HUMBOLDT STATE UNIVERSITY

Climate Action Plan

HSU Office of Sustainability

December 12, 2016

President's Statement

A bold and transformational commitment to sustainability is necessary to have an impact on our climate and planetary future and to foster the next generation of sustainability leaders.

To meet the challenges of the future and to further a climate of resilience and environmental stewardship, our campus has developed a plan that will lead us toward carbon neutrality in the coming years, and eventually to carbon negativity. Let me tell you more about that.

First, I'm excited to announce an audacious yet thorough new path Humboldt State is preparing to embark on that will help our campus make good on its commitment to environmental sustainability. For more than two years, the HSU Climate Action Committee has been developing the **Campus Climate Action Plan**. But before we can discuss the plan, I think it's important I tell you why I think HSU is more than ready to begin this undertaking.

Humboldt State University has long had a commitment to sustainability. An early first step in this journey was the Graduation Pledge, which HSU founded in 1987 by committing to social and environmental responsibility. Last year we took that pledge one step further and created the HSU Pledge for all HSU community members to express commitment to consider the social and environmental consequences of each choice and decision we make.

In 2007, our students expressed their on-going commitment to reduce HSU's carbon footprint by approving a student fee for the Humboldt Energy Independence Fund that supports campus facility projects that reduce energy consumption on campus.

The Schatz Energy Research Center works to establish clean and renewable energy technologies in our society. The Center is dedicated to research and passionate about educating people on the potential of a clean energy future.

Humboldt State University Advancement Foundation is a leader in the area of green investing. In 2013, a group of students worked with the HSU Advancement Foundation Board to develop a strategy for beginning to divest the University's endowment from fossil fuels. Their work led to the establishment of the Humboldt Investment Pledge. Significantly, in undertaking this effort, HSU has joined a small group of institutions nationwide focusing on the difficult challenge of divesting from mutual funds rather than just direct holdings.

In January 2016, HSU became a Charter Signatory for the Campus Climate Commitment, which encompasses the goals of achieving both carbon neutrality as well as improving community resiliency. HSU joined over 680 higher education institutions in the nation to play a prominent leadership role in shaping research, learning, and communities that inspire and operationalize this future. This commitment is closely aligned with major elements of our strategic plan.

Finally, in August of 2016, I announced the 'moon shot' goal of becoming a carbon neutral[i] by 2030 and a carbon negative campus thereafter.

Our strategic plan, with all its complexity, contains quite an ambitious agenda: to help all of our students succeed, to provide an education with our values of social justice and environmental sustainability at its core, and to manage our campus in a sustainable way.

This Climate Action Plan, with more than 50 action items, lays out the long-term and short-term goals to begin making progress towards these audacious goals. The plan is both bold and far-reaching. It touches every area of our campus operations and will guide us toward making lasting changes that will be felt by generations to come. It will make us take the time to reflect on our commitments and to take action to give life and meaning to our goals.

We have done much already, but we can and will do more. A number of actions, like energy contracts, are outside our full control, but in what we can control, we will be a model and a leader in the CSU and in California. Our efforts will be an example for others. Please join me in thanking the members of the Climate Action Plan Steering Committee and Working Groups. They put in countless hours researching goals, developing strategies, and vetting the plan with campus constituents. This plan is another step on our journey toward environmental sustainability and will require the support and commitment of every member of the campus community. I call on each of you to do your part to implement the Climate Action Plan.

Acknowledgements

The following individuals deserve special recognition and thanks for their contributions to the data gathering, emissions calculations, strategy development and communications associated with the Climate Action Plan:

Climate Action Committee

Chair
Joyce Lopes, Vice President of Administrative Affairs

Members
TallChief Comet, Sustainability Office Director
Traci Ferdolage, Assoc Vice President of Facilities
Kevin Fingerman, Asst Professor of Env Sci & Mgmt
Tawny Fleming, Contracts & Procurement Supervisor
Alec Howard, Environmental Science Student
Morgan King, Sustainability & Waste Coordinator
Kathryn Lancaster, Assoc Professor School of Business
Dave Nakamura, Executive Director of the University Center
Stephen St. Onge, Director of Housing
Jarad Petroske, Communications Specialist
Kathleen Koscielak, Sustainability Analyst

Energy & Utilities Working Group

Co-Chairs
Silas Biggin, Chief Engineer
Morgan King, Sustainability & Waste Coordinator

Members
Molly Daly, Environmental Policy Student
Mike Fisher, University Planner
Lou Jacobson, Program Manager, Redwood Coast Energy Authority
Matthew Marshall, Executive Director, Redwood Coast Energy Authority
Steve McKenzie, Assoc Director of Housing
Jim Zoellick, Senior Research Engineer, Schatz Energy Research Center

Transportation Working Group

Co-Chairs
Krista Chalker, Parking Coordinator
Morgan King, Sustainability & Waste Coordinator

Members
Aisha Cisna, Environmental Science Student
Doby Class, Public Works Director, City of Arcata
Stephanie Lane, Alumni Relations Outreach Lead

Solid Waste, Purchasing & Food Working Group

Co-Chairs
Brigid Wall, Contracts Specialist
Morgan King, Sustainability & Waste Coordinator

Members
Ed Goodeyon, Custodial & Distribution Services Manager
Alec Howard, Environmental Science Student
Ron Rudebock, Director of Dining

Curriculum & Research Working Group

Co-Chairs
Genevieve Marchand, Asst Professor, Kinesiology & Rec
Morgan King, Sustainability & Waste Coordinator

Members
Steve Karp, Executive Director of the Sponsored Programs Foundation
Kathryn Lancaster, Assoc Professor of the School of Business
Rosemary Sherriff, Assoc Professor of Geography

Other Contributors

Brynn Allen, CCAT Co-Director
Michelle Anderson, Assistant to the VP of Admin Affairs
Jerome Carman, Research Engineer, Schatz Energy Research Center
Adele Desadier, Admin Support Coordinator
Denise Gentry, Admin Support
Matthew Ware, Power Save Campus Team Lead

Table of Contents

How Do I use this Plan?

This Climate Action Plan is designed to serve as a starting point for the work ahead as the university moves toward a carbon-neutral and ultimately carbon-negative future. Here are tips to getting the most out of the Climate Action Plan:

***Understand** that the Humboldt State University Climate Action Plan will guide our campus toward achieving the California State University's goals for reducing greenhouse gas emissions.

***Know** that the the Climate Action Plan was developed with broad campus support and provides concrete steps that can be taken to achieve these goals.

***Read** this plan to understand the role your campus unit will need to play in achieving these goals.

1.0 Executive Summary

Humboldt State University's Climate Action Plan sets a course for the campus to reduce greenhouse gas emissions to 1990 levels by 2020, to 80% below 1990 levels by 2040, and to become carbon neutral by 2050. This document outlines a roadmap for achieving these goals, as well as strategies that will further the integration of sustainability into academics and engender a culture of sustainability across the campus.

In 2015-2016 the university achieved three key milestones, which have informed and strengthened the case for curtailing greenhouse gas emissions associated with campus activities and operations. The first milestone was the release of an updated greenhouse gas emissions Inventory, reporting on emissions from 1990 to 2013, as the initial step towards developing the Climate Action Plan (CAP). The second milestone was the publication of the 2015-2020 Strategic Plan, which prioritizes sustainability in campus operations and the growth of social and environmental leaders. The third milestone was President Dr. Lisa Rossbacher signing the Second Nature Climate Commitment, a pact focused on achieving carbon neutrality and increasing resilience in the face of expected and unanticipated consequences of climate change.

This plan presents strategies to curb greenhouse gas emissions resulting from the university's energy consumption, from indirect emissions from related activities – business travel, student and employee commute, and solid waste disposal, and for integrating sustainability into academics and student life. The plan calls for cutting energy related emissions through a number of energy efficiency and energy conservation projects, combined with on-site renewable energy generation and the purchase of power generated by renewable sources. Indirect emissions will be reduced through campus-wide waste reduction strategies, as well as alternative transportation and public transit programs that will lessen business travel and lead to reductions in single occupant vehicle (SOV) commuter trips.

The greenhouse gas inventory within this plan includes a business-as-usual (BAU) emissions projection through 2050. These emissions levels are estimated based on projected campus population growth and resultant demand on utilities and resources, as well as external forces (e.g., an increasing percentage of grid electricity derived from renewable sources) that will impact the campus' carbon footprint. If the university were not to implement any GHG-reducing projects, HSU may see a steady increase in emissions over the next decade. The university is currently on track to meet or exceed the 2020 target of reducing GHG emissions to 1990 levels. Assuming we reach this target, HSU must still reduce emissions by about 1,500 metric tons of carbon dioxide equivalent (MT CO_2e) every five years to reduce emissions to 80% below 1990 levels. To reach carbon neutrality by 2050, HSU will need to incrementally reduce emissions by an estimated 2,100 MT CO_2e between 2040 and 2050.

The strategies within this plan are designed to meet or exceed reduction targets set forth in the CSU Sustainability Policy; however, timing of project implementation will depend on cost, funding mechanisms, staffing requirements and other factors. Tracking and reporting on progress towards achieving reduction targets and, ultimately, carbon neutrality, will take place on an annual basis. The plan itself will be reviewed every five years, which may include the adoption of new strategies and new reduction targets. Indeed, the next iteration of this plan will focus on achieving the 'moon shot' goal of becoming a carbon neutral campus by 2030 and a carbon negative campus thereafter.

2.0 Introduction

2.1 Purpose

The Humboldt State University CAP is a planning document designed to guide the University's efforts to curb greenhouse gas emissions, in accordance with the CSU Sustainability Policy, which states that, at a minimum

The CSU will strive to reduce system-wide facility greenhouse gas (GHG) emissions to 1990 levels, or below, by 2020 consistent with AB 32, California's Global Warming Solutions Act of 2006; and,

The CSU will strive to reduce facility GHG emissions to 80 percent below 1990 levels by 2040.

The intended purpose of the CAP is to provide:

- A better understanding of the scope of the challenge;
- An opportunity to define goals and strategies to achieve meaningful reductions;
- A roadmap for action;
- A process that encourages collaboration across the campus community, and
- An institutional commitment to meeting the challenge and potentially exceed State and CSU system mandates for achieving meaningful reductions.

Important components of the CAP include:

- Academic, research, auxiliary and campus operations' climate action goals;
- Target dates for achieving goals, including interim goals;
- A greenhouse gas inventory that provides a baseline from which to track emissions reductions;
- A look at how campus emissions might increase if reduction strategies are not implemented;
- Strategies and actions to:
  - Integrate climate change and sustainability into the curriculum and other educational experiences
  - Expand research on climate change, mitigation and adaptation strategies
  - Reduce HSU's GHG emissions; and,
- Mechanisms for tracking progress on goals and actions

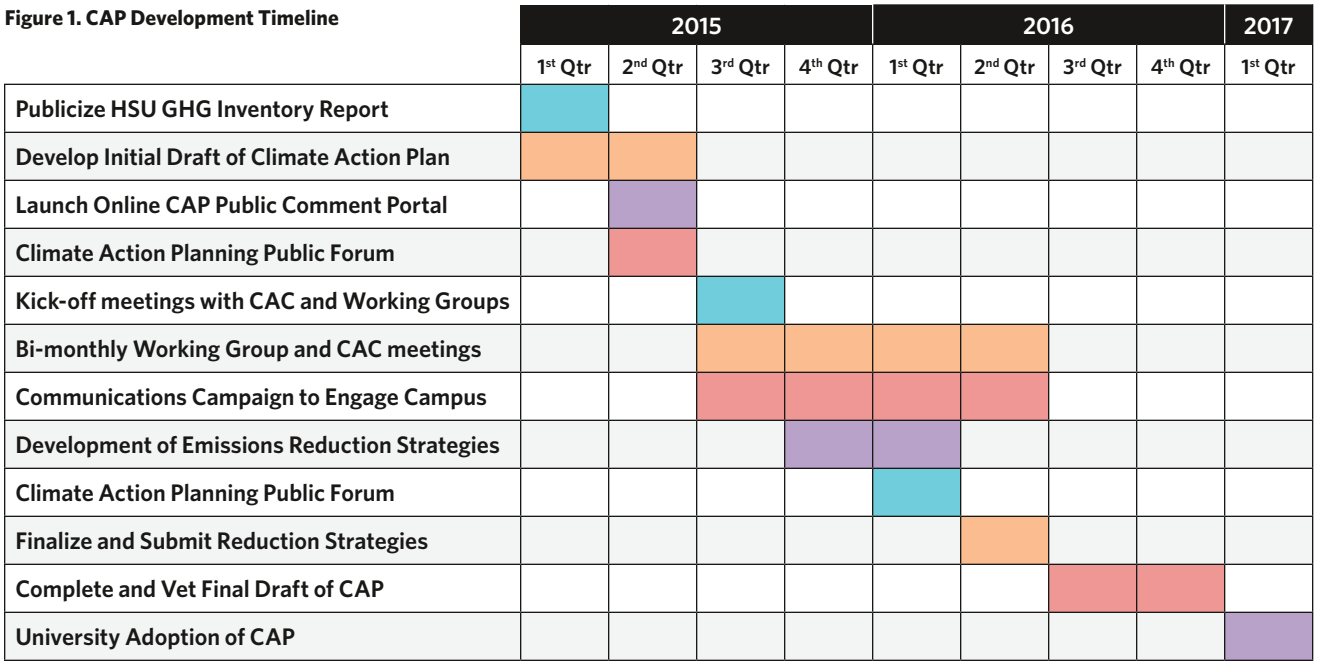
"A bold and transformational commitment to sustainability is necessary to have a real impact on our climate—and planetary—future and to foster the next generation of sustainability leaders. Making this commitment emphasizes our willingness to make changes to adapt to a changing climate."

Dr. Lisa Rossbacher, President, Humboldt State University

2.2 Report Development

Led by the Sustainability Office, development of the CAP required significant stakeholder input and campus buy-in to identify and prioritize functional strategies to meet emissions reduction targets. The Sustainability Office (SO) formed and facilitated a Climate Action Committee (CAC) and four Working Groups to foster the development of the CAP. These groups were comprised of faculty, staff, student and administrative representatives, as well as invited individuals from relevant agencies (i.e. the Redwood Coast Energy Authority and the City of Arcata). The CAC provided oversight of the climate action planning process, goal setting and selection of strategies for inclusion in the CAP. The Working Groups were organized around four specific categories. These are (1) Utilities – Energy, (2) Transportation, (3) Curriculum & Research, and (4) Solid Waste, Purchasing & Food. The CAC and working groups met once to twice a month over AY 2015-16 for development and the CAC met periodically over Fall 2016 to finalize the plan. The SO also facilitated two open campus forums and ongoing campus communications to enable faculty, student and staff participation in the process.

Figure 1. CAP Development Timeline



2.3 The Climate Commitment

Reflecting Humboldt State's commitment to environmental sustainability, University President Dr. Lisa Rossbacher signed Second Nature's Climate Commitment in January 2016, a pact focused on achieving carbon neutrality and increasing resilience in the face of expected and unanticipated consequences of climate change. By participating in the Climate Commitment, HSU has dedicated itself to including target dates and strategies for achieving carbon neutrality within its Climate Action Plan, a commitment to eventually emit net zero greenhouse gases from its buildings and vehicle fleet. The Commitment also requires HSU to lead a campus-community effort to assess vulnerabilities, identify and act on strategies to increase resilience, and integrate resiliency planning into campus planning, operations, academics and research. This effort will include the formation of a joint campus-community task force to drive the development of a plan to mitigate and adapt to a changing climate on a local scale. On an annual basis, HSU will submit a publicly available progress report to Second Nature.

Founded in 1993, Second Nature is the nation's largest university-based climate alliance focused on mitigating and preparing for climate change among its network of over 650 colleges and universities.[ii] The Boston-based organization has worked with over 4,000 faculty and administrators at hundreds of colleges and universities to help make the principles of sustainability fundamental to every aspect of higher education.

2.4 Other Relevant Policies and Procedures

The Climate Action Plan is closely aligned with several major California State University and State of California planning efforts, executive orders and policies that enhance the university's sustainability practices. These include but are not limited to:

A. The HSU 2015 – 2020 Strategic Plan
The Strategic Plan[iii], which lays out priorities, goals and concrete steps to meet the University's mission, has four key goals focused on Student Success, Supporting Diversity, Partnerships & Community, and Resources & Sustainability. These are:

1. Prepare students to be socially and environmentally responsible leaders in a diverse and globalized world
2. Foster meaningful relationships across differences, including diverse cultural communities, identities, and competencies
3. Strengthen partnerships with local communities

Serve as effective stewards of the natural and built environment and the University's financial resources with a focus on sustainability

B. The CSU Sustainability Policy
Adopted in 2014, the System-wide policy aims not only to reduce Universities' environmental impact, but also to integrate sustainability principles and climate science into the curriculum as well as in campus planning and operations. It furthermore encompasses State as well as self-supporting and external organizations operating on the campuses. Besides the goal of reducing GHG emissions, the policy includes the following relevant directives:

1. Reduce solid waste disposal by 80 percent by 2020, and move to zero waste
2. Increase sustainable food purchases to 20 percent of total food budget by 2020
3. Pursue water conservation to reduce water consumption 20 percent by 2020

C. Executive Order 987
Signed in 2006, this Order delegates to each University President the implementation of the CSU Board of Trustee's energy conservation, sustainable building practices, and physical plant management policy. It includes the following mandates:

1. Design and build all new buildings and major renovations to meet or exceed LEEDTM "Silver" guidelines
2. Designate an energy/utilities manager with the responsibility and authority for carrying out energy conservation and utilities management programs
3. Pursue cost effective renewable power generation

2.2 Humboldt State University and the Humboldt Bay Region

Humboldt State University (HSU) is located near Humboldt Bay, approximately 270 miles north of San Francisco. A comprehensive, residential campus of the 23-campus California State University system, HSU serves more than 8,700 students and offers a wide array of academic choices, with 48 majors and 12 graduate programs in three Colleges. The rural, 144-acre main campus is bordered by coast redwood forest to the north and east, and the City of Arcata to the south and west. HSU also owns, leases or has use agreements to 591 additional acres, including a marine lab, observatory, natural history museum, salt water marsh, freshwater marsh, small lakes and ponds, forest lands, sand dune preserve, research vessel, Third Street Gallery, and the Wildlife Care Facility. Campus building stock comprises 113 buildings totaling 1,407,133 assignable square feet. The area experiences a mild climate, typified by a year round temperature average of 57 degrees. Overall, Humboldt County receives an average of 37.5 inches of rain per year.

Humboldt State University (HSU) has a longstanding commitment to environmental and social responsibility and is a leader in the integration of sustainability into its operations and academics. Many of HSU's operational and business activities generate greenhouse gases, however, which contribute to global climate change and its associated effects on social, economic and environmental systems. The Humboldt Bay region has already begun to experience manifestations of climate change, and these impacts are expected to intensify with increasing climate disruptions. 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 for the Humboldt Bay region indicate that sea level rise, flooding, shifting fire regimes and their attendant

socioeconomic disruptions are but some of the climate change-related impacts the area, including Humboldt State University, will experience in the coming decades. HSU 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

Measuring emissions and identifying their sources are the first steps towards identifying effective mitigation strategies. This section presents results of an inventory of the greenhouse gas emissions generated by Humboldt State University's primary operations and associated activities since 1990. A greenhouse gas (GHG) is generally defined as a gas that traps heat in the atmosphere. Anthropogenic emissions of carbon dioxide (CO2), methane (CH4), and other GHG are driving global climate change, as they are responsible for nearly all of the increase in greenhouse gases in the atmosphere over the last 150 years.

Greenhouse gas emissions are divided into three scopes. Direct emissions from combustion of fuels by campus owned or operated equipment falls under Scope 1. This includes fuel for campus fleet vehicles as well as natural gas for air/water heating and on-site electricity generation in a combined heat and power plant. Scope 2 comprises indirect emissions (i.e., emissions at the power plant) from electricity purchased by HSU, while Scope 3 includes emissions from related activities – business travel, student and employee commute, and solid waste disposal.

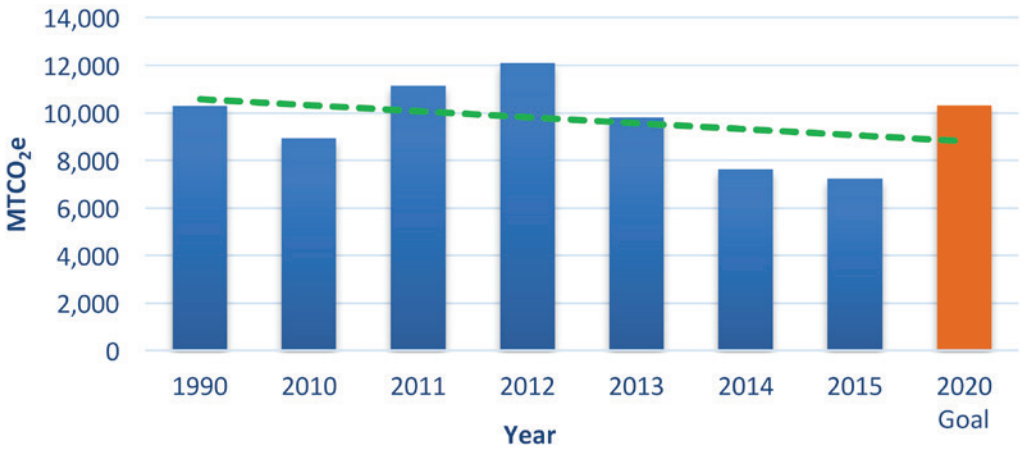
As with other California State Universities, HSU has the goal of reducing its Scopes 1 and 2 greenhouse gas emissions to 1990 levels by 2020, and to further reduce greenhouse gas emissions to 80% below 1990 levels by 2040. This inventory presents Scopes 1-2 emissions for the years 1990 and 2010 – 2014. Emissions are reported in Metric Tons of Carbon Dioxide Equivalent, or $MTCO_2e$, the most accepted unit of impact. Updated GHG emissions inventories will be conducted every two years following the formalized establishment of the CAP.

Figure 2 illustrates HSU's progress towards achieving this goal, based on the University's Scope 1 and 2 emissions reported by the CSU Chancellor's Office from 1990 to the present. Reasons for year to year variations in emissions include:

- 2011 was the first full year of operation for the College Creek Complex, which includes 97 apartments, a community center and market/deli.
- There were 28% fewer heating degree days in 2014 than there were in 2013. 2014 was a very mild year and required significantly less mechanical heating for the campus compared to 2013.
- California's Renewables Portfolio Standard (RPS) required that 20% of the electricity sold to HSU be derived from eligible renewable energy resources by December 31, 2013.
- High efficiency lighting and building HVAC upgrade projects in 2014-15.

As of the 2015 reporting year, HSU had dropped its measured Scopes 1 and 2 emissions by approximately 3,000 MTCO2e below 1990's total.

Figure 2. Meeting the Goal of 1990 Level Emissions by 2020 (Scopes 1 and 2 Only)



3.1 What Is Not Included In The Inventory

An accounting of indirect, Scope 3 emissions from solid waste, business travel, and student and employee commute was conducted alongside the Scopes 1 and 2 inventory. See Appendix B for a detailed analysis of Scope 3 emissions. Significantly, when compared to Scopes 1 and 2, results from this accounting indicate that Scope 3 emissions may comprise over one third of the campus' carbon footprint in any given year. The university recognizes the importance of eliminating these emissions to the greatest extent possible, and although reductions in Scope 3 emissions will not be counted towards the stated GHG reduction targets, the climate action plan does nonetheless include specific strategies for curbing emissions from commute, business travel and solid waste. Indeed, HSU is addressing Scope 3 emissions outside of this climate action plan by adhering to related targets stated in the CSU Sustainability Policy, which include the following:

- The CSU will encourage and promote the use of alternative transportation and/or alternative fuels to reduce GHG emissions related to university associated transportation, including commuter and business travel; and
- Campuses shall seek to reduce the solid waste disposal rate by 80 percent by 2020, and move to zero waste.

There are other related campus activities that generate indirect emissions, most notably the embodied emissions from water and the various products (i.e., food) consumed on campus. See Appendix C for details on why these emissions sources were not included in the final inventory.

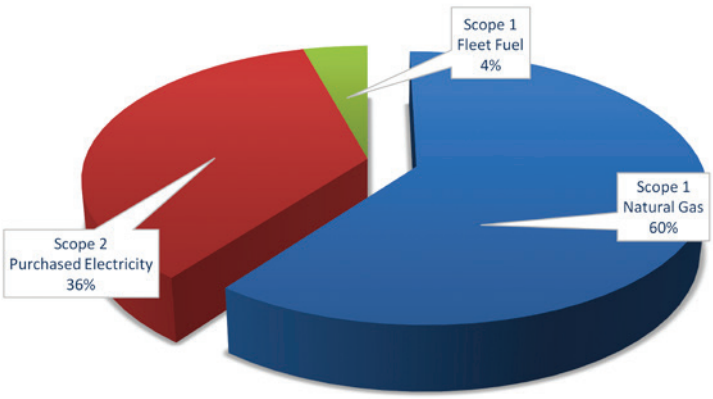
3.2 Scopes 1 And 2 Reporting

The Sustainability Office utilized emissions reports from the CSU to inventory Scopes 1 and 2 emissions. The CSU emissions reports are based off of monthly energy reports from HSU and are organized in accordance with the Climate Registry General Reporting Protocol.[xi] Scope 1 includes emissions released from sources that are owned or controlled by the university, such as vehicles, a co-generation (i.e., Combined Heat and Power) plant, laboratory equipment and boilers.

Scope 2 is comprised of emissions released as a result of campus purchased electricity. HSU, along with other universities in the Cal State University system, purchases the majority of its electricity through a Direct Access agreement with Shell Energy North America, an Energy Service Provider (ESP). Less than 10% of auxiliary and campus electricity is purchased directly from PG&E. The university currently does not purchase renewable energy credits (RECs), nor does it have any significant solar photovoltaic or other "green" self-generation installations to offset purchased power.[xii] The CSU utilized purchased electricity data and Direct Access specific emissions factors to identify Scope 2 (i.e., purchased power) emissions.

Figure 3 shows the contributions of Scopes 1 and 2 sources to HSU's carbon footprint in 2014. For each reporting year, natural gas consumption (Scope 1) has been the largest contributor to the campus' overall emissions footprint. Meanwhile, purchased electricity (Scope 2) continues to be approximately one third of the overall emissions footprint. These results are in part indicative of the geographical, climatic, and rural aspects of HSU. For example, campuses in hot climates have significant, energy-intensive cooling loads (i.e., electrical air conditioning, chilled water). HSU enjoys a mild climate year-round, leading to a nominal electrical cooling load limited to server rooms and other sensitive areas. Overall, however, HSU's emissions are trending towards meeting the goal of 1990 level emissions by 2020.

Figure 3. Distribution of 2014 Scope 1 and 2 Emissions ($MTCO_2e$)



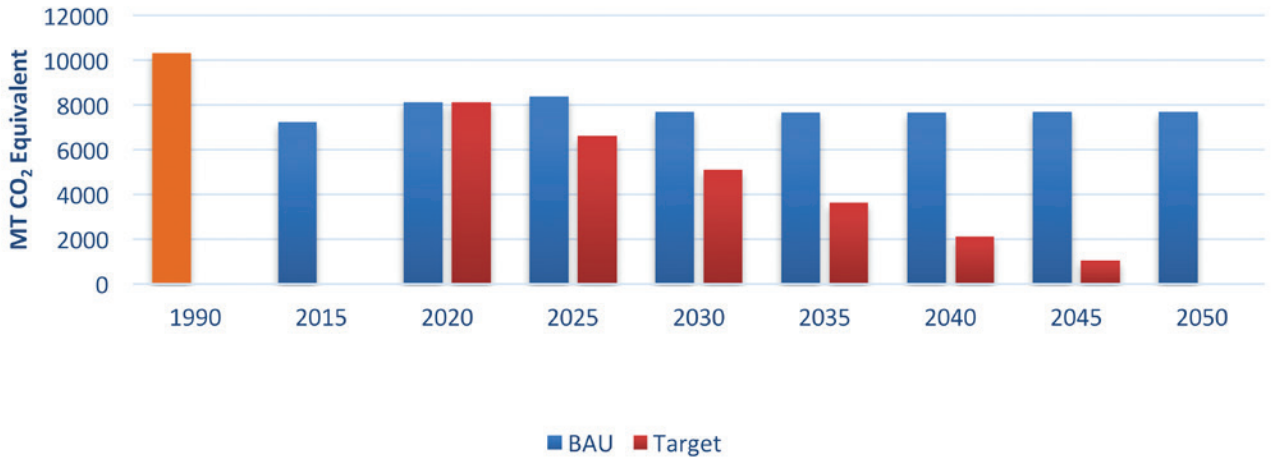
3.3 Emissions Projection and Business-As-Usual Scenario

Figure 4 illustrates total projected business-as-usual (BAU) emissions for HSU between 2020 and 2050, as well as the emissions reductions that will need to take place to reach year 2040 and year 2050 targets. This BAU scenario takes into account the following assumptions:

- Student population (FTES) estimates assume an annual growth rate of 1.5% per year until 2030, followed by zero net growth.
- Faculty and staff population estimates are based on current headcounts projected out at the same annual growth rate as students.
- Anticipated increase in miles traveled over time by campus fleet as service calls increase, as well as potential emissions reductions associated with further electric vehicle integration into the campus fleet, and the California Low Carbon Fuel Standard, which requires a 10 percent total reduction in petroleum-based fuels carbon intensity by 2020
- California Renewables Portfolio Standard (RPS) requires electric service providers to increase procurement from eligible renewable energy resources to 33% by 2020, and 50% by 2030.

Scope 1, comprised of emissions from burning natural gas and from fleet vehicle use, is projected to gradually increase over the next decade as usable square footage in campus buildings increases to accommodate a growing student body. After 2030, Scope 1 emissions are expected to remain relatively steady. Scope 2 emissions, which result from grid electricity consumption, are anticipated to decline. Although campus demand for electricity is projected to increase, emissions reductions resulting from emissions factor improvements for retail electricity, primarily as a result of RPS requirements, far exceeds any emissions increase attributable to growing demand. Between now and 2040, the University must incrementally reduce emissions by about 1,500 MT CO2e every five years to reduce its combined Scopes 1 and 2 emissions to 80% below 1990 levels. To reach carbon neutrality by 2050, HSU will need to incrementally reduce emissions by an additional 2,100 MT CO2e.

Figure 4. Business As Usual (BAU) Scenario



4.0 Previous Accomplishments

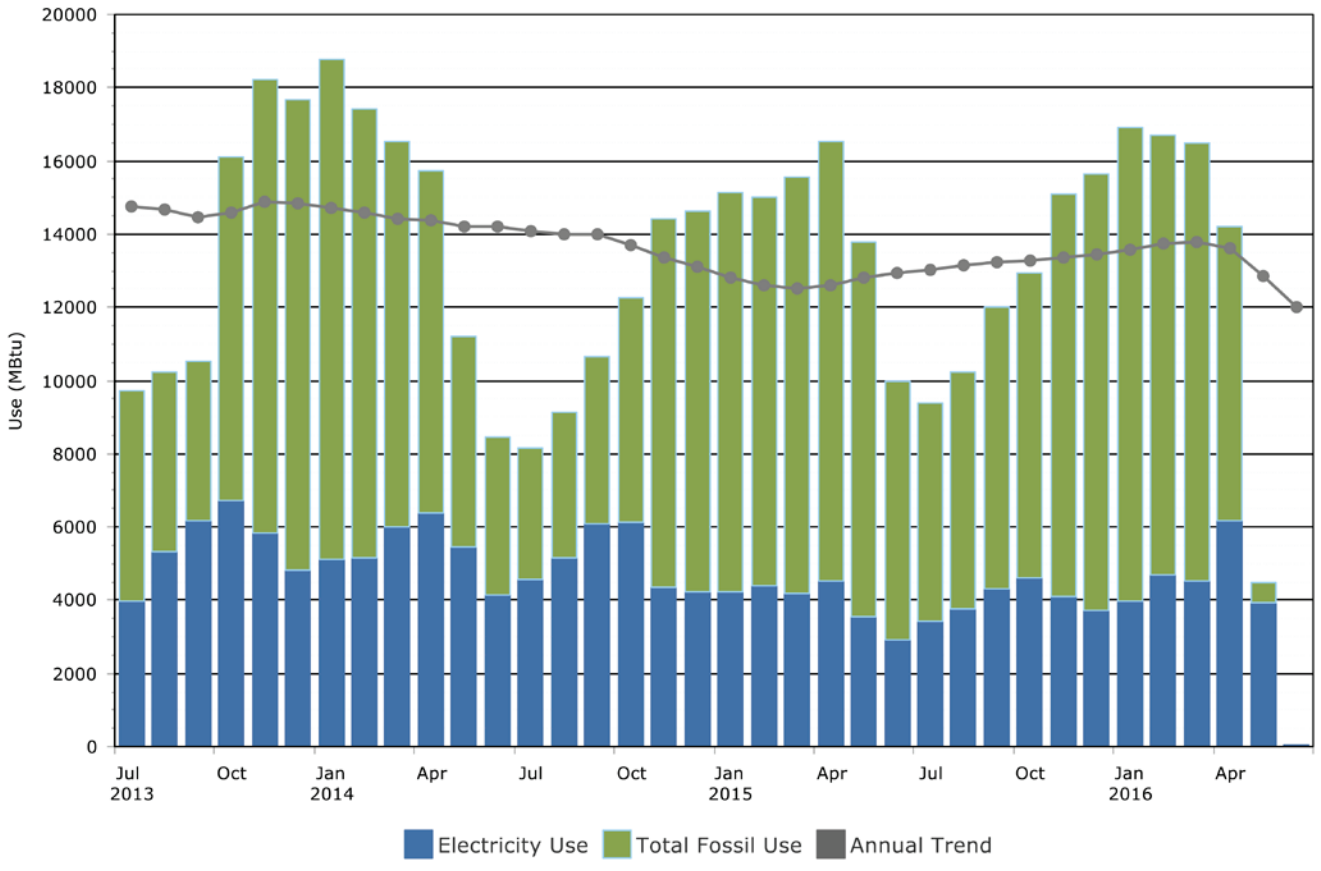
4.1 Energy Consumption

HSU has already taken significant steps to reduce its emissions, and ongoing efforts in the areas of energy efficiency and engagement around energy conservation behaviors have borne fruit in recent years, leading to declines in electricity and natural gas use. Figure 5 illustrates overall campus energy reduction between 2013 – 2016.

Recent accomplishments to reduce energy and on-site fuel consumption include but are not limited to:

- Introduction of electric vehicles (EVs) into the campus fleet. EVs now comprise approximately 15% of the campus fleet
- Behavioral & Social Sciences Building built to LEED Gold certification (USGBC)
- Monitoring Based Commissioning projects to tune up heating and ventilation controls in five campus buildings
- HVAC upgrade in Student Business Services
- Twenty high efficiency boiler upgrades
- LED and high efficiency lighting retrofits in buildings, stadium lighting and streetlights
- IT server virtualization and desktop power management
- Student energy reduction competitions and monthly power down events

Figure 5. Historical Energy Use Trend

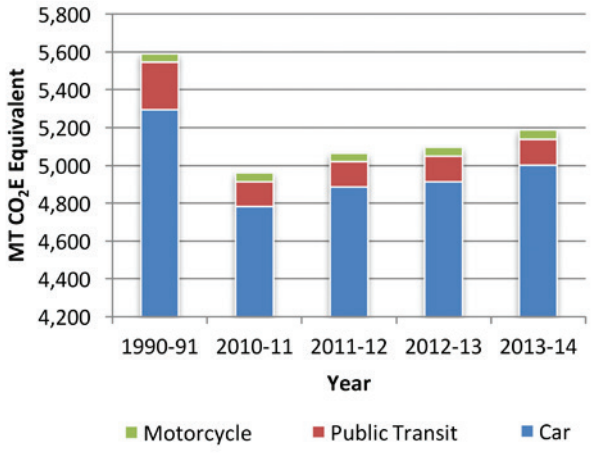


4.2 TRANSPORTATION

Emissions caused by commuter trips to and from campus continue to make up a significant portion of the university's overall carbon footprint (Figure 6), while causing traffic congestion and parking constraints. Vehicle fuel efficiency has improved since 1990, which has indirectly led to some decrease in commute-related GHG emissions.[xiii] Also, while the automobile continues to be the primary motorized mode of travel to and from campus, the University has implemented a series of programs that have had some impact in reducing single occupant vehicle trips, including:

- Since the 1990's, the Bicycle Learning Center, a student-run bicycle repair shop on campus, has focused on helping the campus community learn how to repair and maintain their own bikes and to be more comfortable riding.
- In 2007 HSU implemented the Jack Pass program, which has significantly increased bus ridership by giving students unlimited free ride access to county bus systems
- In 2011 HSU launched a Zipcar program, a car-sharing alternative to car ownership that also reduces demand for on-campus parking. Today the University hosts four Zipcar vehicles.
- In 2013 HSU partnered with ZimRide to provide a platform for carpool and rideshare alternatives for the campus community.
- HSU offers preferential parking on campus for students, faculty and staff that carpool to campus

Figure 6. Commute Emissions

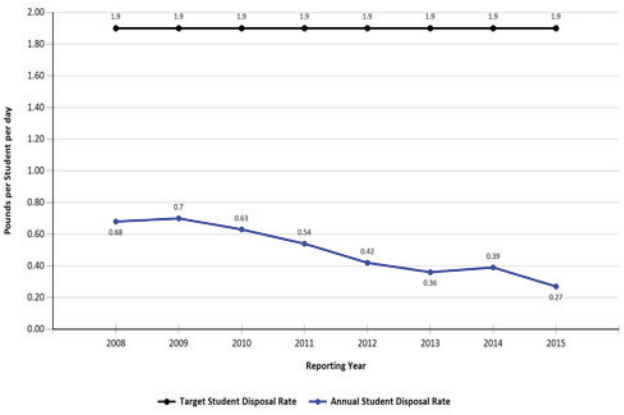


4.3 Waste Management

The university continues to make significant progress diverting waste from the landfill, far exceeding the State of California's per capita disposal rate targets per student and employee. Since 2008, waste minimization efforts have led to a reduction of 76% for employee waste and 60% for student waste. Figure 7 below shows the ongoing decline in annual student disposal rates, well below the State target of 1.9 pounds per student per day (Source*: State Agency Reporting Center: HSU 2015 Waste Management Annual Report*). Efforts driving these reductions include:

- A food waste diversion program that diverts pre- and post-consumer food waste from food service, residence halls, campus bins and events
- A phase out of Plastic Bottled Water sales and the institution of a plastic bag ban
- Black & White, double sided default on all networked printers within Administrative Affairs
- Donation Dash, which captures up to 14 tons of donate-able items from residents moving out of the residence halls
- Reusable Office Supply and Exchange, a student-run depot on campus for lightly used office and classroom supplies
- Green Events Certification, a student-led program to incorporate zero waste into campus events
- All HSU coffee shops serve hot and cold drinks in mason jars to reduce single-use cups and containers
- 100% Recycled Paper Policy requires the use of 100 percent post-consumer waste recycled office paper (or tree-free paper alternative) by all departments

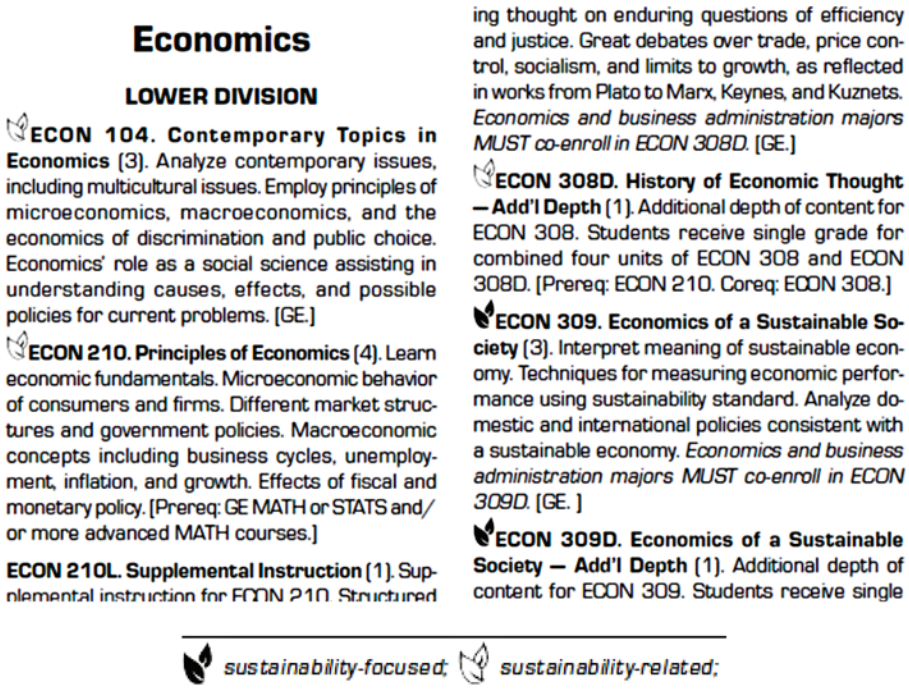
Figure 7. Annual Student Per Capita Disposal Rate vs. State Target Disposal Rate



4.4 Curriculum, Research and Engagement

HSU's mission is to serve its students by providing a wide array of programs and activities that promote understanding of social, economic and environmental issues, and to help individuals prepare to be responsible members of diverse societies.[xiv] To this end the university encourages the integration of sustainability into the curriculum, the utilization of campus infrastructure and operations for hands-on learning, research and scholarship in sustainability issues, and programs that provide experiential learning in sustainability outside of the classroom. These efforts include:

- The Campus Center for Appropriate Technology (CCAT) is a live-in laboratory and active demonstration of sustainable living. This student-led center provides hands-on learning opportunities in appropriate technology, self-sufficiency and living lightly on the earth. Most courses in the Appropriate Technology minor take place on CCAT's grounds.
- The mission of the Schatz Energy Research Center (SERC) is to promote clean and renewable energy. This facility is responsible for a number of technological breakthroughs, including America's first street-legal polymer electrolyte membrane (PEM) fuel cell powered car. SERC engineers work side by side with students on a broad range of projects.
- The HSU course catalog identifies courses that are sustainability-*focused* (i.e., concentration in sustainability) or sustainability-*related* courses (i.e. integration of social or economic issues with environmental dimensions) with a leaf symbol.
- In 2012 the university overhauled its Master of Business Administration program to focus on strategic sustainability. The newly designed MBA program prepares graduates to be innovative and responsible business leaders with the acumen to drive strategic change within their organizations.
- The Graduation Pledge of Social and Environmental Responsibility is a campus tradition since 1987 that has spread to other campuses around the world. Graduates make this vow to consider the social and environmental consequences of the decisions made after leaving the University. Today, the HSU Pledge calls on current students, faculty and staff to act on their values while on campus. The Pledge states, "I pledge, as an HSU community member, to explore and discover the social and environmental consequences of my choices and I will engage in positive change on our campus and community."
- The 2016 Humboldt Orientation Program hosted a mandatory series of hands-on workshops in zero waste for approximately 1,400 students.



Economics

LOWER DIVISION

ECON 104. Contemporary Topics in Economics (3). Analyze contemporary issues, including multicultural issues. Employ principles of microeconomics, macroeconomics, and the economics of discrimination and public choice. Economics' role as a social science assisting in understanding causes, effects, and possible policies for current problems. [GE.]

ECON 210. Principles of Economics (4). Learn economic fundamentals. Microeconomic behavior of consumers and firms. Different market structures and government policies. Macroeconomic concepts including business cycles, unemployment, inflation, and growth. Effects of fiscal and monetary policy. [Prereq: GE MATH or STATS and/or more advanced MATH courses.]

ECON 210L. Supplemental Instruction (1). Supplemental instruction for ECON 210. Structured

ing thought on enduring questions of efficiency and justice. Great debates over trade, price control, socialism, and limits to growth, as reflected in works from Plato to Marx, Keynes, and Kuznets. *Economics and business administration majors MUST co-enroll in ECON 308D.* [GE.]

ECON 308D. History of Economic Thought — Add'l Depth (1). Additional depth of content for ECON 308. Students receive single grade for combined four units of ECON 308 and ECON 308D. [Prereq: ECON 210. Coreq: ECON 308.]

ECON 309. Economics of a Sustainable Society (3). Interpret meaning of sustainable economy. Techniques for measuring economic performance using sustainability standard. Analyze domestic and international policies consistent with a sustainable economy. *Economics and business administration majors MUST co-enroll in ECON 309D.* [GE.]

ECON 309D. Economics of a Sustainable Society — Add'l Depth (1). Additional depth of content for ECON 309. Students receive single

sustainability-focused; sustainability-related;

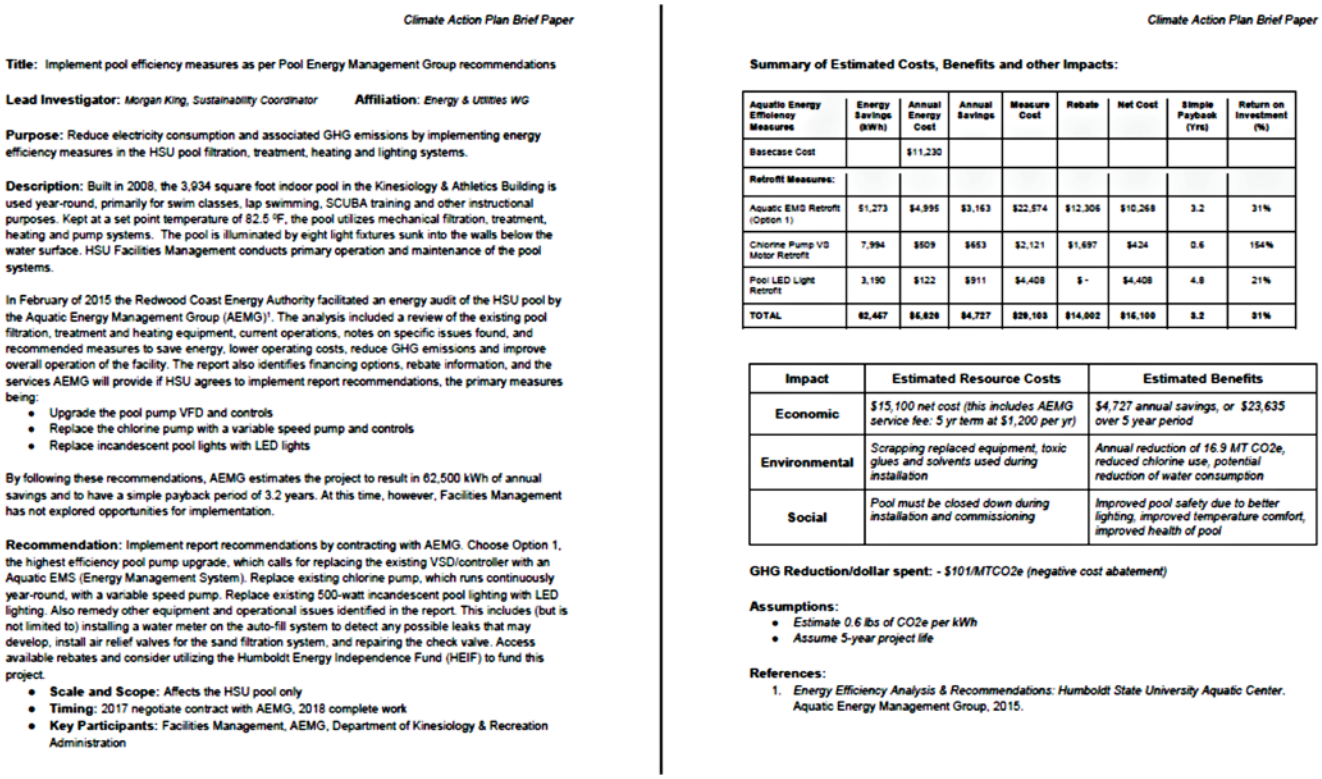
5.0 Recommended Strategies to Mitigate Emissions

5.1 Process For Selecting and Prioritizing Strategies

The Sustainability Office invited stakeholders from across campus to collaboratively develop strategies to reduce emissions and/or integrate sustainability and climate science into the curriculum and campus culture. They formed four topic-specific working groups, and over an eight-month period reviewed other campuses' plans, established baseline metrics, collected data, conducted cost-benefit analyses and produced strategy brief papers (see Figure 8) supporting the strategies recommended in this document. The Climate Action Committee guided the working groups in strategy development, organized campus stakeholder feedback for inclusion in the strategies, and reviewed strategies to determine their inclusion in the final plan.

Strategies in this plan take into account the three interrelated dimensions of sustainability: Ecology, Society, and Economy. Development of the strategies included evaluation and prioritization of unquantifiable co-benefits, such as improved health, heightened sustainability literacy, and behavior change. Strategies also take into account their potential negative impacts, such as reduced parking availability or increased maintenance requirements. Furthermore, the working groups utilized a "Dollar spent per $MTCO_2e$ reduced" metric to identify the overall cost-effectiveness of strategies with quantifiable emissions reductions.

Figure 8. Strategy Brief Paper



Climate Action Plan Brief Paper

Title: Implement pool efficiency measures as per Pool Energy Management Group recommendations

Lead Investigator: *Morgan King, Sustainability Coordinator* **Affiliation:** *Energy & Utilities WG*

Purpose: Reduce electricity consumption and associated GHG emissions by implementing energy efficiency measures in the HSU pool filtration, treatment, heating and lighting systems.

Description: Built in 2008, the 3,934 square foot indoor pool in the Kinesiology & Athletics Building is used year-round, primarily for swim classes, lap swimming, SCUBA training and other instructional purposes. Kept at a set point temperature of 82.5 °F, the pool utilizes mechanical filtration, treatment, heating and pump systems. The pool is illuminated by eight light fixtures sunk into the walls below the water surface. HSU Facilities Management conducts primary operation and maintenance of the pool systems.

In February of 2015 the Redwood Coast Energy Authority facilitated an energy audit of the HSU pool by the Aquatic Energy Management Group (AEMG)[1]. The analysis included a review of the existing pool filtration, treatment and heating equipment, current operations, notes on specific issues found, and recommended measures to save energy, lower operating costs, reduce GHG emissions and improve overall operation of the facility. The report also identifies financing options, rebate information, and the services AEMG will provide if HSU agrees to implement report recommendations, the primary measures being:

- Upgrade the pool pump VFD and controls
- Replace the chlorine pump with a variable speed pump and controls
- Replace incandescent pool lights with LED lights

By following these recommendations, AEMG estimates the project to result in 62,500 kWh of annual savings and to have a simple payback period of 3.2 years. At this time, however, Facilities Management has not explored opportunities for implementation.

Recommendation: Implement report recommendations by contracting with AEMG. Choose Option 1, the highest efficiency pool pump upgrade, which calls for replacing the existing VSD/controller with an Aquatic EMS (Energy Management System). Replace existing chlorine pump, which runs continuously year-round, with a variable speed pump. Replace existing 500-watt incandescent pool lighting with LED lighting. Also remedy other equipment and operational issues identified in the report. This includes (but is not limited to) installing a water meter on the auto-fill system to detect any possible leaks that may develop, install air relief valves for the sand filtration system, and repairing the check valve. Access available rebates and consider utilizing the Humboldt Energy Independence Fund (HEIF) to fund this project.

- **Scale and Scope:** Affects the HSU pool only
- **Timing:** 2017 negotiate contract with AEMG, 2018 complete work
- **Key Participants:** Facilities Management, AEMG, Department of Kinesiology & Recreation Administration

Climate Action Plan Brief Paper

Summary of Estimated Costs, Benefits and other Impacts:

Aquatic Energy Efficiency Measures	Energy Savings (kWh)	Annual Energy Cost	Annual Savings	Measure Cost	Rebate	Net Cost	Simple Payback (Yrs)	Return on Investment (%)
Basecase Cost		$11,230						
Retrofit Measures:								
Aquatic EMS Retrofit (Option 1)	51,273	$4,995	$3,163	$22,574	$12,306	$10,268	3.2	31%
Chlorine Pump VS Motor Retrofit	7,994	$509	$653	$2,121	$1,697	$424	0.6	154%
Pool LED Light Retrofit	3,190	$122	$911	$4,408	$ -	$4,408	4.8	21%
TOTAL	62,457	$5,626	$4,727	$29,103	$14,002	$15,100	3.2	31%

Impact	Estimated Resource Costs	Estimated Benefits
Economic	*$15,100 net cost (this includes AEMG service fee: 5 yr term at $1,200 per yr)*	*$4,727 annual savings, or $23,635 over 5 year period*
Environmental	*Scrapping replaced equipment, toxic glues and solvents used during installation*	*Annual reduction of 16.9 MT CO2e, reduced chlorine use, potential reduction of water consumption*
Social	*Pool must be closed down during installation and commissioning*	*Improved pool safety due to better lighting, improved temperature comfort, improved health of pool*

GHG Reduction/dollar spent: *- $101/MTCO2e (negative cost abatement)*

Assumptions:

- *Estimate 0.6 lbs of CO2e per kWh*
- *Assume 5-year project life*

References:

1. *Energy Efficiency Analysis & Recommendations: Humboldt State University Aquatic Center.* Aquatic Energy Management Group, 2015.

The subsequent pages present a summary of the recommended strategies to advance HSU towards its GHG reduction targets. This summary includes the following qualitative parameters that were used in the evaluation process:

- Estimated Investment: Initial capital outlay as well as ongoing estimated costs over duration of project.
  - Low = $1 - $25,000 over duration of project
  - Moderate = $25,001 - $100,000 over duration of project
  - High = over $100,000

- Cost Savings: Estimated savings attributable to energy, water or waste reductions, decreased fuel use, as well as reduced purchase or labor requirements, over duration of project.
  - Low = $1 - 25,000
  - Moderate = $25,001 - $100,000
  - High = over $100,000

- Cost Effectiveness ($/MTCO$_2$e): Estimated cost abatement as the total expense over project life divided by total estimated lifetime emissions abatement.
  - **-** = negative cost, or $ savings per MTCO2e over life of project
  - **+** = positive cost, or $ spent per MTCO2e over life of project
  - **L** = Low, $1 - 100/MTCO2e; M = Moderate, $101 - 500/MTCO2e; H = High, $501+/MTCO2e

Strategies to be implemented within the next five years are highlighted in a lighter color; strategies to be implemented beyond five years from now are highlighted in a darker color. Many of these actions, however, can and will be undertaken simultaneously. All recommended strategies herein will be subject to further administrative review and funding availability, and until analyzed on a project by project basis, the true cost and the full potential for GHG reduction cannot be determined.

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

Goal: Reduce Scopes 1 and 2 GHG emissions to or below 1990 levels by 2020, and to 80% below 1990 levels by 2040.

This section outlines strategies to curb Scopes 1 and 2 emissions to meet the specific reduction targets previously mentioned in this plan. Each strategy includes a summary that identifies (a) which division or department will take a leadership role in implementing the strategy; (b) the primary resources needed to implement the strategy; (c) the anticipated quantitative and/or qualitative impact; (d) the combined estimated initial and ongoing capital investment; (e) the anticipated lifetime project cost savings, and (f) the marginal abatement cost of the project. Short term strategies are highlighted in light orange, while long term strategies are highlighted in dark orange. See the Appendix for further information on each strategy.

Figure 9. Strategies to Curb Emissions from Natural Gas, Fleet Fuel and Electricity Consumption

Strategy	Leadership	Estimated Resources	Estimated Impact	Estimated Investment	Cost Savings	Effectiveness ($/MTCO2e)
Implement pool efficiency measures as per Pool Energy Management Group recommendations	Facilities	Staff time to install new equipment, service fee to Pool Energy Mgmt Group	Energy savings, GHG reductions, improved pool comfort	Low	Low	-M
Enforce Executive Order 987 and remove unnecessary devices like personal refrigerators, heaters, decorative lighting	Facilities	Staff time to develop SOP, work with student groups on outreach campaign	Energy savings, space efficiencies, lower maintenance costs	Low	Low	-L
Reduce energy consumption from campus computing through server virtualization, desktop power management and other efforts	ITS	Staff time, convene Green IT Working Group, equipment costs, outreach materials	Energy savings, GHG reductions, reduced cooling load	Low	High	-M
Use renewable diesel (RD) fuel in diesel fleet vehicles	Facilities	Incremental fuel cost increase	GHG reductions	Low	None	+L
Implement building HVAC and water heating upgrades and controls	Facilities	Project team to scope upgrades and costs.	utility cost savings, GHG reductions, improved building comfort	[High]	[High]	-M
Develop building scheduling system to consolidate off-hour and summer classes into select buildings (as per EO 987)	Facilities, Academic Affairs, University Center	Staff time	energy reduction, reduced facilities operation costs, GHG reductions	[Low]	[Moderate]	-M
Implement high efficiency interior lighting guidelines for all renovation and new construction projects	Facilities	Staff time to develop guiding document, HEIF student time, incremental cost increase for LED and sensor technologies	energy reduction, reduced relamp costs, GHG reductions, improved safety	Unknown	Unkown but expected	-H
Increase energy awareness and action through better signage and outreach campaigns	Green Campus	Student staff time, outreach materials, incentives	Behavior change, utility cost savings, some GHG reductions	High	Moderate	-M
Upgrade exterior lighting systems to LED with appropriate controls	Facilities	Staff time to develop phased implementation strategy	energy and utility cost savings, reduced re-lamping, safety	High	High	-L
Install rooftop solar photovoltaic systems on campus buildings through a power purchase agreement (PPA)	Facilities	Staff time to put out to bid, no start-up costs if PPA, but may see incremental increase for power purchase	Significant GHG reductions, student engagement, high profile project	Low	None to low	+L
Encourage all divisions participate in the Green Workplace Assessment and Certification Program	Green Campus, Sustainability Office	Student and staff time, outreach materials, audit tools, incentives	Resource conservation, utility savings, behavior change	Low	Low	+L
Begin planning and advocating for switch to an electrical provider with a climate friendly power content label	Business Services	Staff time to negotiate, incremental cost increase per kWh	Elimination of Scope 2 emissions	High	None	+H
Eliminate hot water option in residence hall washing machines and conduct outreach campaign to educate residents on cold water washing	Housing	Staff time, small materials cost	Natural gas savings, GHG reductions	Low	Moderate	-M
Investigate opportunities to improve waste heat/electricity utilization of Housing CHP plant	Housing	Staff time, contract engineering firm, infrastructure costs	Reduced natural gas consumption, GHG reductions	High	Unknown	Unknown
Install individual meters with automated controls and real-time feedback on primary campus buildings	Facilities, Green Campus	Metering equipment, staff time to install, student time for outreach	Behavior change, utility cost savings, some GHG reductions	High	Unknown	Unknown
Apply carbon neutrality building standards to new construction projects and major renovations when appropriate	Facilities	Staff to develop internal scorecard to evaluate project proposals based on carbon neutrality criteria	Reduced building lifecycle costs, utility savings	Low	None	Unknown
Pilot heat pump technology in campus building to reduce natural gas used for space and water heating	Facilities	Staff time, equipment costs	Reduced dependence on natural gas, GHG reductions, potential utility cost savings	Moderate	Unknown	Unknown

5.3 Strategies to Reduce Emissions from Commuter And Business Travel

Related Goal: Encourage and promote the use of alternative transportation and/or alternative fuels to reduce GHG emissions related to university associated transportation, including commuter and business travel (CSU Sustainability Policy).

This section outlines strategies to curb Scope 3 emissions attributed to non-fleet transportation to and from campus. Each strategy includes a summary that identifies (a) which division or department will take a leadership role in implementing the strategy; (b) the primary resources needed to implement the strategy; (c) the anticipated quantitative and/or qualitative impact; (d) the combined estimated initial and ongoing capital investment; (e) the anticipated lifetime project cost savings, and (f) the marginal abatement cost of the project (if known). Short term strategies are highlighted in light green, while long term strategies are highlighted in dark green. See the Appendix for further information on each strategy.

Figure 10. Strategies to Reduce Emissions from Commuter and Business Travel

Strategy	Leadership	Estimated Resources	Estimated Impact	Estimated Investment	Cost Savings	Effectiveness ($/MTCO2e)
Expand the Bicycle Learning Center on campus to host bike repair workshops, bike tours of campus and community and other events like the National Bike Challenge	Rec & Wellness	Hiring new staff, yearly budget, space for Center	Reduced SOV trips, minor GHG reductions, improved health	High	Low	Unknown
Transportation Demand Management Plan to improve bike/pedestrian infrastructure and accessibility to/from and on campus	Facilities Management	staff time to hire/oversee contractor	Potential for large GHG reductions, reduced parking constraints, increase safety, preserve green space	Moderate	Unkown	Unknown
Explore developing a bike share and/or bike rental program	Office of Sustainability, BLC, City of Arcata, Rec& Wellness	Staff time, bikes and parts, BLC provide maintenance	Reduced SOV trips, minor GHG reductions, improved health	Low	Unkown	Unknown
Establish dedicated parking/ charging for electric vehicles	Facilities Management	Four EV charging stalls, staff time to install, dedicated parking spaces	GHG reductions, incentivize low carbon vehicles	Moderate	Low	+L
Establish a carpool program	Parking Services	Staff time, dedicated parking spaces, permit process	Recovered revenue from freed-up parking meters, reduced SOV trips	Low	Moderate to High	-M
Encourage limits to business travel by expanding use of video/ teleconferencing technologies	Admin Affairs, ITS	Staff time to develop policy and procedures, equipment to expand video-conferencing capabilities	GHG reductions from reduced business travel, business travel cost savings	Low	Moderate	-M
Expand marketing of Zip Car, Zim Ride and Jack Pass Programs to first year students	Housing, Parking & Comm. Svcs	Staff time to develop outreach materials, incentives	Reduced SOV trips, more first year students not bringing car to HSU	Low	Low	Unknown
Establish incentive for voluntary car-free commuter commitment: parking permit buy-back program	Parking Services	Staff time, pro-rated cash refund for permits, Jack Pass and Zip Car credits as ongoing incentive	Minor GHG reduction, reduced parking constraints	Low	None	Unknown
Better align local bus schedules with class schedules to increase bus ridership, and offer Jack Pass for summer sessions	Parking & Comm. Svcs	Staff time to work with transportation agencies, funding for summer Jack Pass	Reduced SOV trips and parking issues	Low	Potential savings by mitigating need for additional parking	-L

5.4 Strategies to Reduce Emissions from Solid Waste, Purchasing and Food

Related Goal: Reduce solid waste disposal rate by 80 percent by 2020, and move to zero waste. To move to zero waste, campus practices should encourage use of products that minimize the volume of trash sent to landfill and promote vendors who reduce waste (CSU Sustainability Policy).

This section outlines strategies to curb Scope 3 emissions attributed to solid waste disposal and to expand waste minimization efforts in the areas of procurement and dining services. Each strategy includes a summary that identifies (a) which division or department will take a leadership role in implementing the strategy; (b) the primary resources needed to implement the strategy; (c) the anticipated quantitative and/or qualitative impact; (d) the combined estimated initial and ongoing capital investment; (e) the anticipated lifetime project cost savings, and (f) the marginal abatement cost of the project. Short term strategies are highlighted in light blue, while long term strategies are highlighted in dark blue. See the Appendix for further information on each strategy.

Figure 11. Strategies to Reduce Emissions from Solid Waste, Purchasing and Food

Strategy	Leadership	Estimated Resources	Estimated Impact	Estimated Investment	Cost Savings	Effectiveness ($/MTCO2e)
Require and enforce increased construction & demolition debris recycling from contractors	Facilities	"Staff time, Recycling Guide"	"Low-moderate GHG reduction, waste reduction"	Low	High	-L
"Require double sided, B&W printing default set on all networked campus printers/copiers"	ITS	"Staff time, outreach "	"Reduce paper use by 500+ cases, Low GHG reduction, waste reduction, paper cost savings"	Low	High	-M
Write single use water container ban into formal policy that requires compliance from all State and non-State entities on campus	"Office of Sust., Admin Affairs"	"Staff time, low cost"	Waste reduction	Low	Low	-L
"Online posting systems, supplies and equipment to encourage inter-departmental and campus community re-use of durable goods"	Asset Management	"Low maintenance cost, staff time; WRRAP assist with outreach"	"Reduced waste, reduced miles traveled by fleet, some GHG reduction"	Moderate	Moderate	-L
"Standardize Recycling, Compost and landfill bins, colors and signage across campus"	Office of Sust.	"Initial moderate cost, then savings"	"Reduced waste, tip fee savings, minor GHG reduction"	Low	Low	-L
Require paper towel composting while phasing out paper towels for hand dryers	Facilities Management	"Moderate investment, staff time"	"Waste reduction, paper towel cost savings, low GHG reduction"	Low	High	-H
Require events held on campus to be zero waste when feasible and practical	"Office of Sustainability, Admin Services"	"Staff time, update forms, outreach"	"Waste reduction, tip fee savings, low GHG reduction"	Low	Low	-L
Food Recovery: Work with vendors to divert non-perishable food past its sell-by date to the Food Pantry and/or local charities;	"Dining Services, Health Education"	"Staff time, update vendor agreements, bins for collection"	"Reduced waste, improved food security"	Low	Low	Unknown
Convene Zero Waste Purchasing Group, work to minimize packaging waste of purchases across all State and non-State entities on campus	Contracts & Procurement	"Staff time, potential additional cost for low-waste items"	"Reduced waste, tip fee savings, minor GHG reduction"	Low	Low	Unknown
"Formal policy for HSU Dining & Catering to donate, when feasible, any perishable food left over at end of event, or end of day"	Dining Services	"Staff Time, training, coordination with org's"	"Reduced waste, improved food security"	Low	Low	Unknown

5.5 Curriculum, Research and Student Engagement Strategies

Related Goals: Seek to further integrate sustainability into the academic curriculum (Sustainability Policy). Prepare students to be socially and environmentally responsible leaders in a diverse and globalized world (2015-2020 HSU Strategic Plan).

This section outlines strategies to integrate sustainability into academics and student life and otherwise foster a culture of sustainability at HSU. These strategies will not lead to a direct or quantifiable emissions reduction. However, an increased level of understanding and engagement in sustainability and climate change issues will engender a higher level of participation in our climate protection efforts, while preparing future professionals, leaders and citizens in all disciplines. Each strategy includes a summary that identifies (a) which division or department will take a leadership role in implementing the strategy; (b) the primary resources needed to implement the strategy; (c) the anticipated impact, and (d) the combined estimated initial and ongoing capital investment. Short term strategies are highlighted in light yellow, while long term strategies are highlighted in dark yellow. See the Appendix for further information on each strategy.

Figure 12. Strategies to Integrate Sustainability into Academics and Campus Culture

Strategy	Leadership	Estimated Resources	Estimated Impact	Est. Investment
Campus as a Living Laboratory: Expand the utilization of the campus as a context for learning across all disciplines (with a focus on sustainability)	Academic Affairs, Sust. Office	Staff, Faculty time, training costs	Integration of sustainability into curriculum, reduced utility costs	Low to moderate
Integrate sustainability offerings into orientation programs and messaging	HOP, HOOP, Residence Life, Sust Off	Cost to update website, orientation materials, handbook and green map, training time	Student engagement leads to behavior changes, STARS 2 points up to 21 points, reduced utility costs	Low
Create an Eco-Rep program in the residence halls	Residence Life	Cost to hire or provide incentives for Eco Reps, staff to supervise, small budget for materials	Reduced utility costs, waste reduction	Low to moderate
Encourage yearly sustainability projects showcase (e.g., gallery or fair)	Student Affairs, Office of Sust	Cost for organizing and advertising event. Staff time	Community engagement, student learning	Low
Develop directory of local sustainability practitioners that can be guest speakers	Sust Office	Staff time to develop and update directory	community connections, learning opportunities, STARS points	Low
Develop a sustainability path in GE courses	Academic Affairs	Faculty/staff time, update catalog and course material	increased sustainability literacy. More meaningful GE experience	Low
Update/expand courses identified as sustainability-focused or related	Academic Affairs	Staff and faculty time, update catalog and websites	Enhance visibility of sustainability themed courses. STARS points	Low
Provide annual sustainability orientation for current and newly hired faculty, including incorporation into ISS book circle	Sust Office, Academic Affairs	Staff/faculty time to develop and lead orientation, materials cost	Empower faculty, increase sustainability literacy	Low
Outstanding Sustainability Awards for faculty/staff/student/department/building	Admin Affairs, Academic Affairs, Sust Off	Staff time, cost for awards and reception	Acknowledge sustainability champions, positive peer pressure	Low

Figure 12. Continued

Strategy	Leadership	Estimated Resources	Estimated Impact	Est. Investment
Create designated outdoor classroom	"Facilities, Academic Affairs"	"Costs for site assessment, design, install and ongoing maintenance"	"Increase opportunities for ecological literacy, STARS points"	High
Establish an Institute for Sustainability at HSU on the academic side	"Provost, Academic Affairs"	"Hire additional staff, operating budget, physical space"	"Strengthen sustainability integration, attract grants, faculty and student resource"	High
Explore a sustainability learning outcome and assessment for seniors	Academic Affairs	"Cost for faculty orientation speaker fee and materials, faculty time. Will need to explore effective ways to assess; potentially working with GWPE"	"Sustainability integration into curriculum, student engagement"	Low
Develop a sustainability minor capitalizing on existing courses	"Academic Affairs, ICC"	"Faculty/staff time to be on working group, ongoing oversight, course materials"	"Sustainability integration into curriculum, prep for green jobs, STARS points"	Low to moderate
Pursue/explore a sustainability course or units requirement to graduate	Academic Affairs	Faculty time	Graduate students with sustainability competency	Low

5.6 Catalysts to Facilitate Implementation of Strategies

Catalysts are defined strategies, developed by the Climate Action Committee and working groups, that, once implemented, will facilitate the implementation of all aforementioned strategies. These catalysts do not fit neatly into a strategy category, and are thus presented here.

The plan recommends the immediate establishment of an official, long term Sustainability Committee to oversee efforts to implement the climate action plan and the Climate Commitment. This Committee will serve as a governing board with an established charge, regular leadership rotation, election terms and procedures to advise the Sustainability Office and other campus entities working on sustainability efforts. Comprised of stakeholders from all campus constituencies, the Sustainability Committee will advise on policies and priorities and help plan short and long-term initiatives and programs. It should also include a Climate working group tasked with reviewing data for monitoring progress towards meeting reduction targets, evaluating and recommending further action to achieve meaningful GHG reductions. The Sustainability Office will participate in and provide information and support to the Committee.

The university, however, cannot afford to delay implementation until the **Sustainability Committee** is convened, as it may take many months before a framework and a membership roster are approved and committee members are recruited. Therefore, this plan also recommends that, in the period of time between adoption of the climate action plan and the establishment of the Sustainability Committee, an interim Bridge Group is formed. This group will meet with Department leads to review strategies that fall under their purview. In particular, the Bridge Group will work with Department leads to facilitate the planning that must take place prior to implementation of strategies. In particular, this group will

- Cultivate sponsorship of and buy-in for the strategies amongst Department leads;
- Identify barriers to implementation and solutions to overcome barriers;
- Identify funding and resource requirements needed for implementation of proposed strategies, and
- Facilitate prioritization of strategies based on initial costs, funding, estimated payback period and other factors.

In an effort to expand the Sustainability Office's capacity, the plan also recommends that a mechanism be developed to assign a faculty member to directly assist with the implementation of curriculum and research related strategies. This **Faculty Sustainability Champion** will help coordinate processes to advance the university's sustainability integration initiatives on the academic side, support outreach to Academic Affairs and faculty, and otherwise assisting with incorporating carbon neutrality, resiliency and sustainability concepts into the educational experience.

The high initial cost of some strategies in the Climate Action Plan might deter or otherwise delay their implementation, despite the fact that such projects may demonstrate a long-term cost savings. The plan therefore recommends the establishment of a **Green Revolving Loan** Fund to provide capital for energy or resource efficiency projects that lead to demonstrable savings. Those savings can then be directed back into the fund to finance additional projects.

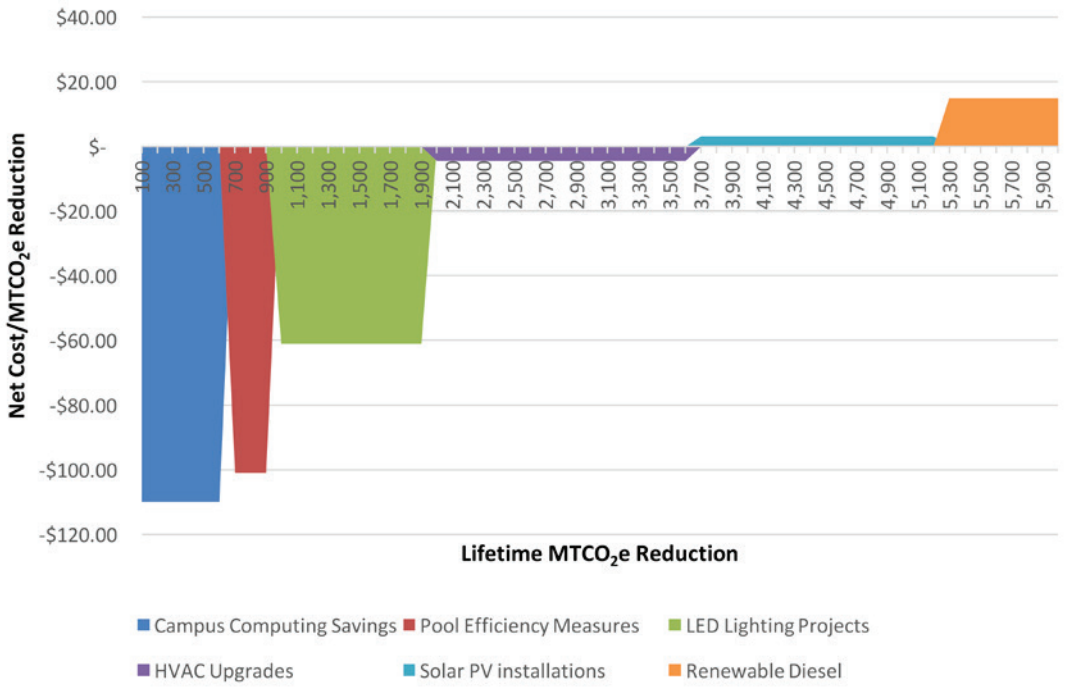
Successful implementation of many of the strategies within this plan will require accurate, automated utility metering as the best method to monitor consumption patterns, to optimize system efficiencies and to quantify savings and GHG reductions. Furthermore, direct feedback or real-time monitoring and display of utility consumption can produce behavior-based savings of over 5%.[xv] At present many campus buildings are not sub-metered for water or energy. The plan therefore recommends thorough deployment of individual **utility meters** with automated controls and real-time feedback on primary campus buildings.

Finally, the plan recommends the development of a tool to assess **student sustainability literacy**. This tool will assist the campus in understanding the baseline levels of understanding of sustainability concepts across the campus community. Furthermore, an annual assessment can track the long-term changes in sustainability literacy rates as a means of measuring the impact of strategies that integrate sustainability into the curriculum or campus life.

6.0 Implementation

Where possible, strategies in this plan were analyzed and prioritized according to their cost-benefit, anticipated resource requirements and other factors. According to the Business-As-Usual (BAU) scenario, the university will need to reduce its emissions by approximately 6,000 $MTCO_2e$ to achieve the 2040 goal of 80% below 1990 level emissions. Figure 13 summarizes the top six prioritized Scopes 1 and 2 strategies that could collectively get HSU to the 2040

Figure 13. Scope 1 and 2 Priority Projects



target. In this figure, projects are ordered according to their abatement potential. The width of the bar represents the carbon savings potential of a project over its lifetime. The height of each bar represents the abatement cost of the project, or the dollar cost required to abate one metric ton of CO_2e.

Abatement costs for these six projects were modelled based on the following:

- GHG reductions were estimated based on 2015 emissions factors
- Energy savings were estimated based on current energy costs
- Project lifetimes are assumed to be 20 years

Interestingly, certain projects have a negative cost over their lifetime, meaning they have a net financial as well as carbon benefit. The primary challenge with these projects will be to secure the initial capital, yet once implemented these projects will pay for themselves (e.g., through energy cost savings) over time.

The successful completion of the HSU Climate Action Plan is due in great part to the contributions of students, faculty, staff and community members. No longer is change driven primarily as a response to student agitation for action. As evidenced by the signing of the Climate Commitment, the entire campus community, from the student body through the administration, is collectively engaged in integrating sustainability into the culture and operations of this campus. With the goal of reaching 80% below 1990 levels by 2020, and achieving climate neutrality by 2050, it will thus take strong leadership, coupled with broader campus collaboration, to see the successful implementation of the strategies set forth in this plan. The university's next step is therefore to prioritize, develop timelines and assign leadership responsibility to implement strategies outlined herein. Proposed implementation is outlined below:

- A Sustainability Committee will be convened as soon as possible to oversee priority setting, timeline development, and action plan implementation.
- Responsibility for the development, implementation and reporting on specific strategies will be shared across various departments, depending on the type of project. For example, Facilities Management will lead building energy efficiency projects; Academic Affairs will lead curriculum projects.

While the Sustainability Committee is being formalized, a bridge group will work with department leads to facilitate the planning that must take place prior to the implementation of strategies.

- The Sustainability Office will conduct biennial GHG emissions inventories and report findings to the Sustainability Committee, Second Nature, the CSU Chancellor's Office, and the campus at large.
- The Sustainability Office will monitor, support and evaluate strategy implementation and will provide regular progress reports to the Sustainability Committee and Second Nature.
- The Sustainability Office, in conjunction with the Sustainability Committee, will update the CAP every five years, as required by the Climate Commitment.

7.0 The Path Forward

Various pathways exist for eliminating Scopes 1 and 2 emissions from campus buildings and fleet. To become carbon neutral and eventually carbon *negative*, the university must reduce emissions from these sectors to the greatest extent possible, and then 'offset' any remaining emissions. In concert with the strategies found within this plan, options to achieve climate neutrality include:

- Expand fuel-switching from natural gas to electricity beyond pilot phase by replacing all gas-fired boilers, air heaters and other gas-fired appliances on campus with heat pumps or similar technology
- Transitioning 100% of the campus fleet to electric or net zero carbon vehicles such as renewable diesel or biogas
- Offsetting remaining emissions through strategies such as purchasing carbon credits and/or implementing carbon sequestration measures

Carbon sequestration describes 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 campus activities. The L.W. Schatz Demonstration Tree Farm is a 385-acre forest holding used primarily for research by the Forestry and Wildland Resources Department. In 2016 researchers estimated its actual carbon stock and annual sequestration potential. Compared to the university's greenhouse gas emissions inventory, researchers determined that this land holding can sequester 16-26% of the university's emissions. Although more research needs to be done in this area, we recognize

the role that carbon sequestration can take as an additional strategy for achieving carbon neutrality by 2050. Because the strategies in this plan will guide the campus towards eliminating Scope 2 emissions (e.g., through 100% green power purchasing), carbon sequestration and other offset strategies may only need be applied to offsetting Scope 1 emissions otherwise not addressed through the strategies in this Plan.

The University must start planning efforts today if we are to achieve carbon neutrality. Achieving a net zero carbon – and ultimately net negative – carbon footprint may require a significant shift in how the campus operates and serves its students. Sustainability must be a strategic priority for all of campus, so that all major decisions, planning efforts and activities are conducted according to the "Triple Bottom Line": the interrelated dimensions of sustainability that are ecology, economy and social equity. It must also become fully integrated into the culture of the campus, so that students, faculty and staff are not merely aware of our carbon neutrality goal, but are active participants in campus and regional sustainability efforts. Finally, we must graduate students with a high level of sustainability literacy, to equip our future leaders with skills and knowledge to thrive through an uncertain future. All of this will take time and the engagement of the entire campus community. This Climate Action Plan provides an extraordinary starting point for the work ahead, and we look forward to the resiliency that will emerge as the strategies in this plan are implemented.

8.0 Appendix

8.1 Glossary

Adaptation: Adjustment or preparation of natural or human systems to a new or changing environment which moderates harm or exploits beneficial opportunities. *Source: United States Environmental Protection Agency*

Alternative Fueled Vehicle: A vehicle that operates on a non-traditional fuel, including electricity, biofuels or hybrid power systems.

Anthropogenic: Made by people or resulting from human activities. Usually used in the context of emissions that are produced as a result of human activities. *Source: United States Environmental Protection Agency*

Business As Usual (BAU) Scenario: A model that projects GHG emissions into the future assuming no GHG mitigation projects are implemented. The BAU provides a baseline from which to track progress towards reductions targets.

California Low Carbon Fuel Standard (LCFS): Administered by the California Air Resources Board, this program uses a market-based approach to lowering greenhouse gas emissions from petroleum-based transportation fuels by 10% by 2020.

California Renewable Portfolio Standard (RPS): Legislation requiring California utilities deliver 50 percent of their retail electricity from renewable sources by 2030.

Carbon Dioxide Equivalent: A metric measure used to compare the emissions from various greenhouse gases based upon their global warming potential (GWP). The carbon dioxide equivalent for a gas is derived by multiplying the tons of the gas by the associated GWP. *Source: United States Environmental Protection Agency*

Carbon Neutrality: Reduction of the campus carbon footprint to a net zero by minimizing GHG emissions as much as possible and using carbon offsets or sequestration to mitigate the remaining emissions.

Carbon Negative: Reduction of the campus carbon footprint to less than neutral, so that the campus has the net effect of removing carbon emissions from the atmosphere rather than adding them.

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.

Commuter: Individual who travels to and from the campus on a regular basis. Emissions from single occupant vehicle (SOV) commuter trips make up the majority of commuter emissions.

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

Greenhouse gases (GHGs): Gases that trap heat in the atmosphere, including carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Each of these gases can remain in the atmosphere for different amount so time, ranging from a few years to thousands of years. Human activities are responsible for almost all of the increase in greenhouse gases in the atmosphere over the last 150 years. *Source: United States Environmental Protection Agency*

Heating Degree Days: A measurement for determining the demand for energy needed to heat buildings, HDD are a measure of how much (in degrees), and for how long (in days), outside air temperature was lower than 65° Fahrenheit for a given year.

Intangible Benefit: benefits associated with GHG emissions reduction strategies that are difficult or impossible to quantify, including improvements to air quality, public health, social equity, etc.

LEED Certification: Leadership in Energy and Environmental Design, this program by the US Green Building Council provides a third-party certification process for constructed or rehabilitated buildings that meet sustainable design and construction standards.

Metric Ton: Carbon dioxide equivalents are commonly expressed in metric tons of carbon dioxide equivalents, or $MTCO_2e$. One metric ton is equivalent to approximately 2,204.6 pounds.

Resilience: The ability of a system or community to survive disruption and to anticipate, adapt, and flourish in the face of change. *Source: Second Nature*

Renewable Energy Credit (REC): A verification representing one megawatt-hour of electricity generated from an eligible renewable energy resource, such as solar or wind. A customer can purchase RECs to offset its non-renewable electricity consumption.

Sequestration: Terrestrial, or biologic, carbon sequestration is the process by which trees and plants absorb carbon dioxide, release the oxygen, and store the carbon. *Source: United States Environmental Protection Agency*

Solar Power Purchase Agreement (PPA): A financial agreement through which a developer installs and maintains a solar electric system on a customer's property and then sells the power generated back to the customer at a rate typically lower than the local utility's retail rate.

Sustainability: The principle that everything we need for our survival and well-being depends, either directly or indirectly, on our natural environment, and on social and economic equity. To pursue sustainability is to create and maintain the conditions under which humans and nature exist in productive harmony to support present and future generations. *Source: United States Environmental Protection Agency*

Vulnerability: 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 is a function of the character, magnitude, and rate of climate variation to which a system is exposed; its sensitivity; and its adaptive capacity. *Source: United States Environmental Protection Agency*

8.2 What is Not in the Inventory

The greenhouse gas emissions inventory establishes and quantifies our campus' carbon footprint from direct sources (i.e., natural gas and fleet fuel combustion) and related but indirect sources (i.e., purchased electricity, business travel, solid waste and commute emissions). Obviously, there are other related campus activities that generate indirect emissions, most notably the embodied emissions from the water and the various products (e.g., food) consumed on campus. This section details why water and food procurement-related emissions were not considered in the campus greenhouse gas inventory.

Water

It takes considerable energy to pump, convey, heat, process and treat domestic water. In California, approximately 12% of the total energy used in the state is related to water.[xvi] The majority of that energy comes from electricity and natural gas. Therefore, any activity to reduce water consumption will reduce energy use and associated GHG emissions. HSU Facilities Management utilized the California Public Utilities Commission Water-Energy Calculator,[xvii] to determine the embodied emissions from HSU's water consumption. The analysis indicated that emissions resulting from campus water use are *de minimis*, or too minor to warrant consideration within the greenhouse gas inventory. This determination is due in great part to the proximity of HSU to its water source (requiring less energy for extraction and conveyance), the low-energy system for treating HSU waste water (the innovative Arcata wastewater treatment facility[xviii]) and the fact that HSU is located in a wet and mild climate.

Although HSU is not including water in its climate action plan, the campus is addressing water conservation by adhering to the reduction targets stated in the CSU Sustainability Policy, and by actively reducing water consumption and reporting directly to the CSU Chancellor's Office. The CSU Sustainability Policy states that all CSU campuses will reduce water consumption by 10% by 2016, and 20% by 2020, through measures like installing irrigation controls, reducing restroom/shower water use, and promoting reclaimed/recycled water. Furthermore, due to the ongoing multi-year drought in California, the CSU has called on its campuses to implement measures to meet or exceed State water conservation goals. In response, HSU has curtailed irrigation of certain turf areas, deployed low flow fixtures in restrooms and showers, repaired water leaks and other measures.

Food Procurement

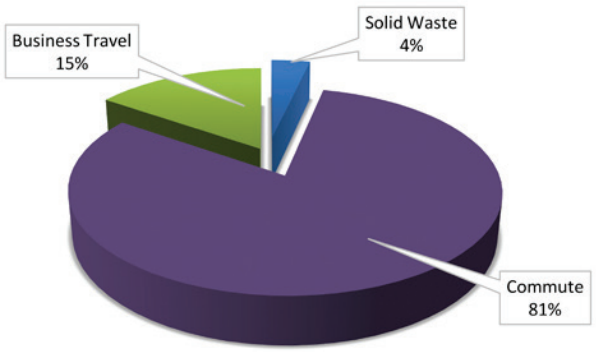
HSU Dining Services currently addresses food purchasing-related emissions by striving to increase sustainable food purchases to 20 percent of total food budget by 2020, as per CSU Sustainability Policy guidelines. The policy, however, does not require campuses to include food purchase-related emissions in overall Scope 3 emissions calculations or in the climate action plan. This is due in large part to the fact that a complete calculation of indirect, procurement-related emissions (e.g., food purchases) requires identifying the lifecycle emissions from the production, packaging, transport, and disposal of the goods in question, a very complex effort given that campus dining organizations work with a number of vendors to purchase a diversity of ever-changing processed and unprocessed foods for the campus.

However, HSU realized the importance of including a critical component of sustainable food management – the treatment of food waste and recovered food – in the climate action planning process, and thus convened the Solid Waste, Purchasing & Food Working Group. This group focused on strategies to reduce packaging and to eliminate food waste from the solid waste stream through source reduction, food recovery and composting. See *5.4 Strategies to Reduce Emissions from Solid Waste, Purchasing and Food* for details.

8.3 Scope 3 Accounting

An accounting of Scope 3 emissions was also conducted alongside the Scopes 1 and 2 inventories. Although emissions reduction targets only focus on reducing Scopes 1 and 2 emissions, the climate action plan nevertheless includes strategies for curbing Scope 3 emissions. Scope 3 includes indirect emissions from related activities – business travel, student and employee commute, and solid waste disposal. Of these sources, commuter emissions comprise the largest contribution to HSU's Scope 3 accounting (see Figure 14).

Figure 14. Distribution of 2013 Scope 3 Emissions



Methodology and Results

Business Travel

HSU policy requires a travel pre-authorization and expense claim process for domestic and international travel. Business travel includes:

- Faculty and staff travel for university sanctioned activities, meetings and conferences
- Student recruitment efforts
- Athletics and sports team travel
- International travel, including study abroad programs

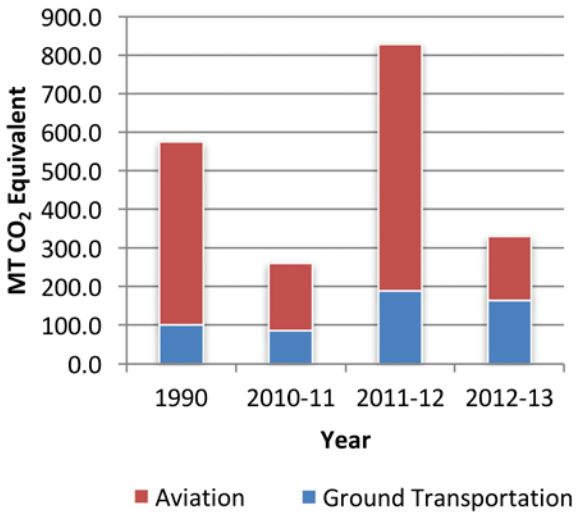
Researchers utilized archived travel expense claim forms, campus population data, and current and historical fuel economy averages to identify business travel-related emissions for the reporting years. Expense claim forms give access to a wide range of data, including destinations, dates, vehicle type, and trip description. Methods for extracting travel mileage from each claim form varied based on the degree of detail – in some instances mapping software was utilized to approximate travel distances.

The university has no archived record of 1990 travel claims. To estimate emissions from business travel for 1990, researchers calculated a mileage for both air and ground transport from a 3% sample of travel claim forms in each reporting year, establishing a "miles driven per person" total by dividing total miles driven by the employee count for the reporting year. By assuming the amount of travel per employee remained relatively constant from year to year, researchers approximated miles driven in 1990 by applying the 1990 employee count to average miles driven per person from the other reporting years and taking the average.[xix] Researchers also included emissions from an additional 40 miles of assumed ground travel (e.g., taxi to/from airport) associated with air travel, and then utilized 1990 Corporate Average Fuel Economy (CAFE) standard miles per gallon to determine total fuel amount used for that year.[xx]

Researchers calculated air travel emissions utilizing Tier 3 inventory methodology.[xxi] Tier 3 methodology utilizes "data for each flight containing aircraft type and flight distance, subdivided into domestic and international". Researchers utilized a flight tracking website (www.flightaware.com) to determine average aircraft flying in and out of the Arcata/Eureka airport as well as other domestic and international flights. Emissions were calculated using Climb/Cruise/Descent (CCD) and Landing and Takeoff Oscillation (LTO) cycle emission projections in the EMEP/EEA Air Pollutant Emission Inventory Guidebook 2013 Appendix D and interpolated emissions using nautical miles for the specified flight. Researchers approximated 1990 air transport emissions by multiplying 1990 employee count with average air emissions per person per year.

Due to significant increases in efficiency between 1990 and now, data suggests that current business travel is less carbon intensive than it was in 1990. Overall, emissions associated with business related travel have seen a considerable reduction except for fiscal year 2011-12 (Figure 15). CO2e emissions during 2011-12 were approximately 30% higher than estimated 1990 levels, and considerably less than 1990 levels in the 2010-11 and 2012-13 fiscal years.

Figure 15. Business Travel Emissions



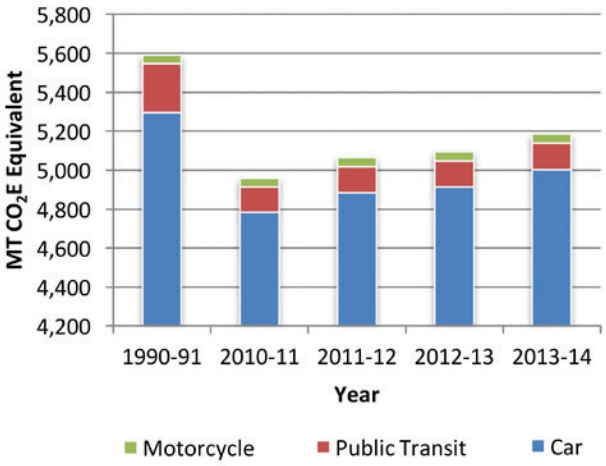
2. Commuting

Commute is defined as regular travel from residence to HSU for work, instruction, recreation or other campus activity. To estimate emissions associated with commuting, the Sustainability Office released a campus-wide survey in 2014, which posed a series of questions to assess the commuting and parking practices of students, faculty and staff – namely, modes of travel, distance from points of origin, frequency of commute, and parking preferences. Approximately 20% of the randomly selected students, faculty and staff responded to the survey. Researchers estimated commute emissions (Figure 16) using the following procedure:

- Determined the total number of miles traveled per mode by multiplying number of commutes per week per mode by the respondents' corresponding average distance in miles.

- The total number of miles per week using each mode of transportation was multiplied by 30 (weeks) to determine the total number of miles traveled per academic year. [xxii]
- Researchers divided the total number of miles traveled per academic year (for all modes of transportation) by the number of respondents to determine average miles traveled per person.
- Researchers then multiplied the average miles traveled per person by the campus population in the reporting years to determine total miles traveled in each academic year by the entire campus population.[xxiii] Total miles traveled in each academic year were multiplied by the percentage of miles traveled by each mode of transportation (dividing the total number of miles traveled using each mode of transportation by total number of miles traveled using all modes of transportation) to determine the total number of miles traveled by the campus population, using each mode of transportation, for the reporting years.[xxiv]
- The total miles traveled by car and motorcycle in each academic year were divided by the respective CAFE average miles-per-gallon in each year to determine total gallons of fuel used each year.
- The total number of gallons of fuel for each year was multiplied by 8.5 kg to find the CO2 equivalent from car and motorcycle. For public transit (i.e., buses), the total number of gallons for each year was multiplied by 8.5 kg then divided by the estimated passengers per bus. Researchers assumed the average number of passengers per bus in 1990 was 9.2, the national average. Based on survey results, researchers estimated ridership to have doubled to 18.4 since the inception of the Jack Pass.[xxv]

Figure 16. Commute Emissions



3. Solid Waste

The Sustainability Office tracks the total tons of municipal solid waste (MSW) collected on campus each year. MSW refers to solid waste consisting of common trash items. It excludes construction & demolition debris, recycling, and organic waste recycling.[xxvi] When MSW is landfilled, anaerobic bacteria degrade the materials, producing the greenhouse gases methane (CH4) and carbon dioxide (CO2).

Researchers utilized Version 13 of the EPA Waste Reduction Model (WARM) to estimate emissions associated with the hauling and landfilling of MSW.[xxvii] Solid waste emissions include landfill emissions as well as the tailpipe emissions from the trucks hauling waste to the landfill. WARM utilizes material tonnage, distance to landfill, and information on landfill gas recovery operations to establish an emissions total.

- In 1990, HSU was sending its MSW to the Cummings Road Landfill in Eureka, CA, approximately 11 miles distant. Cummings Landfill had no landfill gas (LFG) recovery system in place.
- In subsequent reporting years, MSW generated on the HSU campus has been hauled to the Anderson Landfill in Anderson, CA, approximately 190 miles away. The Anderson landfill utilizes a LFG recovery system.

Figure 17. Municipal Solid Waste Emissions

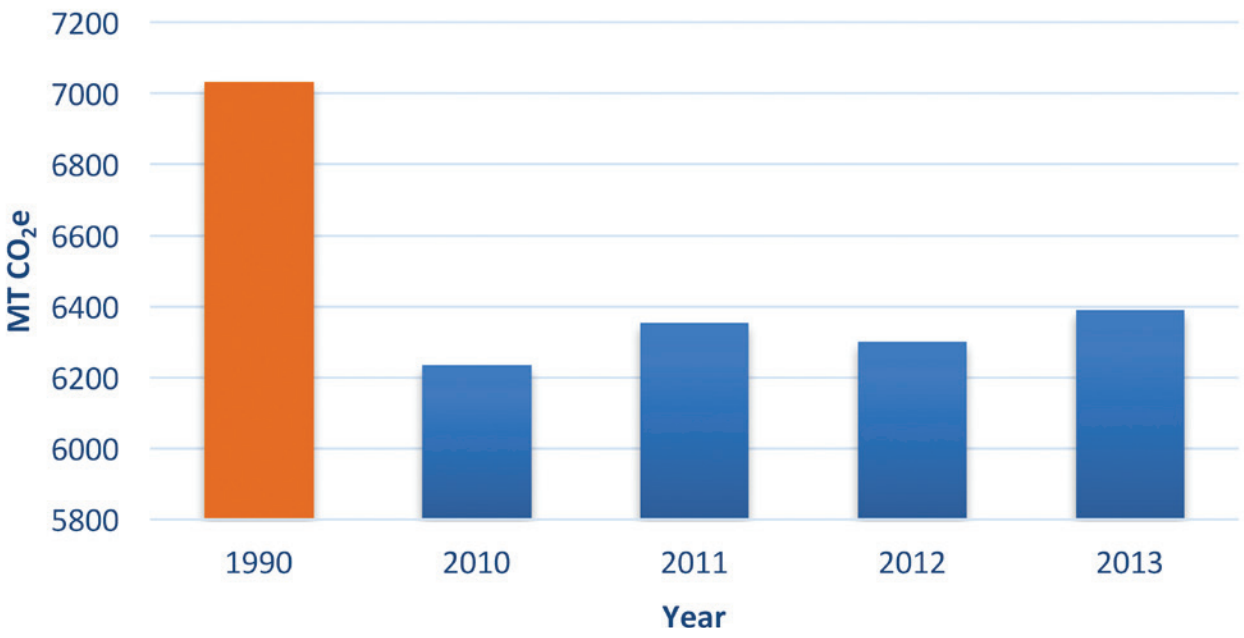
Year	MSW (Lbs)	Short tons	Miles to Landfill	LFG Recovery?	Total Emissions (MTCO2e)
1990	838,830	419.415	11	N	540
2010-11	1,239,680	619.84	190	Y	342
2011-12	1,213,860	606.93	190	Y	334
2012-13	893,700	446.85	190	Y	247
2013-14	816,940	408.47	190	Y	225

CONCLUSION

Figure 18 shows estimated Scope 3 emissions from related activities – business travel, student and employee commute, and solid waste disposal – for 1990 and 2010 to 2013. Emissions rose annually between 2010-12, as a result of a number of factors including student population growth, increased business travel and indirect emissions associated with construction project waste. Overall, however, HSU's Scope 3 emissions are trending downward from 1990 levels, due to external and internal influences and activities. These include but are not limited to:

- Significant improvements in fuel economy within ground and air transport over the past 2.5 decades;
- The expansion of recycling and waste reduction operations and the addition of a composting program;
- State requirement that at least 50% of construction waste is recycled or otherwise diverted from the landfill
- Adoption of the Jack Pass, Zip Car, Zim Ride and other alternative transportation programs;

Figure 18. Scope 3 Emissions



8.0 Appendix

8.4 Strategy Brief Papers

Working groups first convened in September 2015 to support development of a climate action plan for Humboldt State University. The primary purpose of the groups was to develop strategies to directly or indirectly curb greenhouse gas emissions and to integrate sustainability and climate literacy into the academics, student life and culture of the campus. Ideas for strategies came from experts within each working group, from participants at open forums, and from successful strategies gleaned from other campuses. Once consensus was reached within a working group to pursue a strategy idea, one member in the group was assigned the task of further developing the idea into a strategy brief paper, i.e., a proposal to include this particular strategy in the climate action plan. When possible, working group members estimated costs, potential savings and estimated GHG reductions for each strategy, along with co-benefits and potential repercussions.

All strategy brief papers listed in this climate action plan can be viewed at the Office of Sustainability's Climate Action Plan webpage, **humboldt.edu/sustainability/node/192**.

9.0 Endnotes

[i] Carbon neutrality refers to achieving net zero carbon emissions by (a) upgrading infrastructure and changing operations to reduce emissions and then (b) balancing remaining amount of released carbon with an equivalent amount that is sequestered or otherwise offset.

[ii] Second Nature Climate Commitment, http://secondnature.org/climate-guidance/the-commitments/

[iii] HSU 2015-2020 Strategic Plan, www.strategicplan.humboldt.edu

iv Cal State Sustainability Policy, http://www.calstate.edu/cpdc/sustainability/policies-reports/

[v] Executive Order 987, www.calstate.edu/EO/EO-987.html

[vi] *Climate Change 2014: Impacts, Adaptation and Vulnerability.* www.ipcc.ch/report/ar5/wg2

[vii] Cal-Adapt, www.cal-adapt.org; and District 1 Climate Change Vulnerability Assessment and Pilot Studies Final Report, 2014, www.dot.ca.gov/hq/tpp/offices/orip/climate_change/documents/ccps.pdf]

[viii] To see the complete HSU Greenhouse Gas Inventory, go to http://www2.humboldt.edu/sustainability/node/192

[ix] 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.].

[x] CO2e allows many types of greenhouse gases with different heat trapping capacities, also referred to as global warming potential (GWP), to be converted to a standardized unit.

[xi] The Climate Registry General Reporting Protocol, http://www.theclimateregistry.org/resources/protocols/general-reporting-protocol/

[xii] HSU's largest self-generation system, a 10 kW solar photovoltaic system installed on the roof of the Music A building in 2009, generates approximately 12,500 kWh a year, or enough electricity to power two to four single family homes.

[xiii] In 1990, average fuel economy for a light duty vehicle was 20.2 miles; by 2010 average fuel economy had improved to 23.5 miles. Source: US Energy Information Administration, http://www.eia.gov/totalenergy/data/annual/showtext.cfm?t=ptb0208

[xiv] Mission Statement, HSU Office of the President, http://www2.humboldt.edu/president/vision

[xv] Darby, Sarah. "The Effectiveness of Feedback on Energy Consumption." (n.d.). University of Oxford. Environmental Change Institute, 2006. Web. (http://www.eci.ox.ac.uk/research/energy/downloads/smart-metering-report.pdf)

[xvi] CA Department of Water Resources, Water-Energy Nexus: Statewide, http://www.water.ca.gov/climatechange/WaterEnergyStatewide.cfm

xvii California Public Utilities Commission Water-Energy Calculator, http://www.cpuc.ca.gov/nexus_calculator/

[xviii] Arcata Marsh and Wildlife Sanctuary, http://www.cityofarcata.org/340/Arcata-Marsh-Wildlife-Sanctuary,

[xix] To see the complete report, go to University Travel Emissions Auditing Project, ENVS 410 Senior Capstone project, 2013. http://www2.humboldt.edu/sustainability/node/182

[xx] National Highway Traffic Safety Administration – CAFE Fuel Economy, http://www.nhtsa.gov/fuel-economy

[xxi] EEA (2013). EMEP/EEA Air Pollutant Emission Inventory Guidebook 2013. Technical Guidance to Prepare National Emission Inventories, Part B, Combustion.

[xxii] Although there are 32 weeks in an academic year, the weeks of Thanksgiving and Spring Break are excluded.

[xxiii] It was assumed that that the 1990 population distribution, in regards to the distance that individuals lived from HSU, was generally the same in each category of commute distance as in the 2014 commuter survey.

[xxiv] The total number of miles traveled by carpool was divided by two, assuming two people per carpool.

[xxv] Jack Pass is a student fee-funded program enabling unlimited access to Humboldt County bus systems. Staff, faculty and Extended Education students can buy into the program for $60.00 per semester.

[xxvi] Organic waste includes green waste, used vegetable oil, food waste, and other organics. In 2013 HSU sent 138 tons of food waste to a commercial composting facility. In 2014 the loss of a regional food waste diversion program forced HSU to suspend its large scale food waste collection. HSU is planning to resume this program in 2015.

[xxvii] US Environmental Protection Agency's Waste Reduction Model (WARM), http://epa.gov/epawaste/conserve/tools/warm/index.html

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