecified sources, such as natural gas, large hydroelectric and nuclear).

SCOPE 3: Emissions from related activities and supply chain not under direct control. This includes transport and landfill emissions associated with Humboldt's solid waste, emissions from directly financed air travel, and emissions from student, faculty and staff commute.

SCOPE 4: The embodied carbon footprint of materials. The Buy Clean California Act (BCCA)[7] establishes the maximum acceptable emissions for construction materials such as structural steel, flat glass and mineral wool board insulation. Scope 4 emissions are not included in the greenhouse gas inventory but are addressed in climate action planning strategies.

3.1 Current Emissions

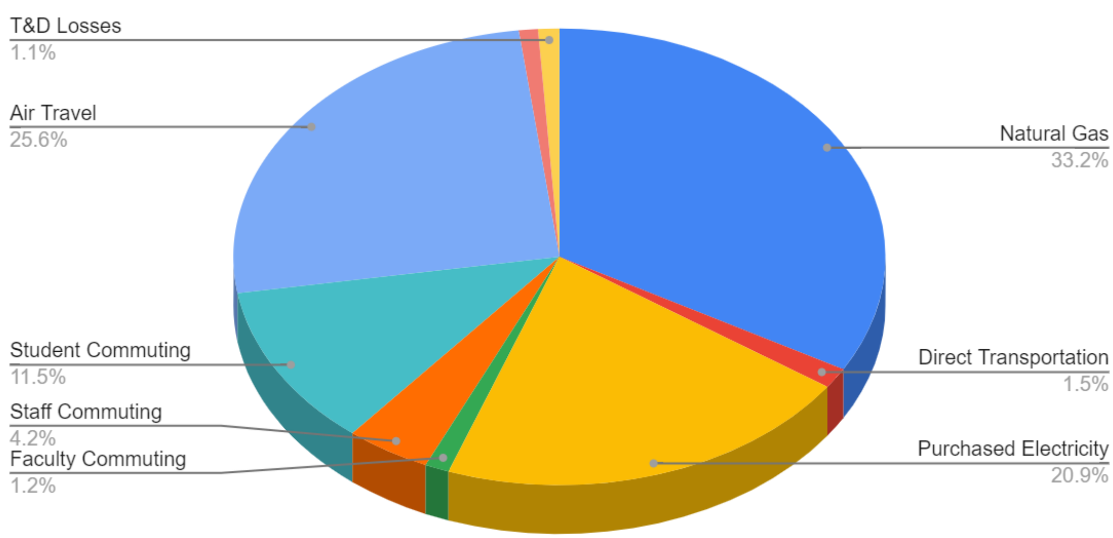
Humboldt conducts an annual greenhouse gas inventory as per Second Nature Climate Commitment guidelines, which call on campuses to report Scopes 1-3 emissions. Annual energy and fuel consumption, solid waste totals, air travel data and commuter survey results[8] are inputted into the Sustainability Indicator Management & Analysis Platform (SIMAP)[9] to calculate and inventory Scopes 1-3 emissions. These sources emit a variety of greenhouse gasses, such as carbon dioxide, methane, and nitrous oxide, which vary in their heat-trapping capacities. For example, methane has 25 times the global warming potential (GWP) as carbon dioxide. Metric tons of carbon dioxide equivalent, or MTCDE, is the common metric used to measure GHG emissions from all gasses combined. Table 4 and Figure 2 present the contributions of Scopes 1-3 sources to Humboldt's carbon footprint in the 2019-20 fiscal year. Scope 1 emissions accounted for 34.6% of the footprint, while Scope 2 emissions contributed 20.9%. At 44.5%, Scope 3 emissions contributed the largest amount to the campus' carbon footprint:

[6] *De minimis* determination is based in part on a 2021 GHG inventory of refrigerant use and recharge on campus that assumed an industry standard of 25% annual rate of leakage. Although refrigerants such as hydrofluorocarbons (HFCs) have a global warming potential of hundreds to thousands of times that of carbon dioxide, refrigerant emissions constitute less than half of one percent of the campus' overall carbon footprint.
[7] Buy Clean California Act, Public Contract Code Sections 3500 - 3505.
[8] See the Commuter Survey Report to better understand student and employee transportation choices and associated greenhouse gas impacts.
[9] Sustainability Indicator Management & Analysis Platform (SIMAP).

Table 4. 2019-20 GHG Emissions by Source

Scope	Source	MTCDE	Percent of Total
1	Natural Gas	4,556.6	33.2%
1	Fleet and Grounds Fuels	199.3	1.5%
2	Purchased Electricity	2,866.0	20.9%
3	Faculty Commute	165.0	1.2%
3	Staff Commute	579.34	4.2%
3	Student Commute	1,578.8	11.5%
3	Air Travel	3,507.4	25.6%
3	Landfilled Solid Waste	129.9	1.0%
3	T&D Losses[10]	144.3	1.1%
	TOTAL	**13,726.64**	**100.0%**

Figure 2. 2019-20 Campus Carbon Footprint



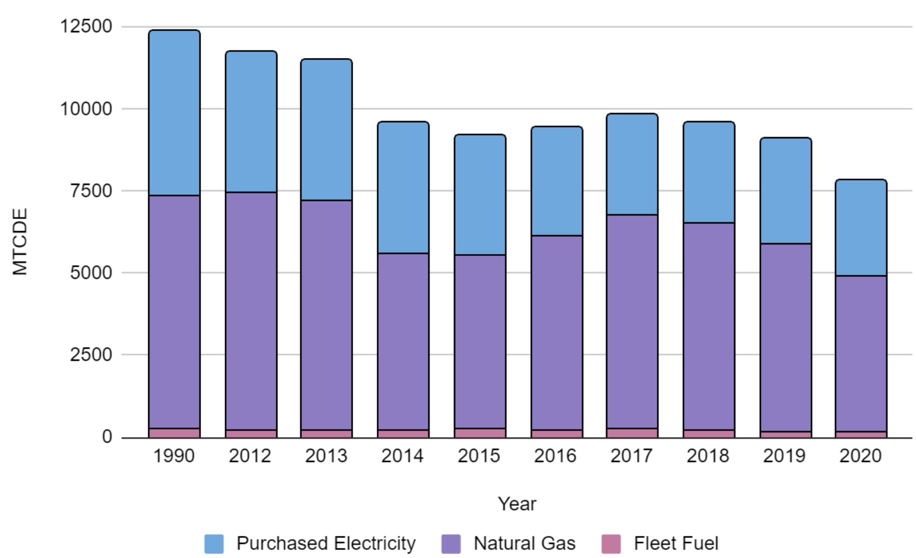
[10] Transmission and Distribution (T&D) losses account for the difference between the amount of electricity generated and the amount of electricity actually delivered.

3.2 Historical Emissions: Scopes 1 & 2

Humboldt's first Climate Action Plan, adopted in 2017, called for reducing Scopes 1 & 2 emissions to 1990 levels by 2020. The campus achieved this goal, and now, along with other California State universities, has the goal of achieving operational carbon neutrality (i.e., eliminating and/or offsetting Scopes 1 & 2 emissions) by 2045, with an interim goal of reducing Scopes 1-2 emissions to 80% below 1990 levels by 2040. As Figure 3 indicates, Humboldt's facilities and fleet emissions have decreased over time as a result of many factors, including:

- California's Renewables Portfolio Standard (RPS) has required electricity sold in the state be derived from an increasing percentage of eligible renewable resources[11];
- Grid electricity has become less carbon intensive than natural gas, so emissions dropped when the campus 350 kW natural gas-fired cogeneration plant was taken offline and supplanted by grid electricity;
- Warming trends have resulted in reduced demand for mechanical heating. There were 14% fewer heating degree days in 2019-20 compared to 2010-11;
- Server virtualization, energy efficient lighting and motor upgrades have reduced electricity consumption;
- HVAC upgrades, higher efficiency boiler retrofits, and building commissioning projects have reduced natural gas consumption, and
- Addition of electric and gas efficient vehicles and use of B20 biodiesel blend has reduced fleet emissions.

Figure 3. Scopes 1 (Natural Gas + Fleet Fuel) and 2 (Electricity) Emissions



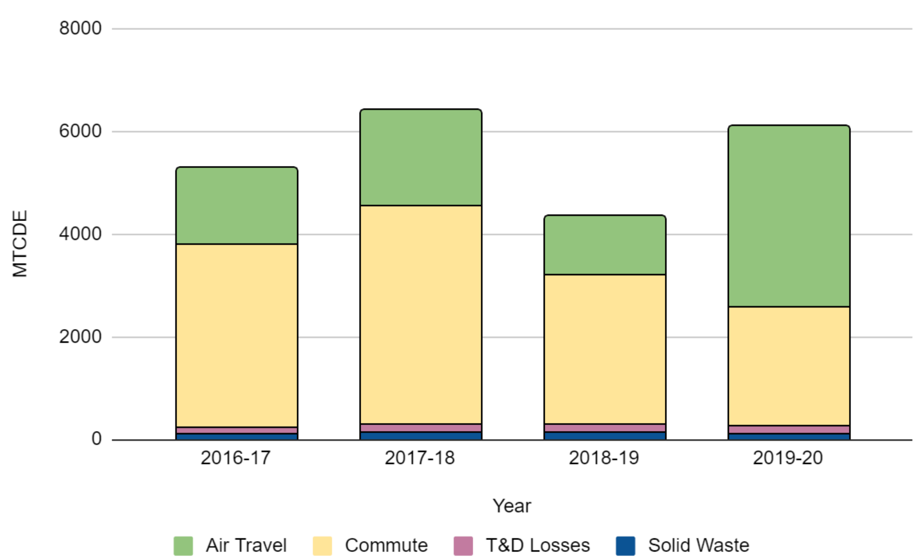
[11]See the California Renewable Portfolio Standard (RPS).

3.3 Historical Emissions: Scope 3

While the majority of total campus GHG emissions fall within Scopes 1 and 2, emissions from Scope 3 sources can be responsible for one third or more of the campus carbon footprint. These supply chain-related emissions are in many respects outside of the university's direct control, representing both significant challenges and opportunities to reduce Humboldt's overall carbon footprint as it seeks to achieve Scope 3 carbon neutrality by 2045. The campus has tracked its Scope 3 emissions starting in the 2016-17 fiscal year (Figure 4). Results indicate that:

- Single Occupancy Vehicle (SOV) trips account for the majority of commuter emissions. Investment in bikeshare, carpool, transit pass and other alternative transportation programs contributed to an overall downward trend in SOV trips in both student and employee populations;
- The campus has historically not collected data sufficient to calculate air travel emissions with confidence, so approximations are based on annual estimates of dollars spent on directly financed air travel. Emissions are estimated to have significantly increased in 2019-20, in part as a result of the additional air travel required by a new HSU President and administration joining the campus that year, and
- Food waste diversion, source reduction, re-use and recycling programs have helped prevent growth in emissions from solid waste sent to the landfill.

Figure 4. Scope 3 Emissions

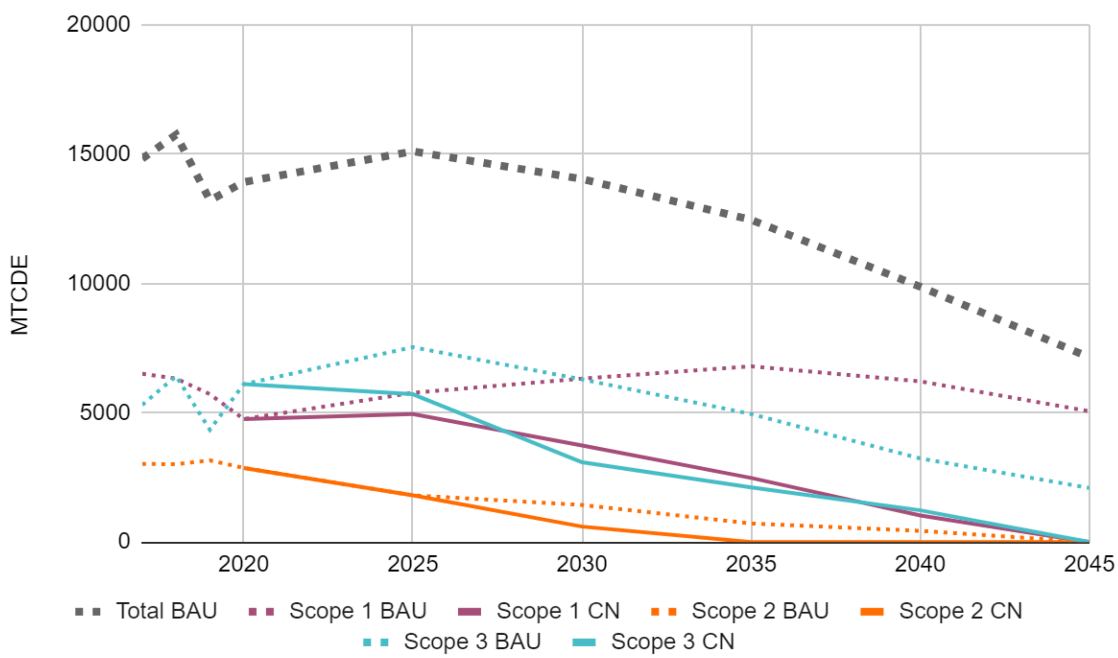


3.4 Projected Emissions

Overall, Humboldt's historical emissions have declined over time. Into the future, total emissions are projected to continue trending downwards under Business As Usual (BAU) conditions, but not at a rate sufficient to achieve carbon neutrality by 2045. Planned and anticipated new construction, along with an anticipated increase in campus population, are expected to slow emissions reductions. Figure 5 illustrates total projected business-as-usual (BAU) emissions, as well as the emissions reductions that will need to take place to reach carbon neutrality (CN). This BAU scenario takes into account the following assumptions:

- California's *100 Percent Clean Energy Act of 2018,* or SB 100, requires renewable energy and zero-carbon resources supply 60% of California's electricity by 2030 and 100% by 2045[12];
- Per Executive Order N-79-20, 100% sales of zero emission cars and passenger trucks by 2035, full transition of off-road vehicles and equipment to zero emission by 2035, full transition of buses to zero emission by 2045 in California[13];
- Increase in electricity use resulting from switching away from natural gas (estimated based on efficiency factors of air source heat pump technology);
- Near term building growth during the next five to ten years to support the academic mission, to house students and accommodate growth in student and employee population.
- The addition of diesel-powered backup emergency generators to maintain critical loads during power outages, and
- Increased campus population adding to commuter, air travel and solid waste emissions.

Figure 5. Projected Emissions under Business as Usual (BAU) and Carbon Neutrality (CN) Scenario



Per State law, our purchased electricity will be carbon free by 2045. However, reductions in stationary and mobile fuels, solid waste and air travel are estimated to be insufficient unless we enact more rigorous actions to curtail or offset these emissions sources. Carbon neutrality

[12] See California Senate Bill 100, The 100 Percent Clean Energy Act of 2018.
[13] See Executive Order N-79-20 from September, 2020.

projections in Figure 5 are estimates resulting from the implementation of planned strategies to transition towards carbon neutral facilities, operations and purchasing, and to develop carbon offset projects. These and other strategies are explained in the following pages.

4.0 Previous Accomplishments

This section summarizes results from the implementation of Humboldt's 2017 Climate Action Plan, which included 55 strategies for achieving Scopes 1 & 2 reductions (Energy & Utilities strategies), Scope 3 reductions (Transportation and Waste, Purchasing & Food strategies), and for furthering the integration of sustainability into academics and research (Curriculum & Research strategies). Additional strategies (i.e., *catalysts*) facilitated implementation of aforementioned categories while engendering a culture of sustainability across campus. Not all strategies in the plan were started or completed (Table 5), however the campus did achieve the CAP 1.0 goal of reducing GHG emissions below 1990 levels by 2020.

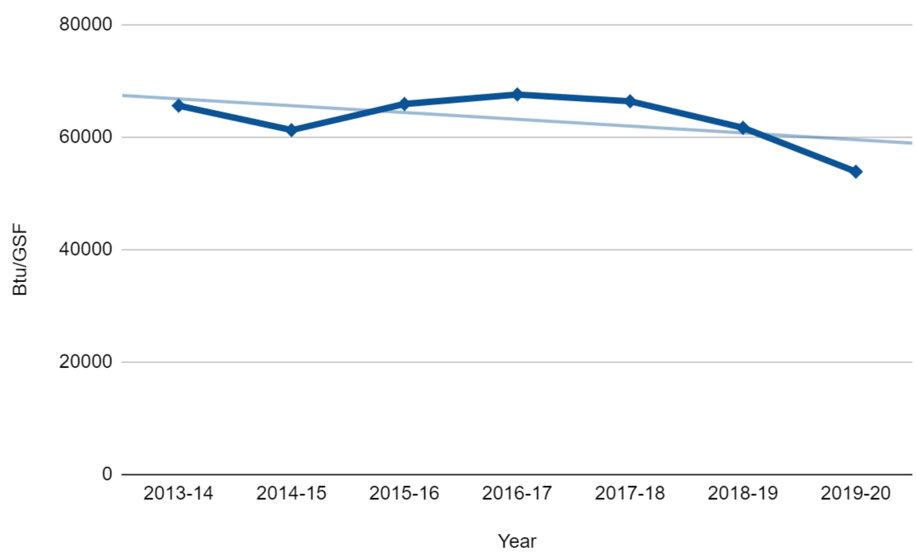
Table 5. Status of CAP 1.0 Strategy Implementation as of 2020

Strategy Category	Number of Strategies	Not Started	In Development or Implementation	Completed
Energy & Utilities	17	11.8%	23.5%	64.7%
Curriculum & Research	14	14.3%	21.4%	64.3%
Transportation	9	22.2%	11.1%	66.7%
Waste, Purchasing & Food	10	0%	20.0%	80.0%
Catalysts	5	0%	0%	100%
All Strategies	**55**	**9.7%**	**15.2%**	**75.1%**

4.1 Energy Consumption

Energy & Utilities strategies in the initial CAP (CAP 1.0) were designed to curb emissions associated with the operations of our facilities and fleet. The implementation of energy efficiency and conservation strategies - lighting, motor and HVAC upgrades, outreach campaigns, and other measures - contributed to declines in electricity and natural gas use. For example, between 2013-14 and 2019-20, building gross square footage increased by 5%, while overall energy use (natural gas + electricity) declined by 18% in the same period (Figure 6):

Figure 6. Energy Use Intensity (EUI)



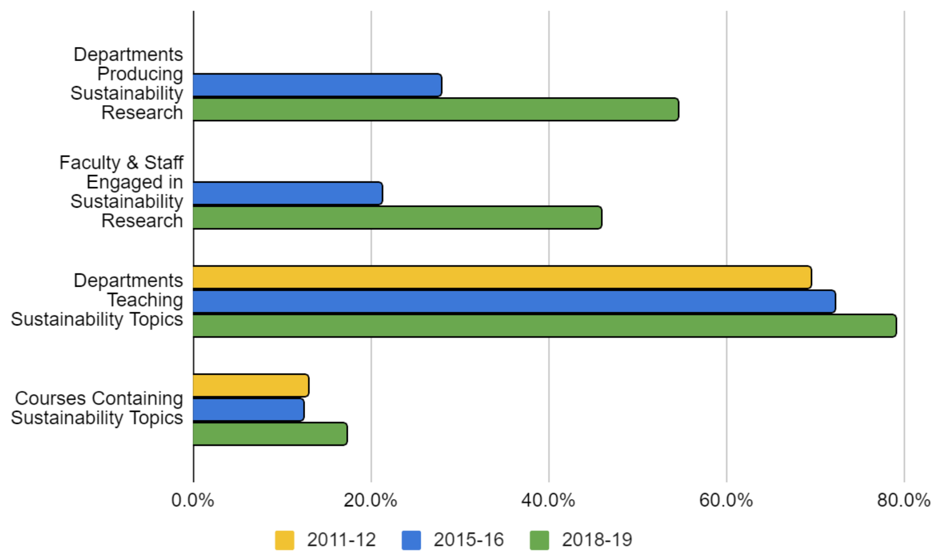
Implemented strategies have included:

- Upgrades of interior and exterior lighting to Light Emitting Diode (LED) fixtures with smart controls;
- Implementation of server virtualization and desktop power management;
- Upgrade of pool lighting , pumps, filtration and control system;
- Use of biodiesel (B20) in fleet vehicles;
- HVAC recommissioning;
- Residence hall cold water laundry project, and
- Green Workplace Assessment program to educate employees.

4.2 Curriculum & Research

Curriculum & Research strategies were designed to prepare students with the skills and knowledge to be sustainability leaders in their communities, to foster campus engagement with sustainable behaviors, and to expand teaching and research into sustainability challenges and solutions. Regular assessments show that the campus has increased sustainability content in curriculum and research (Figure 7):

Figure 7. Sustainability in Curriculum and Research



Implemented strategies have included:

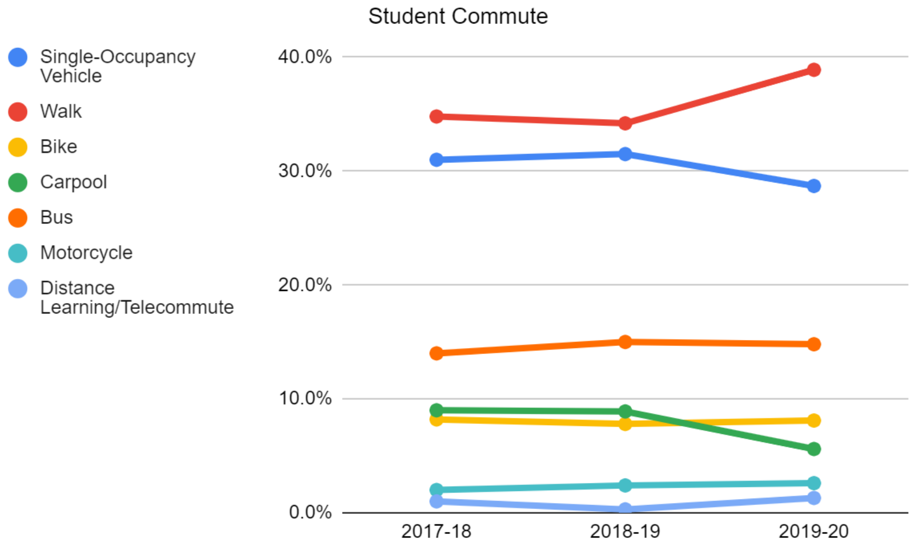
- Formalization of institutional learning outcomes requiring competence in equity and social justice and in sustainability and environmental awareness[14];
- Increase in the number of courses teaching sustainability content;
- Connecting local sustainability practitioners with faculty and students through the Sustainability Practitioners Directory;
- Sustainability research projects showcased through annual ideaFest event and journal[15];
- Development of a sustainability minor, and
- Annual Sustainability Champion Awards highlighting achievements of students, faculty and staff.

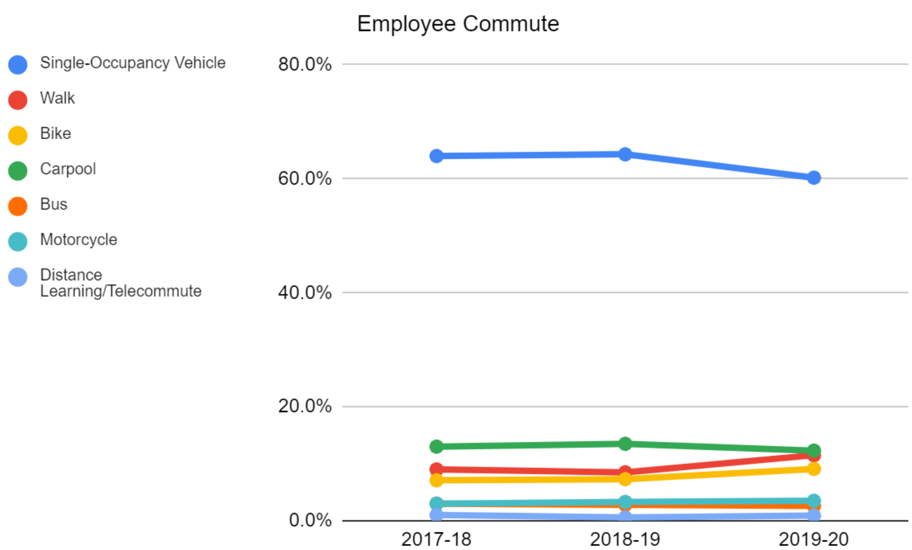
4.3 Transportation

CAP 1.0 transportation strategies were designed to curb emissions from business travel and student/employee commutes, expand alternative transportation programs, and educate the campus community about smart transportation options. Many strategies in this category sought to reduce single occupant vehicle (SOV) trips while increasing transit, bicycling and other alternative transportation modes. Results from a 2019-20 commuter survey show a 4% drop in SOV as primary mode for employees - and a 2.3% drop for students - between 2017-18 and 2019-20 (Figure 8):

[14] See Institutional Learning Outcomes #1 (Equity and Social Justice) and #2 (Sustainability and Environmental Awareness).
[15] ideaFest is an annual event and journal showcasing research, performance, digital projects and more.

Figure 8. Annual Commuter Survey Results





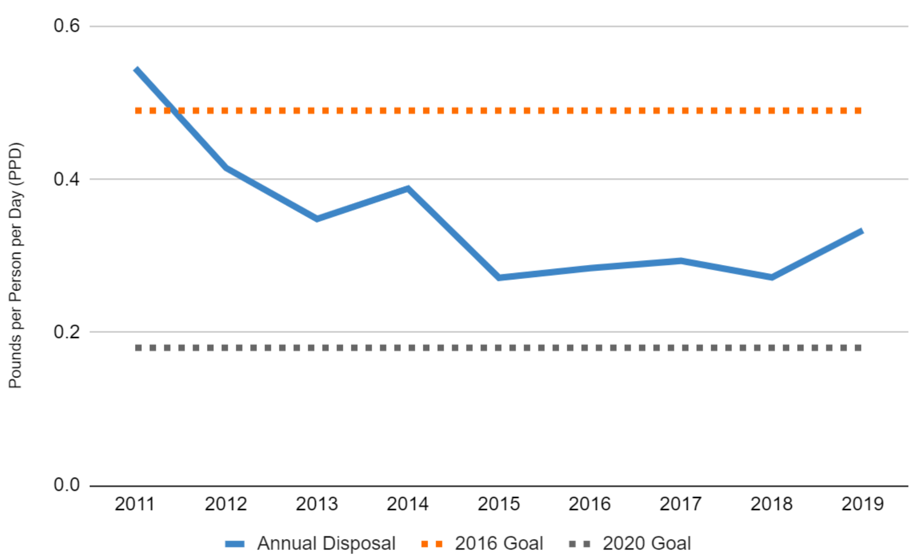
Implemented transportation strategies have included:

- Expansion of the Bicycle Learning Center to better serve more students;
- Implementation of a bikeshare program in partnership with the City of Arcata;
- Carpool program with dedicated parking spaces;
- Dedicated rooms on campus with technology for remote conferencing, and
- Annual Alternative Transportation Fair for new students.

4.4 Solid Waste

Waste, purchasing & food strategies were designed to reduce solid waste[16] disposal and thereby curb indirect emissions associated with its hauling and landfilling. These strategies focused on source reduction, improving recovery and recycling, and engaging the campus in waste reduction behaviors. CAP 1.0 had the goal of reducing per capita solid waste to 80% below 2006 levels by 2020 [17]. Although waste disposal has trended downward over the years, as of 2019 the campus was short of reaching this goal (Figure 9).

Figure 9. Solid Waste Disposal Rate



Implemented solid waste strategies included:

- Increased Construction & Demolition diversion rate from 50% to 65% and codified in Construction Management Guidelines;
- Enabled default double sided printing in networked printer/copiers to reduce paper waste;
- Implemented food recovery program to divert leftover food from Dining Services to the campus food pantry;
- Catering Services switched to durable tableware only and composting of unrecoverable leftovers, and
- Online posting system (CampusWall), pop-up thrift shop and clothing exchanges to increase re-use.

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[16] Solid waste at Cal Poly Humboldt refers to *all* waste going to the landfill. This includes municipal/residential solid waste, along with construction & demolition debris and hazardous waste.
[17] Waste reduction goals in CAP 1.0 were based on the 2014 CSU Sustainability Policy, which included an interim goal of achieving 50% of the 2006 disposal rate by 2016.

4.5 Catalysts

Catalysts did not fit neatly into any particular strategy category. Rather, these were strategies that were cross-cutting in nature and expected to facilitate the implementation of other strategies in CAP 1.0. Successfully implemented catalyst projects included:

- Formalization of an advisory committee on sustainability;
- Establishment of a green fund to provide seed money for student engagement and sustainability projects;
- Implementation of building level utility meters with automated controls, and
- Annual sustainability literacy assessment[18] to evaluate student competency, behaviors and perceptions.

4.6 Next Steps

Overall declines in campus energy consumption, combined with strengthened RPS requirements, fuel efficiency standards, less artificial heating required due to a warming climate and other internal and external factors, have led to ongoing reductions in greenhouse gas emissions over time. Indeed, successful implementation of some CAP 1.0 strategies directly contributed to these reductions. However, those strategies in the plan with the greatest potential for reducing emissions - commercial onsite solar, adoption of green building standards that go beyond LEED *Silver*[19], and purchasing electricity from 100% renewable sources - did not move forward, due primarily to a dearth of human and monetary capital. As we move forward with an eye towards carbon neutrality by 2045, Humboldt must commit to these and other large projects, and if needed leverage creative financing schemes to overcome financial barriers.

5.0 Strategies to Achieve Carbon Neutrality

The following pages present recommended goals and strategies to move Cal Poly Humboldt towards carbon neutrality and resilience to climate change impacts. See the Appendix for the specific actions recommended to facilitate implementation of each strategy, along with a summary of the (a) co-benefits and identified challenges associated with strategy implementation; (b) anticipated GHG reductions; (c) economic impacts; (d) the feasibility of strategy implementation; (e) related plans or policies that may drive adoption of strategies, and (f) the department or division identified to lead strategy development and implementation. Development of goals, strategies and actions took into account equity and social justice, to ensure that the benefits of any actions or programs reach all people, especially disadvantaged communities and populations. All recommended strategies herein will be subject to further administrative review and funding availability, and until analyzed on a

[18] The Sustainability Literacy Assessment is a longitudinal survey conducted each fall (with new students) and each spring (with graduating students.

[19] According to the 2014 CSU Sustainability Policy, The CSU shall design and build all new buildings and major renovations to meet or exceed the minimum requirements equivalent to LEED "*Silver*."

project by project basis, the true cost and the full potential for GHG reductions may not be fully determined.

5.1 Strategies to Reduce Emissions from Natural Gas, Electricity and Fleet Fuel

This section outlines strategies to curb Scopes 1 and 2 emissions and to adapt our buildings, utilities and fleet infrastructure to climate change impacts. Buildings are the largest users of energy and the largest source of greenhouse gas emissions for the campus. Designing, operating and maintaining our buildings in ways that provide a safe, healthy and accessible indoor environment can simultaneously mitigate our buildings' impact on the outdoor environment. Implementing energy efficiency measures, phasing out fossil fuels through electrification, and powering our campus with on-site and purchased renewable energy will further curtail emissions while saving money and protecting Humboldt from utility rate volatility and the consequences of climate change events.

Figure 10. Buildings, Energy & Fuels (BEF) Goals, Strategies and Actions

BEF Goal 1	**All owned/operated buildings will generate zero direct emissions by 2045**
Strategy 1.1	By 2025, 50% of new major renovations of state buildings will be zero net energy (ZNE). By 2030, 50% of buildings will be retrofitted to ZNE and all new construction will be ZNE.
BEF 1.1.A	All new buildings and major renovations are built in accordance with the CSU Sustainable Building guidelines to meet LEED *Gold* equivalency.
BEF 1.1.B	Utilize the CSU Building Decarbonization Framework and Lifecycle Cost Analysis (LCCA) for new capital and renewal project planning/scoring.
BEF 1.1.C	To the extent possible, design all new construction and major renovations to exceed Title 24 Energy Code by 10%.
Benefits	• Shifts focus from first-cost construction practices to long-term cost effective operation • Provides students and employees with healthy, functional and resilient facilities • Better buildings improve productivity, promote health and inspire their users. • STARS credits
Challenges	• Extra capital needed to meet green standards. • Realized utility savings may have long payback periods.
GHG Impact	Large: Commercial buildings built to green standards can achieve over 30% in GHG emissions reductions.
Economics	Neutral: Green building practices have a large initial cost but will garner savings over the life of the building from reduced operations and maintenance, as well as improved productivity from a better working environment. Green buildings also typically cost 20% less to operate than standard commercial buildings.
Feasibility	Achievable with some challenges: Much easier to include efficiency at the forefront of design than retrofitting existing buildings. Additional time and money may be needed for construction projects, plus expertise needed to overcome “value engineering” and “first-cost bias.” Could take several years to implement policy and design standards.

Related Plans	California Energy Efficiency Strategic Plan: 50% of new major renovations of state buildings will be ZNE by 2025, and all new commercial construction will be ZNE by 2030[20]; and, CSU Compliance Requirements for 2016 and 2019 Title 24 Building Energy Efficiency Standards[21], which sets a target for CSU buildings to equal or exceed 10% better performance than Title 24 energy standards.
Lead	Planning, Design & Construction

Strategy 1.2	Adopt whole-building performance targets for campus buildings to further energy and water efficiency.
BEF 1.2.A	Extend comprehensive metering to all existing and planned buildings.
BEF 1.2.B	To the extent possible, develop energy use intensity (EUI) and water use intensity (WUI) baselines and reduction targets for different building/space types - and for the entire campus - to inform project design and development.
BEF 1.2.C	Develop baseline and reduction targets for campuswide per capita energy and water use.
BEF 1.2.D	Utilize building level dashboards and monitoring to adjust HVAC and electrical systems and to conduct continuous commissioning.
Benefits	• Improved temperature control, indoor air quality, light quality and safety leads to improved comfort, health and productivity • Quickly identify and address energy and water use anomalies • Reduce analog meter read and billing charge-back mistakes • Meter data provide student research opportunities • Can integrate demand response for further cost savings • STARS credits
Challenges	• Low to moderate initial capital outlay for individual projects • Discarded fluorescent lamps are an environmental hazard
GHG Impact	Moderate to Large: Substantial GHG reductions could be realized due to large energy demand that HVAC, lighting and computing requires.
Economics	Net Savings as a result of reductions in water, natural gas and electricity consumption and peak demand reductions. New meters for un-metered buildings may cost ~$50-66,000 per building, but quick payback will be realized through increased control, quicker response, and behavior change.
Feasibility	Achievable: May require some engineering/design and commissioning work, but financing opportunities exist that guarantee a projected return on investment.
Lead	Facilities Management

[20] See zero net energy goals in the California Energy Efficiency Strategic Plan.
[21] See the CSU Compliance Requirements for 2016 and 2019 Title 24 Building Energy Efficiency Standards.

Strategy 1.3	Reduce natural gas consumption below 2018-19 levels by 50% by 2030, by 75% by 2040, and by 100% by 2045.
BEF 1.3.A	Adopt a Zero Scope 1 emissions infrastructure procurement policy, which prioritizes electrification of water, space heating and cooking equipment[22].
BEF 1.3.B	Strive to deliver 100% electric new construction and major building renovations.
BEF 1.3.C	Develop a plan for early retirement of existing natural gas fired equipment and its replacement with electric equipment.
BEF 1.3.D	Until retired, operate existing natural gas-fired boilers at the highest efficiency possible, including resetting temperatures, adjusting building HVAC run times and upgrading controls.
BEF 1.3.E	Specify low-GWP refrigerants for any new heat pump or equipment utilizing refrigerants.
Benefits	• Eliminate natural gas, the primary source for GHG on campus • Air source heat pumps can be used for either heating or cooling,, for space or water heating • Heat pumps can reach efficiencies of over 350% • Can be powered by 100% renewable energy • STARS credits
Challenges	• Large capital outlay to replace boilers with heat pumps and gas-fired cooking appliances with electric ranges, ovens, etc. • Heat pumps that utilize low-GWP refrigerants may be more expensive. • Power outage may require battery back-up or fossil fuel generator to power equipment
GHG Impact	Significant. Harry Griffith Hall annually emits ~63 MTCDE from natural gas. Electrification in this building is expected to reduce heating related emissions to ~34 MTCDE (based on current grid mix), a 54% reduction in emissions.
Economics	Net Savings: Can take 15+ years until return on investment, although equipment lifespan is 30+ years.
Feasibility	Challenging: Campus currently spends more on electricity than on natural gas, so need to overcome first-cost bias. Requires significant capital outlay to electrify all existing buildings and may require additional utilities and space redesign specific to each building. However, the campus is already underway with heat pump implementation. Best coupled with building envelope improvements.
Lead	Planning, Design & Construction

Strategy 1.4	Increase installation of solar photovoltaic energy systems on campus infrastructure to a minimum of 2.5 MW by 2025
BEF 1.4.A	Explore feasibility of power purchase agreements to install additional solar on rooftops and carports.
BEF 1.4.B	Require all new major construction and additions be built “solar ready”.
Benefits	• Reduce dependency on grid • Real-time solar metering provides student research opportunities • Very low operating expense and maintenance requirements • STARS credits

[22] See the CSU Chico Facilities Management Services Zero Scope 1 Emissions Procurement Policy.

Challenges	- Requires initial investment or long term contract with third party (i.e., power purchase agreement) - Unless roofing is relatively new, may need to remove rooftop arrays to replace roofing - Additional infrastructure and space required if installing parking lot canopy or ground mount solar - Interconnection fees may apply - Finding suitable vendors to do the installations
GHG Impact	Low to Moderate: A 1 MW system in the Humboldt Bay area may generate 878 MTCDE in annual reductions, ~30% of current emissions from purchased electricity, but electricity consumption is expected to rise as natural gas use is phased out.
Economics	Neutral to Net Savings: SGIP, CREBs and other financing and incentive options available for a campus-owned/operated system, can realize payback in 7-12 years. With power purchase agreement, can adopt a negative escalator to realize long term savings.
Feasibility	Achievable: can utilize the CSU solar master enabling agreement. CSU Chancellor's Office covers the cost of proposal and economic review. Power Purchase Agreements are turnkey and based on contractual agreement.
Lead	Planning, Design & Construction

BEF Goal 2	**Build resilience into campus buildings and infrastructure to adapt to, and continue to provide functionality during, climate change impacts**
Strategy 2.1	Ensure critical loads maintain power during power shut-off events utilizing low-carbon technologies.
BEF 2.1.A	Install solar microgrid with battery storage.
Benefits	- Maintains continuity during power outages and blackouts - Potential for economic benefit by reducing peak electric demand charges - Community asset during emergencies
Challenges	- Requires initial investment or long term contract with third party - May require additional utilities and other infrastructure
GHG Impact	Low: Depends on size of microgrid and how and when solar generated electricity and battery electricity are dispatched.
Economics	Net Cost: Some utility cost savings can be realized if battery electricity is dispatched during peak times and as part of a demand response program. Solar and battery systems can be developed through power purchase agreements. Estimate $1-2 million to develop the microgrid.
Feasibility	Challenging but achievable: The campus worked with the Schatz Energy Research Center to conduct a feasibility study and has since released a Request for Proposal. Large initial capital outlay but SGIP and other grants, incentives and financing mechanisms may apply.
Lead	Planning, Design & Construction

BEF Goal 3	Zero emissions fleet by 2045
Strategy 3.1	Adopt and implement a long-range plan for transitioning fleet and Grounds equipment to zero emissions.
BEF 3.1.A	Implement a purchasing policy requiring 100% of all light duty vehicle purchases be ZEV or PHEV by 2025, unless there is not an available EV/PHEV model that can meet the required functionality. By 2030, only ZEV can be purchased for fleet light duty vehicles.
BEF 3.1.B	Plan for full transition of off-highway vehicles and equipment (includes Athletics and Grounds vehicles and forklifts) to ZEV as soon as feasible but no later than 2035.
BEF 3.1.C	Until replaced by a ZEV alternative, use lower carbon fuels when possible in fleet and fossil fuel-powered equipment.
BEF 3.1.D	Convert Grounds small off-road engine (SORE) equipment (i.e., mowers, trimmers, blowers) to all-electric by year determined by California Air Resources Board[23] but no later than 2030.
BEF 3.1.E	Transition all buses in the campus fleet to zero emission as soon as possible but no later than 2040.
BEF 3.1.F	Pilot electric assist cargo bikes for mail delivery and other on-campus uses.
BEF 3.1.G	Enhance charging infrastructure to match adoption of electric fleet vehicles.
Benefits	• Reduce air and noise pollution • Health benefits for employees • Reduce reliance on fossil fuels • STARS credits
Challenges	• Run time based on battery capacity • Charging infrastructure required, adding to cost • May require replacement batteries over lifetime of equipment • Batteries require non-renewable metals with their own set of negative environmental impacts
GHG Impact	Moderate: ZEV fleet can reduce fleet vehicle emissions over 80% (based on current California electrical grid mix)[24]. A new gas-powered mower running for 1 hour produces similar emissions to the average car driving 100 miles[25]. Campus can realize ~66% reduction in emissions in Grounds SORE equipment.[26]
Economics	Net Savings: zero emission alternatives may cost more initially, although costs are coming down as ZE increases market share. Savings will be realized by fuel switching and reduced maintenance[27]. Incentive programs or leasing options available to reduce upfront cost. ROI for SORE equipment can be ~3 years.
Feasibility	Achievable with some Challenges: Fast charging infrastructure will be required. Mechanics may need additional training, but maintenance will be less compared to gas-powered vehicles/equipment.

[23]Per California AB 1346, the California Air Resources Board unanimously voted to phase out manufacture and sales of gas powered lawn and garden equipment starting in 2024.

[24] Alternative Fuels Data Center, U.S. Department of Energy: https://afdc.energy.gov/vehicles/electric_emissions.html

[25] See California Air Resources Board, https://ww2.arb.ca.gov/our-work/programs/zero-emission-landscaping-equipment

[26] See *Report on Gas vs Battery Powered Maintenance Tools on the University of Arkansas Campus*, https://sustainability.uark.edu/_resources/publication-series/project-reports/reports-electric_power_tools_ua-2017-ofs.pdf

[27] For cost comparisons of EV vs ICE, see PG&E's EV Savings Calculator.

Related Plans	ICSUAM Section VIII, Section 9171: 10% of all light-duty fleet purchases by campuses and CSU shall be zero emissions vehicles (ZEV) in FY 2017/18, increasing by 5% annually through FY 2024/25 to a total of 50% of light duty fleet vehicles purchases. EO N-79-20: Governor's order banning sales of gas powered vehicles starting in 2035. Directs CARB to phase out gas-powered passenger vehicles and certain freight trucks by 2035, and medium and heavy duty trucks by 2045. It calls for (a) 100% sales of zero-emission passenger vehicles by 2035, (b) full transition to zero-emission short-haul trucks by 2035, (c) full transition of buses and heavy-duty long-haul trucks to zero emission where feasible by 2045, and (d) full transition of off-road vehicles and equipment operations in the State to ZEV by 2035. CA Assembly Bill 1346: Requires the California Air Resources Board to set emissions requirements for small off-road engines to zero by 2024.
Lead	Facilities Management

According to a Business-As-Usual (BAU) Scenario, the university will need to reduce its emissions by approximately 7,622 MTCDE to achieve Scopes 1-2 carbon neutrality. Figure 11 and Table 6 illustrate the estimated GHG reductions from key source reduction and carbon offset/sequestration strategies proposed in the CAP 2.0. Note that, by default, carbon content of electricity purchases will continue to decline per SB 100 requirements, but Humboldt will continue to prioritize the purchase of high renewable power content/low unspecified power content grid electricity as it develops on-site renewable energy generation.

Figure 11. Estimated Scopes 1-2 Reductions Following Key Strategy Implementation

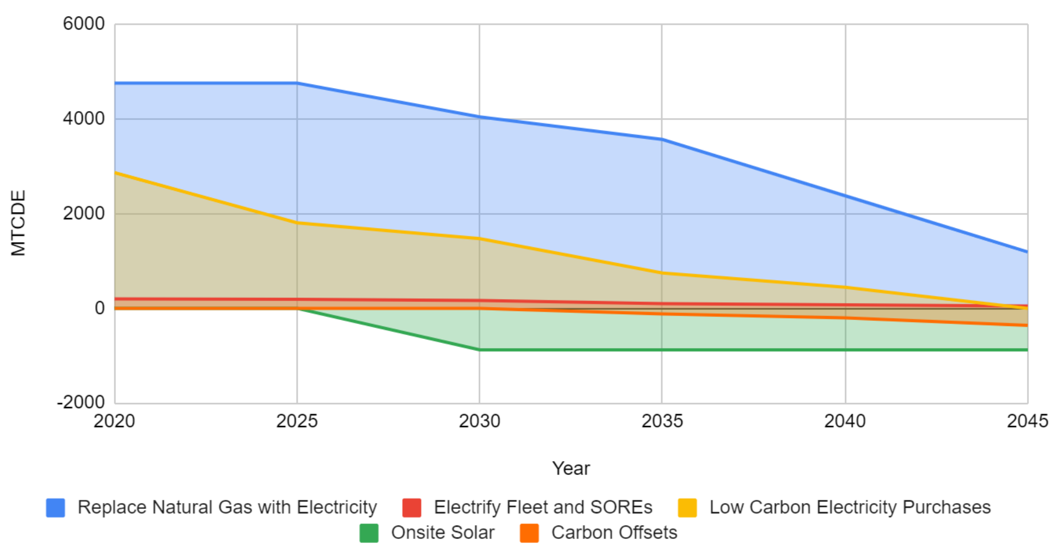

Table 6. Estimated GHG Reductions Resulting from Scopes 1-2 Strategy Implementation

Year	Scope 1		Scope 2	Mitigation		Total (MTCDE)
	Natural Gas (MTCDE)	Campus Fleet and SOREs	Purchased Electricity	On-Site Solar	Carbon Offset	
2020	4756	199	2866	0	0	7821
2025	4756	190	1806	0	0	6752
2030	4043	165	1473	-878	0	4803
2035	3567	100	747	-878	-120	3416
2040	2378	75	444	-878	-200	1819
2045	1189	50	0	-878	-361	0

5.2 Strategies to Reduce Emissions from Commuter and Business Travel

Scope 3 emissions are attributed to non-fleet transportation to and from campus. This includes student, faculty and staff commuting as well as business-related air travel, which combined accounted for over 40% of the University's quantified carbon footprint in 2019-20. By committing to Scope 3 carbon neutrality by 2045, the campus must take aggressive action to reduce the number of single occupant vehicle (SOV) trips, foster alternative transportation programs and infrastructure, improve access to public transit, and adopt provisions to limit business travel. Furthermore, by lessening our dependence on fossil fuels, Cal Poly Humboldt can positively impact human and ecological health while supporting local economies and equitable transportation systems. These actions are in line with the CSU Transportation and Parking Policy, which requires campuses to prioritize bicycle, pedestrian, and transit (BPT) commute modes over additional vehicle parking infrastructure.[28]

Figure 12. Transportation (TRA) Goals, Strategies and Actions

TRA Goal 1	**Reduce commute emissions 50% below 2015 levels by 2030, and to zero by 2045**
Strategy 1.1	Develop and implement a Transportation Demand Management (TDM) Plan
TRA 1.1.A	Form an alternative transportation committee to oversee development of the TDM plan and implementation of its strategies.
TRA 1.1.B	Ensure sufficient staffing to implement a comprehensive sustainable transportation program, which may include hiring a sustainable transportation coordinator.

[28] See the CSU Transportation and Parking Policy (PolicyStat ID: 7728108).

TRA 1.1.C	Integrate TDM and "Complete Streets" design into campus master planning and environmental impact analyses.
Benefits	• Guides the shift from single occupancy automobile travel to transit, rideshare, bicycle or pedestrian travel • Leads to more efficient use of transportation resources • TDM strategies provide economic, social and environmental benefits • Leads to Improved transportation accessibility and equity
Challenges	• Staff and committee time • May need to hire third party
Economics	Net Cost: If not done in-house, development of a TDM plan may cost $20-40,000.
Feasibility	Achievable: HSU already has a Parking & Transportation Committee, strong partnerships with local transit agencies, and some alternative transportation programs.
Related Plans	CSU Transportation and Parking Policy: Requires campuses instate an alternative transportation committee and develop a TDM plan Humboldt Parking Market Demand Study (2018): Includes strategies to reduce parking constraints by supporting public transit and alternative transportation programs
Lead	Facilities Management

Strategy 1.2	Adjust parking policies, programs and infrastructure to reduce number of personal, non-zero emission vehicles on campus
TRA 1.2.A	Rebrand "Parking & Commuter Services" to "Commuter Services."
TRA 1.2.B	Update websites and other campus media to prioritize alternative transportation over parking.
TRA 1.2.C	Disallow student general parking permits for students living within 1.5 mile radius from campus with certain exceptions.
TRA 1.2.D	Develop policy to limit first year campus residents from bringing a personal vehicle to campus with certain exceptions.
TRA 1.2.E	Participate in regional partnerships to establish park-n-ride opportunities for students, faculty and staff.
TRA 1.2.F	Develop off-site parking, with bike/ped and/or transit access to campus, for reduced cost and long term parking.
TRA 1.2.G	Once off-site parking is developed, increase on-campus parking fees for campus residents above cost for non-resident users.
TRA 1.2.H	Explore the possibility of offering 3 - 5 discounted daily parking permits per semester to commuters that pledge to use alternative transportation as primary modes of travel.
TRA 1.2.I	Increase the number of carpool-only parking stalls on campus.
TRA 1.2.J	Develop EV charging infrastructure plan, in partnership with regional transportation partners, to match anticipated growth in EV usage[29].

[29] The California Air Resources Board anticipates 8 million out of 28 million (28.5%) of light duty vehicles in the state will be ZEV by 2030. See Figure 15 of the 2020 Mobile Source Strategy report.

TRA 1.2.K	Develop parking area(s) and "green" permit pricing for e-scooters, e-mopeds and other non-gas powered vehicles that cannot use traditional parking stalls or bike parking.
Benefits	• Alleviate parking constraints on campus • Reduce air and noise pollution • Improve campus walkability/bikeability • More users of local transit means improved transit services • EV charging on campus could be a revenue stream
Challenges	• Potential loss of parking permit/ticket revenue • May be challenging to accurately identify current address of students • May increase student parking on nearby city streets and neighborhoods • HSU's electricity consumption goes up as EVs get charged on campus
GHG Impact	Large: Potential annual GHG reductions of 500 - 800 MTCDE
Economics	Neutral: Some parking permit revenue may be lost, but savings will be realized through the reduction in size of costly additional parking facilities. There may be costs associated with operating off-site parking. HSU can charge for EV charging to recoup the cost of charging infrastructure.
Feasibility	Challenging: Some campuses (including CSUs) already prevent first year students from bringing vehicles on campus. May require improvements in local transit service to accommodate more student riders.
Lead	Administration & Finance

Strategy 1.3	Improve walkability and bikeability of campus and area surrounding campus
TRA 1.3.A	Strive towards achieving Bicycle Friendly University status[30].
TRA 1.3.B	Investigate feasibility of widening sidewalks on B Street, Laurel, Union and 17th streets to accommodate pedestrians during peak usage.
TRA 1.3.C	Identify feasible safety improvements for bicycles turning across traffic to enter or exit campus (i.e., at the LK Wood intersections with Sunset Ave., Plaza Ave., and Harpst St.).
TRA 1.3.D	Integrate secure, sheltered and inclusive[31] bicycle parking facilities into the design of all new construction of on-campus and off-campus housing and any new passenger vehicle parking facilities.
TRA 1.3.E	Include showers and secure, sheltered and inclusive bicycle parking facilities in the design for all new non-residential construction, while pursuing opportunities to add bicycle facilities to/outside of existing buildings.
TRA 1.3.F	Install charging infrastructure for electric bicycles.
TRA 1.3.G	Lay down clearly marked, ADA accessible crosswalks at street locations commonly crossed by pedestrians (e.g., Laurel/Sequoia, on B Street midway between Harpst and Laurel, and on B Street on the west side of the Natural Resources building).
TRA 1.3.H	Participate in local and regional collaboratives for planning and designing walkable/bikeable networks between campus and adjacent neighborhoods/city streets.

[30] Bicycle Friendly University designation, League of American Bicyclists.
[31] Inclusive bicycle parking facilities can accommodate adaptive cycles (e.g., hand bikes, tricycles), recumbents and cargo bikes.

TRA 1.3.I	Investigate feasibility of developing a separated bikeway along the east side of LK Wood, extending from the north end of campus to the south end.
Benefits	• Improves safety of campus users • Incentivizes low carbon mobility • Reduces time to cross campus by foot or by bike • Publicity impact
Challenges	• May slow motorists, including service vehicles and truck deliveries • Addition of infrastructure will take staff time and some costs
GHG Impact	Unknown, but will contribute to emissions reductions as more students, faculty and staff choose alternatives to driving.
Economics	Net Cost to widen sidewalks, develop crosswalks and other infrastructure
Feasibility	Doable to Challenging: Some of these strategies will require significant capital outlay and staff time. For example, it may require some re-engineering of roadways to accommodate sidewalk expansions that could cost $100,000+.
Lead	Facilities Management

Strategy 1.4	Support and expand alternative transportation programs
TRA 1.4.A	Expand bikeshare and carshare programs, including adding bikeshare stations and car share vehicles into design and planning for construction of off-campus housing.
TRA 1.4.B	Institutionalize and support annual Alternative Transportation Fair and other outreach campaigns to encourage incoming students and new hires to utilize alternative transportation options and resources.
TRA 1.4.C	Develop Guaranteed Ride Home (GRH) program for employees and qualifying students who choose to carpool, take public transit, bike or walk to campus[32].
TRA 1.4.D	Develop a Sustainable Transportation Rewards program/commuter club to encourage, support and track alternative transportation mode adoption[33].
TRA 1.4.E	Provide new students, faculty and staff with discounted use of car sharing and bike sharing programs.
Benefits	• Builds transportation equity • Improves safety of campus users • Incentivizes low carbon mobility • Hassle free parking for carshare users
Challenges	• Staff time to develop and manage programs
GHG Impact	Unknown, but will contribute to emissions reductions as more students, faculty and staff choose alternatives to driving.
Economics	Net Cost: Bikeshare program generates some revenue but costs ~$18,000/yr; minimal cost to operate GRH program; ZipCar and carpool networking are zero cost to the campus.
Feasibility	Achievable: many of these programs have been or currently are in place.

[32] See the CSU Long Beach Guaranteed Ride Home (GRH) program.
[33] For example, see the Indiana University Hoosier Commuter Club.

Lead	Office of Sustainability, Parking & Commuter Services

Strategy 1.5	Support improvement of public transit services to the campus
TRA 1.5.A	Collaborate with regional transit agencies to better align bus schedules with class times, to encourage routes to/from neighborhoods with high student density, and to identify additional funding to increase frequency of regional transit services.
TRA 1.5.B	Upgrade transit stop facilities to improve accessibility, lighting, safety and comfort.
Benefits	• Equitable, accessible, safe and convenient transportation for all • Improved transit reduces car trips to campus • Reduces transportation expenses for students
Challenges	• Difficult for local transit to add drivers and increase frequency before there are more riders to subsidize these additions • Student body must vote to raise Jack Pass student fee • Staff time to work with local transit agencies
GHG Impact	Unknown, but will contribute to emissions reductions as more students, faculty and staff choose public transit over driving.
Economics	Neutral to Net Cost: Jack Pass is funded through an Instructionally Related Activities (IRA) fee levied on students, but costs will be associated with upgrading transit stops.
Feasibility	Doable: Requires coordination between Associated Students and University, and student support. May require a slight increase to the IRA fee to cover a summer session Jack Pass.
Lead	Administration & Finance

Strategy 1.6	Adopt additional provisions to reduce employee trips to/from campus
TRA 1.6.A	Support telecommuting arrangements when determined to be operationally feasible[34].
TRA 1.6.B	Consider expansion of flextime options for staff, e.g., working four, ten hour days, when determined to be operationally feasible.
TRA 1.6.C	Support expansion of on-campus childcare capacity for faculty, staff and student parents.
TRA 1.6.D	Survey faculty and staff to gauge interest and conduct cost/benefit analysis for making free or reduced transit passes available to all non-student employees.
TRA 1.6.E	Explore the possibility of incentivizing active commuting through a health insurance discount program.
Benefits	• Reduces commute pressures • Reduces campus utility use • Increases job satisfaction and productivity • Better meet family and personal needs
Challenges	• Can hinder communication and teamwork • Some loss of community • Additional staff, space and coordination to increase childcare capacity

[34] As of 12/15/21 the campus had not opted-in to the California State University Telecommuting Program.

GHG Impact	Unknown, but will contribute to GHG emissions reductions resulting from fewer commute trips. Campus energy, water and waste reduction can also be realized with remote work.
Economics	Neutral to Net Savings: University may save money on utilities and on a reduction in parking facility maintenance costs..
Feasibility	Doable: HSU already has temporary telecommuting and flextime policies in place and will be constructing a new children's center.
Lead	Administration & Finance

TRA Goal 2	**Reduce business air travel emissions by 50% of 2015 levels by 2030**
Strategy 2.1	Educate air travelers on their impact while enhancing alternatives to air travel
TRA 2.1.A	Formalize a process for collecting and reporting business travel carbon emissions, and make emissions impact visible to travelers.
TRA 2.1.B	Consider minimum justification criteria for requesting state funds for air travel.
TRA 2.1.C	Continue to enhance facilities and equipment for high-quality remote conferencing capabilities.
TRA 2.1.D	Promote the "Nearly Carbon-Neutral Conference Model" for cost/emissions reductions, improved discussion and greater dissemination of ideas.
Benefits	• Educates travelers on the GHG impacts of their travel choices • Directs dollars spent on unnecessary travel to better serving students
Challenges	• Staff time to develop procedures and tracking/reporting process • Resources to improve video-conferencing capabilities • Can hamper communication and teamwork
GHG Impact	Moderate: Estimated potential annual GHG reductions of 350 - 525 MTCDE if realized reduction in air travel by 10-15%.
Economics	Net Savings: cost savings realized in travel budgets.
Feasibility	Doable: Concur travel request process can track emissions, and the campus has established systems for remote conferencing.
Lead	Administration & Finance

5.3 Strategies to Reduce Emissions from Solid Waste and Purchasing

This section outlines strategies to curb Scope 3 emissions attributed to solid waste disposal and to expand adoption of zero waste guidelines in purchasing and procurement practices. Zero Waste is a strategy by which Humboldt can take a whole systems approach to products, services and processes, to systematically eliminate the volume and toxicity of waste, and to conserve and recover resources. Zero waste encourages the redesign of resource lifecycles, so that all materials can be reused, returned or recycled. Although recycling and organics diversion are critical components to a zero waste program, emphasis is placed first and foremost on source reduction and reuse. These initiatives decrease the extraction of virgin materials from the earth and shrink the waste flow to landfills that contaminate air and water, produce carbon emissions and tend to have disproportionate negative impacts on lowest income communities of color. Zero waste initiatives also reduce water and fuel consumption while saving on costly landfill and hauling fees. Thus, each purchasing decision represents an opportunity to choose environmentally and socially preferable products and services that support sustainability and equity.

Figure 13. Solid Waste and Purchasing (SWP) Goals, Strategies and Actions

SWP Goal 1	**Humboldt is a zero waste campus by 2045**
Strategy 1.1	Develop and implement a Zero Waste Action Plan to achieve 50% below 2015 levels by 2030 and 80% below 2015 levels by 2040 for residential and commercial waste (measured in pounds per person per day, or PPD)
SWP 1.1.A	Incorporate waste reduction elements and infrastructure into new construction and major remodel design (e.g., insets in hallways to accommodate compost/recycle/landfill receptacles).
SWP 1.1.B	Develop interior/exterior building waste management standards and cut sheets specifying bin types, recommended placement, signage, access requirements, etc. for utilization by architects in planning and building design.
SWP 1.1.C	Participate in and support local and regional efforts to develop a commercial facility that can accept pre- and post-consumer food waste and compostable products.
SWP 1.1.D	Implement bin centralization, coupled with an occupant education campaign, in buildings where feasible (i.e., remove bins from classrooms and common rooms, office occupants empty deskside bins into hallway receptacles).
SWP 1.1.E	Encourage all departments with break rooms to participate in the compost bucket program.
SWP 1.1.F	Make more indoor and outdoor waste receptacle sets of 3 (recycle/compost/landfill) with appropriate colors and signage while reducing the overall number of waste receptacles on campus, in Dining Services and in Housing.
SWP 1.1.G	Develop waste education modules, to be integrated into new student and new employee orientations, and to be offered as an ongoing training.
SWP 1.1.H	Reduce the amount of plastic-packaged food sold on campus by instituting more self-serve options (e.g., bulk bins, fountain drinks, salad bars) and by including restrictions on packaging in agreements with food trucks and vendors.
SWP 1.1.I	Identify additional departments to participate in a disposable glove recycling program.
SWP 1.1.J	Continue to adopt digital processes to replace paper-based processes.
SWP 1.1.K	Implement paper towel composting in restrooms while phasing out paper towel dispensers for electric hand dryers, where feasible.
SWP 1.1.L	Require events held on campus be zero waste when feasible and practical.

Benefits	• Decrease labor and costs associated with campus waste management • Reduce tip fee costs for waste disposal • Lessen dependency on landfills • STARS credits
Challenges	• Initial cost to purchase additional waste receptacles and other collection equipment • Requires additional training for custodial services • Requires greater, sustained participation by all faculty and staff
GHG Impact:	Low: Landfilled solid waste only accounts for approximately 1.0% (130 MTCDE) of the campus' carbon footprint.
Economics:	Neutral: Cost savings from tip fee and labor reductions will offset initial costs over time.
Feasibility:	Challenging: Requires orientation of custodial services, Facilities Management and purchasing towards zero waste methods and thinking.
Related Plans:	CA SB 1383: Requires organics/food waste collection service and edible food recovery programs at universities[35] CA AB 1826: Businesses generating 2 cubic yards of waste per week are required to recycle organic waste
Leads:	Housing and Facilities Management

Strategy 1.2	Reduce waste associated with campus resident move-out by 25% below 2019 levels by 2025.
SWP 1.2.A	Increase opportunities and improve accessibility for residents to donate, compost and recycle items as they move out of residence halls.
SWP 1.2.B	Require any new housing owned or operated by Humboldt be designed with space to accommodate Donation Stations and other waste reduction infrastructure.
Benefits:	• More donatable goods benefits local charities and the community • Helps campus meet its waste diversion goals • Educates student residents on waste reduction and proper sorting
Challenges:	• Requires additional labor (includes students and FM staff) • More staff time and resources to conduct education and outreach to campus residents
GHG Impact:	Low: A conservative estimated increase in diversion of 4.5 tons of donatable goods, 0.83 tons of organics and 0.56 tons of recycling = 10 MTCDE.
Economics:	Neutral: local charities and students volunteer at Donation Stations, savings in tip fee covers some additional costs.
Feasibility:	Doable with some challenges: Donation Station locations must be accessible by truck, which may limit options. Requires additional coordination with charities, Housing and Recology.
Lead:	Facilities Management

[35] For more information, see the SB 1383 Short-Lived Climate Pollutants law

SWP Goal 2	Reduce non-hazardous construction and demolition waste going to the landfill
Strategy 2.1	Divert a minimum of 65% of non-hazardous construction and demolition waste; by 2030 increase diversion rate to 75%.
SWP 2.1.A	Require contractor compliance with each California Green Building Standards Code cycle waste diversion requirement for non-hazardous construction and demolition waste.
SWP 2.1.B	Work with the CSU to update CSU Division 1 General Conditions to specify waste reduction and recycling/diversion requirements for contractors.
SWP 2.1.C	Develop and continually update construction and demolition reuse & recycling guides for contractors.
SWP 2.1.D	Develop and implement contractor training on waste diversion prior to job start.
Benefits:	• Reduces impacts of transport and landfilling of C&D debris • Aligns with green building (e.g., LEED) criteria • STARS credits
Challenges:	• Limited number of local recycling & salvage businesses for C&D debris • Staff time to develop guide and to enforce guidelines
GHG Impact:	Low: 40-100 MTCDE reduced per project at 65% diversion rate depending on size and scope of project.
Economics:	Neutral: Contractors absorb any additional costs or savings related to increasing diversion.
Feasibility:	Doable: SUAM General Conditions Section 01151 already requires waste and recycling plans and reporting by Contractors; Section 5.408 in the 2016 Green Building Standards Code already requires a 65% diversion rate.
Lead:	Construction, Planning & Design

SWP Goal 3	**By 2030 prioritize the procurement and use of materials, goods, and supplies that are recycled, reused, repurposed or returned at the end of life.**
Strategy 3.1	Implement policies and procedures to maximize the use of suppliers and vendors with sustainable practices in campus contracting activities.
SWP 3.1.A	When possible, implement a bid evaluation preference for sustainability criteria when procuring category specific[36] supplies and equipment.
SWP 3.1.B	Prioritize product packaging that is designed, produced, and distributed to the end user in a sustainable manner, and in coordination with campus waste and local waste management capabilities.
SWP 3.1.C	Educate personnel purchasing goods and services on the sustainability criteria, such as adding a sustainable purchasing module to Pro-card training.
SWP 3.1.D	Increase percentage of purchased electronics certified EPEAT Gold and/or third party certified at the highest achievable level under multi-attribute sustainability standards.
SWP 3.1.E	Increase percentage of janitorial cleaning and paper products that meet green certification criteria.

[36] See Appendix 10.2 Category Specific Sustainability Criteria for details.

SWP 3.1.F	Expand paper purchasing policy P19-01 to include stationery, envelopes and other office paper.
Benefits	• Complies with CSU and State purchasing policies • Reduces solid waste generation • Reduces costs and labor associated with waste management • Improves environmental quality • STARS credits
Challenges	• Additional staff time to develop procedures and train buyers • May reduce the number of product choices • Sustainable alternatives may be more expensive • Dearth of local entities able to accept hard-to-recycle materials
GHG Impact	Low: Potential annual reduction to campus carbon footprint (estimate 40 - 80 MTCDE resulting from waste reduction), but moderate Scope 4 reductions could be realized.
Economics	Small Net Cost: Additional cost of sustainable products may outweigh reduction in landfill costs.
Feasibility	Achievable with Some Challenges: Campus already purchases recycled paper, some EPEAT and certified green cleaning products. Challenge will be to develop and abide by a process for evaluating and selecting vendors and products.
Related Plans	Humboldt Policy P19-01: requires exclusive purchase of 100% recycled or 100% agricultural waste fiber paper for general use white paper[37] CSU Single-Use Plastics Policy: Requires elimination of single-use plastic and polystyrene products[38] CSU Sustainable Procurement Policy: Requires evaluating product selection based on sustainability criteria and reducing packaging waste[39]
Lead	Contracts & Procurement

SWP Goal 4	**Reduce the embodied carbon of specified construction materials by 50% of 2022 levels by 2030**
Strategy 4.1	Reduce Scope 4 emissions by only purchasing specified building materials with a global warming potential below the industry average
SWP 4.1.A	Evaluate project bids based on contractor disclosure of environmental product declarations for concrete, glass, steel and other specified materials.
Benefits	• Complies with State and DGS purchasing policies • Reduces embodied carbon of our buildings • Encourages manufacturer shift towards lower carbon materials
Challenges	• May require update to bid, evaluation and reporting guidelines and procedures • May reduce the number of product choices • Lower carbon alternatives may be more expensive
GHG Impact	High: Significant Scope 4 reductions.
Economics	Small Net Cost: Lower carbon construction materials may cost more than traditional materials.

[37] See Policy P19-01 requiring use of chlorine free, 100% recycled or 100% agricultural waste fiber paper.
[38] For more information, see the CSU Single Use Plastics Policy.
[39] A CSU Sustainable Procurement Policy (5325.00) was still in draft form as of Dec 2021.

Feasibility	Achievable.
Related Plans	AB 262 Buy Clean California Act: Targets embedded carbon emissions of certain construction materials[40] AB 262 Step-By-Step Guide: Guidelines for CSUs[41].
Lead	Contracts & Procurement

5.4 Carbon Sequestration and Offset Strategies

Carbon sequestration is the process by which trees, grasses and other plants remove carbon dioxide from the atmosphere to be stored as organic carbon in forest biomass and soils. Forests managed for carbon sequestration offer a method for offsetting emissions associated with institutional activities. The L.W. Schatz Demonstration Tree Farm (385 acres), the Jacoby Forest (880 acres), the Bello Forest (400 acres) and other campus properties offer such an opportunity. Carbon offset programs are another approach for the campus to compensate for emissions caused by its activities. Carbon offsets can be bought and sold to transfer climate benefits between entities while in turn helping fund reforestation and other GHG reduction projects. Locally, the Arcata Community Forest is a verified forest carbon offset program through the Climate Action Reserve[42].

Humboldt will prioritize strategies to replace sources of emissions, reduce existing emissions, and avoid new emissions. However, it may be that these actions alone will not completely zero out Humboldt's emissions by 2045. For example, the campus may still use some natural gas for discrete purposes in the ceramics, sculpture and research labs. Investment in sequestration and establishment of internal carbon pricing and offset programs - in particular those that support the academic mission, contribute to community resilience, support local projects, and otherwise produce corollary social and environmental benefits - may be necessary tools for achieving our targets.

Figure 14. Carbon Sequestration & Offset (CSO) Goal, Strategies and Actions

CSO Goal 1	**By 2045, any remaining GHG emissions are mitigated through sequestration and carbon offset programs or purchases**
Strategy 1.1	Identify and manage for carbon sequestration on Humboldt managed properties
CSO 1.1.A	Formalize management for carbon sequestration in forest management plans, for forests held by the Humboldt Foundation and by the University.
CSO 1.1.B	Develop a program with the Dept of Forestry & Wildland Resources to train students to conduct regular carbon inventories, and to calculate carbon sequestration, of campus trees[43].
CSO 1.1.C	Explore the feasibility of retiring carbon credits from the Jacoby Creek Forest.

[40] California Assembly Bill 262, the Buy Clean California Act.
[41] See the guidelines in the AB 262 Step-by-Step Guide.
[42] The City of Arcata sells carbon offsets through the Arcata Community Forest Carbon Offsets Program.
[43] See *10.3 Proposal for Campus Forest Carbon Project* in the Appendix.

Benefits:	• Applied learning and/or paid opportunity for students • Wildlife and habitat enhancement • Improves nutrient cycling, air and water purification • Offsets emissions generated by campus operations
Challenges:	• May need faculty buy-out to conduct carbon measurement trainings • May need funding to pay students to conduct inventories • Access to equipment necessary to do this work
GHG Impact:	Large: potential of ~60 MTCDE/acre in the first reporting period.
Economics:	Net Savings: Sale of carbon offsets will generate revenue, which offsets initial costs for other projects.
Feasibility:	Achievable: Forestry already teaching carbon measurement practices (e.g., in FOR 210) and conducting irregular inventories; managing Foundation and HSU forests for carbon is proposed in forest management plans.
Lead:	Department of Forestry & Wildland Resources

Strategy 1.2	Offset 25% of emissions from business air travel by 2025, and 100% of remaining emissions from air travel by 2045
CSO 1.2.A	Develop and implement Air Travel Offset Policy[44], adding a carbon surcharge to every air travel trip for University business, to purchase verified carbon offsets or to fund verifiable campus carbon reduction projects.
CSO 1.2.B	Establish a voluntary carbon offset purchase program to offset study abroad air travel emissions.
Benefits:	• Supports development of carbon reducing projects with co-benefits • Easy way to immediately reduce net emissions • Incentivizes alternatives to air travel
Challenges:	• Staff time to modify travel reimbursement and develop accounting system • Travel budgets already constrained • Exempts grant-funded travel • May require some employee education to prevent push-back
GHG Impact:	Low to Moderate: Depends on dollar amount and number of trips/yr, but could offset 300 - 500 MTCDE/yr.
Economics:	Small Net Cost: this is a purchase with no return on investment.
Feasibility:	Doable: Once set up, the system can run with little input.
Lead:	Contracts & Procurement

[44] See the CSU East Bay Air Travel Offset Policy, which directs $9 from every air travel trip to fund carbon reduction projects.

Strategy 1.3	Offset 10% of emissions from commute by 2025, and 100% of remaining emissions from commute by 2045
CSO 1.3.A	Establish a voluntary Green Permit program, wherein permit holders pay a carbon surcharge to offset commute-related emissions, either at point-of-purchase or through payroll deductions.
CSO 1.3.B	Provide voluntary carbon offset surcharge option for daily and hourly parking purchases (e.g., through the Passport mobile payment app).
Benefits:	• Funds go to purchasing local community offsets or verifiable campus carbon reduction projects • Incentivizes alternative commuting choices • Easy way to immediately reduce net emissions
Challenges:	• Staff time to modify parking fees and/or payroll deductions • May require some education to prevent push-back
GHG Impact:	Small: Depends on dollar amount and level of participation.
Economics:	Cost Neutral. Surcharge covers any ongoing programmatic costs.
Feasibility:	Doable: Once set up, the system can run with little input.
Lead:	Contracts & Procurement

Strategy 1.4	Develop community based small-scale carbon offset projects
CSO 1.4.A	Develop and implement small scale offset projects through Second Nature Offset Network[45] and other programs, e.g., urban forestry, blue carbon and habitat restoration projects.
Benefits:	• Provides educational and research opportunities • Strengthens campus-community partnerships • Builds community resilience • Alternative to traditional offset options • Used to offset Scope 3 emissions
Challenges:	• Staff time for long-term coordination and reporting • Requires community partner committed to project long-term • Must find peer verifier from another academic institution
GHG Impact:	Small: Emphasis is on co-benefits, not on maximizing GHG reductions.
Economics:	Small Net Cost: Requires initial investment and some ongoing maintenance to sustain the project.
Feasibility:	Some Challenges: Requires significant coordination between community, campus, and peer verifier over a long term.
Lead:	Office of Sustainability

[45] Second Nature Offset Network facilitates offset projects for institutions of higher education.

Strategy 1.5	Develop a carbon reduction fund for purchasing carbon offsets through the traditional voluntary market and for funding small scale carbon projects.
CSO 1.5.A	Grow the carbon reduction fund through the capture of one-time (roll-forward) savings, internal carbon surcharge revenue and donations.
CSO 1.5.B	Develop and release a Request for Proposal (RFP) for carbon offset purchases, and develop internal processes to evaluate the incoming RFP responses.
Benefits:	• Quickly and efficiently address remaining emissions • Supports development of carbon reducing projects with co-benefits anywhere in the world
Challenges:	• May need to hire third party to manage offsets • Additionality can be challenging to quantify • There may not be a strong connection to projects far from campus
GHG Impact	Large: Offsets can mitigate a significant amount of MTCDE.
Economics:	Net Cost: This is a purchase with no return on investment.
Feasibility:	Doable: Easiest way to immediately reduce net emissions. Offsets can be bought at any time.
Lead:	Administration & Finance

Strategy 1.6	Integrate carbon sequestration into campus decision-making.
CSO 1.6.A	Develop and implement a "No Net Tree/Forest Area Loss" policy, requiring that trees are planted/regenerated on or off campus when trees on campus are cut down.
CSO 1.6.B	When possible, proceeds from the sale of any high value tree cut on campus go into a carbon reduction fund to support offset, sequestration and education projects.
CSO 1.6.C	Become a Tree Campus through the Tree Campus Higher Education program, yielding social and ecological co-benefits along with sequestration from campus trees.
Benefits:	• Sequesters carbon, moderates temperatures and improves air quality • Provides educational and research opportunities • Helps qualify HSU to receive Tree Campus USA designation
Challenges:	• Space to plant new trees • Staff time to plant and maintain new trees • May require alterations of landscape design
GHG Impact	Small: Emphasis is on co-benefits, not on maximizing GHG reductions
Economics:	Cost Neutral to Small Net Cost: This is a purchase with no return on investment - cost of planting a tree may be equal to or less than cutting down a tree. Tree planting cost can be included into overall project cost.
Feasibility:	Doable: Requires development and implementation of policy
Lead:	Administration & Finance

6.0 Strategies to Further Sustainability in Academics & Research

Cal Poly Humboldt is well positioned to understand and address the global challenges of climate change. By developing and offering learning opportunities, platforms for research, and faculty development in sustainability, social and environmental justice, we can help equip our students to be leaders in building resilience to climate change. Co-curricular instruction - and utilizing the campus as a living laboratory - can have the co-benefits of fostering behavior change while contributing to emissions-reducing or resilience-building activities. Extending beyond the campus, engagement with the broader community builds leadership skills while deepening student understanding of practical, real-world problems and the processes for working towards equitable solutions. And by fostering research in sustainability and climate impacts, we can continue to help the world to better understand sustainability challenges, to apply traditional ecological knowledge, and to develop new technologies, strategies and approaches to address climate challenges:

Figure 21. Academics & Research (A&R) Goals, Strategies and Actions

A&R Goal 1	**Further integrate sustainability into the curriculum**
Strategy 1.1	Increase the percentage of *courses* with sustainability content to 25% by 2025 and to 40% by 2030. Increase the percentage of *academic departments* with sustainability course offerings to 85% by 2025 and to 90% by 2030.
A&R 1.1.A	Offer annual professional development on integrating sustainability and climate resilience into the curriculum.
A&R 1.1.B	Develop an ongoing program that offers incentives for lecturers, tenured, and non-tenured faculty in multiple disciplines/departments to develop new sustainability courses and/or incorporate sustainability into existing courses.
A&R 1.1.C	Seek to increase the number of departments integrating sustainability into Retention, Tenure and Promotion (RTP) standards and that incentivize interdisciplinarity.
A&R 1.1.D	Direct each academic department to develop program learning outcomes that address the *Equity and Social Justice* and the *Sustainability and Environmental Awareness* institutional learning outcomes.
A&R 1.1.E	Expand utilization of campus infrastructure and operations as a living laboratory for applied student learning.
A&R 1.1.F	Further integrate community and place-based learning opportunities in sustainability into course content.
A&R 1.1.G	Include sustainability integration goals in campus strategic planning, the academic road map, and college-level planning and integrated assessment practices.
Benefits	• Improves sustainability literacy • Recruitment tool - prospective students attracted to sustainability • STARS credits • Enhances recruitment of faculty with background in sustainability • Supports Academic Roadmap • Opens new and innovative pathways for learning

Challenges	• Will need support and resources for transdisciplinary and other non-traditional models of instruction • May require additional faculty training • May be perceived as additional unpaid work by some faculty • Some departments may push back
Economics	Net Cost: additional cost to to support release time, faculty training and course redesign, although may be offset by attracting more students as a result.
Feasibility	Doable with some challenges: May require support from University Senate, the Integrated Curriculum Committee. Requires buy-in from all departments, must overcome perception that sustainability integration is an undue burden on faculty not already teaching sustainability. Requires some funding.
Related Plans	Academic Roadmap: Recommendations for advancing integration of sustainability, equity, social and environmental justice into academic programs, courses and pedagogy.
Lead	Office of Academic Affairs

A&R Goal 2	**Foster cross-disciplinary research and creative activities in sustainability.**
Strategy 2.1	Increase the percentage of researchers that are engaged in sustainability research to 50% by 2025 and to 60% by 2030.
A&R 2.1.A	Maintain an annual public showcase and publication of student and faculty research in sustainability.
A&R 2.1.B	Organize opportunities for intra- and cross-campus collaboration in sustainability research.
A&R 2.1.C	Create curated grant opportunity lists for sustainability research.
Benefits	• Contributes to finding solutions to shared global challenges • Attracts faculty and students interested in sustainability research • Provides applied learning opportunities for students • STARS credits
Challenges	• Requires faculty with sufficient interest and expertise • Dependent on grants and potentially unpredictable funding sources • Perceived impact on faculty autonomy
Economics	Neutral: Research funded primarily through grants and other sources not tied directly to university.
Feasibility	Some Challenges: Need to encourage this research without mandating it and be able to attract the necessary funding.
Lead	Sponsored Programs Foundation.

Strategy 2.2	Support the increase and enhancement of creative activities in sustainability.
A&R 2.2.A	Maintain an annual public showcase and publication of student, faculty and staff creative activities in sustainability.
A&R 2.2.B	Organize opportunities for intra- and cross-campus collaboration on creative activities in sustainability.
A&R 2.2.C	Create curated grant opportunity lists for creative activities in sustainability.

Benefits	• Contributes to finding solutions to shared global challenges • Fosters community resilience building through art and communications • Provides applied learning opportunities for students
Challenges	• Requires faculty with sufficient interest and expertise • Dependent on grants and potentially unpredictable funding sources • Perceived impact on faculty autonomy
Economics	Neutral: Creative activities funded primarily through grants and other sources not tied directly to university.
Feasibility	Some Challenges: Need to encourage creative activities without mandating it and be able to attract the necessary funding.
Lead	Sponsored Programs Foundation.

A&R Goal 3	**Firmly and publicly establish Cal Poly Humboldt as a hub for sustainability innovation, curriculum and research**
Strategy 3.1	Support the establishment of a sustainability center by 2025.
A&R 3.1.A	Hold a visioning charrette to identify goals, programs, partners, physical space and funding for a center.
A&R 3.2.A	Institutionalize annual faculty sustainability fellow position to support sustainability in academics in collaboration with the sustainability center.
Benefits:	• Focal hub for campus-community partnerships • Supports faculty by seeking grants and resources on their behalf • Resource for students and prospective students
Challenges:	• May take significant faculty and staff time to develop • Fundraising to support new program
Economics	Net Cost, although grants may help to offset.
Feasibility	Challenging: requires physical space, staffing, budget and leadership.
Leads	Facilities Management, Office of the Provost

7.0 Climate Resilience Plan

In Humboldt County, like elsewhere in California and across the world, climate change-driven events are increasing in frequency and severity. Wildfire, sea level rise, intense storm events and other hazards have the potential of - or are already - disrupting nearly all aspects of community function, from public health to economic continuity, agricultural productivity, transportation networks, ecosystem services and infrastructure.

Building resilience means anticipating risks and preparing for changing conditions, so that when a severe hazard strikes, the campus and community will not suffer irreparable harm. It requires us to clearly define our vulnerabilities, as well as our strengths and assets that may support resilience. To do so, we take an intersectional approach to develop adaptation strategies that build resilience within the economic, social, and environmental dimensions of our campus community. In this way, we are better able to prepare for changing conditions, to endure and recover rapidly from disruptions, and to prepare our students to be leaders in building resilient communities.

Campus and community stakeholder engagement has been critical to campus climate resilience planning and capacity building. This has included:

- Report on the Initial Assessment of Campus-Community Resilience[46], completed in April 2018, which identifies vulnerabilities to climate change impacts, initial opportunities to strengthen resilience, and indicators the campus and City of Arcata can use to track progress;
- The Community Resilience Building Workshop in March 2019[47], which brought together campus and community stakeholders to identify and prioritize actions to improve campus-community resilience;
- The Climate Resilience Deliberative Forum[48], held in April 2019, which hosted an expert panel and engaged 50 student participants in developing recommendations, and
- Development of the Student Leadership Institute for Climate Resilience (SLICR), a three-day immersive residential program with service learning project for 25 student leaders, which was canceled in March 2020 due to Covid-19 restrictions but has spawned development of a Certificate in Climate Justice program through the Environmental Studies department.

7.1 Climate Hazards of Greatest Concern

The Humboldt Bay region is exposed to three climate change hazards of greatest concern: sea level rise, extreme weather events, and wildfire. Additional climate-related impacts to our area include drought, storm surges, invasive species, and the influx of climate refugees into our communities. Although there is some uncertainty in the timing and levels of frequency and severity of future impacts, Humboldt is planning now to adapt to the climate change hazards affecting our area. The hazards of greatest concern are discussed below.

A. Sea Level Rise

Sea level rise (SLR) is driven by increased global average temperatures causing thermal expansion of seawater and glacial melting. Humboldt Bay is currently experiencing the highest rate of *relative* sea level rise compared to the rest of California (0.2 inches per year, or 19 inches per century), and this rate is expected to increase in the future[49]. Models suggest that, by 2050, Humboldt Bay will

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[46] The Initial Assessment of Campus-Community Resilience was developed in accordance with Second Nature Climate Commitment guidelines and reporting requirements.
[47] The HSU-Community Resilience Building Workshop utilized a model developed by Community Resilience Building. See the HSU Workshop Summary of Findings.
[48] See the Climate Resilience Deliberative Forum Summary Report.
[49] *Relative* sea level rise accounts for both the rate of sea level rise and land subsidence (local sinking), caused by the movement of tectonic plates. Humboldt Bay is experiencing subsidence of approximately 0.09 inches per year, or almost 10 inches per century. Interestingly, mankind's manipulation of Humboldt Bay has made it into a carbon source: thousands of acres of "reclaimed" tidelands (cut off from the bay by the construction of dikes) are now seasonal freshwater wetlands generating methane emissions, although these emissions may subside

experience between 1.5 - 3.2 feet of sea level rise, depending on different emissions scenarios[50]. Three feet of sea level rise may cause Humboldt Bay to increase in size by 60%, threatening vulnerable coastal ecosystems, communities and infrastructure due to increased flooding, daily inundation and erosion. Although the main campus is approximately 1.5 miles from Humboldt Bay, students, faculty and staff living within and/or utilizing roadways within potential inundation zones will be directly affected. Critical university, municipal and commercial infrastructure (e.g., Arcata Wastewater Treatment Facility, the Humboldt Bay Aquatic Center, port facilities, U.S. Route 101) and farmlands are also within vulnerable locations.

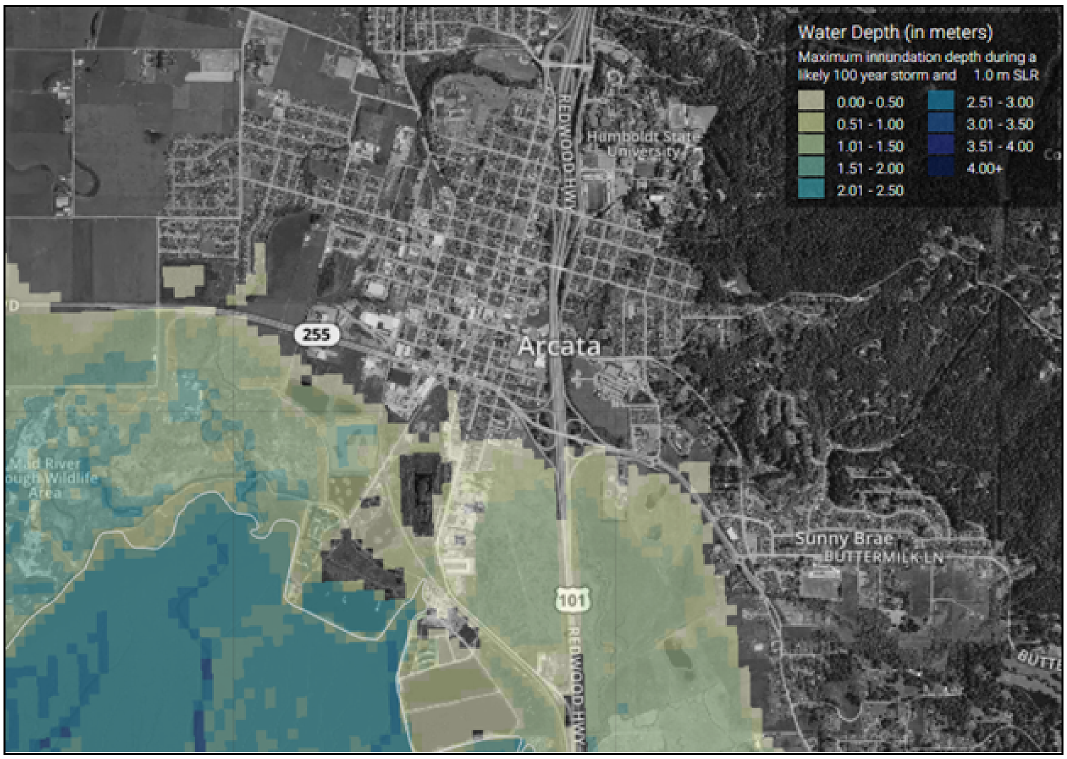

Figure 15. Map depicting Humboldt Bay inundation into the City of Arcata with a sea level rise scenario of 3.2 feet. Source: Cal-Adapt, http://cal-adapt.org/tools/slr-calflod-3d/.

B. Extreme Weather

Climate change is expected to result in growing frequency and intensity of high precipitation events, such as extreme atmospheric rivers responsible for great amounts of rain in a short period of time[51], increasing the likelihood of larger and longer-lasting floods and landslides with far-reaching consequences. Already, during winter storm events, one or more of the primary routes into Humboldt County (i.e., US Routes 101 and 199, State Routes 299 and 36) are regularly closed, due to landslides, flooding or snow conditions. Our communities feel the impacts of these extreme weather (EW) related closures in the loss of economic activity, the movement of goods and services, and the ability of residents to reach their homes, work, or emergency services. Similarly, students and

over time as SLR-driven expansion of Humboldt Bay returns the freshwater wetlands to saltwater wetlands. For more information on Humboldt Bay and SLR, see the Humboldt Sea Level Rise Initiative.

[50] Laird, A. (2018). Humboldt Bay Area Plan Sea Level Rise Vulnerability Assessment.

[51] Dettinger, M. (2011). Climate change, atmospheric rivers, and floods in California - a multimodel analysis of storm frequency and magnitude changes. *Journal of the American Water Resources Association*, 47(3), 514-523.

employees may find themselves unable to get to campus or leave the county during winter break highway closures. Food shipments to HSU's dining services may not reach the campus, affecting on-campus residents. In September 2019 the Humboldt Bay area was struck by a supercell rain event. Within the span of approximately 45 minutes, the event caused flooding in over 15 campus buildings and facilities, causing tens of thousands of dollars in damage, closures, and relocation of campus residents[52]. Heavier downpours on campus and communities surrounding Humboldt Bay will also increase the amount of urban run-off into streams, rivers and the bay, stressing wastewater treatment facilities and washing pollutants, trash, sediment, nutrients and other materials into sensitive areas. Roadways, made impassable by flooding or landslides, will prevent the movement of people and goods to campus and surrounding communities.

Figure 16. In February 2019, heavy rains brought flooding to the Eel River Valley, closing Highway 211, isolating the town of Ferndale and causing the death of one person. Source: California Department of Transportation.

C. Wildfire

Although the Humboldt Bay area is mostly within a low fire-hazard severity zone, the majority of the rest of Humboldt County is in high or very high fire-hazard severity zones[53]. Wildfire (WF) frequency and severity are projected to intensify in our region, and Humboldt County is projected to have one of the highest increases in burn areas in California, with projections as high as 300% by 2085[54]. Over the coming decades the campus community will be further exposed to diminished local air quality resulting from nearby wildfires. Atmospheric conditions will drive smoke and ash into the area, exacerbating heart and respiratory conditions within vulnerable groups, and reducing productivity

[52] See the *Lost Coast Outpost*, HSU Ravaged by Yesterday's Flooding; Numerous Buildings Suffer Water Damage.
[53] CalFire. (2007). *Draft Fire Hazard Severity Zones in LRA*.
[54] Westerling, A., Bryant, B.P., Preisler, H.K., Holmes, T.P., Hidalgo, H.G., Das, T., & Shrestha, S.R. (2011). Climate change and growth scenarios for California wildfire. *Climatic Change*, 109 (SUPPL. 1), 445-463.

as outdoor activities are canceled and HVAC systems struggle to maintain indoor air quality. Other risks to the campus community include loss of natural systems, property damage, power and telecommunication outages[55], landslides and soil erosion.

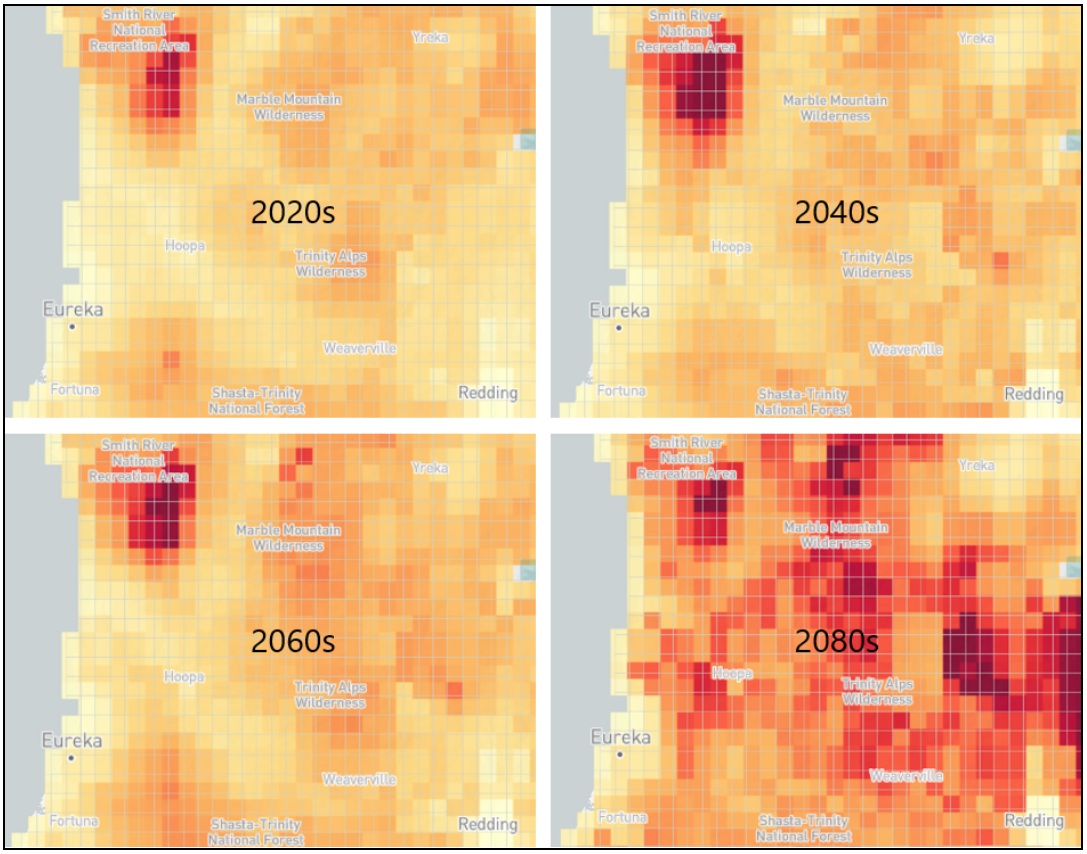

Figure 17. Decadal Averages Map showing Modeled Annual Area Burned under a Medium Emissions scenario and Central Population Growth scenario. Each grid cell represents 100 hectares. Source: https://cal-adapt.org/tools/wildfire/

7.2 Critical Vulnerabilities to Hazards of Greatest Concern

Cal Poly Humboldt and the communities near Humboldt Bay are impacted, either directly or indirectly, by the same climate change hazards, and therefore share many of the same vulnerabilities. The interrelationship between Humboldt and local communities provides a framework for evaluating critical vulnerabilities to hazards of greatest concern (Figure 18):

[55] Public Safety Power Shutoffs (PSPS) are conducted by PG&E, particularly during heavy wind events, to reduce risk of the utility's equipment starting wildfires. In 2020 PG&E was successful in islanding the Humboldt Bay Generating Station from the larger grid so it can continue to supply electricity locally while other parts of the grid are de-energized.

Figure 18. Identified Vulnerabilities to Climate Hazards of Greatest Concern

Dimension	Vulnerability	Hazard: SLR	Hazard: EW	Hazard: WF
Infrastructural	Telecommunications			
	Power Grid			
	Water Supply/Treatment			
	Roads/Transportation Networks			
	Buildings			
Societal	Housing Security			
	Outreach & Education			
	Food Security			
	Medical and Emergency Services			
Environmental	Coastal Ecosystems (marsh, wetland, dune)			
	Terrestrial Ecosystems (forests, riparian corridors)			
	Agricultural lands (farming, ranching, aquaculture)			
	Air Quality			

SLR = Sea Level Rise | EW = Extreme Weather | WF = Wildfire

7.3 Strengths and Assets

Strengths and assets are resources, capacity and characteristics that can be leveraged to overcome climate change impacts. Local governments, tribes, NGO's and Humboldt are already engaged to varying degrees in climate change adaptation, resilience planning and capacity building – a common strength that is building cohesive, self-sufficient communities with engaged citizens (Figure 19):

Figure 19. Strengths and Assets that Support Resilience

Dimension	Strengths and Assets
Infrastructural	Emergency power (micro-grids at the Blue Lake Rancheria and Humboldt County Airport)
	Capacity for emergency shelter (gymnasiums and other facilities)
	Stable domestic water systems with existing large capacity emergency water storage
Societal	High concentration of educated, actively engaged members of community and campus (e.g., technological and organizational expertise, educators)
	Local expertise in traditional ecological knowledge and self-sufficiency
	Proactive local and tribal governments building capacity and planning for disruptions
	Coordinated and collaborative emergency response
Environmental	Temperate climate
	Water supplies are stable
	Community protection and restoration of wetlands, forests, coastal buffers, parks and trails
	Local agricultural land, bay and ocean can be used to raise food for local consumption
	Local forests provide habitat, carbon sequestration, nutrient cycling, air and water purification, and other benefits to humans and non-humans

7.4 Strategies to Build Resilience

Cal Poly Humboldt understands resilience as the capacity to anticipate risk and to prepare for changing conditions, to retain essential functions during and after a hazard strikes, and to rapidly recover from severe disruptions. We build resilience through the implementation of adaptation measures that reduce our carbon footprint, that build equity and self-reliance, that protect biological and cultural diversity, and that ensure that basic goods and services (healthy food, clean water, health care, transportation) are accessible to all. The following strategies support Humboldt's core educational mission, values and strategic priorities.

Figure 20. Resilience (RES) Goal, Strategies and Actions

RES Goal 1	**Develop a campus and community that can withstand and thrive through climate change-driven disruptions**
Strategy 1	Plan now for a future constrained by climate change impacts.
1.1.A	By 2025, integrate climate resilience, equity, adaptation and hazard mitigation strategies into the campus physical master plan.
1.1.B	Add climate adaptation planning to the charge of relevant committees, including the Space & Facilities Advisory Committee, the Landscape and Tree Advisory Committee, and the Parking & Transportation Committee.
1.1.C	Advocate for transfer agreements with other CSU's to facilitate educational continuity during a disaster-driven campus closure.
1.1.D	Maintain and enhance community partnerships to improve emergency response, decrease response times, better utilize resources, and advocate for vulnerable/underserved populations.
1.1.E	Strengthen dialogue with tribal, cultural and faith-based leaders to build trust and coordinated responses to climate related hazards. (e.g., community resilience collaborative).
Benefits	• Proactive vs. reactive approach to climate change impacts • Bake in nimbleness to response to future risks • Forge stronger relationships with community • Engage campus decision makers in resilience planning
Challenges	• Requires investment in education and training of constituents • May require paradigm shift in how planning is conducted
Economics	Low investment today will avoid potentially significant costs in the future (due to clean-up and repair costs, loss of productivity due to climate related disruptions, high costs for emergency response, insurance costs, etc.).
Feasibility	Achievable: Campus is already engaged in a master plan update and has built relationships with community partners.
Leads	Office of the President, Administration & Finance

Strategy 2	Educate the campus community about climate change vulnerabilities and adaptation strategies.
1.2.A	Develop "Building Resilience to Climate Change" displays or dashboards highlighting vulnerabilities, strengths and progress.
1.2.B	Expand emergency preparedness training programs for students, faculty and staff, to address response to poor air quality, flood hazard, and other climate change-driven hazards.
1.2.C	Increase ability to respond to future disasters on and off campus by supporting Center Activities' delivery of CPR, first aid and first responder training.

1.2.D	Foster research on climate adaptation strategies by offering faculty professional development opportunities and encouraging systems to share best practices.
1.2.E	Integrate preparedness, climate resilience and traditional ecological knowledge (TEK) modules into relevant academic curricula.
1.2.F	Enhance opportunities for students to gain hands-on learning in climate resilience through service learning, internships, and other community based offerings.
Benefits	• Prepares students, faculty and staff with skills and knowledge to be active participants in climate resilience and emergency response • Fosters self-sufficiency • Builds community resilience through research outcomes • STARS credits
Challenges	• May depend on securing grants from unpredictable funding sources • Requires faculty and staff with interest and expertise • May be perceived as an attack on faculty autonomy
Economics	Net cost to enhance training and professional development programs; research can be funded by grants.
Feasibility	Some challenges but achievable: an emergency preparedness program is already in place, professional development on integrating climate resilience into the curriculum has been launched.
Leads	Academic Affairs, Dean of Students, Sustainability Office, Risk Management

Strategy 3	Reduce food and housing insecurity.
1.3.A	Expand and support the Oh SNAP! food pantry's fresh farm stand, its partnership with local working farms, and its food education programs.
1.3.B	Support the development of traditional and culturally appropriate campus gardens, edible landscapes and curriculum to increase opportunities for students to learn how to grow, find and preserve food.
1.3.C	Support campus and municipal efforts to develop affordable, equitable, transit-oriented housing in proximity to campus.
1.3.D	Except where infeasible, incorporate community garden space into the design of all new on- or off-campus housing developments.
Benefits	• Addresses basic needs • Fosters self-sufficiency • Cost savings and GHG reductions for students • Potential to positively impact enrollment
Challenges	• Costs and available land for new housing, transit and bike parking infrastructure • Limitations to space and solar access for edible landscapes/gardens
Economics	Net Cost
Feasibility	Achievable but with Challenges: High costs for new housing, but some managed gardens and edible landscapes already exist on campus, Oh SNAP currently coordinates a limited farm stand, and the campus participates in housing discussions with the City.

Leads	Facilities Management, Health Education

Strategy 4	Improve ecosystem management to increase biodiversity, remove invasive species, and foster pollinator health.
1.4.A	Develop and implement an Integrated Pest Management (IPM) plan.
1.4.B	Phase out the use of glyphosate, aka Roundup ®, and other pesticides harmful to biodiversity and human health.
1.4.C	Where possible, replace invasive species with native and pollinator friendly plants.
1.4.D	Where possible, convert unused turf areas to native, climate adapted and pollinator friendly plants.
1.4.E	Become a *Bee Campus USA* affiliate[56].
1.4.F	Process all green waste on site to use for composting, mulching, moisture retention and carbon sequestration.
1.4.G	To the greatest extent possible, incorporate climate resilient landscape design and the use of native, climate adapted plants into landscape planning for all new construction on and off campus.
Benefits	• Enhances ecosystems services • Fosters human health, including health of Grounds personnel • Reduces resource consumption and GHG emissions • Service learning opportunities for students • STARS credits
Challenges	• Replacing chemical applications with cultural and mechanical practices may require additional labor hours • May need to train Grounds personnel in alternative techniques • Maintenance of some non-turf landscapes may take as much or more time than turf
Economics	Cost Neutral to Net Cost: cost savings realized from reduced gas, water and chemical use, and from green waste transport costs and fertilizer purchases may offset turf conversion costs, IPM plan development and Bee Campus application fee.
Feasibility	Achievable: the Grounds department has completed some turf conversions already and practices limited application of chemical treatments.
Lead	Facilities Management

Strategy 5	Improve storm, wastewater and irrigation management.
1.5.A	Develop and implement a holistic, Low Impact Development (LID) plan, based on flood modeling, to manage stormwater, wastewater and groundwater (e.g., with bioswale, permeable surfaces, storm drain maintenance, rainwater capture/storage, and greywater treatment/re-use).
1.5.B	Integrate LID and infiltration elements, such as permeable pavement and bioswales, into new paving projects to reduce runoff volume.

[56] See the Bee Campus USA Commitments. Application fee is $300.

1.5.C	Where feasible, decrease runoff from existing parking lots by adding LID elements like open-grid pavement and vegetated bioswale areas.
1.5.D	Work with the City of Arcata to determine the feasibility of irrigating campus with reclaimed water.
Benefits	• Clean and slow down release of stormwater prior to discharge into the creeks and City system • Comply with stormwater discharge requirements • Mitigate point source pollutants entering waterways • Reduce dependence on domestic water • STARS credits
Challenges	• Costs and maintenance requirements for certain LID elements like bioswales • Costs and permitting for "purple pipe" reclaimed water infrastructure
Economics	Net Cost: Some savings may be achieved by reducing domestic water consumption and stormwater discharge fees.
Feasibility	Doable to Challenging: Significant capital outlay may be required for reclaimed water infrastructure and for planning, engineering and installation of LID elements.
Lead	Facilities Management

Strategy 6	Improve indoor and outdoor air quality.
1.6.A	Develop and implement Smoke Readiness Plans for campus buildings.[57]
1.6.B	Design new housing with specific measures to minimize occupant exposures to wildfire smoke events, e.g. main entrance doors on the opposite side of the building from prevailing winds, high efficiency HVAC filtration, and building weatherization to limit smoke entry.
1.6.C	Designate and equip indoor clean air respite centers to protect the most vulnerable from hazardous air quality.
1.6.D	Strengthen Zero/Low Volatile Organic Compounds (VOC) requirement for all paints, floor coverings and furniture.
1.6.E	Communicate and comply with CARB anti-idling regulations[58]
Benefits	• Protect health and well-being of vulnerable populations • Improved building comfort and air quality • STARS credits
Challenges	• Space and resource requirements to open clean air respite centers • Low to moderate additional capital outlay for high efficiency filtration for buildings • Zero/Low VOC materials and furnishings generally cost more
Economics	Net Cost, although some energy savings may be realized over time through weatherization and HVAC efficiency.
Feasibility	Achievable with Some Challenges: May be difficult to retrofit some existing buildings.

[57] See the ASHRAE Planning Framework for Protecting Commercial Building Occupants from Smoke During Wildfire Events.
[58] California Air Resources Board (CARB) anti-idling regulations.

Lead	Facilities Management, Risk Management & Safety Services

Strategy 7	Strengthen campus emergency operations and response.
1.7.A	Maintain emergency water supply to provide a gallon a day per campus resident for up to seven days.
1.7.B	Maintain and strengthen redundancies in campus telecommunications and IT networks.
1.7.C	Install a solar microgrid with battery storage on campus to maintain continuity of power to critical loads in times of power outage (see BEF 2.1.A).
1.7.D	Support systems for non-electronic communication that require no electricity or internet, such as emergency wayfinding signage.
Benefits	● Maintain continuity during extended power outages ● Help ensure basic needs are met for most vulnerable populations ● Enhance quick response times in an emergency
Challenges	● Solar and battery project requires long term contract with a third party ● May require additional utilities and other infrastructure ● Emergency water distribution requires organized distribution and communications
Economics	Neutral to Net Cost: utility savings can be realized from solar electric systems supplying the microgrid. Grants, incentives and financing mechanisms may apply.
Feasibility	Achievable: Emergency water supply system is currently in place, the IT department is already investing in telecommunications redundancies, and RFP for solar and battery has been released.
Leads	Facilities Management, Risk Management & Safety Services

8.0 CAP 2.0 and Resilience Plan Implementation

It will take strong leadership, coupled with broad campus and community engagement, to successfully implement the strategies in this plan. The entire campus community, from the student body to administration, will collectively engage with integrating sustainability and resilience into all facets of the campus, but leadership responsibility must first be assigned to departments or offices best positioned to implement the various strategies. These areas will then prioritize and develop realistic timelines for the strategies outlined herein. Proposed oversight of CAP 2.0 strategy implementation is summarized below:

- The Humboldt Advisory Committee on Sustainability will support oversight of CAP 2.0 implementation, advise campus leadership on its progress, and intercede as needed to ensure forward movement and campus-community engagement;
- Responsibility for the development, implementation and reporting on specific strategies will be shared across various departments and offices, depending on project type. For example, Construction, Planning & Design will lead electrification and microgrid projects; Contracts & Procurement will lead sustainable purchasing projects;
- The Office of Sustainability will monitor and support strategy implementation, and conduct annual GHG emissions inventories and annual evaluation reporting to the Advisory

Committee on Sustainability, Second Nature, the CSU Chancellor's Office, and the campus at large, and
- The Office of Sustainability will lead the process to update the CAP every five years, as required by the Second Nature Climate Commitment.

8.1 Funding

Achieving carbon neutrality will incur significant financial costs, but we must consider what the costs will be if we fail to act. Adopting a less ambitious GHG reduction goal, or none at all, will not only lead to greater financial loss over time, but will also contribute to further damage to ecological and social systems and to public health, to the exacerbation of climate change-driven disasters, and potentially to the diminishment of Cal Poly's standing as a leader in sustainability. These additional costs, though more difficult to calculate, must remain part of the calculus in our decision-making.

Leveraging internal as well as external sources of funding will be critical to bringing initial costs down. Additionally, energy and other utility-related GHG reduction strategies can generate utility cost savings, operational savings, and utility rebates and incentives that, combined, can be leveraged to reduce or negate total project costs, or even lead to net savings. By far, the largest cost for the campus will be to electrify existing infrastructure (i.e., replace existing natural gas infrastructure with infrastructure powered only by electricity). Based on current fuel-switching projects, decarbonization of our facilities could cost between \$60.62 to \$75.77 per gross square foot. Decarbonizing approximately 1.92 million square feet could therefore cost between \$116.4 million to \$145.5 million. If the university was able to retire verified carbon offsets from its forests, this estimated cost could be lowered to between \$87.8 million and \$103.3 million[59].

Departments responsible for implementing strategies may need to find additional funding. Fortunately, there exists a range of external as well as internal funding sources and finance mechanisms, some of which are described below (Figure 22):

Figure 22. External and Internal Funding Sources

External Sources
Self-Generation Incentive Program (SGIP)
Incentives to support existing, new and emerging distributed energy resources.
California Climate Investments
Statewide program infusing cap-and-trade dollars into GHG reduction projects.
On Bill Financing
Zero interest financing for energy efficiency retrofits, repaid through monthly PG&E bill.
Power Purchase Agreement (PPA)

[59] Cal Poly Humboldt Forestry Department estimates that the University and Foundation forest lands could sequester enough carbon to offset 15-20% of the campus carbon footprint. It could cost the university between \$5 to \$17 per MTCDE to verify sequestration and retire the offsets.

Long-term arrangement between University and a developer that installs and operates on-site power generation (e.g., solar). Avoids initial cost and guarantees long-term utility savings.
Energy Performance Contract (EPC)
No initial cost and guaranteed savings for equipment and services from an energy services company (ESCO)
Hazard Mitigation Grants
Sponsored by FEMA and the DOD, funds projects that build climate resilience, e.g., micro-grids.

Internal Sources
State Capital Outlay Funds
Allocations from the State Legislature used to build and renovate campus facilities.
Non-State Capital Outlay Funds
Revenue set aside by self-support and auxiliary organizations for construction projects.
Humboldt Energy Independence Fund
Student fee generated fund for campus sustainability projects inspired by student ideas.
Parking Permit Sales/ Parking Fines and Forfeiture Funds
Funds can be used for alternative transportation projects.
Go Green Fund
Advancement Foundation fund supports sustainability projects with direct student involvement and benefit.

8.2 Plan Review and Future Updates

The CAP 2.0 is based on current scientific understanding of climate change and its projected impacts, and recommends best practices to stem GHG emissions based on the current understanding of emissions sources and anticipated campus growth. As a living document, the HSU Climate Action Plan will be reviewed and evaluated no less than every five years, as per Second Nature Climate Commitment requirements. Over time, the plan may need further updates, as anticipated - as well as unanticipated - internal and external factors continue to shape the University's carbon footprint. Such factors may include:

- Humboldt becoming a polytechnic institution, leading to increased campus population, additional construction and solid waste, and other impacts;
- Advancements in energy, energy storage, transportation, and building technologies;
- Variability in capital improvement costs as market competition potentially drives down costs of emerging technologies;

- Updates to building and energy codes requiring more aggressive (and perhaps more expensive) approaches;
- CSU policies and State guidelines requiring additional sustainability measures, and
- Climate change impacts that accelerate at an unpredicted frequency and intensity.

As Humboldt strives for carbon neutrality and resilience, we must evaluate emerging technologies and new approaches to current systems and, where appropriate, leverage these opportunities to make campus infrastructure, operations, programs and services more efficient, equitable and resilient. And through continuous monitoring, we can make course corrections as needed to ensure we remain on track to meet the 2045 neutrality goal.

9.0 The Path Forward

Global climate change is causing widespread catastrophic impacts locally and throughout the world, including increased frequency and potency of extreme weather events, sea-level rise, species extinction, water shortages, wildfires, declining agricultural production and the spread of diseases. These and other impacts are particularly pronounced for low-income communities and communities of color. The world's top scientists agree that we have about a decade to make drastic changes before we reach a point where runaway global climate change becomes irreversible[60]. This could be the world we graduate our students into.

The situation demands we take immediate and decisive action, to create a campus wherein sustainability defines its built, natural, and socio-cultural dimensions, and where students, faculty and staff are actively engaged in justice as a common good. We can enhance campus community resilience by cooperatively striving towards reducing our carbon footprint, building equity and self-reliance, protecting biological and cultural diversity, and ensuring that basic goods and services (healthy food, clean water, health care, transportation) are accessible to all. To achieve this, we must see our actions as a consequential part of a broader societal transition from an extractive economy to a regenerative one. With humility, with the recognition that humanity is a part of the natural world and not separate from it, and with the understanding that healthy social and economic systems depend on the health and resilience of ecological systems, we must leave behind fossil fuels, landfills, inequality and other social and ecological injustices as relics of the past. And just as importantly, we must embrace the responsibility of preparing our students with the knowledge and skills necessary to navigate a climate constrained world. All of this will take time and the full engagement of the entire campus community. The CAP 2.0 provides a path forward to our shared, resilient future.

[60] U.N. General Assembly High Level Meeting on Climate and Sustainable Development, 28 March 2019.

10.0 Appendix

10.1 Glossary of Terms

Adaptation: Adjustments of natural or human systems, in response to a changing environment, that mitigate harm from climate change impacts or that take advantage of beneficial opportunities.

Additionality: A carbon offset project's measures resulting in actual reductions/sequestration that would not have otherwise occurred under a business-as-usual scenario.

Anthropogenic: Made by humans or resulting from human activity, such as greenhouse gas emissions generated by human activities.

Blue Carbon: Carbon stored in coastal and marine ecosystems, mostly by algae, seagrasses, macroalgae, mangroves, and other plants in coastal wetlands. These ecosystems can sequester and store more carbon per unit area than terrestrial forests.

Business as Usual (BAU) Scenario: A model that projects GHG emissions into the future, assuming no GHG mitigation projects are implemented outside of what is required by law or policy.

California Renewable Portfolio Standard (RPS): Program requiring retail electricity sold in California is sourced from renewable resources. SB 100 (de Léon, 2018) mandates a 60% RPS by 2030 and requires all the state's electricity to come from carbon-free resources by 2045.

Carbon Dioxide Equivalent: a metric measure used to compare the emissions from various greenhouse gases based on their global warming potential (GWP). The carbon dioxide equivalent is derived by multiplying the tons of the gas by its associated GWP.

Carbon Offset: Investment in an off-site carbon reduction or sequestration project to compensate for emissions.

Carbon Neutrality: Reduction of the measured campus carbon footprint to net zero, whereby carbon emitted is balanced by carbon sequestered. Carbon neutrality may be achieved through a combination of source elimination and carbon offset practices.

Carbon Sequestration: Process by which trees, plants and soil absorb carbon dioxide, release the oxygen, and store the carbon.

Climate Change: Refers to any significant, persistent change in the climate, including temperature, precipitation, or wind patterns, due to natural variability or to human activity, that occurs over several decades or longer.

Complete Streets: Planning, designing and operating roadways to ensure safe mobility for all users, regardless of age, abilities, or mode of transportation (i.e., pedestrians, bicyclists, or transit riders).

De Minimis: term to describe something too minor to merit consideration. In this case, emissions from refrigerants are considered *de minimis* and therefore not included in the GHG inventory.

Electrification: Switching out fossil-fuel powered equipment with equipment powered by electricity.

Energy Efficiency: Using less energy to provide the same level of service (i.e., lighting, computing, ventilation).

Energy Use Intensity (EUI): Annual total energy consumed divided by the total gross floor area of a building.

Global Warming Potential (GWP): Different GHGs have different effects over different periods of time on the Earth's warming. GWP is a method for comparing global warming impacts of different gasses. For example, carbon dioxide (CO_2) has a GWP of 1 over any timeframe, methane (CH_4) has a GWP of 28-36 over 100 years.

Greenhouse gasses (GHGs): Carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons, and other heat trapping gasses that can remain in the atmosphere and oceans for a few years to thousands of years. Anthropogenic emissions are responsible for almost all of the increase of global GHGs in the last 150 years.

HVAC: Heating, ventilation and air conditioning.

Internal Combustion Engine (ICE): Engine that creates power by burning fossil fuels or blends such as gasoline, diesel or biodiesel.

Life Cycle Cost Analysis (LCCA): Method for assessing the total cost of ownership. LCCA takes into account cradle to grave costs associated with procurement, ownership, and disposal of a facility or piece of equipment.

Leadership in Energy and Environmental Design (LEED): Internationally recognized green building rating system for evaluating the design and performance of nearly all building types.

Resilience: The capacity to prepare for changing conditions, to endure and recover rapidly from disruptions, and to adapt to climate change events, especially when those adaptation strategies substantially reduce greenhouse gas emissions and build social equity.

Single Occupant Vehicle (SOV): Privately operated vehicle in which the driver is the only occupant.

Sustainability: HSU defines sustainability as the recognition that humanity is a part of the natural world, not separate from it, and that healthy social and economic systems depend on the health and resilience of ecological systems.

Unspecified Power: Imported electricity that is not traceable to specific generation sources. In 2019, 28% of electricity purchased by HSU came from eligible renewable resources, while the remaining 72% came from unspecified sources of power.

Water Use Intensity (WUI): Describes a building's total water consumption divided by the buildings' area in gross square feet.

Zero Emission Vehicle (ZEV): Generates zero tailpipe emissions. Battery electric vehicles and hydrogen fuel cell vehicles are examples of ZEV.

Zero Net Energy (ZNE): Total amount of energy used on an annual basis is equal to the amount of renewable energy generated nearby or on site.

10.2 Category Specific Sustainable Purchasing Criteria

The following are recommended sustainable purchasing criteria, for specific product categories, to support the implementation of Solid Waste & Purchasing Strategy 3.1. Relevant reporting requirements are derived from the Sustainability Tracking and Rating System (STARS) and State Agency Buy Recycled Campaign (SABRC) frameworks.

Product Category	Relevant Reporting	Criteria
Electronics	STARS OP-12: *Electronics Purchasing* STARS OP-20: *Hazardous Waste Management*	1. All purchased electronics shall be rated EPEAT Gold. If an EPEAT rating is not available for a certain electronics product, it will be ENERGY STAR certified. 2. All purchased electronics shall be recycled by an e-Steward Certified recycler recognized by the Basel Action Network (BAN) or donated to a non-profit organization or sold. CSU shall require vendors to establish BAN-certified e-Steward Enterprise (e-Stewards for Enterprises) manufacturer take-back programs by January 1, 2022.
Cleaning and Janitorial	STARS OP-13: *Cleaning and Janitorial Purchasing*	1. All purchased Cleaning and Janitorial Paper Products shall meet one or more of the following certifications: Cradle to Cradle Certified, ECOLOGO certified (UL Environment), Forest Stewardship Council (FSC) certified, Green Seal certified, and/or U.S. EPA Safer Choice.
Office Paper	STARS OP-14: *Office Paper Purchasing* SABRC Annual Report	1. All office paper products shall be a minimum of fifty percent (50%) post-consumer fiber by fiber weight or agricultural residue content. Per state requirements, all paper products purchased must be at least 30 percent (30%) post-consumer fiber by fiber weight. 2. All wood-based fiber paper products shall be either Forest Stewardship Council (FSC), Sustainable Forestry Initiative (SFI), and/or Green Seal (GS-07) certified. Additional preference will be given for paper that is Processed Chlorine Free (PCF).
Other Consumable Office Products	STARS OP-11: *Sustainable Procurement* SABRC Annual Report	1. All purchased non-paper office supplies shall meet the minimum recycled-content levels of the EPA's Comprehensive Procurement Guidelines[61] for Non-Paper Office Products, and a minimum 30% recycled content for all writing utensils (dry erase markers, highlighters, markers, pens, and pencils) or other plastic-based accessories. 2. All purchased toner shall have at least 10% post-consumer material, have high yield remanufactured cartridges, and have a vendor-offered program that will take back the printer cartridge after their useful life to ensure that the cartridge is recycled and complies with the definition of recycled, per requirements of SABRC. Toner cartridges that are only refilled or recharged do not qualify.

[61] EPA Comprehensive Procurement Guideline (CPG).

		3. All purchased batteries, with exception for use in smoke alarms and emergency kits, will be rechargeable. 4. All purchased lamps will be low mercury lamps.
Indoor Furniture	STARS OP-11: *Sustainable Procurement*	1. All furniture purchased shall meet one or more of the following certifications: BIFMA Level, Cradle to Cradle (C2C), SCS Indoor Advantage Gold, GREENGUARD Gold. 2. All furniture shall be free of flame retardant chemicals at levels above 1,000 parts per million (ppm) in both standard and optional components, excluding electrical components. 3. End of life procedures shall prioritize 1) repurposing furniture with other departments on campus, 2) selling or donating to local non-profit or state organizations, and 3) sending to a recycler that directs the furniture away from landfills.
Water Appliances and Fixtures	STARS OP-11: *Sustainable Procurement*	1. All purchased water appliances and fixtures shall be WaterSense certified. 2. Water appliances and fixtures include residential toilets, showerheads, bathroom faucets, commercial toilets, urinals, pre-rinse spray valves, irrigation controllers, and spray sprinkler bodies.
Garments and Linens	STARS OP-11: *Sustainable Procurement* STARS EN-15: *Trademark Licensing*	1. All apparel bearing the institution's logo shall be made with organic, bio-based, or recycled content textiles. 2. Maintain current membership in the Worker Rights Consortium (WRC) and/or the Fair Labor Association (FLA) to ensure that apparel bearing our name/logo is produced under fair working conditions.
Compost	STARS OP-9: *Landscape Management* SABRC Annual Report	1. Per state requirements, all mulch, compost, and co-compost purchased shall be at least 80% recovered material that would otherwise be disposed of in a landfill.
Glass	SABRC Annual Report	1. Per state requirements, all glass purchased must be at least 10% post-consumer, by weight.
Lubricating Oils	SABRC Annual Report	1. Per state requirements, all lubricating oils purchased shall be at least 70% re-refined base oil.
Plastic	SABRC Annual Report	1. All plastic purchased shall be at least 10% post-consumer, by weight.
Paint	SABRC Annual Report	1. Per state requirements, all paint purchased shall be at least 50% post-consumer paint. When 50% post-consumer content is not available or is restricted by a local air quality management district, then a substitute of 10% post-consumer content is applied.
Antifreeze	SABRC Annual Report	1. Per state requirements, all antifreeze purchased shall be at least 70% post-consumer material.
Tires and Tire-Derived Products	SABRC Annual Report	1. Per state requirements, retreaded tires must use an existing casing that has undergone an approved or accepted recapping or retreading process, in accordance with Chapter 7 (commencing

		with Section 42400) of Part 3 of Division 30 of the Public Resources Code. 2. Per state requirements, all tire-derived products purchased shall be made up of at least 50% recycled used tires.
Metal	SABRC Annual Report	1. Per state requirements, all metal purchased shall be at least 10% post-consumer material, by weight.
Food Serviceware	STARS OP-8: *Sustainable Dining*	1. Prioritize reusable and/or fiber-based compostable products that are locally compostable. Bioplastics are only to be used if a campus' composting facility accepts and composts bioplastic materials. 2. All compostable food service ware shall be certified compostable by the Biodegradable Products Institute (BPI) or Green Seal GS-35, or made 100% from uncoated, unlined, obviously plant based material, and appears on the Cedar Grove Accepted Items List. Additional preference will be given for compostable food service ware that is FSC, Protected Harvest, Rainforest Alliance or Fair Trade USA certified.

10.3 Proposal for Campus Forest Carbon Project

Introduction: Cal Poly Humboldt is striving to achieve carbon neutrality by 2045, while further developing opportunities for students to gain skills and knowledge relevant to the social, economic and environmental dimensions of a future influenced by climate change. The growing carbon offset industry offers employment opportunities not seen even a few years ago; meanwhile, the campus can train students to count the carbon sequestration of its campus trees against its carbon footprint as an important strategy for achieving carbon neutrality.

Proposal: The Forestry Department and the Sustainability Office seek to collaborate on a Campus Forest Carbon Program. The proposed scope of work is as follows:

1. Recruitment. Students that have completed FOR 21 *Forest Measurements & Biometry* will be recruited to participate in the program. This course will provide students with the fundamental skills and knowledge necessary to inventory campus forest carbon sequestration.
2. Training. Professor Pascal Berrill (Forestry and Wildland Resources) will develop and lead student training on conducting inventory. The Sustainability Office will assist with development of training materials.
3. Equipment. Necessary equipment for conducting inventory can be checked out from the Forestry Department. Potential opportunity to include remote sensing through drone flights
4. Funding. The Sustainability Office will seek funding to pay students for their services, e.g., through the Go Green Fund.
5. Process. A thorough inventory of the defined campus forest must be done every five years. The campus forest can be divided into five zones, so that one zone receives a discrete inventory each year.
    a. Year 1
        i. Define campus forest

ii. Trees comprising the campus forest (includes trees within the campus boundary) will be tagged
iii. Campus will be divided into five zones
iv. Student training by Dr. Berrill
v. Student team will conduct inventory of Zone 1
vi. Students will record and report data

b. Year 2
    i. Student training by Dr. Berrill and/or Forestry colleagues
    ii. Student team will conduct inventory of Zone 2
    iii. Students will record and report data
c. Year 3
    i. Student training by Dr. Berrill and/or Forestry colleagues
    ii. Student team will conduct inventory of Zone 3
    iii. Students will record and report data
d. Year 4
    i. Student training by Dr. Berrill and/or Forestry colleagues
    ii. Student team will conduct inventory of Zone 4
    iii. Students will record and report data
e. Year 5
    i. Student training by Dr. Berrill and/or Forestry colleagues
    ii. Student team will conduct inventory of Zone 5
    iii. Students will record and report data
f. Year 6
    i. First estimate of growth rates (remeasuring year 1 trees)
    ii. Develop a protocol for verifying offsets generated by this project (unique to Duke and other Carbon Network protocols)