Mt. San Antonio College
2018 Climate Action Plan

AUTHORS

- James Stone, Faculty, Political Science; Chair, CCIC
- Chris Briggs, Faculty, Biological Sciences; Member, CCIC
- Kamran Golestaneh, Faculty, Chemistry; Member, CCIC
- Chisato Uyeki, Faculty, Library; Member, CCIC
- Eera Babtiwale, HMC Architects
- Sheryl Sterry, HMC Architects
- James Del Monaco, P2S
- Aravind Batra, P2S
- Tin Cheung, Psomas Engineering
- Jennifer Marks, Psomas Engineering
- Xiomara Chavez, Strategic Energy Innovations, Energize Colleges Fellow
- Carol Martinez, Sustainability Student Assistant

ACKNOWLEDGMENTS

- William T. Scroggins, President

- Irene Malmgren, Vice President, Instruction

Climate Commitment Implementation Committee (CCIC)

- Matt Judd, Dean, Natural Sciences
- Jeanne Marie Velickovic, Associate Dean, Humanities and Social Sciences
- Mika Klein, Senior Facilities Planner
- James Stone, Faculty, Political Science; Chair, CCIC
- Chris Briggs, Faculty, Biological Sciences; Member, CCIC
- Kamran Golestaneh, Faculty, Chemistry; Member, CCIC
- Chisato Uyeki, Faculty, Library; Member, CCIC
- Logan Snyder, Associated Students Environmental Senator
- Carol Martinez, EAGLE member

Local Expert Review Session Participants

- Bill Asher, Assistant Director, Facilities Management and Planning
- Ruben Avila, Director, Grounds and Transportation
- Art Cadena, Manager, Energy Services
- Cesar Castaneda, Lead, Irrigation
- Angela Cosio, Sodexo Supervisor
- Ruben Flores, Lead Horticulture Technician, Grounds Dept.
- Gary Gidcumb, Senior Construction Manager
- Kamran Golestaneh, Professor, Dept. of Chemistry
- Jennifer Hinostroza, Professor, Horticulture
- Rene Jimenez, Student
- Martin Jones-Ramey, President, Academic Senate
- Mika Klein, Senior Facilities Planner

- Carol Minning, Construction Manager
- Carol Martinez, Sustainability Tours Coordinator
- Ken McAlpin, Manager, Custodial
- Gary Nellesen, Director, Facilities, Planning & Management
- Danny Paz, Sodexo General Manager
- Aaron Salinger, Professor, Dept. of World Languages
- Rondell Schroeder, Procurement Specialist
- Andrea Sims, Director, Student Life
- Fernan Siocon, Construction Project Manager
- Logan Snyder, Associated Students Environmental Senator
- Matt Thatcher, Special Projects Manager
- Jeanne Marie Velickovic, Associate Dean, Humanities and Social Sciences

Readers and Reviewers

- Bill Asher, Assistant Director, Facilities Management and Planning
- Terri Beam, Professor, Dept. of Chemistry
- Thomas Edson, Professor, Dept. of Art History
- Ruben Flores, Lead Horticulture Technician, Grounds Dept.
- Kamran Golestaneh, Professor, Dept. of Chemistry
- Ashley Haines, Faculty, Dept. of History
- Rene Jimenez, Student
- Carol Martinez, Sustainability Tours Coordinator & Energize Colleges Fellow
- Liesel Reinhart, Faculty Professional Development Coordinator
- Aaron Salinger, Professor, Dept. of World Languages
- Logan Snyder, Associated Students Environmental Senator
- Janet Truttmann, Professor, Dept. of Chemistry
- Jeanne Marie Velickovic, Associate Dean, Humanities and Social Sciences

SECTION 1 EXECUTIVE SUMMARY

Mt. San Antonio College administration and faculty, with support from staff and students, have decided to embrace the critical role and responsibility of higher-education institutions in preparing society for a sustainable future. The campus recognizes the potential environmental, economic, and social benefits of resource efficiency and sustainability. Furthermore, the passage of the California Global Warming Solutions Act (AB-32) and the establishment of a Sustainability Policy by the California Community Colleges (CCC) Board of Governors have made it imperative for all community colleges in California to develop an organized, comprehensive approach that incorporates the elements of sustainability, satisfies state regulations, takes advantage of available resources and complementary programs, and adopts the best practices of other institutions further along this path. Second Nature's *Climate Leadership Statement,* below, describes the view adopted by Mt. SAC.

Climate Leadership Statement

"We… believe firmly in the power, potential, and imperative of higher education's key role in shaping a sustainable society. Not only are we deeply concerned about the increasing pace and intensity of global climate change and the potential for unprecedented detrimental impacts, but we also understand that technology, infrastructure, global interconnectedness, and our greatest asset – engaged, committed, smart students – allow us to explore bold and innovative solutions and to lead in climate action and sustainable solutions.

"We have begun to experience the effects of climate change in our communities and we understand that these effects are projected to become more severe and damaging. We recognize that mitigation and adaptation are complementary strategies for reducing the likelihood of unmanageable change, managing the risks, and taking advantage of new opportunities created by our changing climate.

"We believe colleges and universities must exercise leadership in their communities and throughout society by providing the knowledge, research, practice, and informed graduates to create a positive and sustainable future. Along with other aspects of sustainability, campuses that address the climate challenge by reducing greenhouse gas emissions and by integrating resilience into their curriculum, research, and campus operations will better serve their students and meet their social mandate to help create a vital, ethical, and prosperous civil society.

"We further believe that exerting leadership in addressing climate change will reduce our long-term energy costs and the costs of climate disturbance, increase our quality of life, attract excellent students and faculty, and build the support of alumni and local communities.

"We have resolved to take action in one of the following Climate Leadership Commitments. We believe carbon neutrality and resilience are extremely high priority areas of action for all institutions and we aim to lead the nation in these efforts. We urge others to join us in transforming society towards a sustainable, healthy, and more prosperous future."[1]

[1] *The Climate Leadership Commitment,* Second Nature
http://secondnature.org/wp-content/uploads/Climate-Commitment-2017-Second-Nature.pdf

PURPOSE

The purpose of this Climate Action Plan (CAP) is to prepare Mt. San Antonio College for the coming environmental and regulatory challenges of the 21st century, to guide the campus towards becoming a more sustainable institution, and to prepare students to engage in future solutions. The plan articulates the vision, goals, and objectives (strategies to meet these goals) to move Mt. SAC to become a sustainable campus with net zero carbon emissions. This plan has been developed in coordination with campus stakeholders to ensure that it meets the various needs of the campus.

DEFINING TERMS

Carbon neutrality is defined as "having no net greenhouse gas (GHG) emissions, to be achieved by either (a) eliminating net GHG emissions, or (b) by minimizing GHG emissions as much as possible, and using carbon offsets or other measures to mitigate the remaining emissions."[2]

Resilience is defined as "increasing the ability to survive disruption, and to anticipate, adapt, and flourish in the face of change."[3]

Sustainability is defined as "meeting the needs of the present without compromising the ability of future generations to meet their own needs."[4] The American Association for Sustainability in Higher Education (AASHE) further identifies three elements of sustainability: economic sustainability, social sustainability, and environmental sustainability. The relationships among all these elements must be considered to ensure the long-term viability of our communities and our planet. Throughout the Climate Action Plan, the concepts of sustainability, carbon neutrality, and resilience are referred to collectively as "sustainability."

MTCO2e is an abbreviation for "metric tons of carbon dioxide equivalent." [5] This plan addresses a variety of activities and chemicals, and it is useful to have a single unit to describe and compare relative impacts of these activities and chemicals. For example, once everything is converted to MTCO2e, it is easy to compare the pollution from a diesel bus with the emissions from generating electricity.

POLICY CONTEXT FOR SUSTAINABILITY PLANNING

Since the early 1960s when Charles David Keeling produced the first reliable measurements of the amount of carbon dioxide in the atmosphere, scientific consensus around climate science has become increasingly robust. The International Panel on Climate Change is the most authoritative international body assessing climate science, and predicts that if carbon dioxide in the atmosphere reaches over 1000 ppm, the planet will likely warm between 2.6 - 4.8 degrees Celsius by the year 2100. Only if atmospheric carbon dioxide concentrations are held to 430 - 480 ppm will we avoid climate-related feedbacks that are disruptive to civilization.

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[2] http://secondnature.org/wp-content/uploads/ClimateResilienceHandout-Nov2015.pdf
[3] Ibid.
[4] World Commission on Environment and Development, 1987
[5] Greenhouse Gases, CO2, CO23, and Carbon: What Do All These Terms Mean? Ecometrica. 2012. https://ecometrica.com/white-papers/greenhouse-gases-co2-co2e-and-carbon-what-do-all-these-terms-mean

George H.W. Bush signed the United Nations Framework Convention on Climate Change in 1992, which included voluntary agreements to limit greenhouse gas emissions by signatories. Other progress came when the Obama Administration provided $40 billion for investment in renewable energy and "green industries." Obama later announced the Clean Power Plan, committing the United States to a 30% reduction in GHG emissions in the power sector of its economy by 2030. As part of his Presidential Climate Action Plan Obama set a goal of reducing GHG gas emissions in the United States 17% below 2005 levels by 2020. Finally, the Obama Administration proposed an average increase in fuel economy standards for passenger vehicles to 54.5 miles per gallon by 2025. The Trump administration has announced that the United States will withdraw from the Paris Agreement on Climate Change, repeal the Clean Power Plan, cut federal subsidies for renewable energy, preserve subsidies for fossil fuel exploration, repeal the stricter fuel economy standards, and will not allow California to set higher fuel economy standards. (California has announced its intention to file suit over the issue.) *Section 2, Background*, and an Appendix of this CAP provide additional details of the policy context at the international, national, and state levels.

In the face of a failure to take significant action at the federal level, California has passed a series of laws designed to comprehensively reduce GHG emissions in the state and transition to a clean energy economy. In 2006, the California Assembly passed AB 32, the Global Warming Solutions Act. Since then California has since gained over a decade of experience with the Act's cap and trade policies. These policies have driven growth and have been effective in decreasing per capita GHG emissions. California has established itself as a leader in pioneering green industries, which are likely to become major areas of growth in the 21st century. As a result of this explosive growth, while there are roughly 2.5 jobs in renewable energy generation for each job in fossil fuel generation in the United States as a whole, in California there are 8.5 jobs in renewable energy generation for each job in fossil fuel generation. Research shows strong job growth due to the transition away from fossil fuels. SB 350 substantially ratchets up the state's GHG emissions reduction requirements over the next decade, and at the same time it is difficult to predict the possible impact of eliminating federal subsidies and tax credits.

California Higher Education

Consistent with the commitments of California's state government, California's institutions of higher education are taking the lead in addressing the challenge of climate change and preparing students for the opportunities presented by the emergence of green industries. The UC system has committed to reducing GHG emissions to 1990 levels by 2020 and in 2014 UC system President Janet Napolitano committed the UC campuses to a goal of achieving carbon neutrality by 2025. The CSU system has committed to reducing GHG emissions to 1990 levels by 2020 and to 80% below 1990 levels by 2040. While the California Community College system has not made a similar commitment related to GHG emissions, it has made commitments in the areas of energy conservation and water conservation that bear directly on GHG emissions and climate resilience.

CAMPUS CLIMATE CONDITIONS

Understanding the climate conditions that are experienced on the campus is an important first step toward planning responsively and sustainably. Working with the natural conditions, and being able to anticipate potential climatic conditions in the microclimate surrounding the campus, will allow the College to respond effectively with more resilient and resource-efficient buildings. This in turn will result in a reduced carbon

footprint for the campus as a whole. A thorough climate analysis was conducted for the purposes of this plan, in order to define this relationship between climate and carbon footprint. (This analysis may be found in *Section 3, Campus Climate Conditions.*) Mt. SAC is in California Climate Zone 9—situated in the Pomona-Walnut Valley, one of southern California's inland valleys. The analysis however uses weather data from the Chino Airport Weather Station, which, although located in Climate Zone 10, is the nearest weather station and experiences the most climatically similar conditions to the Mt. SAC campus.

Predicted GHG Emission Trends and Phased Emissions Reductions

This plan analyzes Mt. SAC's GHG emissions according to Second Nature's carbon calculator, developed by the University of New Hampshire. The GHG emissions inventory addresses emissions from stationary as well as mobile sources (including commutes). The year 2014 is used as a baseline in the analysis. Emission trends are examined through a 'business as usual' lens, as well as through an 'emissions reduction strategies' lens. The business as usual lens provides a perspective of a future in which the College would experience increasing carbon emissions while the mitigation measures lens provides a perspective of a reduced carbon footprint. By implementing Phase 1 emissions reduction measures by 2020, the College would potentially experience a 20% reduction in GHG emissions by 2025. By implementing Phase 2 emissions reduction measures starting in year 2025, the College would potentially experience a 50% reduction in GHG emissions by 2035. By implementing Phase 3 emissions reduction measures starting in 2035, the College would potentially experience a 100% reduction in GHG emissions by 2050. GHG emissions and emissions reductions strategies are further described in Sections 5 through 9 of this plan.

Overall GHG Emissions

This plan documents the emissions associated with campus operations from 2014 to 2016. The American Colleges and University Presidents Climate Commitment delineated the scopes of emissions included in the inventory. Scope 1 includes direct emissions from owned or controlled sources, such as natural gas combusted on campus, campus fleet, agricultural sources, and refrigerants. Scope 2 includes electricity purchased for the campus. Scope 3 includes solid waste as well as all student, faculty, and staff transportation. The majority of Mt. SAC's emissions are contributed by Scope 3, transportation. In 2016, the net greenhouse gas emissions totaled 63,778 metric tonnes of carbon dioxide equivalent (MTCO2e). Scope 1 accounted for 13,227 MTCO2e, Scope 2 accounted for 9,431 MTCo2e, and Scope 3 accounted for 41,220 MTCO2e. Scope 3 accounted for 61% of the total carbon emissions of the campus, and 50% was attributed to transportation alone.

Direct Emissions and Purchased Electricity Emissions

Emissions have risen approximately 18% from 2015 to 2016 as the College has added roughly 118,359 Gross Square Feet (GSF) in several buildings (a 5% increase). The non-linear rate of increase of the electrical use during this period, relative to the increase of building GSF, would indicate these are energy intense buildings, such as the Food Service Building. Future new building projects will further increase the campus' GSF and therefore are likely to contribute additional emissions. In 2016, direct emissions on campus (Scope 1) accounted for 13,227 MTCO2e, and purchased electricity (Scope 2) accounted for 9,431 MTCo2e. Section 6 of this plan provides further details regarding these emissions and corresponding reduction strategies.

Emissions from Transportation

Transportation and vehicle emissions represent about half of Mt. SAC's greenhouse gas emissions. These mobile source emissions emanate primarily from employee and student commutes and the operation of campus fleet vehicles. A campus-wide transportation survey collected 2000 responses from students, faculty and staff regarding trip frequency, length, carpooling, and fuel economy. Section 7 of this plan provides further details regarding transportation emissions and corresponding reduction strategies.

Emissions from Waste

In 2016, 8,314 metric tons of solid waste accounted for 13% of the total emissions on Mt. SAC's campus. This equates to 0.11 metric tons of solid waste per student, or 242 pounds. Section 8 provides further details regarding solid waste and corresponding reduction strategies.

Water, Wastewater, and Landscaping

The College's water use includes on-campus domestic uses, landscape irrigation, athletic field irrigation, pasture and range land irrigation, and wildlife sanctuary uses. In 2016, the College consumed roughly 104 million gallons of water. The majority of this water is assumed to be consumed by the College's extensive athletics fields, but water use is not metered by building and site, and is instead combined into one main utility reading. Therefore, it is challenging to estimate the amount of water consumed by each part of campus. Looking forward, the College will seek to meter water use at both the site level and the individual building level. The College does not currently practice on-site water reclamation to treat wastewater, but this strategy is being researched for potential future application. Section 9 of this plan provides further details regarding water, wastewater, landscaping consumption, and conservation strategies.

INSTITUTIONALIZING SUSTAINABILITY

The success of our Climate Action Plan depends upon the institutionalization of the implementation work into our established organizational structure, planning, and operations. *Section 4: Programs and Projects for Implementation* describes the management and organizational structure necessary to support successful implementation of the CAP. That section also describes policies and procedures to consider for review or adoption. Staffing recommendations to support the necessary activities include a Sustainability Director, and a reassigned faculty position of Sustainability Coordinator. Further recommendations include having each unit/department assess their operations for sustainability, addressing funding considerations, and working with Student Life. A key recommendation from this section calls for the establishment of a Sustainability Center, to provide a physical home for these cross-campus academic and operational sustainability efforts. The Center would also work to nurture collaboration with the local community on sustainability activities.

Curriculum

Mt. SAC has a long history of educational programming devoted to a range of environmental issues. Faculty across campus are working to incorporate sustainability into their curriculum, as evidenced by initiatives articulated in the 2018 Educational and Facilities Master Plan. To further the curriculum goal of incorporating

sustainability into the educational experience of all students, the following recommendations are outlined in *Section 11: Curriculum, Professional Development, and Research* and *Appendix: Leaf Course Designation:* establishing LEAF designated classes that integrate sustainability into their curriculum, possibly incentivizing students to take LEAF designated classes, developing educational experiences to provide new students an early introduction to Sustainability at Mt. SAC, encouraging students to initiate their own sustainability-related education through choices of project topics, and establishing a voluntary online sustainability pledge.

To guide the implementation of these activities and to institutionalize the faculty leadership role, the Academic Senate passed a recommendation calling for the allocation of reassigned time for a faculty member to serve as Sustainability Coordinator. This coordinator will guide the LEAF designation process, help build professional development in sustainability, and support the implementation of other sustainability-related activities.

Professional Development

Meeting the goals outlined in this Climate Action Plan will require changes across campus. Enacting these changes will require further training, education, and professional development across all units of campus. In general, professional development at Mt. SAC supports programs and services by providing professional learning opportunities for all employees. The desired outcomes of the professional development components in the CAP are to support the implementation of the CAP and the campus' progress towards becoming a sustainable and zero emissions campus.

Professional development opportunities related to sustainability have been available for faculty over the past five years, including Flex Day presentations and support for attendance at state and national conferences. Sustainability has begun to be integrated into the New Faculty Seminar and the adjunct faculty online orientation. Even so, there is an ongoing need for additional professional development. This section of the CAP seeks to further integrate and prioritize sustainability into professional development by enhancing the breadth and depth of offerings to reflect the complexity of this plan. This plan also recommends that sustainability be included as a broad theme in the next campus Professional Development Plan.

This CAP calls for the further development of resources to provide and support professional development, including the expansion of existing online resources for faculty, staff, managers, and students; continued offerings at Flex Days for faculty and classified staff; the development of an online POD certificate course for faculty on integrating sustainability into the curriculum; the development of sustainability-related Student Learning Outcomes; and ongoing support for conference and travel resources to support specialized professional development to enhance the sustainability literacy of faculty, staff, and managers. As mentioned above it is recognized that these professional development opportunities must be tailored to the diverse needs of classified staff, faculty, and managers. The plan calls for a collaborative approach to identifying the needs and developing the opportunities through work with the appropriate committees.

Research

Various groups at Mt. SAC have affirmed the important role of student research in higher education. For example, the Academic Senate passed Resolution 2015 – 04 Support of Undergraduate Research, calling for the establishment of an undergraduate research office and a faculty coordinator position to support student

research activities.[6] Sustainability research goals include analyzing the resilience of social, human, natural, financial, and physical attributes of our campus and community; identifying economic and workforce needs as related to sustainability; seeking opportunities to partner on sustainable research initiatives; establishing a sustainability/climate center as a campus hub to present research activities and inform the community on our progress toward our climate goals; encouraging faculty to include sustainability in their sabbatical research; encouraging the use of sustainability issues in student research projects; involving students in research that aids our campus sustainability efforts; enabling student participation in the installation of sustainability-related facilities projects on campus; having students perform energy audits of several of the older buildings on campus; and having each of our buildings used as learning/living laboratories, where students, staff, faculty and community members may see the energy usage and savings taking place.

Community Outreach

The Climate Leadership Statement requires signatory colleges and universities to reach out to community residents and organizations. Mt. SAC is engaging community members and pursuing partnerships related to sustainability through education programs for students and the community, vocational training and research in support of green businesses and jobs, and partnerships with community organizations to undertake projects related to sustainability.

The creation of a Sustainability Center is recommended to be the physical space for bringing together the campus and community. Staffed by a Director of Sustainability and the necessary support staff, the center will be responsible for helping to coordinate educational tours of the Wildlife Sanctuary, the Farm, and campus LEED-certified buildings, drought tolerant landscaping and other sustainability features on campus to the community, as well as publicizing sustainability-related events such as Earth Day and Debbie Day to the community. Through the Sustainability Center, Mt. SAC will work to build stronger partnerships in the area of sustainability with other local colleges and universities, such as Cal Poly Pomona, as well as with municipal government and community organizations for the purpose of undertaking joint projects in the area of sustainability.

The creation of a Sustainability Center on campus and the hiring of a full time Sustainability Director will provide an opportunity to build relationships with municipal government and community partners in the areas of green jobs, support for green businesses and joint sustainability projects. By defining the Sustainability Director's duties to include sitting on community boards related to sustainability and meeting regularly with Sustainability Directors at other schools with an interest in partnering on sustainability projects, Mt. SAC might begin to develop an institutional infrastructure in the future that would enable it to play a more robust role in educating the broader community, building the green economy, and working on local sustainability projects with other community partners. By laying the foundation for this institutional infrastructure in the five year period after the completion of its first CAP, Mt. SAC can play the pivotal role in facilitating the transition to the just and sustainable society of the twenty first century.

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[6] Resolution text: http://mtsac.edu/governance/academicsenate/resolutions/15-04%20Support%20of%20Undergraduate%20Research.pdf

Area of Sustainability	Established Goal
Greenhouse Gas Reduction	Reduce energy consumption from the 2014 baseline by 20% by the end of 2025, 50% by 2035 and 100% by 2050.
Green Building Standard	All new, major capital projects (10,000 square feet and above) will outperform Title 24 Standards by at least 15%, and all major renovation projects will outperform Title 24 by at least 10%.
Water Use Reduction	Reduce water use per student by 50% from 2014 levels by 2030.
Waste Diversion and Management	Net Zero Waste by 2050.
Institutionalization	Hire a full-time Sustainability Director by the end of 2018. Secure release time for a Sustainability Coordinator starting Fall 2019. Establish a Sustainability Center by 2020.
Curriculum Integration	Build sustainability into the educational experience of 50% of students by 2025, and 100% of students by 2035.
Professional Development	Establish professional development in sustainability for all new faculty and adjunct instructors by 2020. Integrate sustainability into campus Professional Development Plan by 2020. Offer online Sustainability Certificate for faculty
Research and Community Outreach	Publicize campus sustainability efforts to surrounding community annually, starting in 2019.

SECTION 2 BACKGROUND

SUSTAINABILITY EFFORTS TO DATE

Mt. San Antonio College has demonstrated robust leadership in the area of sustainability, particularly over the course of the last four years. Moreover, the actions that have been taken by students, faculty, and administration demonstrate the emergence of a vibrant sustainable community on campus, founded on a strong partnership among major campus stakeholders, that can be expected to support further innovation in the coming years. The emergence of this community has enabled Mt. SAC to take major strides in moving its facilities and campus operations in the direction of greater sustainability and to undertake major initiatives in the area of public education.

Grants and Awards

Mt. San Antonio College has received multiple grants and awards which have demonstrated the College's commitment to climate action and sustainability. These achievements have laid the groundwork and have provided momentum for the future success of Mt. SAC's sustainability prowess. These include:

- $14,000 grant to promote mulching and recycling of green waste
- The U.S. Department of Labor awarded a $30,000 grant to fund Mt. SAC's innovative building automation system.
- Irwindale Chamber of Commerce honored Mt. SAC with its 2014 Water Preservation Award and its 2015 Energy Preservation Award.
- The California Community Colleges Board of Governors honored Mt. SAC for its Central Plant and Thermal Energy Storage (TES) System, which is 20 percent more efficient than conventional systems.
- In 2015, President Scroggins instituted the Mt. SAC Presidential Student Sustainability Award.

CREATION OF THE CLIMATE ACTION PLAN

In August 2014 the President of Mt. San Antonio College, William T. Scroggins, signed the American College and University Presidents' Climate Commitment (ACUPCC). This commitment is now called the *Carbon Commitment*, and states that Mt. SAC will complete a comprehensive Climate Action Plan (CAP). The CAP must include a target date for achieving carbon neutrality, mechanisms for tracking progress, actions to make carbon neutrality and resilience a part of the educational experience of all students, and actions to expand research in carbon neutrality and resilience.

In order to develop campus vision, goals, and objectives, and to write this Climate Action Plan, the campus established the Climate Commitment Implementation Committee (CCIC). This committee is further described in a later section of this Plan.

THE POLICY CONTEXT OF SUSTAINABILITY PLANNING

The Scientific Case for Climate Change

Since the late 1950s and early 1960s when Roger Revelle developed evidence demonstrating that the chemistry of seawater imposes constraints on the ability of the oceans to absorb carbon dioxide and Charles David Keeling produced the first reliable measurements of the amount of carbon dioxide in the atmosphere at Mauna Loa observatory and developed the Keeling curve charting the link between rising greenhouse gases and rising temperatures, the scientific consensus around climate science has become increasingly robust. By 1970, the year of the first Earth Day, the U.S. National Oceanic and Atmospheric Administration, the world's leading funder of climate research, was created. By 1979 a U.S. National Academy of Sciences report found it "highly credible" that doubling CO2 will bring 1.5-4.5 degrees Celsius of global warming.[7]

An international scientific consensus developed in the 1980s, (after some debate about whether global temperatures had cooled during the 1960s and 1970s), that global temperatures began steadily rising again in the mid-1970s and that the 1980s contained the warmest three years during the 134 year period when global temperatures were being measured.[8] In 1986 and 1987 American climate scientist James Hansen testified before Congress, stating that he and his group of climate modelers could "confidently state that major greenhouse climate changes are a certainty." Hansen added that "the global warming predicted in the next 20 years will make the Earth warmer than it has been in the last 100,000 years." [9]

Key Dates

In 2014 the IPCC released its fifth assessment report, which asserted that the atmospheric concentration of key greenhouse gases is "unprecedented in at least the last 800,000 years," therefore, the evidence for global warming is "unequivocal" and it is "highly likely" that most of the warming observed in the last 50 years has been caused by human GHG emissions.

As a result of climate change the IPCC predicts that "it is very likely that heat waves will occur with a higher frequency and longer duration" and extreme precipitation events "over most mid-latitude land masses and over wet tropical regions will very likely become more intense and more frequent."11 Also many plant and animal species will be driven to extinction as they are unable to adapt to the changing climate or move fast enough.

In 1988 the International Panel on Climate Change (IPCC) was established. It would become the most authoritative international body assessing climate science. In 1990 the first IPCC assessment report stated that "the world has been warming and future warming seems likely." [10] In 1995 the second IPCC assessment report predicted a doubling of carbon dioxide in the Earth's atmosphere by the middle of

[7] The Discovery of Global Warming, https://history.aip.org/climate/timeline.htm
[8] Ibid, https://history.aip.org/climate/20ctrend.htm#L_M017
[9] Ibid, https://history.aip.org/climate/public2.htm#L_M011
[10] Ibid, https://history.aip.org/climate/timeline.htm

the 21st century and a temperature increase of "1.5-4.5, and perhaps as much as 5.5," degrees Celsius by the end of the 21st century. [11]

In 2001 the IPCC issued its third assessment report which held that "the observed warming of the last 50 years is likely to have been due to the increase in greenhouse gas concentrations" and added that the rate of future warming is "very likely to be without precedent during at least the last 10,000 years." The third IPCC assessment report went on to predict warming by the end of the 21st century of between 1.4-5.8 degrees Celsius. This assessment report effectively ended debate about climate change among all but a few scientists.[12]

In 2007 the IPCC issued its fourth assessment report, which projected a likely temperature increase of 3 degrees Celsius by the end of the 21st century if greenhouse gas emissions were not substantially curtailed. The projected range of possible temperature increase was from 1.5 to over 6 degrees Celsius with devastating impacts on many animal and plant species, as well as human civilization at the higher end of that range. The report concluded that the costs of avoiding extreme climate change would be much less than the costs it would impose if allowed to proceed unchecked.[13]

The IPCC report predicted that if humanity continues on its current path and drives the level of carbon dioxide in the atmosphere to over 1000 ppm the planet will likely warm between 2.6-4.8 degrees Celsius or more by the end of the 21st century. Only if humanity holds carbon dioxide concentrations in the atmosphere to 430 to 480 ppm will it likely be able to limit global temperature increase to 2 degrees Celsius or less, which is the limit the IPCC has stated that humanity must not transgress if it wants to avoid climate-related feedbacks that will be difficult for civilization to adapt to.[14] (In April of 2017 carbon dioxide concentrations in the atmosphere soared above 410 ppm for the first time in millions of years.) With 1000 ppm or more of carbon dioxide in the atmosphere the IPCC predicts that the Greenland and Antarctic ice sheets will decrease by 35% to 85% and global mean sea level will rise by as much as 0.82 meters by the end of the century. If humanity limits atmospheric concentrations to no more than 480 ppm, however, sea levels are not likely to rise by more than 0.55 meters by the end of the century.[15] Under the IPCC's best case scenario ocean acidification will likely increase by 15%-17% by the end of the century, while under the worst case scenario acidification will increase by 100% to 109%, devastating coral reefs and many species of marine life.

Marine life will be impacted by ocean acidification while the "progressive expansion of Oxygen Minimum Zones and anomic 'dead zones' in the oceans will further constrain fish habitats." [16]

Key Dates

The International Energy Agency said that switching from fossil fuels to low-carbon sources of energy will cost $44 trillion between now and 2050.15 The IEA predicts, however, that the cost of converting from fossil fuels to low carbon or no carbon fuels will be offset by the savings from energy conservation and not having to rely on fossil fuels.

Against these numbers must, of course, be weighed the cost of doing nothing. The IPCC's Fifth Assessment report estimated that an increase in temperatures of 2 degrees Celsius would result in a reduction of gross national incomes of between 0.2 and 2 percent.18

[11] Ibid, https://history.aip.org/climate/internat.htm#L_M063
[12] https://history.aip.org/climate/internat.htm#L_M072
[13] Ibid, https://history.aip.org/climate/internat.htm#L_M084
[14] International Panel on Climate Change, Fifth Assessment Report, 2014, Synthesis Report, p. 60.
[15] Ibid.
[16] Ibid, p. 67.

The IPCC observes that the social impacts of climate change are likely to be no less devastating. The fifth assessment report states that "climate change impacts are projected to slow down economic growth, make poverty reduction more difficult, further erode food security and... exacerbate poverty in most developing countries and create new poverty pockets in countries with increasing inequality, in both developed and developing countries." [17] Partly as a result, "Climate change can indirectly increase risks of violent conflict by amplifying well-documented drivers of these conflicts, such as poverty and economic shocks." [18]

In its fifth assessment report the IPCC predicted that stabilizing greenhouse gas emissions at a level low enough to keep global temperatures from rising above 2 degrees Celsius would cost about $13 trillion through 2030.[19] The International Energy Agency (IEA) said that switching from fossil fuels to low-carbon sources of energy will cost $44 trillion between now and 2050.[20] The IEA predicts, however, that the cost of converting from fossil fuels to low carbon or no carbon fuels will be offset by the savings from energy conservation and not having to rely on fossil fuels.[21]

The IPCC also predicted that reducing emissions will reduce the rate of global economic growth due primarily to rising energy prices, though growth will , on average, be reduced by less than a tenth of a percentage point per year between 2014 and 2100.[22] The IPCC cautioned, however, that the longer humanity postpones the investments needed to curb and reduce greenhouse gas emissions the higher the price tag is likely to climb. For example, in 2012 the International Energy Agency estimated that it would only cost the world $36 trillion to transition to low-carbon energy, which was $8 trillion less than the 2014 estimate of $44 trillion.[23]

The Fourth National Climate Assessment produced by 13 U.S. federal agencies released in November, 2017 underscores the IPCC's assessment of the costs of climate change since it estimates that climate change-related weather catastrophes "have cost the United States $1.1 trillion since 1980".[24] An econometric study led by two UC Berkeley scholars provides a more detailed analysis of costs in the United States. It found that for each 1 degree Fahrenheit increase in temperature "the U.S. economy stands to lose about 0.7 percent of its Gross Domestic Product, with each degree of warming costing more than the last." Furthermore, these economic impacts will not be distributed evenly, with the least affluent third of counties in the United States losing between 2.0 percent and 19.6 percent of their incomes while regions such as New England and the Pacific Northwest are likely to become more prosperous overall.[25]

Key Dates

According to the Los Angeles Times, between 1998 and 2005 Exxon provided between $16 million and $30 million (estimates from the Union of Concerned Scientists and Greenpeace vary) in funding for at least 43 climate skeptic organizations such as the Heartland Institute and the Global Climate Coalition. 23

[17] Ibid, p. 73.
[18] Ibid.
[19] Kevin Bullis, "How Much Will it Cost to Solve Climate Change," MIT Technology Review, May 15, 2014.
[20] Ibid.
[21] Ibid.
[22] Ibid.
[23] Ibid.
[24] Lisa Friedman and Glenn Thrush, "U.S. Report Says Humans Cause Climate Change, Contradicting Top Trump Officials," New York Times, November 3, 2017.
[25] Solomon Hsiang, Robert Kopp, Amir Jina, et. al., "Estimating Economic Damage from Climate Change in the United States," Science, June, 2017.

The Public Debate Over Climate Change

As Noami Oreskes and Erik M. Conway have documented in their book Merchants of Doubt, rather than adapting to the reality of climate change by developing new forms of energy, the fossil fuel industry elected to invest its resources in funding pseudo-science aimed at discrediting legitimate climate science of the sort that informed IPCC assessment reports. In this respect, Oreskes and Conway observe, its behavior was similar to the tobacco industry's response to science which established an empirical link between cigarette smoking and negative health effects ranging from heart disease to cancers and respiratory illnesses. In fact, they document that many of the same scientists and professional contrarians who were involved in defending the tobacco industry have also been involved in the effort to promote doubt about climate science.[26]

A series of articles published in the Los Angeles Times in late 2015 documented that Exxon knew that human generated greenhouse gas emissions, particularly carbon dioxide, were likely driving climate change and would have increasing effects in the future as early as the early 1980s. According to the *Times*, Duane Lavine, Exxon's manager of science and strategy development, gave a briefing to the company's board of directors in 1989, that acknowledged the scientific consensus that carbon dioxide emissions from burning fossil fuels could raise global temperatures "between 2.7 and 8.1 degrees Fahrenheit" by the middle of the 21st century.[27] Exxon confirmed the accuracy of academic and government sponsored climate science by funding its own scientific research on climate change, but chose to cover up findings by government scientists as well as its own scientists by investing in the pseudo-science chronicled by Oreskes and Conway. Partly in response to the reporting on the issue by the *Los Angeles Times* and *Inside Climate News* state Attorneys General Eric Schneiderman of New York and Maura Healey of Massachusetts launched investigations of Exxon's funding of contrarian climate science. At issue is whether or not Exxon's funding of this pseudo-science, when its own internal records indicate it was convinced of the reality of climate science, constitute "a form of fraud against its shareholders and the public." [28] In January of 2018 New York's mayor Bill De Blasio announced that New York City will divest the $5 billion invested in fossil fuel companies from its $189 billion public pension funds. (New York State is also reportedly planning to divest fossil fuel holdings from its public pension funds. To date, countries, states, cities, universities, corporations and nonprofits have announced plans to divest over $6 trillion in assets from fossil fuel companies.) De Blasio also announced that New York City will be suing BP, Exxon Mobil, Chevron, Conoco Phillips, and Shell due to their contributions to climate change and their role in covering it up.[29] San Francisco and Oakland announced similar lawsuits against the same five companies in December of 2017.[30]

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[26] Naomi Oreskes and Erik M. Conway, Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming. (New York: Bloomsbury Press, 2011

[27] "How Exxon Went From Leader to Skeptic on Climate Change Research," Los Angeles Times, October 23, 2015.

[28] In Setback for Exxon, Texas Judge Kicks Climate Change Case to New York," Inside Climate News, March 30, 2017.

[29] Milman, Oliver. 10 Jan 2018. "New York City plans to divest $5bn from fossil fuels and sue oil companies." The Guardian.
https://www.theguardian.com/us-news/2018/jan/10/new-york-city-plans-to-divest-5bn-from-fossil-fuels-and-sue-oil-companies

[30] Cama, Timothy. 20 Sept 2017. "San Francisco, Oakland sue oil companies over climate change." The Hill.
http://thehill.com/policy/energy-environment/351603-san-francisco-oakland-sue-oil-companies-over-climate-change

The Politics of Climate Change and International and U.S. Climate Policies

George H.W. Bush signed the United Nations Framework Convention on Climate Change in 1992. This first UNFCCC treaty, which included voluntary agreements to limit greenhouse gas emissions by signatories, was then submitted to the U.S. Senate for ratification. The Senate ratified the treaty, which included only voluntary agreements on greenhouse gas emissions, and it went into effect.

The Clinton Administration subsequently pledged the United States to abide by the requirements of the Kyoto Protocol in 1997, which included mandatory limits on greenhouse gas emissions for developed countries, but not for developing countries such as China and India. The rationale for this two tiered structure was the argument made by developing countries that they were responsible historically for a much lower percentage of the carbon dioxide in the atmosphere than developed countries and also that they were responsible for less carbon dioxide emissions on a per capita basis. Furthermore, they argued that because they are poorer than developed countries they have less ability to pay the costs of greenhouse gas mitigation. Significantly, the Clinton Administration never submitted the Kyoto treaty to the U.S. Senate for ratification. This was largely because the Senate had overwhelmingly passed a resolution prior to the Kyoto conference asserting that the United States should not be a party to any treaty that didn't include strict greenhouse gas emissions limits on developing countries as well as developed countries or any treaty which "would result in serious harm to the economy of the United States." [31] In his campaign for the Presidency George W. Bush pledged to cap carbon dioxide emissions and require power plants to reduce greenhouse gas emissions. Once elected Bush appointed Christine Todd Whitman as head of the Environmental Protection Agency. Whitman subsequently affirmed at a meeting on climate change in Italy, that the Bush Administration was planning to cap greenhouse gas emissions and she subsequently reiterated this position on a CNN talk show.[32] When Republican senators sent Bush a letter asking if he intended to place a cap on carbon emissions, however, he reversed the position he took during the campaign and said he would not place a cap on carbon dioxide emissions.[33] In 2001 the Bush Administration formally announced that the United States would not implement the Kyoto Protocol.

Subsequently, in their campaigns for the presidency both Barack Obama and John McCain acknowledged the veracity of climate science and proposed policies to address climate change. After the election the Obama Administration provided $40 billion as part of its 2009 economic stimulus for investment in renewable energy and "green industries," such as Tesla Motors. Obama later announced the Clean Power Plan, committing the United States to a 30% reduction in greenhouse gas emissions in the power sector of its economy by 2030. The Obama Administration also committed the United States to install 100 megawatts of renewable energy in federally subsidized housing units by 2020, permit ten gigawatts of renewable energy projects on public land by 2020, deploy three gigawatts of renewable energy on military installations by 2025, and double wind and solar energy generation in the United States by 2015. The Obama Administration also proposed average fuel economy standards for passenger vehicles of 54.5 miles per gallon by 2025.[34]

Most significantly, President Obama negotiated a bilateral deal with China to reduce greenhouse gas emissions. The bilateral deal with China removed a significant obstacle to the development of a global

[31] The Byrd-Hagel Resolution, July 25, 1997, https://www.nationalcenter.org/KyotoSenate.html
[32] PBS Frontline, "Timeline: The Science and Politics of Global Warming." http://www.pbs.org/wgbh/pages/frontline/hotpolitics/etc/cron.html
[33] Ibid.
[34] Obama Administration White House Archives, https://obamawhitehouse.archives.gov/energy/climate-change

deal at the UNFCCC COP 21 in Paris in December of 2015, concerning the disagreement between developed and developing countries over how the costs of addressing climate change would be apportioned that dated back to the Rio Summit in 1992, as discussed above.

In his 2016 campaign for the presidency, Donald Trump tweeted in 2012 "The concept of Global Warming was created by and for the Chinese in order to make U.S. manufacturing non-competitive." [35] In other tweets Trump referred to climate change as a "hoax." [36] Subsequently in a September 27, 2016 interview with CNN Trump campaign manager Kellyanne Conway explained that President Trump believed that climate change is happening, but is "naturally occurring." [37] In 2017, when he announced that he would withdraw the United States from the Paris Agreement on Climate Change, Trump cited research from the conservative think tank National Economic Research Associates claiming that complying with the terms of the Paris climate agreement would cost the United States as much as $3 trillion in lost GDP and 6.5 million industrial jobs by 2040.[38] (Withdrawal from COP 21 will not formally happen until 2020.) Soon after, the Trump administration announced its intention to repeal the Obama administration's Clean Power Plan. In late 2017 the Republican majority in the House and the Senate passed a tax reform bill that proposed cuts to federal subsidies for renewable energy and tax credits for installation of residential solar energy as well as the purchase of electric vehicles, while preserving subsidies for fossil fuel exploration. These statements and actions drive home a point made by Jonathan Chait in a 2015 New York Magazine article: "Of all the major conservative parties in the democratic world, the Republican Party stands alone in its denial of the legitimacy of climate science." [39]

Key Dates

The fact is that, according to Next Ten's 2017 "California Green Innovation Index," from 2006 when AB 32 was enacted to 2015 California enjoyed GDP per capita growth of almost $5,000 per person, nearly twice the growth experienced by the national economy . During the same period per capita greenhouse gas emissions in California decreased by 12 percent.38

Against these numbers must, of course, be weighed the cost of doing nothing. The IPCC's Fifth Assessment report estimated that an increase in temperatures of 2 degrees Celsius would result in a reduction of gross national incomes of between 0.2 and 2 percent.18

California Climate Policies

In the absence of significant action by the federal government to effectively address the threat of climate change, California state government has passed a series of laws designed to comprehensively reduce greenhouse gas emissions in the state and transition it to a clean energy economy. Executive Order 5-3-05 and Assembly Bill 32 set a goal of reducing net greenhouse gas emissions in California to 1990 levels by 2020 and cutting net greenhouse gas emissions 80% below 1990 levels by 2050. To achieve the 2020 targets there is a goal of achieving reductions of 15% in the building sector of the state's economy, 15% in the energy production sector, and 33% in the transportation sector. The remaining reductions are supposed to come from a cap and trade system involving the sale of emissions permits to large industries in the state and use of the revenue raised from the sale of the permits to fund investments in measures designed to achieve further reductions in greenhouse gas

[35] Donald Trump tweet, November 6, 2012, https://twitter.com/realdonaldtrump/status/265895292191248385?lang=en
[36] Donald Trump tweets, 12-2013 thru 01-2014, http://www.snopes.com/donald-trump-global-warming-hoax/
[37] Kellyanne Conway interview, September 27, 2016, http://www.snopes.com/donald-trump-global-warming-hoax/
[38] https://www.whitehouse.gov/briefings-statements/statement-president-trump-paris-climate-accord/
[39] Jonathan Chait, "Why Are Republicans the Only Climate-Science-Denying Party in the World?," New York Magazine, September 27, 2015.

emissions, as well as the planting of forests.[40] (Significantly, Assembly Bill 398, which was passed in 2017, continued California's cap and trade program until 2030. It was passed by a two-thirds bipartisan vote in the state Assembly and the Senate, protecting it from legal challenges for the foreseeable future.)

Executive Order 13-30-15 and Senate Bill 350 were intended to augment Executive Order 5-3-05 and Assembly Bill 32 by setting interim targets for greenhouse gas reductions between 2020 and 2050. They require a 40% reduction of greenhouse gas emissions below 1990 levels by 2030. In addition, SB 350 raises the California renewable portfolio standard to 50% and creates a regulatory mandate that all homes, businesses, and factories must be 50% more energy efficient by 2030.

During the negotiations that led to the Paris Climate Agreement, California Governor Jerry Brown also promoted the Under 2 MOU. This agreement involves a voluntary pledge by regional and local government signatories to achieve 85% to 95% reductions in greenhouse gas emissions below 1990 levels by 2050. As of July 2017 there were 176 regional and local government signatories to the agreement.[41]

The California Air Resources Board adopted the California Advanced Clean Cars Program in 2012. The Clean Cars Program requires automobile manufacturers to produce an increasing number of zero emissions vehicles (ZEVs) so that 1.5 million ZEVs (or 15.4% of all new cars sold in California) will be on the road by 2025. Section 177 of the Advanced Clean Cars Program also allows other states to adopt California's automotive emissions standards.[42] Pursuant to the passage of Senate Bill 605 and Senate Bill 1383, the California Air Resources Board developed a Short Lived Pollutant Reduction Plan which sets a goal of reducing methane emissions and hydrofluorocarbons 40% below 2013 levels by 2030 and reducing anthropogenic black carbon 50% below 2013 levels by 2030. Since the California Air Resources Board estimates that these Short Lived Pollutants are responsible for 40% of net climate forcing it labels them "super pollutants" and places a high priority on achieving immediate reductions. Since more than half of California's methane is emitted by the dairy and livestock industries, the states aims to reduce emissions from dairy manure by 75% by 2030 via an investment of $100 million for waste diversion and $35 million for dairy digester development to produce biofuel. Furthermore, Assembly Bill 1613 and Senate Bill 859 specify a spending plan for cap and trade revenues which provides $5 million for black carbon wood smoke reductions and $7.5 million for the state's Healthy Soils

Key Dates

From 2010 to 2015 solar installations in the golden state increased 1,738.3% due to state policies and there was a 48% reduction in the cost of solar PV systems between 2010 and 2014.43

Additionally, California accounts for 50% of all zero emissions vehicle sales in the United States, while around the world sales of electric cars has risen tenfold. Driving the spike in sales is the fact that the cost of a battery used in an electric car has dropped by half in the last five years and is expected to drop by half again in the next five years without any radical technological breakthroughs. 45

[40] PBS, *Nova,* "The Big Energy Gamble," January 20, 2009, http://www.pbs.org/wgbh/nova/tech/big-energy-gamble.html

[41] Under 2 MOU signatories, July 22, 2017, http://under2mou.org/coalition/

[42] Governor's Interagency Working Group on Zero Emissions Vehicles, 2016 ZEV Action Plan, https://www.gov.ca.gov/docs/2016_ZEV_Action_Plan.pdf

Program.[43]

Economic Impacts of California's Climate Change Policies

According to Naomi Oreskes and Erik M. Conway, one of the pivotal arguments which the fossil fuel industry was advised to make by Exxon Manager of Science and Strategy Development Duane Lavine as well as leaders at organizations such as the Heartland Institute and the Global Climate Coalition was that a hasty imposition of climate legislation to reduce greenhouse gas emissions would burden consumers and businesses with rising costs. In fact, they argued that rising costs associated with taxing fossil fuels and energy would threaten the health of the U.S. economy itself. Similarly there were politicians and economists in California who predicted a mass exodus of manufacturing businesses from the state due to rising energy costs precipitated by its landmark climate legislation, the Global Warming Solutions Act. [44] Because the California Assembly passed AB 32, the Global Warming Solutions Act, in 2006 California has now had about a decade of experience with the cap and trade policies that are integral to it, therefore, it serves as a good laboratory for assessing the economic impacts of climate change policies. The fact is that, according to Next Ten's 2017 "California Green Innovation Index," from 2006 when AB 32 was enacted to 2015 California enjoyed GDP per capita growth of almost $5,000 per person, nearly twice the growth experienced by the national economy. During the same period per capita greenhouse gas emissions in California decreased by 12 percent.[45]

Additionally, from 2012 through 2016, "California averaged 2.7 percent job growth per year, compared to 1.8 percent nationwide." [46] Finally, California's cost of electricity was 1.63 percent of GDP in 2015, the second lowest in the United States and much lower than its 1990 cost of electricity, which was 2.4 percent of GDP.[47] Partly as a result, "California had among the lowest inflation-adjusted average electricity bills in 2015 for the residential and industrial sectors." To date these savings have mostly come from California's ability conserve energy rather than from lower energy costs, however, as the costs of renewable energy continue to fall relative to the costs of fossil fuels and nuclear energy there are good reasons to believe that this trend will continue.[48]

There continue to be critics who warn that, despite the fact that AB 32 hasn't yet resulted in the loss of significant numbers of jobs and businesses to states with less regulation and lower energy costs, more recent legislation that substantially ratchets up the state's greenhouse gas emissions reduction requirements will surely have that effect.[49] (It is also difficult to predict what the elimination of federal subsidies and tax credits for renewable energy and electric and hydrogen powered vehicles may do.) The flip side of the pessimistic view, however, is the perspective of those such as former governor Arnold Schwarzenegger, who maintain that investments in clean technology and clean industry in the golden state could emerge as significant new centers of growth. While it is too early to know for certain if the ambition of California's climate policies is exceeding the ability of its economy to adapt, there is clear evidence that California has established itself as a leader in pioneering green industries, which are likely to become major areas of growth in the 21st century. As a result of this explosive growth, while there

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[43] Short-Lived Pollution Reduction Strategy, November, 2016, https://www.arb.ca.gov/cc/shortlived/meetings/11282016/revisedproposedslcp.pdf

[44] PBS Nova, "The Big Energy Gamble," 2009.

[45] "California Green Innovation Index, 9th edition," Next Ten and Beacon Economics, 2017, p. 40.

[46] Ibid, p. 41.

[47] Ibid, p. 32.

[48] Ibid, p. 33.

[49] Gabriel Kahn, "Dreamers of the Golden Dream," *Mother Jones*, April, 2016, p.p. 42-43.)

are roughly 2.5 jobs in renewable energy generation for each job in fossil fuel generation in the United States as a whole, in California there are 8.5 jobs in renewable energy generation for each job in fossil fuel generation.[50]

Additionally, California accounts for 50% of all zero emissions vehicle sales in the United States, while around the world sales of electric cars has risen tenfold. Driving the spike in sales is the fact that the cost of a battery used in an electric car has dropped by half in the last five years and is expected to drop by half again in the next five years without any radical technological breakthroughs.[51] This means, according to industry analysts, that electric cars will likely be broadly competitive with fossil fuel powered cars by 2025. In fact, Tesla CEO Elon Musk's unveiling in November of 2017 of an EV semi truck that he claims will have a range of 500 miles and a second-generation roadster with a range of 620 miles makes these projections by industry analysts seem excessively conservative.[52] (Musk has said that the semi truck will be available for purchase by 2019 and the roadster will be available by 2020.) Furthermore, Electrify America, a Volkswagen subsidiary, has earmarked $800 million for installing high capacity 350 kilowatt electric charging locations throughout California (as a result of its settlement of the case against the company involving the illegal installation of software on its vehicles designed to create the appearance of lower smog emissions than were actually being emitted) that will slash the time it takes to fully charge an EV from 4 to 12 hours to 10 to 15 minutes, depending on the vehicle's range.[53] Taken together these developments promise to dramatically accelerate the shift away from fossil fuel powered transportation.

Looking at investment in the green economy, all told California had 5,119 clean technology patents in 2016, while the rest of the United States together had 18,839 clean technology patents. California clean tech companies alone received more than two-thirds of total U.S. venture capital investment in 2016.[54] The rapid growth of California's clean energy and green technology sectors helps to explain why a study by ICF International for Next Gen Climate showed the transition away from fossil fuels could add "up to 1 million net jobs by 2030" and as many as 2 million net new jobs by 2050 if greenhouse gas emissions are reduced by 80 percent.[55] It is worth noting that this is almost the polar opposite of the findings of the National Economic Research Associates study cited by President Trump. While both studies may be seen as politically motivated, a new study from the International Renewable Energy Agency says that "wind and solar power will be on par with -- or even cheaper than -- the cost of fossil fuel-generated electricity by 2020," lending credibility to the ICF International study.[56]

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[50] "California Green Innovation Index, 9th edition," Next Ten and Beacon Economics, 2016, p. 42.)
[51] *Time to Choose* (a documentary by director Charles Ferguson).
[52] https://www.theverge.com/2017/11/17/16655800/tesla-electric-semi-truck-roadster-recap-elon-musk
[53] Eric Taub, The New York Times, "For Electric Car Owners, 'Range Anxiety' Gives Way to 'Charging Time Trauma,'" October 5, 2017.
[54] "California Green Innovation Index, 9th edition," Next Ten and Beacon Economics, 2016, pp. 46-50.
[55] Hoover, Kent. 9 Nov 2015. "1 million jobs could be created by cutting carbon emissions, Tom Steyer says." The Business Journals.
https://www.bizjournals.com/bizjournals/washingtonbureau/2015/11/1-million-jobs-could-be-created-by-cutting-carbon.html
[56] Dudley, Dominic. 13 Jan 2018. "Renewable energy will be consistently cheaper than fossil fuels by 2020, report claims." Forbes.
https://www.forbes.com/sites/dominicdudley/2018/01/13/renewable-energy-cost-effective-fossil-fuels-2020/#2403cd524ff2

Climate Policies of California Colleges and Universities

Consistent with the commitments California state government is making, its institutions of higher education are taking the lead in addressing the challenge of climate change and preparing students for the opportunities presented by the emergence of green industries. The UC system has committed to reducing greenhouse gas emissions to 1990 levels by 2020 and in 2014 UC system President Janet Napolitano committed the UC campuses to a goal of achieving carbon neutrality by 2025.[57]

The CSU system has committed to reducing greenhouse gas emissions to 1990 levels by 2020 and to 80% below 1990 levels by 2040.[58]

While the CCC system has not made a similar commitment related to GHG emissions, it has made commitments in the areas of energy conservation and water conservation that bear directly on GHG emissions and climate resilience. In 2006 the California Community College/Investor-Owned Utilities Institutional Partnership was created to encourage best practices and to promote energy efficient technologies.[59]

The CCC Board of Governors approved an Energy and Sustainability Policy in 2008 that provides goals and guidance to community college districts for energy conservation, sustainable building practices, and physical plant management to maximize reductions in energy consumption. This policy tasks community college districts with reducing energy consumption by a minimum of 15% and outperforming statewide energy standards on construction projects, and it encourages districts to develop strategies for energy procurement and production that reduce capacity loads on the state's electricity grid. To aid in meeting these goals, the Community College Chancellor's Office provides incentives of 2%-3% of construction costs to districts whose state-funded construction projects outperform Title 24 Energy Standards by 10% for modernization and 15% for new construction projects.[60]

In addition, the California Clean Energy Jobs Act (Proposition 39) has provided funding for community college districts to implement 525 energy projects to date across the state that provide for cost savings and energy savings while creating "green" jobs that allow on-the-job training to prepare a workforce with much needed skills and technology. The California Clean Energy Jobs Act (Proposition 39-SB 73, de Leon) allocated revenue to California's General Fund and the Clean Energy Job Creation Fund, for five fiscal years beginning in fiscal year 2013-'14. Under the initiative, funds are available annually for appropriation by the Legislature for eligible projects to improve energy efficiency and expand clean energy generation in schools.[61]

Key Dates

A recent study by ICF International for NextGen Climate America concluded that deep decarbonization of the U.S. economy could add more than 1 million jobs by 2030 and up to 2 million jobs by 2050.

[57] University of California Press Release, "UC Announces New Approaches to Combat Climate Change," September 10, 2014, https://www.universityofcalifornia.edu/press-room/uc-combat-climate-change

[58] Sustainability Report 2014. The California State University. http://www.calstate.edu/cpdc/sustainability/policies-reports/documents/csusustainabilityreport2014.pdf

[59] California Community Colleges Investor Owned Utilities (CCC/IOU) Statewide Energy Efficiency Partnership Program, http://cccutilitypartnership.com/

[60] California Community Colleges Board of Governors Energy and Sustainability Policy, http://extranet.cccco.edu/Portals/1/CFFP/Sustainability/BOG_Energy_Sustainability_Policy_FINAL.pdf

[61] California Energy Commission, The California Clean Energy Jobs Act, http://www.energy.ca.gov/efficiency/proposition39/

Proposition 39 funds have also been used for workforce development.[62] The Workforce and Economic Development Division of the California Community Colleges Chancellor's Office is committed to incentivizing the development of educational and apprenticeship or training programs in the state's 114 colleges. Through grant funding, the plan's key elements are: 1) Smart Growth; 2) Adaptation to fast-changing and existing environmental challenges; and 3) Sustainable development, including resource efficiency (energy, water, and renewables). Mt. San Antonio College received a grant for a Heating, Ventilating, and Air-Conditioning (HVAC) collaborative which aims to bridge the gap between workforce supply and demand across Los Angeles, Orange, Riverside, and San Bernardino Counties.

At the request of the Chancellor's Office, the 2015-16 Budget Act included a provision in the Physical Plant and Instructional Support item allowing districts to go beyond scheduled maintenance and instructional equipment to fund water conservation projects. The types of water conservation projects eligible for funding include the following: 1) Replacement of water intensive landscaping with drought tolerant landscaping, synthetic turf in non-athletic areas, and other non-plant materials; 2) Drip or low-flow irrigation systems; 3) Building improvements to reduce water usage; and 4) Installation of meters for wells to allow for monitoring of water usage.[63]

In addition to securing the districts' ability to fund water conservation projects with local assistance funding, the Chancellor's Office has worked closely with the Division of the State Architect on landscaping and irrigation measures that will result in long-term reductions in water usage on community college campuses. The Division of the State Architect adopted emergency regulations in June and additional regulations in July, pertaining to requirements for landscaping and irrigation in order to generate long-term water savings. The regulations became effective January 1, 2016. They required districts constructing new buildings or additions on community college campuses to replace existing landscaping, equal to 75 percent of the square footage of the building's footprint, with water conserving landscaping and/or the installation of water meters and other water conservation measures. The regulations will be applicable to both state and locally funded capital outlay projects.

The Board of Governors, through the Chancellor's Office states that it is committed to an environmentally sustainable future and promotes the implementation of energy and resource conservation efforts throughout the CCC system. By helping colleges carry out energy and water conservation efforts, the community college system has put in place several programs that support energy and water savings. Moving forward, the Chancellor's Office states that it will continue in these efforts and continue to implement new ideas and strategies and adopt new technologies as resources become available to promote a more sustainable future for California and its students.

CALIFORNIA STATE CLIMATE REGULATIONS: See Appendix on "California State Climate Regulations"

[62] California Department of Education, Clean Energy Jobs Act, http://www.cde.ca.gov/ls/fa/ce/

[63] California Community Colleges Chancellors Office Memorandum July 2, 2015, http://extranet.cccco.edu/Portals/1/CFFP/Fiscal_Services/Budget_Workshop/2015/1516PPISCert.pdf

SECTION 3 CAMPUS CLIMATE CONDITIONS

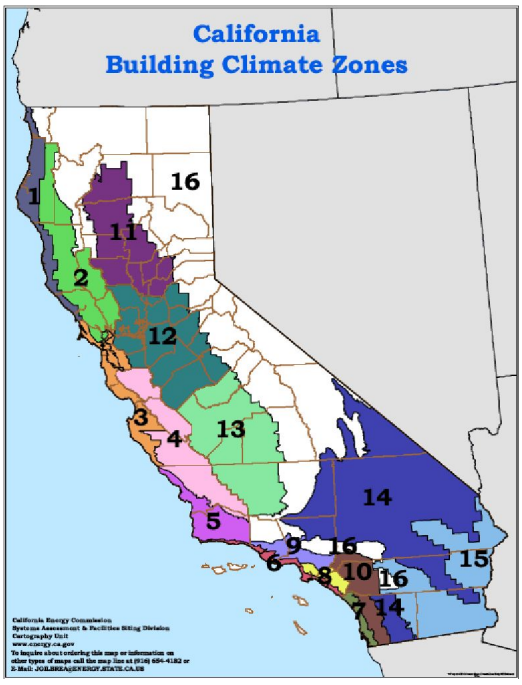
ENVIRONMENTAL CHARACTERISTICS AND CLIMATIC PROFILE

Mt. SAC's commitment to "sustain and improve the institution and the environment" is articulated in its Core Values. The findings of the environmental analysis are intended to inform the selection of sustainable strategies by Mt. SAC. The environmental data used within the analysis reflects campus conditions characteristic of the region which Mt.SAC resides in. Historical weather data has been collected over a number of decades and then assimilated into a database known as a weather station. The resulting environmental analysis of the data was then developed with the input of many stakeholders and its findings were discussed with interested faculty, staff, and students.

Understanding the climate conditions that are experienced on the campus is an important first step toward planning responsively and sustainably. Constructing outdoor spaces and buildings to work in harmony with environmental factors such as wind and solar exposure can simplify the effort and reduce the resources needed to maintain a comfortable and welcoming campus for students and employees.

Climatic Profile

Mt. SAC's campus is in California Climate Zone 9—situated in the Pomona-Walnut Valley, one of southern California's inland valleys. The terrain is hilly and climate conditions are influenced by the occurrence of thermal belts. Hilltops and valley bottoms are colder in the winter and warmer in the summer than the slopes and hillsides from which cold air drains and warm air rises. Unlike the coastal plains to the southwest, the ocean minimally influences this area. The temperature swing over the year is more extreme, with hotter summers and colder winters. Days are mostly clear and sunny with most of the rain falling in winter.



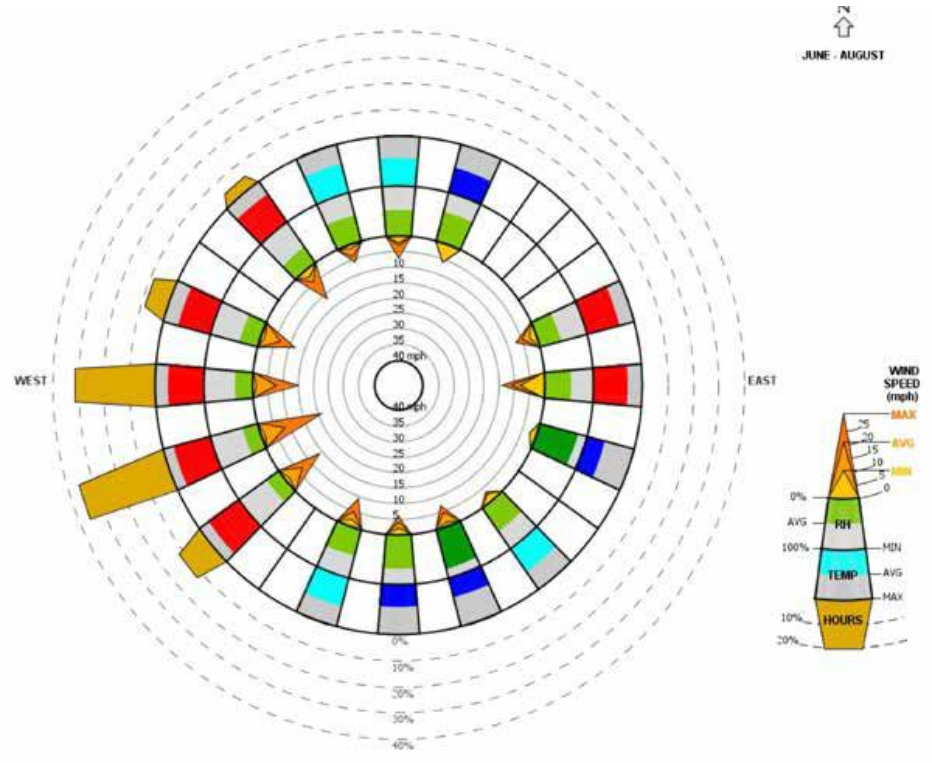
California Building Climate Zones

Climate Analysis Methodology

This analysis uses weather data from the Chino Airport Weather Station, which, although located in Climate Zone 10, is the nearest weather station and experiences the most climatically similar conditions to the Mt. SAC campus. Weather data was imported into Climate Consultant v6.2 software and graphed within a series of charts. Data from the past 20 years has been collected by these weather stations and provides a solid foundation for understanding climatic trends in the area. Anomalies in weather patterns however are not captured by this historical data. In order to reflect these unique conditions, the College's on-campus weather station could be used as a supplement. The College's weather station is currently located near the campus soccer fields. A 12 month recording of data points would need to be retrieved from the existing on-campus weather station and then integrated into Climate Consultant software. This is an action item which could be addressed in future versions of the Climate Action Plan. Data derived from the Climate Zone 10 weather station is provided on the following pages.

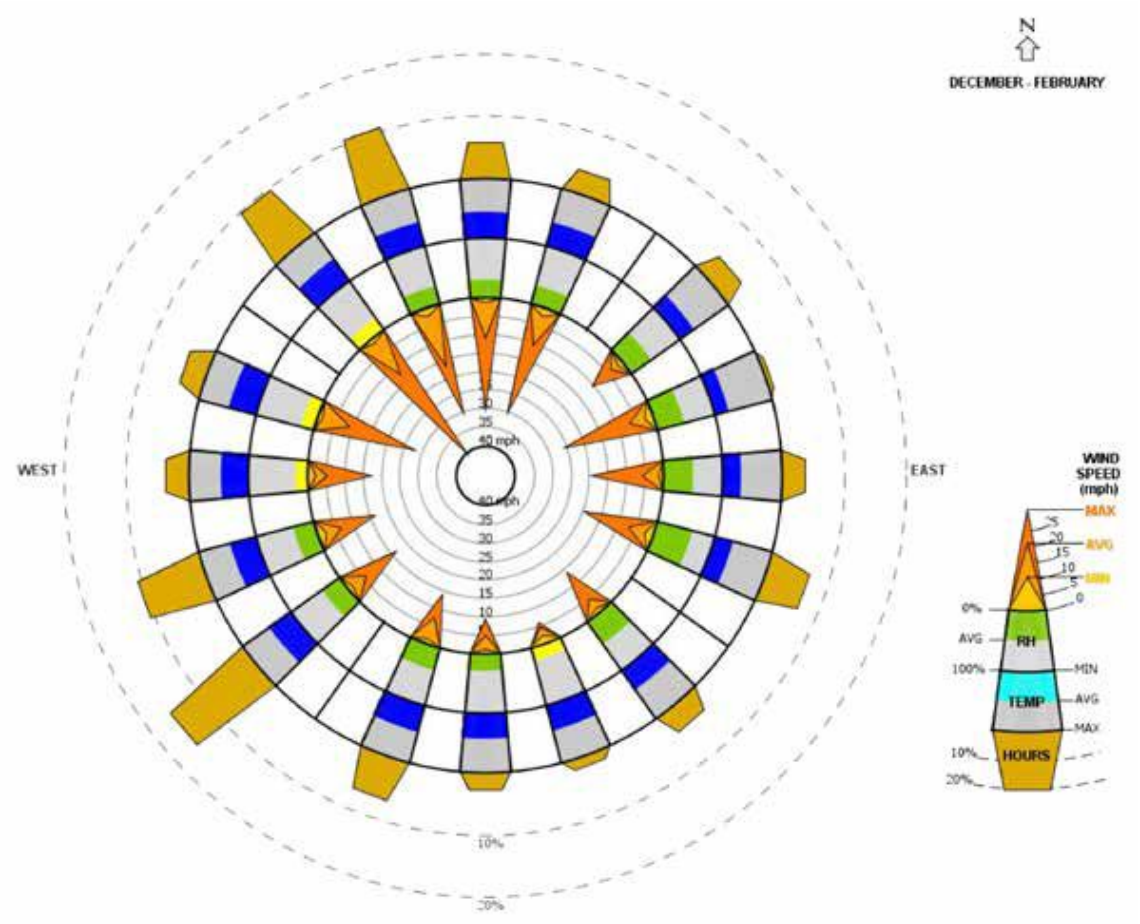
Wind Patterns

The wind rose charts on the following pages illustrate wind frequency, temperature, and humidity for the summer and winter months. This data can help designers orient new buildings to optimize the effects of natural ventilation. During the summer, between the hours of 8 am and 5 pm(when the campus has the greatest number of students, staff and faculty present), the prevailing wind is from the west within a range of 5–10 miles per hour, and with gusts that reach as high as 25 miles per hour. These summer winds tend to be hot and dry with a temperature range of 75–100 degrees Fahrenheit.



Wind Rose, Summer

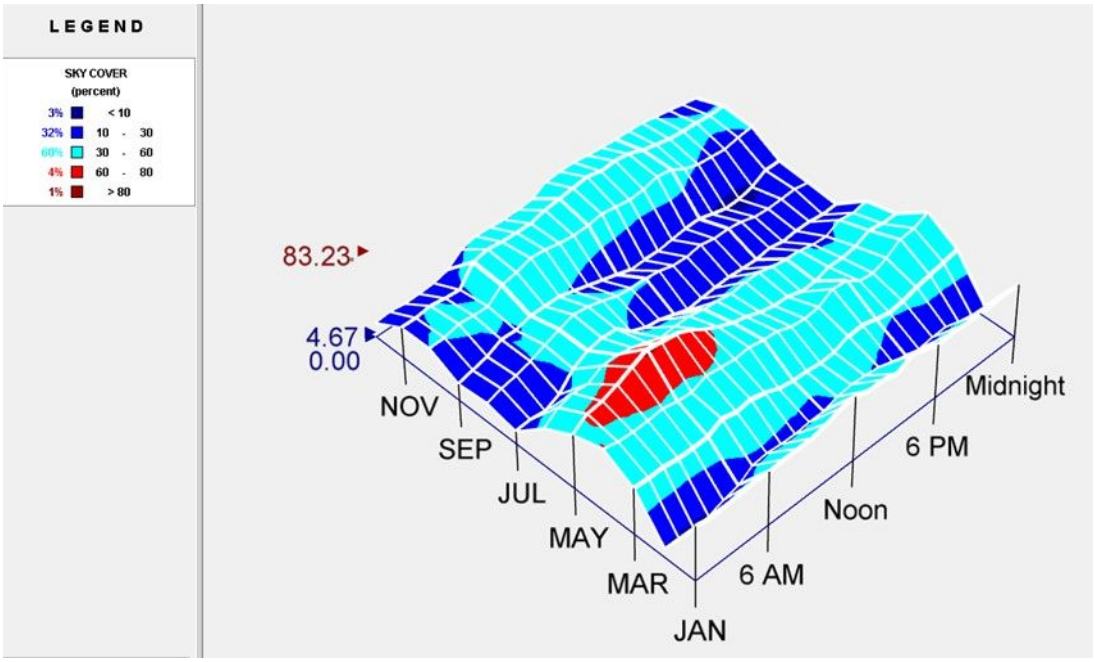
During the winter, between the hours of 8 am and 5 pm, the prevailing winds are from the northwest and southwest, within a range of 5–7 miles per hour and gusts that reach as high as 40 miles per hour. These prevailing winds tend to be more humid and cooler, with a temperature range of 32–70 degrees Fahrenheit.



Wind Rose, Winter

Sky Cover Range

The Sky Cover graphic illustrates the prevalence of clear or cloudy skies above the campus, organized by hours of the day and by months of the year. This information shows the times of the day and the year when being outdoors would be pleasant and comfortable, when solar shades would not be necessary for indoor comfort, or when solar photovoltaic systems would be most efficient. The data for Climate Zone 10 shows that the campus experiences between 30 percent and 60 percent cloud cover for approximately 60 percent of the year. General cloud cover occurs from March through June, in October, and during the later half of the day in December and February. The campus experiences its maximum cloud cover of between 60 percent and 80 percent during the morning hours in the month of May. The campus experiences the least cloud cover from July through September. The campus receives about 6 kWh of solar power per square meter per day -- about twice the solar power received in other states.[64]



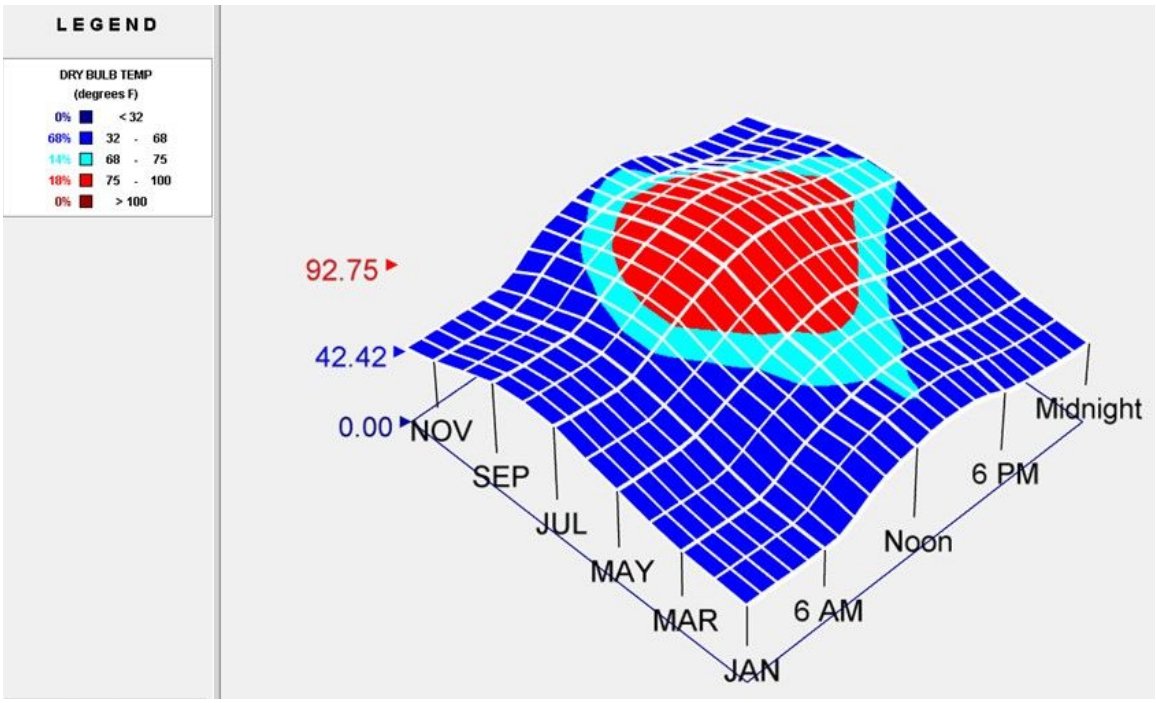
Sky Cover Range

Dry Bulb Temperature and Direct Normal Radiation

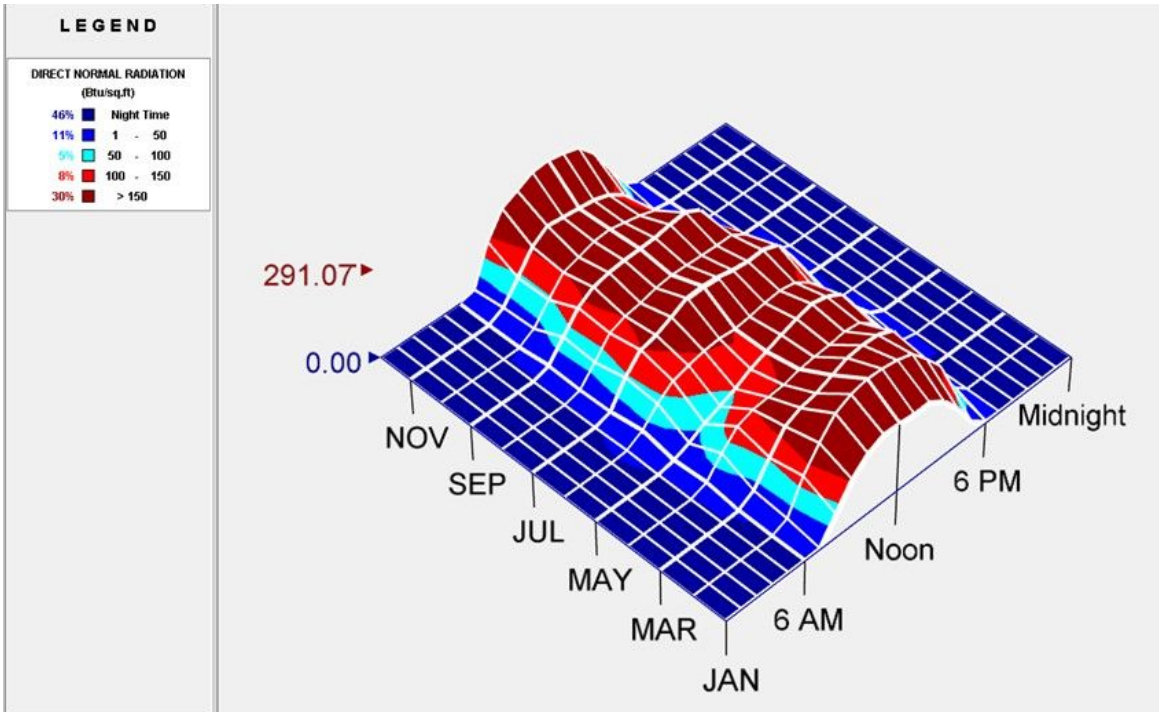
The Dry Bulb Temperature graphic illustrates prevalent outdoor temperatures on the campus over the hours of the day and months of the year. The direct Normal Radiation diagram indicates which times of day, across the course of the year, that the ground surface received direct solar exposure. The combination of this information indicates when when the outdoor temperature and solar exposure is high or low. This information in turn would indicate when mechanical cooling or heating is likely to be necessary to maintain comfort within indoor spaces, as well as when sun exposure or shade is necessary to maintain comfort outdoors. For example, during the morning hours for a majority of the year, the temperature trends between 32-68 degrees. During this time, solar exposure is also minimal. During the winter, these conditions may imply that heating strategies would be beneficial to make indoor building spaces comfortable. During the summer, these conditions may imply that pre-cooling strategies would be logical paths to provide comfortable indoor and efficiently run spaces. The maximum dry bulb temperatures occur during May through November, with the peak of 92.75 degrees Fahrenheit

[64] Solar Maps. National Renewable Energy Laboratory. Geospatial Data Science. https://www.nrel.gov/gis/solar.html.

occurring during the noon hour in August. The maximum Direct Normal Radiation of 291.07 BTU/sf/year occurs around the noon hour throughout the course of the year, when the sun is at it's highest point in the sky.



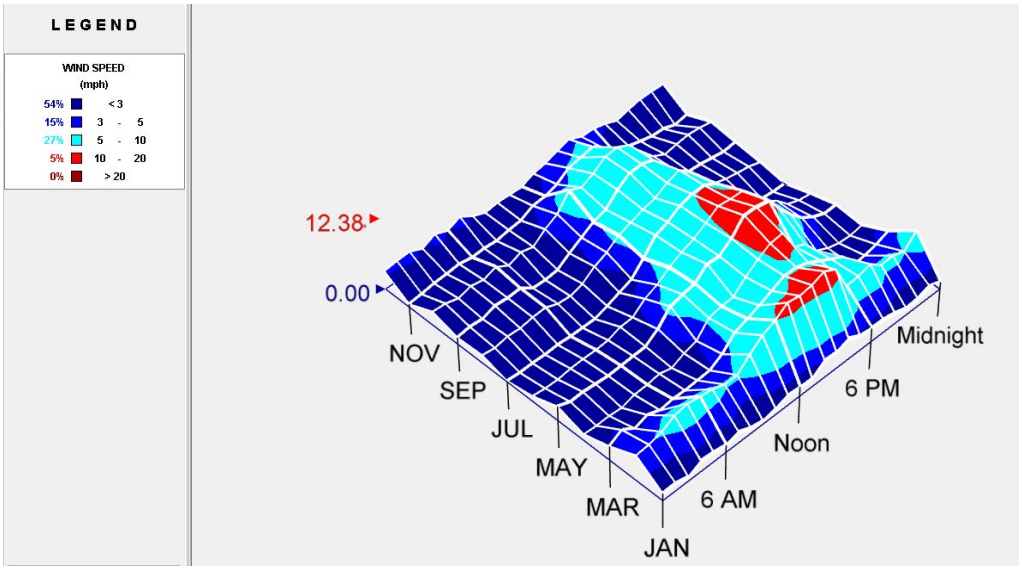
Dry Bulb Temperature



Direct Normal Radiation

Wind Speed

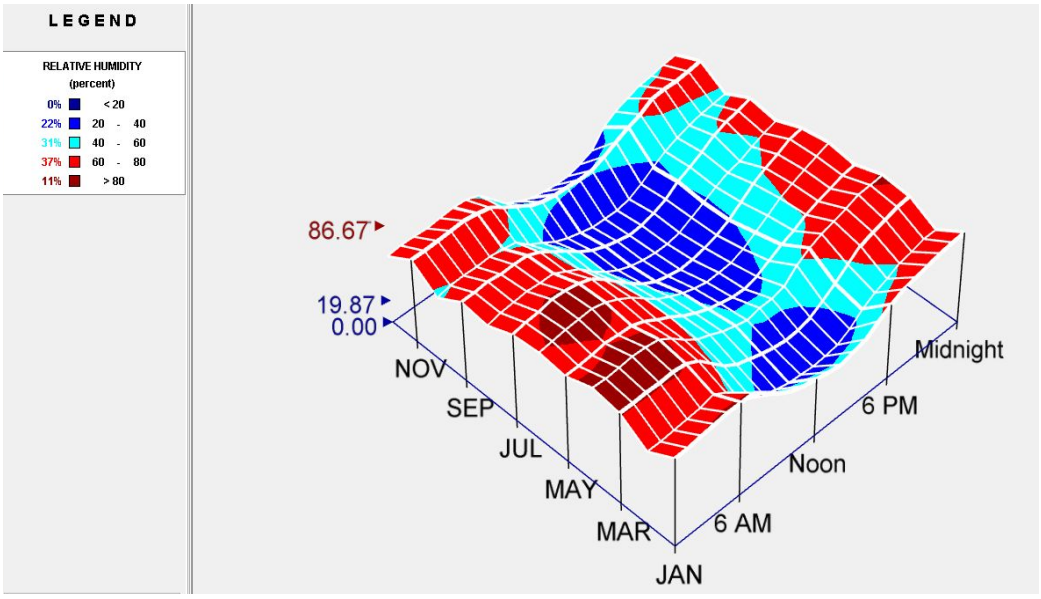
The Wind Speed graphic illustrates average wind velocity on campus over the hours of the day and months of the year. Wind speed data is one of the factors that determine if conditions favor natural ventilation. The campus experiences an average wind velocity of 5–10 miles per hour or slightly higher in the afternoons hours, during most of the year, with an average maximum velocity of 12.38 miles per hour in May.



Wind Speed

Relative Humidity

The Relative Humidity graphic indicates when building occupants may benefit from either more or less humidification to be comfortable. During 37 percent of the year, the campus experiences 50–60 percent relative humidity in the mornings and evenings. During the middle of the day, however, the humidity level tends to be very low, between 20–40 percent, and humidification combined with either heating or cooling is necessary to maintain comfort.



Relative Humidity

Comfort Zone and Diurnal Temperature

Thermal comfort is a result of the combined effects of solar radiation, temperature, air movement, and relative humidity. The temperature swing at the Mt. SAC campus over the year is more extreme than the coastal climates to the west of the site. Mt. SAC has hotter summers and colder winters than coastal areas.

This claim is supported by the Diurnal Temperature chart, which demonstrates bioclimatic needs based off of temperature and humidity data. The Diurnal Temperature chart shows that, most of the time, dry bulb temperatures (represented by the jogging red line) are within or close to the thermal comfort zone (represented by the grey horizontal bar), with peaks occurring during the summer months and valleys occurring during the winter months.

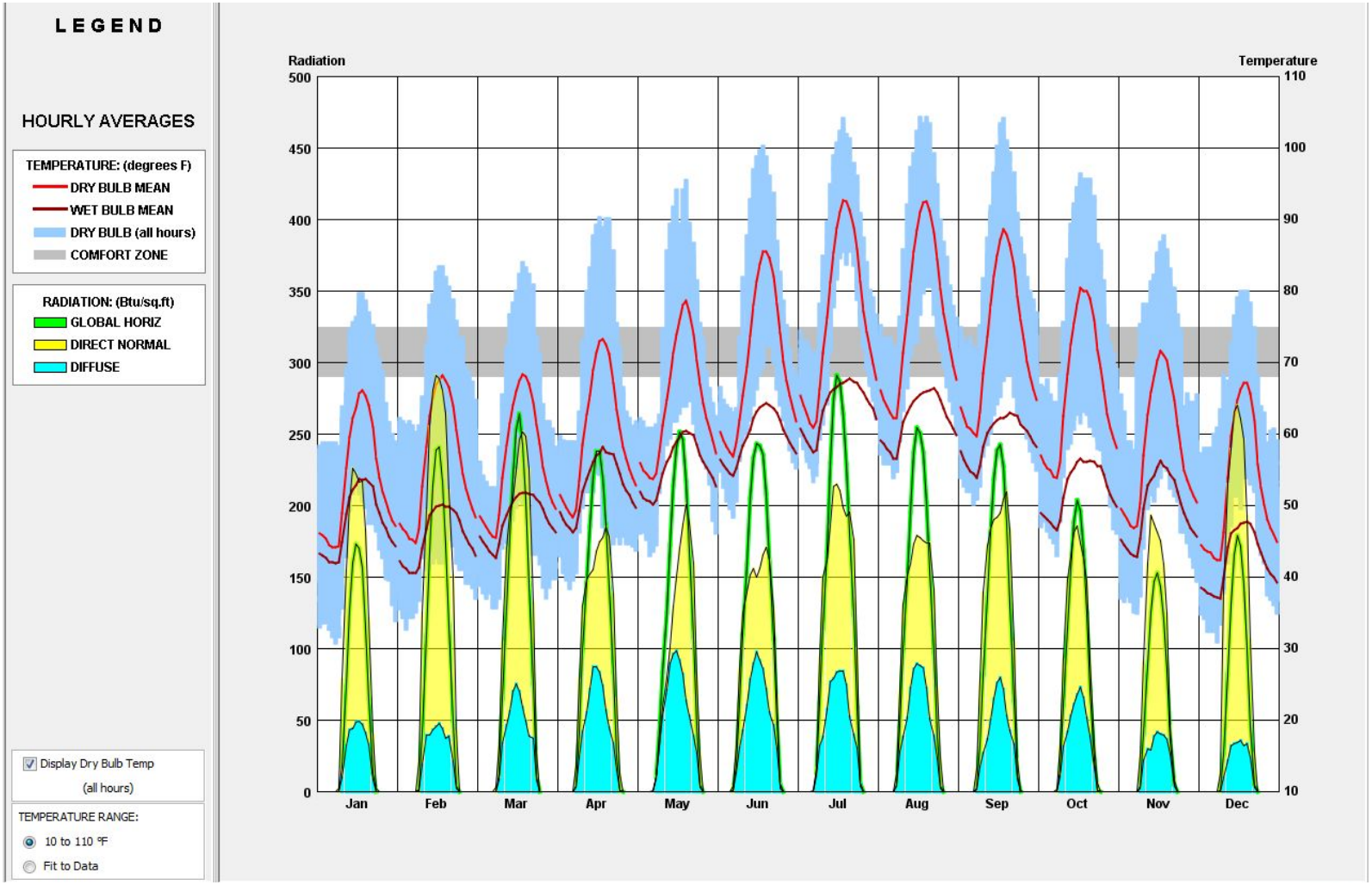
Summer Conditions

During the summer months, temperatures are approximately 10 degrees higher than the comfort zone and would be best mitigated by passive cooling strategies that are potentially supplemented by the use of regulated mechanical cooling to achieve thermal comfort.

Winter Conditions

Similarly, during the winter, temperatures are approximately 10 degrees lower than the comfort zone and would be best mitigated by employing passive heating strategies that are supplemented by mechanical heating.

Diurnal Temperature


LEGEND
HOURLY AVERAGES
TEMPERATURE: (degrees F)
DRY BULB MEAN
WET BULB MEAN
DRY BULB (all hours)
COMFORT ZONE
RADIATION: (Btu/sq.ft)
GLOBAL HORIZ
DIRECT NORMAL
DIFFUSE
Display Dry Bulb Temp
(all hours)
TEMPERATURE RANGE:
10 to 110 °F
Fit to Data
Radiation
Temperature
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450
400
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SECTION 4 INSTITUTIONALIZATION

MANAGEMENT AND ORGANIZATIONAL STRUCTURE

The success of our Climate Action Plan depends upon the institutionalization of the implementation work into our established organizational structure. Implementation of CAP actions would otherwise require continuous efforts by disparate campus groups, and would suffer from lack of follow-through and consistency. Staff and faculty resources are needed to support the oversight of these implementation activities. To begin implementation it is recommended that the following positions be created and funded: a Sustainability Director and a faculty reassigned position of Sustainability Coordinator.

Climate Commitment Implementation Committee

The Carbon Commitment requires the establishment of institutional structures as a first step towards the development of this plan. The Climate Commitment Implementation Committee (CCIC) was established as a campus Governance committee in 2015 to provide leadership and guidance in the development of campus sustainability goals, and to shepherd the creation of this Climate Action Plan. The CCIC reports to the President's Advisory Council. It consists of faculty, staff, and students to provide representation from different campus stakeholders. Additional input comes from the Sustainability Committee, which is open to all campus groups and community members. It is proposed that the Sustainability Coordinator (described further below) will be the co-Chair of the CCIC. The Climate Commitment Implementation Committee is responsible for overseeing the implementation of the Carbon Commitment by raising awareness about climate change and ways to implement cultural and institutional change. The CCIC both supports the incorporation of sustainability into our curriculum and promotes compliance with the Carbon Commitment. An Appendix gives the complete text of the CCIC purpose and function.

Institutionalization Strategies

Adopt District Sustainability Policies and Procedures

We recommend that our Board of Trustees establish a district Board Policy (BP) on Sustainability. The Sustainability Director (described further below) can review established BPs and Administrative Procedures (APs) that may be impacted by climate action initiatives, and update these to include sustainability considerations where appropriate.

Establishment of a district Board Policy (BP) on Sustainability, as well as a review of established BPs and Administrative Procedures (APs) that may be impacted by climate action initiatives, will help institutionalize sustainability. Board policies provide standards for college operations, and therefore should include standards being adopted as articulated in this plan. Administrative Procedures guide the work of the college, and should be updated to include sustainability considerations where appropriate. For example, there is agreement that all appliances purchased will be have efficiency at Energy Star or better levels and this should be reflected in the appropriate AP.

The Board of Trustees can develop the BPs and APs. The Sustainability Director will assist in this process by reviewing what other Community Colleges have done. The Director will also work with appropriate units on campus to review, develop, or recommend necessary policies and procedures.

Idling Policy

The California Environmental Protection Agency Air Resources Board currently restricts idling of commercial diesel-powered vehicles to no longer than five minutes.[65] Some states have adopted more comprehensive restrictions that further reduce idling time and encompass all mobile sources of harmful emissions, including passenger vehicles.[66] These states include Connecticut,[67] Hawaii,[68] Massachusetts,[69] Maryland,[70] New Hampshire,[71] New Jersey,[72] and Vermont.[73] Mt. SAC should investigate instituting an idling policy, following models from these states or from UC San Diego,[74] UC Irvine,[75] and UC Berkeley.[76] Instituting this policy will require working with vendor and education to dispel misperceptions about energy used to restart the vehicle.

Campus Bike Policy and Plan

A Mt. SAC Bicycle Plan could serve as a guide to the continuing improvement and encouragement of bicycling as a significant mode of transportation to, from, and on the Mt. SAC campus. It could describe existing policies and facilities related to campus bicycling, and include a list of projects and programs intended to improve the Mt. SAC cycling environment in the future. This description is paraphrased from the UC Davis Bicycle Plan,[77] and other models are found from the University of North Carolina at Greensboro,[78] the University of North Carolina at Chapel Hill,[79] the University of Illinois at Urbana-Champaign,[80] the University of Wisconsin in Milwaukee,[81] the University of Kansas,[82] and

[65] Written Idling Policy Guidelines. Air Resources Board.
https://www.arb.ca.gov/msprog/ordiesel/guidance/writtenidlingguide.pdf
[66] Idlebase Database of Idling Regulations. Clean Cities. U.S. Department of Energy.
https://cleancities.energy.gov/files/docs/idlebox_idlebase_database.xlsx
[67] Regulations of Connecticut State Agencies Title 22a, 174-18 Conn. Regs. §22a-174-18 (2004). eRegulations - Browse Regulations of Connecticut State Agencies.
https://eregulations.ct.gov/eRegsPortal/Browse/RCSA?id=Title%2022a|22a-174|22a-174-18|22a-174-18
[68] Hawaii Administrative Rules, Title 11, Chapter 60.1 (penalties covered under Hawaii Revised Statutes, Haw. Rev. Stat. §342B-47).
[69] Massachusetts General Law, Chapter 90, Section 16A; Massachusetts General Law, Chapter 111, Section 142A; 310 Code of Massachusetts Regulations (CMR) 7.11 and 7.52.
[70] Maryland Transportation Code, §22-402 (3).
[71] Department of Environmental Services, Administrative Rules Env-A 1101.05, 1101.06, and 1101.09.
[72] New Jersey Administrative Code Title 7, Ch. 27-15.8; N.J.A.C. 7:27-15.8, Control and Prohibition of Air Pollution from Gasoline Fueled Motor Vehicles.
[73] Vermont General Assembly Statute Title 23, Chapter 13, Subchapter 11, §1110.
[74] Diesel Idling Policy. https://blink.ucsd.edu/safety/environment/outdoor/diesel.html.
[75] University of California Irvine Diesel Powered Equipment Idling Policy.
https://www.ehs.uci.edu/programs/enviro/DieselPoweredEquipmentIdlingPolicy.pdf.
[76] University of California, Berkeley Off-Road Diesel Powered Equipment Idling Standard Operating Procedure.
https://ehs.berkeley.edu/sites/default/files/lines-of-services/environmental-protection/idlingstandardoperatingprocedure.pdf.
[77] UC Davis Bicycle Plan. 2011.
http://taps.ucdavis.edu/sites/taps.ucdavis.edu/files/attachments/BikePlanUCDCampus2011.pdf
[78] University of North Carolina at Greensboro. Campus Bicycle Master Plan. 2008.
https://parking.uncg.edu/docs/UNCGBicycleMasterPlanFullFINAL.pdf
[79] University of North Carolina at Chapel Hill. Bicycle Master Plan. 2014. https://move.unc.edu/bike/bike-plan/
[80] University of Illinois at Urbana-Champaign. Campus Bicycle Plan. 2014.
https://icap.sustainability.illinois.edu/files/project/37/2014%20Campus%20Bicycle%20Plan.pdf
[81] University of Wisconsin-Milwaukee. UW-Milwaukee Bike Study. 2014.

Georgia Tech.[83] Los Angeles County already has a Bicycle Master Plan,[84] and Mt. SAC could coordinate within this existing structure.

Landscape Advisory Committee & Tree Campus USA

Landscape advisory committees exist to provide input on various landscaping issues. One model can be found at Chaffey College, in the form of their Trees, Plants, and Grounds Committee. Their committee "works to maximize the pedagogical interest and utility of the college's grounds," and "is advisory to the Superintendent/President or designee on landscaping design and maintenance."[85]
The Tree Campus USA program is administered by the Arbor Day Foundation. In order to be recognized by the program, a college must meet several requirements, which include establishing a Campus Tree Advisory Committee, and developing a Campus Tree Care Plan.[86]

Statement that Mt. SAC will not Adopt New Sources of Emissions

The greenhouse gas mitigation strategies identified in this plan are based on the assumption that our campus will not establish new sources of greenhouse gas emissions. An example policy is in the Climate Action Plan of Bemidji State University in Minnesota, which states that "all new construction on campus will be conducted in a carbon neutral fashion: there will be no new emissions added to the system."

Local Accounting for Externalities

Externalities are costs or benefits that affect a party when that party did not choose to incur the cost or benefit. (One example of a negative externality is freeway pollution that damages the lungs of people living nearby.) Externalities represent failures of our economic system, and lead to inefficient allocation of resources. By accounting for externalities, Mt. SAC and our community could make more efficient and sustainable decisions. Potential interventions are numerous, and include reframing debates (such as viewing road fatalities as a public health issue[87]), or establishing Pigouvian taxes on particular products or behaviors (such as London's congestion charge and British Columbia's carbon tax[88]). Some cities in California are initiating legal action against fossil fuel companies to account for costs of even broader climate-related impacts such as sea-level rise[89], drought, and wildfires.[90] Mt. SAC and surrounding communities could use these or similar tools to properly account for the impacts of local activities.

Integrate Climate Action Planning into Institutional Planning and Campus Master Plan

http://uwm.edu/community-design-solutions/uwm-campus-bike-plan/
[82] University of Kansas. KU Bike Plan. 2016. https://sustain.ku.edu/campus-bike-plan
[83] Georgia Tech. Campus Bicycle Master Plan. 2015. https://space.gatech.edu/bicycle-master-plan
[84] Bicycle Master Plan. County of Los Angeles. 2012. http://dpw.lacounty.gov/pdd/bike/masterplan.cfm
[85] Chaffey College Trees, Plants, and Grounds Committee. http://www.chaffey.edu/committeelist/trees.shtml
[86] Tree Campus USA - The Arbor Day Foundation. https://www.arborday.org/programs/treecampususa/index.cfm
[87] Alina Rocha Menocal, Leni Wild, Daniel Harris, Joseph Wales, Clare Cummings, and Helen Dempster. 2018. The politics of road safety. Overseas Development Institute. https://www.odi.org/projects/2874-politics-road-safety
[88] Externalities: Pigouvian taxes. The Economist. 19 August 2017.
https://www.economist.com/news/economics-brief/21726709-what-do-when-interests-individuals-and-society-do-not-coincide-fourth
[89] Mulkern, Anne C. 18 July 2017. California Locales Sue Fossil Fuel Companies for Rising Seas. Scientific American.
https://www.scientificamerican.com/article/california-locales-sue-fossil-fuel-companies-for-rising-seas/
[90] Zahniser, David. 23 January 2018. L.A. lawmakers look to sue big oil companies over climate change — and the costs that stem from it. LA Times.
http://www.latimes.com/local/lanow/la-me-ln-climate-change-lawsuit-20180113-story.html

We recommend that Institutional Planning include planning and reporting of sustainability (or sustainable/climate neutrality/resilience) activities be added to the current institutionalize planning process. An important component of successful CAP implementation is the integration of climate action planning into the established planning and operational campus structures. Planning for Institutional Effectiveness (PIE) process could be used to integrate sustainability planning into the existing institutional planning process. Through the PIE process all campus departments could report and request resources for curricular or operational activities related to sustainability. These department requests could then be folded into our mitigation strategies and sustainable practices to be be prioritized through strategic planning, and reports could be folded into our regular reports on CAP progress. The current master planning process has included sustainability throughout the development of the plan. Including activities from the CAP in campus planning structures will enable the capture and reporting of activities at various levels of the institution which will contribute to reducing the Mt. SAC carbon footprint and increasing sustainability.

Ideally, as programs, departments, and divisions are assessing their achievements in the area of sustainability, they will consider what actions have been taken in the past year to support the Carbon Commitment -- whether it is a class, a lecture, professional development opportunity, sponsoring students on a field trip, adding a new major, or streamlining or removing paper from a process. If these are reported systematically and the data is retrievable, these distributed activities can be measured together.

The PIE and Strategic Plan are under the purview of the Institutional Effectiveness Committee (IEC). The IEC Co-chair of has agreed to agendize integrating sustainability into campus planning, and the Climate Commitment Implementation Committee (CCIC) will track progress on this front. CCIC members have been part of the master plan development, including presenting at an Eco-Charrette and providing feedback on the draft document.

Perform Sustainability Assessments in All Units and Departments

We recommend that all Units and Departments complete sustainability assessments of their activities. The assessment model was presented to Faculty in a Flex Day session in Fall 2016. The assessment[91] includes questions about department or program administration (e.g., integrate sustainability into unit's mission), waste (e.g., reusable dishes for all food), energy (e.g., use of natural light), curriculum (e.g., courses with sustainability content), community service and outreach (e.g., community partnerships to pursue sustainability), and research (e.g., publications on sustainability issues). The Fall 2016 Flex Day session collected information from nine campus units and departments, each within about one hour.

Establish Sustainable-Purchasing Policies

Mt. SAC already has an informal policy of purchasing Energy Star-rated equipment, and some recycled paper products. We recommend that the Sustainability Director works with Facilities, Custodial Services, and Purchasing to develop a formal policy regarding these and other green purchasing guidelines. These guidelines should include social responsibility considerations. This recommendation grew out of conversations with leadership in campus Purchasing Department.

Food

We recommend that the Director of Sustainability coordinates with on-campus food vendors to establish policies regarding sustainable food purchasing and waste disposal. Sodexo has been consulted

[91] Unit Level Sustainability Planning. Google Forms. https://goo.gl/forms/OpgLfIoaDpT1Relm1

in the development of the CAP and has shown interest in working with CCIC on implementing sustainability measures. (For full discussion see section on Sustainable Food Purchasing under Solid Waste Reduction Strategies, in Section 8.)

Consider Funding to Support Sustainability Activities
Funding considerations include grants, state initiatives, utility agreements, local bonds, and savings from adopted conservation measures. President Scroggins has stated that sustainability projects are to be called out in the project list for upcoming bonds. These project lists will include relevant sustainability-related expenses such as planning, personnel, and materials. Expenses such as professional development and investments in changing campus processes will generally be college funded through regular budget development processes.

Funding is necessary to maintain membership in certification organizations, such as in Second Nature[92]. Specifically, membership with Second Nature grants Mt. SAC employees access to the professional assistance of Second Nature expertise, such as that of their Climate Programs Senior Manager who was instrumental in helping the authors of this plan, by gathering information from other campuses, and by answering questions regarding carbon calculations and institutional strategies. Second Nature also distributes software that is critical for greenhouse gas inventories. The current software is called SIMAP, and it streamlines the analysis and distribution of emissions data. Furthermore, membership with Second Nature establishes Mt. SAC as part of a community of higher-education institutions, and affords Mt. SAC the additional benefits of ambitious deadlines and third-party verification and accountability.

We recommend that the Sustainability Director explores various funding possibilities, working closely with Facilities, Foundation, the Grants Office, and the Board of Trustees.

Sustainability in Investments
We recommend that the Director of Sustainability work with the Mt. SAC Foundation to develop policies and practices regarding sustainability in investments. This is to include environmental, social, and corporate governance criteria (also known as ESG).[93] (*See recommendation regarding divestment in Appendix*.)

Build Sustainability into Existing Student Life Structures
Associated Students currently appoints an Environmental Senator, whose duties include promoting environmental awareness on campus and reporting on current environmental issues or concerns.[94] Associate Students also established a Student Sustainability Council in the 2017-2018 academic year. One sustainability-related club on campus is the Environmental Action Group for a Livable Earth (E.A.G.L.E.). We recommend that opportunities to further weave sustainability into Student Life be explored:

Institutionalize Sustainability Tours within Associated Students. Institutionalization of the Sustainability Tours will create more student jobs on campus as well as provide opportunities for passionate individuals to teach their fellow classmates about sustainability at Mt. SAC.

[92] Second Nature. http://secondnature.org/
[93] The Forum for Sustainable and Responsible Investment. https://www.ussif.org/sribasics
[94] Organizational Directive. Mt. SAC Associated Students. 2014.
http://www.mtsac.edu/studentlife/as/documents/Organizational_Directive_approved_update06.3.14.pdf

Establish Student "Green Ambassador" Positions
Current students recommend the development of a Green Ambassador program. These student ambassadors can help run the Sustainability Tours, and can expand their responsibilities to include projects such as maintaining a recycling center on campus.

Secure a faculty or staff advisor for the student Green Ambassadors
Alternatively, this could be a responsibility of the Sustainability Director.

Collaborate with the Energize Colleges program
Energize Colleges is a state-funded program through Strategic Energy Innovations (SEI). The program partnered with Mt. SAC starting in Spring 2017. Through Energize Colleges, SEI recruits and places a dedicated Fellow at each participating campus. Fellows are expected to implement programs that provide significant professional development experience through the implementation of climate resiliency projects. Interns are placed in a variety of sustainability internships.

Establish a Sustainability Center

We recommend that Mt. SAC establish a Sustainability Center. This Center shall:

1. Serve as an office location for the Sustainability Director and any additional staff.
2. Serve as the point of contact for organization and coordination of all sustainability-related projects with the community.
3. Promote, store, and display sustainability-related research activities, including our annual greenhouse gas inventory data.
4. Work with Mt SAC's Marketing office to inform our community regarding actions and progress towards our net-zero climate goal.
5. Serve as a repository of ideas for sustainability-related educational activities, to be shared among instructors and with our community. This fits with the theme of the campus as a "living laboratory," mentioned in the 2018 Educational and Facilities Master Plan.

Adequate Staffing

The CAP is a complex plan with various components to implement, and will need to be updated at least every five years. In the summer and fall of 2017, nine LHE of reassigned time were granted and divided among three faculty members, to research and write components of the CAP. Additionally, consultants and interns worked to complete the second greenhouse gas emissions inventory and to develop recommendations for mitigation strategies. Following the approval of this CAP in 2018, updates will be required in 2023, and again in 2028. In addition, the GHG inventory is meant to be completed annually, and regular progress reports benefit the campus.

Accomplishing the work outlined in this plan will require ongoing funding and human resources to be successful. Consistent attention and regular cross-campus collaboration will be necessary to ensure that the mitigation strategies identified in this plan are implemented.

Fund and Appoint a Sustainability Director *(Alternative titles: Campus Sustainability Director, Director of Climate Action, Environmental Solutions Director)*

We recommend that Mt. SAC establish the position of Sustainability Director, who shall:

1. Oversee the annual greenhouse gas inventory.
2. Develop program implementation plans, related budget requirements, and manage the funding

to achieve Climate Action Plan objectives.

3. Lead the review and revision of the CAP in collaboration with the CCIC, the Facilities Advisory Committee, and the Sustainability Coordinator.
4. Summarize activities, metrics, and progress towards CAP goals in a bi-annual report, which will be available publicly on the Mt. SAC sustainability website.
5. Act as an advocate for sustainability practices on campus and foster collaboration across campus and with the local community.
6. Work closely with Facilities, Foundation, and the Board of Trustees to explore funding opportunities from grants, state initiatives, utility agreements, local bonds, and savings from adopted conservation measures.
7. Work with the Mt. SAC Foundation to develop policies and practices regarding sustainability in investments and endowments.
8. Work with Facilities, Custodial Services, and Purchasing to develop a formal policy regarding these and other green purchasing guidelines. These guidelines should include social responsibility considerations.
9. Coordinate with on-campus food vendors to establish policies regarding sustainable food purchasing.
10. Assist in the development of BPs and APs. Review what other Community Colleges have done and make recommendations. Work with appropriate units on campus to review, develop, or recommend necessary policies and procedures.
11. Foster regular cross-campus collaboration to ensure that the mitigation strategies identified in this plan are implemented.
12. Act as liaison between the community and the campus on sustainability issues.
13. Promote relevant campus events and activities, such as annual Earth Day events.
14. Serve as the advisor for student Green Ambassadors.
15. Work closely with any Fellow from Energize Colleges to provide insight and connections.
16. Establish a campus Office of Sustainability.
17. Help designate the temporary location, and eventually guide the construction of, a Sustainability Center as the point of contact for organization and coordination of all joint sustainability-related projects with the community.
18. Contact other schools in the region and explore possible opportunities for collaboration with regard to meeting training and labor force needs of green businesses as well as research needs of green businesses.
19. Consider creating a consortium of regional schools and businesses that can work together with policy makers on sustainability-related issues.
20. Meet regularly with municipal sustainability officers in the Mt. SAC region.
21. Build partnerships between academia and community organizations working on issues of sustainability and environmental justice.
22. Sit on community boards related to sustainability.
23. Meet regularly with Sustainability Directors at other schools with an interest in partnering on sustainability projects.
24. Conduct an inventory of all green businesses in the Mt. SAC region and survey them regarding labor force needs that Mt. SAC can provide.

Allocate Faculty Release Time for a Reassigned Position of Sustainability Coordinator
(Alternative titles: Sustainability Education Coordinator, Sustainability Learning Coordinator)

We recommend that Mt. SAC allocate faculty release time for a reassigned position of Sustainability Coordinator. (As a faculty reassignment, this position must be negotiated between the District and the Faculty Association.)

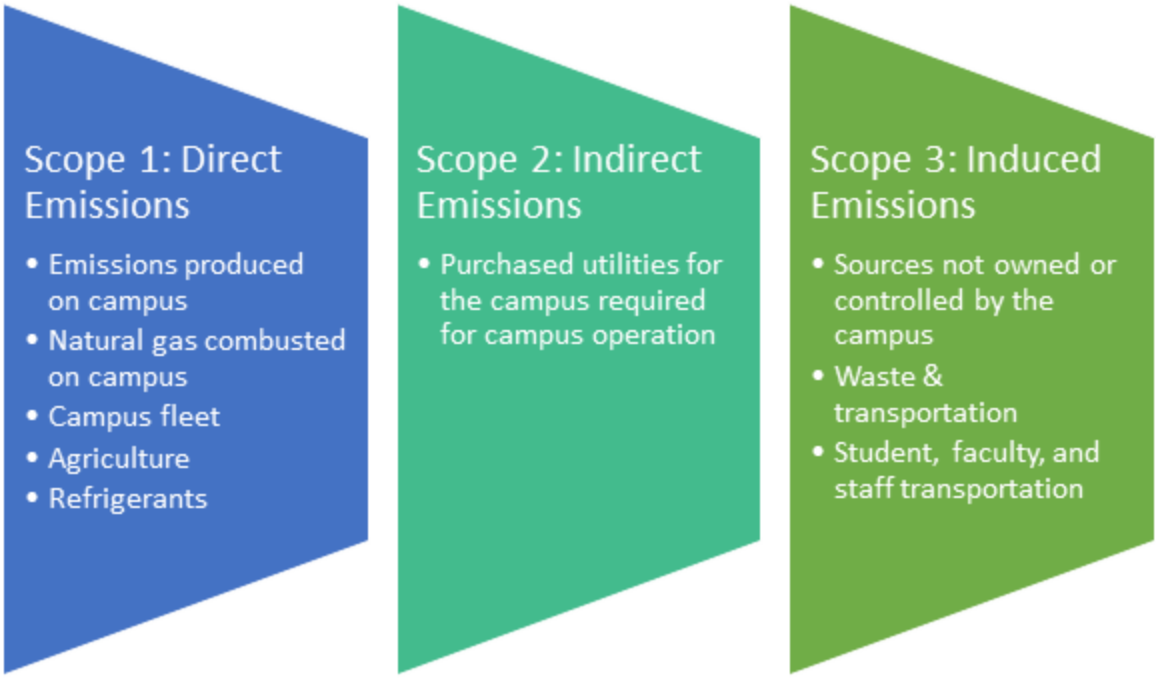
The Sustainability Coordinator shall:

1. Serve a two-year term.
2. Be responsible for representing the position of the Academic Senate on all Sustainability matters.
3. Be the primary faculty contact for questions or concerns regarding the Carbon Commitment.
4. Serve as Chair of the Climate Commitment Implementation Committee.
5. Perform such functions as the President or the Executive Board assign to assist in carrying out the purposes and policies of the Academic Senate with regard to Sustainability and the Carbon Commitment.
6. Mentor and facilitate the college's integration of Sustainability into the curriculum, including maintaining the listing of leaf designated courses and classes.
7. Work closely with Faculty Professional Development Committee and Faculty Professional Development Coordinator to implement professional development for faculty on sustainability, including identifying or developing materials or curriculum for faculty professional development.
8. Present an annual written report to the Academic Senate and write the curriculum component of annual reporting to Second Nature (oversees Carbon Commitment) documenting activities and outcomes.
9. Is responsible for seeing that the President's Sustainability Awards are promoted and awarded annually (could coordinate it themselves or ensure that there is a faculty member in place to coordinate the process and jury.)

SECTION 5 GREENHOUSE GAS EMISSION TRENDS: 2016-2030

GREENHOUSE GAS EMISSIONS BY SCOPE

Mt SAC's Climate Action Plan documents emissions associated with campus operations from 2014 to 2017. The American Colleges and University Presidents Climate Commitment delineates the scope of emissions included in the inventory. The inventory includes emissions associated with Scope 1, Scope 2 and Scope 3. Scope 1 includes direct emissions from owned or controlled sources, such as natural gas combusted on campus, campus fleet, agricultural sources, and refrigerants. Scope 2 emissions includes purchased electricity which is then used on campus. Scope 3 includes transportation and commuting of students, faculty, and staff, as well as an accounting of solid waste.

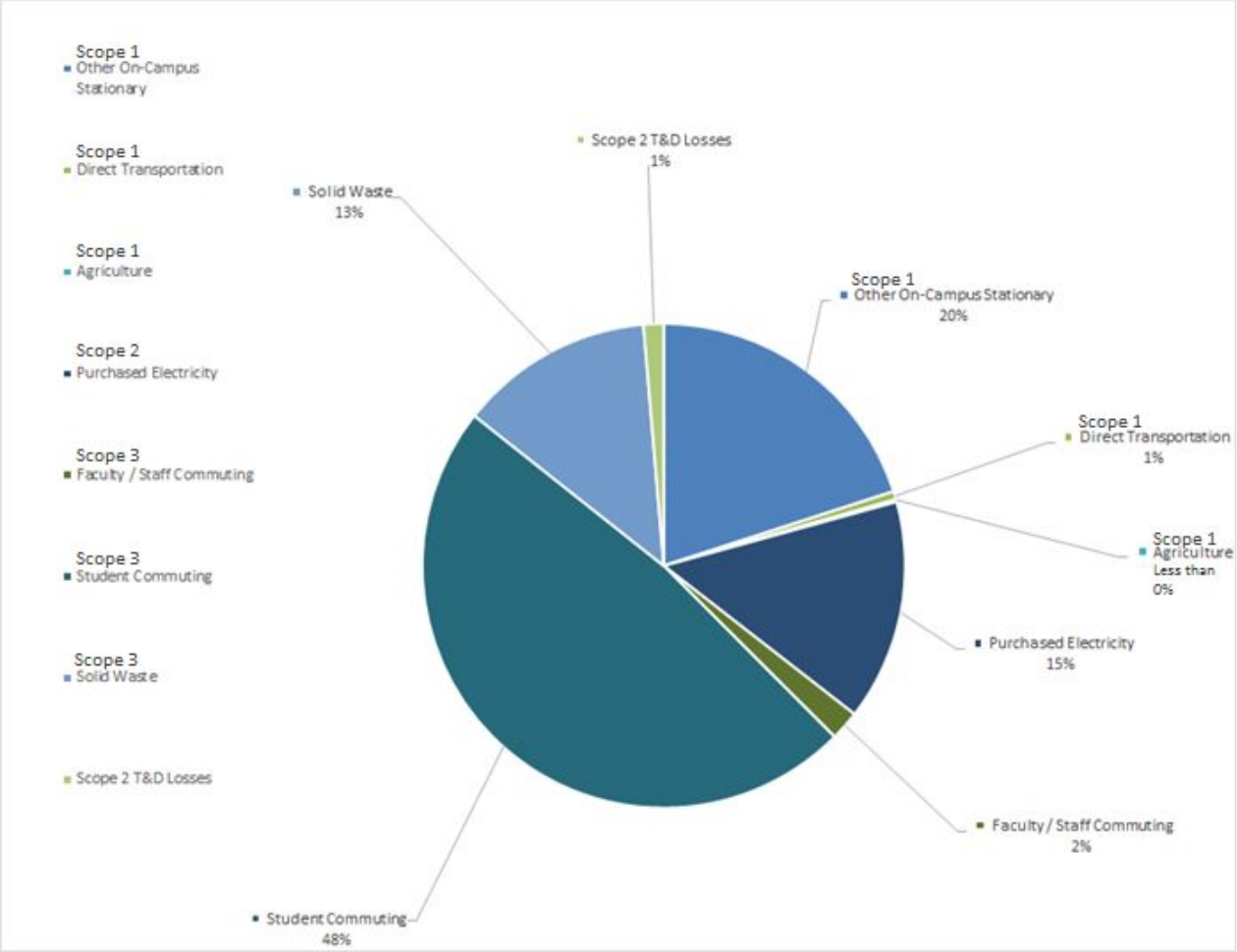


The figure below illustrates these inventory results by sector. Units are in MTCO2e, an abbreviation for "metric tons of carbon dioxide equivalent." [95] This plan addresses a variety of activities and chemicals, and it is useful to have a single unit to describe and compare relative impacts of these activities and chemicals. For example, once everything is converted to MTCO2e, it is easy to compare the pollution from a diesel bus with the emissions from generating electricity. Refer to the College's inventory report for a complete accounting of these emissions (Appendix of Mt. SAC Carbon Calculations Spreadsheets). The majority of emissions is contributed by Scope 3, transportation. Located centrally and offering students a wide variety of academic paths, Mt. SAC attracts students from a large radius. However, this attribute also results in a considerable number of miles traveled, and subsequently, a significant amount of resulting greenhouse gases.

[95] Greenhouse Gases, CO2, CO23, and Carbon: What Do All These Terms Mean? Ecometrica. 2012. https://ecometrica.com/white-papers/greenhouse-gases-co2-co2e-and-carbon-what-do-all-these-terms-mean

Greenhouse Gas Emissions by Sector, 2016

In 2016, the net greenhouse gas emissions totaled 63,778 metric tonnes of carbon dioxide equivalent (MTCO2e). Scope 1 accounted for 13,227 MTCO2e, Scope 2 accounted for 9,431 MTCO2e, and Scope 3 accounted for 41,220 MTCO2e. Scope 3 accounted for 64% of the total carbon emissions of the campus, and 51% was attributed to transportation alone.



Greenhouse Gas Emissions by Sector (Metric Tons CO2e), 2016

Measured and Predicted Greenhouse Gas Emissions: 2014-2030

Details of 2014, 2015, and 2016 greenhouse gas inventories are given in detail in an Appendix. In general, overall campus emissions ranged from about 89,000 MTCO2e in 2014, to 94,000 MTCO2e in 2015, to 64,000 MTCO2e in 2016. The low value in 2016 may be an anomaly from when the cogeneration plant was offline for the year. Between 2014 and 2016, the College was also able to conserve energy by implementing various energy conservation measures. Without further conservation measures, and with continuing growth, emissions are projected to rise steadily, reaching beyond 120,000 MTCO2e in 2030.

Looking further into a detailed breakdown of total emissions by sector, major sources of emissions include commuting, purchased electricity, solid waste, and on-campus combustion of natural gas.

An example set of results from the 2016 greenhouse gas inventory is shown below.

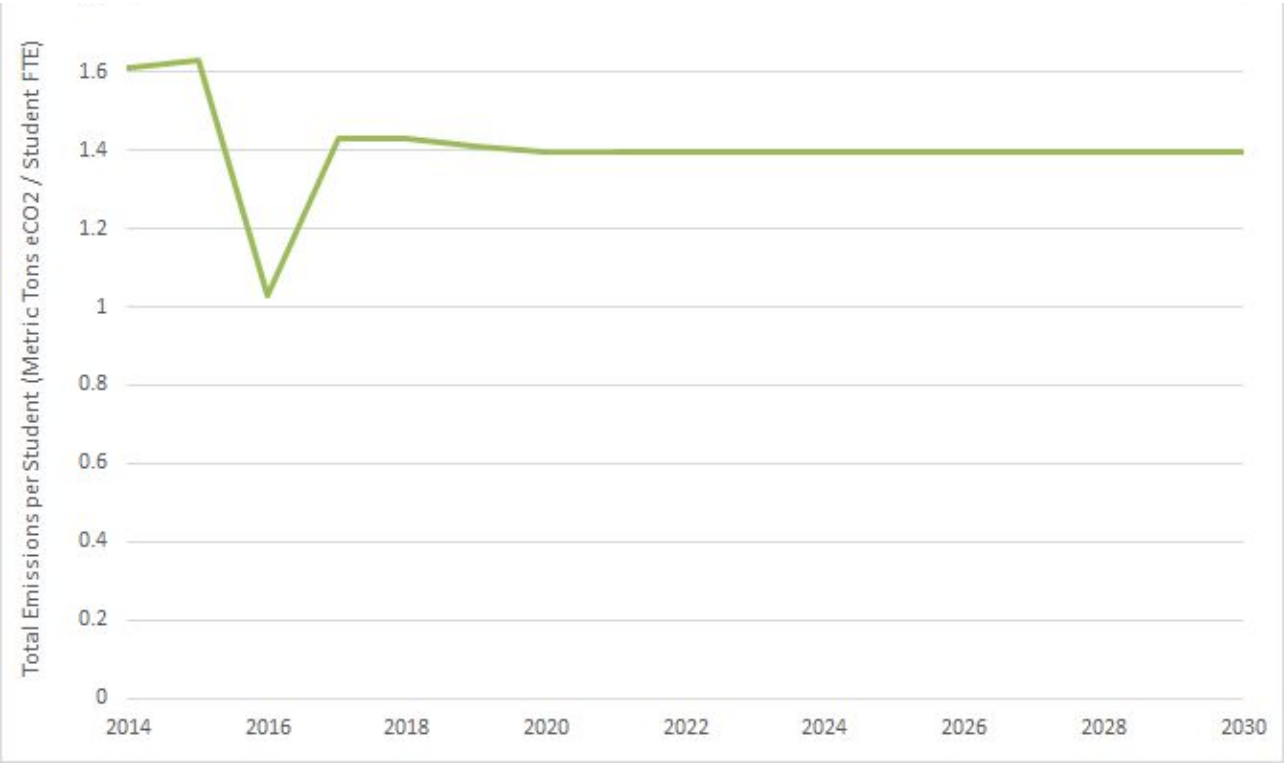
In 2016, campus activities resulted in a total net emission of 63,778 metric tonnes of CO2e. The chart below summarizes emissions for 2016. Details regarding calculations and equivalencies can be found elsewhere.[96]

UNIVERSITY	**Mt SAC Community College**					
Select Year -->	**2016**	**Energy Consumption**	**CO_2**	**CH_4**	**N_2O**	**eCO_2**
		MMBtu	kg	kg	kg	Metric Tonnes
Scope 1	Co-gen Electricity	-	-	-	-	-
	Co-gen Steam	-	-	-	-	-
	Other On-Campus Stationary	240,678.0	12,760,747.6	1,140.6	22.8	12,796
	Direct Transportation	4,757.7	341,276.5	65.9	22.4	350
	Agriculture	-	-	3,540.7	43.3	101
Scope 2	Purchased Electricity	57,173.0	9,373,433.2	129.9	183.1	9,431
	Purchased Steam / Chilled Water	-	-	-	-	-
Scope 3	Faculty / Staff Commuting	17,220.9	1,236,517.5	233.0	79.4	1,266
	Student Commuting	418,406.5	30,042,971.2	5,660.9	1,928.2	30,759
	Study Abroad Air Travel	119.5	23,298.8	0.2	0.3	23
	Solid Waste	-	-	332,568.0	-	8,314
	Scope 2 T&D Losses	5,197.0	852,048.9	11.8	16.6	857
Offsets	Additional					(120)
Totals	Scope 1	245,435.7	13,102,024.0	4,747.2	88.4	13,247
	Scope 2	57,173.0	9,373,433.2	129.9	183.1	9,431
	Scope 3	440,943.9	32,154,836.4	338,474.0	2,024.5	41,220
	All Scopes	743,552.6	54,630,293.6	343,351.0	2,296.0	63,898
	All Offsets					(120)
					Net Emissions:	**63,778**

[96] Campus Calculator Home. Sustainability Institute. University of New Hampshire. https://sustainableunh.unh.edu/calculator

Emissions per Student 2014-2030

The total emissions of the campus was calculated relative to the student population of the College, and then projected from 2014 to 2030. Emissions per student were 1.6 MTCO2e in 2014. This value then dipped significantly in 2016 due to the fact that the cogeneration plant was taken offline. Because of this variation in a small number of data points, it is difficult to predict anything but a steady-state average of the early measurements, or about 1.4 MTCO2e per student, to continue through 2030. As more greenhouse gas inventories are completed, any underlying trends will become more apparent.



SECTION 6 PURCHASED ELECTRICITY, STATIONARY EMISSIONS, BUILDING PRACTICES, AND REDUCTION STRATEGIES

Major emission sources for the Mt. SAC campus include purchased electricity, purchased natural gas for use in the Cogeneration Plant to produce electricity, and natural gas for direct use in buildings (e.g., boilers, heating). Energy Use Intensity (EUI) is a measurement of total annual energy use per square foot, and is typically expressed in kBTU/SF per year. Purchased Electricity data is shown in kWh, and Purchased Natural Gas is shown in therms. These values are converted into a common unit, known as kBTUs. The total kBTUs are then divided by the gross square footage of the campus. The resulting value provides an Energy Use Intensity (EUI) for the campus. The EUI can be used to evaluate the energy performance of a building or campus. Certain building types such as science buildings will labs currently use more energy than other buildings, such as non-lab classroom buildings. A standard classroom building has an EUI of roughly 70 kBTU/SF, whereas a lab building may use over 150 kBTU/SF (Source: Energy Star). Typical net zero buildings of today are targeting 25-35 kBTU/SF. Mt. SAC's EUI ranged from 171-189 kBTU/SF between 2014 and 2016. In the future, specific buildings can be compared on campus, to determine which are performing below expectations for the average building of a similar type.

Annual Energy Use 2014-2016 (Purchased Electricity and Natural Gas)

Year	Gross SF	Annual Purchased Electricity (kWh)	Annual Purchased Natural Gas (Therms)	Annual kBtu	Annual Source kBtu	Annual Source EUI (kBTU/SF)
2014	1,544,390	16,755,752	1,058,124	163,027,136	292,387,563	189
2015	1,544,390	14,261,024	1,187,662	167,424,814	279,048,258	181
2016	1,622,769	20,023,144	587,068	127,025,767	277,433,965	171

PURCHASED ELECTRICITY

Mt. SAC has been purchasing electricity from Southern California Edison (SCE). The campus derives its service from a 12 kV SCE substation located near Grand Avenue. This service is metered at the 12 kV substation and distributes power to substations in each building on campus through a series of electrical maintenance holes and medium voltage duct banks.

Mt. SAC emissions from purchased electricity were 9,373 MTCO2e in 2014, 7,971 MTCO2e in 2015, and 11,192 MTCO2e in 2016.

Emissions from 2014-2015 were reduced approximately 15%. During this period, a number of general energy conservation measure (ECM) projects were implemented on campus. These typically consist of upgrades to higher efficiency equipment, and improved building automation, lighting controls, and sequences of operations. In addition, changes in building schedules, operations, and failure of

equipment can impact energy use. These ECM projects would directly correlate with some of the energy savings experienced during this time.

Emissions have risen approximately 40% from 2015 to 2016 as the College's cogeneration system experienced failure issues during this time. The failure of the cogeneration system requires the campus to purchase more electricity in lieu of producing it on-site. In addition, the College added roughly 118,359 Gross Square Feet (GSF) in several buildings (8% increase). Future new building projects will further increase the campus' GSF and therefore may impact corresponding purchased emissions. The campus has recently upgraded the main central plant and piping distribution system to account for future building loads. These upgrades include a new 840-ton electric centrifugal chiller and 20,000 ton-hour thermal energy storage (TES) tank. The system includes energy-efficient design to reduce the GHG emissions when compared to a traditional electric chilled water plant. Even so, emissions associated with this equipment are not yet captured, because the installation occurred in 2016 and 2017. The new equipment and increase in future building square footage will likely result in increased GHG emissions, unless renewable energy systems are installed for the campus.

Purchased Natural Gas For Cogeneration Plant Operations and Building Operations

The campus' main central plant equipment was installed in 2003 and consists of a 500-ton gas-fired absorption chiller and two 750-ton electric centrifugal chillers. Recent upgrades in 2016 and 2017 include the addition of a fourth chiller, which is an 840-ton electric centrifugal chiller as well as a 20,000 ton-hour thermal energy storage (TES) tank. The 500-ton gas-fired absorption chiller is driven by waste heat from a 1.5 MW Cogeneration system housed in the central plant. The absorption chiller has had issues with operation throughout its life and is currently being used to cool return water back to the TES.

Natural gas service is derived from Southern California Gas Company's high-pressure service laterals leading into the campus. A meter located at the south-west corner of the Student Parking Lot 'D' serves the Cogeneration on-site system.

In addition to the natural gas utilized for the campus cogeneration system, natural gas is distributed to the campus for heating, cooking, and other ancillary needs. Similar to the cogeneration, natural gas service is derived from Southern California Gas Company's high-pressure service laterals leading into the campus. Three main meters are located throughout the campus as the main connection to the SoCal Gas laterals.

Mt. SAC natural gas usage associated with the cogeneration and building systems from 2014-2016 is shown in the Annual Energy Use Table (Purchased Electricity and Natural Gas). Natural gas usage increased slightly from 2014-2015 (~12%). There are no identified causes for this increase in usage. However, a substantial decrease in natural gas usage occurred from 2015-2016. The campus has identified that the cogeneration system was infrequently in operation during this time period.

STRATEGIES FOR REDUCTION OF STATIONARY EMISSIONS

The following strategies have been identified as viable options for reducing the emissions from stationary sources. These strategies are based on the current costs of these technologies and methods, potential incentives, utility rates and structures, and campus usage. As each of these items and the campus evolve, these strategies, and others, should be evaluated for potential implementation.

Emission reduction strategies are categorized by phases and are associated with corresponding milestone target years.

Phase 1 strategies, combined for stationary sources, purchased electricity, transportation, and solid waste, aim to result in a **cumulative emissions reduction of 20% by 2025**.

Phase 2 strategies, combined for stationary sources, purchased electricity, transportation, and solid waste, aim to result in a **cumulative emissions reduction of 50% by 2035**.

Phase 3 strategies, combined for stationary sources, purchased electricity, transportation, and solid waste, aim to result in a **cumulative emissions reduction of 100% by 2050.**

PHASE 1: 2018-2025

Interior Lighting Upgrades/Retrofits

Interior lighting accounts for approximately 33% of annual electric energy use in colleges.[97] One strategy to reduce this energy use is to replace existing on/off manual controls with new high-efficiency LED light fixtures and associated controls. Interior LED light fixtures are typically designed with dimming controls, occupancy sensors, and daylighting sensors to allow for a significant reduction in energy use. With the current utility incentives and time of use structure, these system upgrades typically pay back within 15 years. Some added benefits of LED lighting include integration with building automation systems and better control of the lighting levels within the spaces. The projected annual savings is approximately 506,000 kWhs, or about 140 MTCO2e.

HVAC and Building Automation Controls Upgrades

Heating, ventilation, and air conditioning (HVAC) systems can consume both electricity and gas, and are typically separated into cooling, heating, fans, and pump energy end-uses. HVAC systems account for approximately 43% of annual electric energy use and 63% of annual natural gas use in colleges.[98] Multiple HVAC upgrades and modifications can be made on a case-by-case basis. Strategies include converting constant-speed fans to variable volume, supply temperature reset, pressure reset, and replacement of equipment. A starting point is to conduct an ASHRAE (American Society of Heating Refrigeration and Air Conditioning Engineers) energy audit. There are various levels of the ASHRAE audits, which consist of a basic walk-through of facilities and high-level energy savings calculations to more in-depth energy modeling techniques. At this time, no such audit has occurred and the following projection for Mt. SAC is based on past experience on similar campuses. The projected annual savings of HVAC upgrades is approximately 506,000 kWhs, or about 140 MTCO2e. The return-on-investment will be dependent upon chosen strategies and existing building conditions, but is estimated to be roughly 20

[97] California Commercial End-Use Survey. California Energy Commission. 2006. Table 10-2. http://www.energy.ca.gov/2006publications/CEC-400-2006-005/CEC-400-2006-005.PDF
[98] Ibid. Tables 10-2 and 10-4.

years.

Plug Load Management
Electric use from receptacles accounts for approximately 8% of the annual electric energy use in colleges.[99] Plug load management consists of modifying the electrical distribution system within the building to turn control receptacles independent of the switch of the equipment plugged into the outlet. The controlled receptacles are typically turned off during off-hours, regardless of what equipment is plugged in, since occupants may accidentally leave equipment and devices powered on during off-hours. The projected annual energy savings is approximately 126,000 kWhs, or about 35 MTCO2e.

Exterior Lighting Upgrades/Retrofits
Exterior lighting accounts for approximately 6% of annual electric energy use in colleges.[100] This strategy includes the replacement of existing fixtures with high efficiency LED light fixtures and associated controls. Exterior LED light fixtures are typically designed with occupancy sensors and daylighting sensors to allow for a significant reduction in energy use. With the current utility incentives and time of use structure, these system upgrades typically pay back within 15 years. The projected annual savings is approximately 84,000 kWhs, or about 23 MTCO2e.

Retro-Commissioning
Retro-commissioning is the process to improve the efficiency of existing building equipment and systems. This process may include the resolution of problems that occurred during design or construction, as well as resolving problems that developed throughout the building's life as equipment has aged, building usage changed, and system setpoints and operations have changed. Some of the strategies employed in retro-commissioning will be similar to the ASHRAE energy audits, however, the investigation will go deeper into the operation and condition of the equipment. Studies show that typical payback ranges are within 3 years and can result in approximately 15% energy savings. The projected annual savings is approximately 169,000 kWhs, or about 47 MTCO2e.

Bio-PCM
Bio-PCM is a phase change material that acts to increase the thermal mass of a building.[101] Increasing a building's thermal mass reduces temperature fluctuations within the structure by absorbing, storing, and then releasing heat energy. Bio-PCM can be installed in walls or above ceilings. The simplest approach for retrofit applications is to install in easily accessible T-bar ceilings. The projected energy savings is approximately 126,000 kWhs, or about 35 MTCO2e.

Monitor Utilities
Monitoring electric and natural gas utilities consists of sub-metering these systems at the building level, and potentially sub-metering end-uses within the building. Only recent additions to the campus currently include building level monitoring and end-use monitoring. Studies have shown that submetering of energy use results in energy savings, such that with information, users will change their behavior. This strategy would include providing electric and natural gas meters at each building. The data would be shared with users via a Dashboard or similar communication method. The projected energy savings is approximately 338,000 kWhs, or about 93 MTCO2e.

[99] Ibid. Tables 10-2 and 10-4.
[100] Ibid. Table 10-2.
[101] Phase Change Energy Solutions. https://phasechange.com/

Photovoltaic Systems
These systems are pending discussion with the College. Phase 1 of the photovoltaic (PV) system will be to provide PV on the roof of the proposed parking structure "S". The PV will be used to offset energy consumption in order to reach a 20% reduction. The size of the system required will be 500kW which will generate approximately 775,000 kWh on an annual basis and will equate to a Greenhouse gas offset of approximately 214 MTCO2e. The approximate cost of the system will be $2 million and will require about 54,000 sq-ft of collection area.

PHASE 2: 2025-2035

Participate in Demand Response Programs
SCE offers multiple demand response (DR) programs that help customers save energy and money. SCE incentivizes customers for voluntarily reducing their electricity consumption or for shifting usage to off-peak hours during particular events. The Utility provides advance notice of the event, allowing the customer to take the necessary measures to prepare for the reduction. The participation in DR programs relieves stress on the grid to help prevent power shortages in the community. In addition, SCE offers incentives to purchase and install technologies associated with supporting DR programs. Further information can be found at www.sce.com/drp.

Identify and Take Advantage of Grant and Incentive Programs
Mt. SAC currently participates in SCE's Savings by Design (SBD) program which incentivizes Owners and Design Teams to design and construct energy-efficient buildings. SCE supports this process through design support, detailed analysis, and financial incentives. This process requires involvement at the early stages of a project so that SCE can provide guidance to the parties involved.

SCE also has a Retro-commissioning (RCx) program to provide incentives on existing buildings greater than 25,000 GSF. RCx seeks to identify operational improvements of existing buildings that will increase occupant comfort and save energy. Modification to the building systems may include operational changes as well as retrofit modifications to the equipment.

Energy Efficient Equipment
Mt. SAC's commitment to Savings by Design and LEED will further encourage the use of energy efficient equipment and systems within buildings to meet the requirements of these goals. The incorporation of energy efficient equipment is required in order to meet these goals.

Encourage and Support Energy Efficiency Training of Staff
All new major HVAC and lighting equipment should be specified with training from a factory authorized representative. In addition to the traditional Installation, Operations, and Maintenance (IOM) training, the training should address the equipment or system's impact on energy efficiency. The training should address sequence of operation, setpoints, and how modifications impact the system's energy performance.

Install Energy Management Systems
All new buildings and major renovations should incorporate Energy Management Systems (EMS) in accordance with the campus standards. The current campus standard EMS system is a BACnet system by Automated Logic Corporation (ALC). The system should be used for control and scheduling of the building's HVAC systems. In addition, the system should include, at a minimum, metering of electricity, natural gas, domestic water, and chilled water. The integration of other building systems, such as

lighting and security, should be discussed with the College.

Adjust Temperature Set Points and Schedule Operating Times
Building HVAC systems should be scheduled to operate according to occupancy of the spaces being served. The systems currently start only as early as necessary to meet desired indoor temperatures. This practice should continue, or defer to the one-hour standard in the California Energy Code. In addition, occupancy sensors can be used to turn off the system when spaces are no longer occupied. Temperature reset strategies should also be employed (beyond the buildings where they are already used), to further reduce the heating and cooling demands on the campus. These strategies would include temperature resets of supply air and supply chilled water as well as resetting the space temperature setpoint during unoccupied times. Optimizing the system parameters will improve the energy efficiency of the equipment as well as reduce runtime of the equipment.

Optimize Building Occupancy Scheduling
The College should evaluate the scheduling of classes to optimize the space utilization of buildings. There is a perception that space is limited and scheduling classes difficult. It is possible that alternative scheduling of classes may lead to better utilization of the existing building stock. This is a desirable alternative to increasing building square footage, since additional buildings are likely to increase annual energy and maintenance costs.

Activate Energy-saving Features for Appliances and Computers
All appliances available with an Energy Star rating (www.energystar.gov) are the standard for new and replacement equipment. This includes personal computers, laptops, and monitors, among others. In addition, it is recommended to transition to laptops in lieu of desktop PCs, where possible. Staff should be educated on further energy-saving features for appliances and computers, including sleep mode and standby. Lastly, plug load management will be required for all future buildings, where required by the California Energy Code, and should be reviewed for feasibility in existing buildings to control receptacles and automatically shut receptacles off during off-hours.

Pursue Monitoring-Based Commissioning (MBCx)/Retro-commissioning
Retro-commissioning (RCx) is a systematic process to improve an existing building's performance. This process includes an evaluation of building systems and how they are supposed to operated. A list of operating deficiencies is generated and the issues prioritized. From here, the deficiencies are evaluated and addressed, as appropriate.

Monitoring-based commissioning (MBCx) takes RCx further while utilizing constant feedback. According to a report from the Lawrence Berkeley National Laboratory, "Monitoring based commissioning (MBCx) combines ongoing building energy system monitoring with standard retro-commissioning (RCx) practices with the aim of providing substantial, persistent energy savings." MBCx utilizes continued energy system monitoring to optimize the operation of the building systems, with an average return-on-investment of 2.5 years.

The existing building stock should be evaluated and prioritized for RCx or MBCx. Programs from Southern California Edison offer incentives for RCx and MBCx to further improve the payback rate.

Photovoltaic Systems
A single kW of PV system will generate 1,550 kWh of energy annually and offsets emissions of 0.4 MTCO2e. Phase 2 of the photovoltaic system will be to provide additional PV on building rooftops and

parking lots to offset energy consumption in order to reach a 50% reduction. If alternative cleaner technologies are available at the onset of phase 2, review the feasibility of implementation. The size of the system required will be 4,000kW which will generate approximately 6,200,000 kWh on an annual basis and will equate to a GHG offset of approximately 1716 MTCO2e. The approximate cost of the system will be $16 million and will require about 431,000 sq-ft of collection area. Battery storage should be reviewed at this time for feasibility and impact on electrical demand reduction.

Phase 3: 2035-2050

Additional Strategies – Not Yet Pursued

In addition to the strategies present above, several other strategies were evaluated but not pursued further due to current limitations in technology or cost. As these technologies evolve, utilities incentives or rates change, and capital and/or operating costs of these strategies lowers, the College should reconsider them for implementation. For the purposes of this CAP, the following technologies were considered, but not pursued: solar thermal, electric storage via batteries, and microgrid installation.

Photovoltaic Systems, Battery Storage and Future technology

Phase 3 of the photovoltaic system will be to provide PV on building rooftops and parking lots in combination with battery storage systems as well as alternative cleaner technologies that are not yet developed commercially. Future technology may allow for easier implementation of renewable energy as costs go down and efficiencies increase. The PV and storage systems will be used to offset energy consumption in order to reach a 100% reduction, effectively operating as a Zero Net Energy site. The estimated size of the system required will be 6,500kW which will generate approximately 10,075,000 kWh on an annual basis which will equate to a GHG offset of approximately 2787 MTCO2e. The approximate cost of the system will be $26 million and will require about 700,000 sq-ft of collection area and an additional 5,000 sq-ft for the battery storage systems.

ON-SITE GENERATION AND RENEWABLE ENERGY STRATEGIES

Evaluate Clean Cogeneration and Renewable Energy Generation

Technologies such as cogeneration, fuel cells, solar hot water, and photovoltaics are often utilized on college campuses to offset energy use. With the 2030 net zero energy goals set forth by the State of California, renewable energy generation is more prevalent and necessary than ever before. It is recommended that Mt. SAC investigates the full suite of available renewable technologies available on the market in order to make an informed decision regarding the College's renewable future.

The College has a 1.5 MW cogeneration system on campus, as noted earlier in the Plan, however, it has had issues throughout its life. This system generates electricity as well as waste heat to run the absorption chiller at the plant. The cogeneration system provides resiliency from the Utility, however, it has been problematic to operate and maintain. Further use of cogeneration on campus should be evaluated.

Fuel cells are an emerging technology that should be evaluated for future projects.

Solar hot water systems use rooftop collectors to convert solar energy into hot water. These systems are most appropriate for buildings with a constant heating load, such as pools, athletic facilities, residential, and food service. This technology should be considered as it continues to develop.

Photovoltaic (PV) systems convert solar energy into electricity using solar arrays and inverters. These systems can be used to offset electrical use on the campus grid and are often located on parking structures, covered parking lots, building roofs, and other site locations. The College intends to require future buildings to include PV arrays.

Evaluate Load-Shifting Technologies

The College has a thermal energy storage (TES) chilled water system to generate chilled water during off-peak hours, and use the chilled water during peak hours. The TES system shifts the generation of chilled water to off-peak hours to reduce operating costs and reduce peak demand charges. The system is sized to accommodate future campus growth as well as the current load.

Other load shifting technologies include battery storage and micro-grid technologies. Battery storage is an emerging technology that stores electricity during off-peak hours and discharges during peak-hours. This technology can be paired with PV systems for further energy savings. The technology is fairly new and should be considered as it evolves. Microgrids are localized energy grids with control technologies to optimize the use of energy systems. The system can choose which generation system is most appropriate at a given time to reduce costs. As batteries, PV, and cogeneration become more prevalent on campus, a microgrid control system will be able to optimize the operation of the generation systems.

Evaluate Participation in Community Choice Aggregation

Community Choice Aggregation (CCA) is an alternative to the investor owner utility energy supply system in which local entities aggregate the buyer power of individual customers within a defined jurisdiction in order to secure alternate energy supply contracts. CCAs typical lower costs for consumers or allow consumers greater control of their energy mix. CCAs should be considered for the College if available in the future.

SUSTAINABLE BUILDING PRACTICES

Buildings and Greenhouse Gas Emissions

In the United States, the building sector, (residential and commercial sectors combined) are responsible for 39% of the carbon dioxide (CO2) emitted in the United States per year. This exceeds every other sector in the country, including transportation and industrial sectors. Furthermore, buildings in the United States account for more CO2 emissions per year when compared to buildings in other parts of the world, second only to China.

It is the combustion of fossil fuels used to power, heat, and cool these buildings that is responsible for the emissions. In order to reduce emissions in the U.S., it is necessary to evolve the building industry into a more energy efficient, climate conscious future.

With more than 1.5 billion gross square feet of higher education facilities in the U.S., coupled with an energy demand that represents the second-highest expense area after personnel, higher education facilities are pivotal to this goal of reducing CO2 emissions. In doing so, higher education institutions stand to achieve another, perhaps more meaningful goal. No longer simply a destination for higher learning, college campuses are rapidly becoming “living laboratories” that cultivate the environmental stewards of tomorrow. By addressing climate change through the transformation of college facilities into cutting-edge, climate conscious buildings that teach, motivate, and inspire students, these facilities

become incubators for the next age of sustainability, an age which embraces climate action through thoughtful and proactive planning.

Facilities Accomplishments to Date

Over the past ten years, Mt. SAC has solidified its dedication to green buildings, grounds, and facilities by accomplishing the following:

- Several LEED Silver building certifications/targets:
    - Design Technology Building, LEED Silver
    - Administration Building, LEED certified
    - Child Development Center, LEED certified
    - Mountie Cafe, LEED Silver
    - Student Success Center, LEED certification in progress
    - Mt. SAC Athletics Facility, LEED certification in progress
    - Mt. SAC Business and Computer Technology, LEED certification in progress
- Energy and water conservation retrofits
    - Installation/upgrade of the central cooling plant with thermal energy (ice) storage
    - Site lighting upgrades
    - Building lighting upgrades
    - HVAC upgrades for several buildings on campus
    - Upgrades to plumbing fixtures in several existing buildings on campus
- Drought-tolerant landscaping and drip irrigation conversions
    - Installation of drip irrigation throughout campus ornamental landscaped areas
    - Time and weather sensored irrigation for athletics fields
    - Demonstration gardens incorporated into much of the campus master plan
- Electric vehicle (EV) charging stations
    - 10 electric charging stations have been installed in parking Lot D
    - 4 electric charging stations have been installed near Building 23
- Several sustainability-related projects are in the planning process, including:
    - On-campus transit center that will make riding the bus to campus more convenient
    - Additional Level 2 EV charging stations at five locations:
        - 10 stalls Lot D (conversion of existing outlets)
        - 4 stalls – Building 23 (conversion of existing outlets)
        - 10 stalls – Lot B
        - 10 stalls – Lot G
        - 10 stalls – Lot H
    - Reclaimed water service to irrigate the athletics fields south of Temple Avenue
    - Additional recycling stations and containers
    - Installation of outdoor bottle-filling stations

SUSTAINABLE BUILDING STRATEGIES

The latest evolution of the California Energy Code, the California drought crisis, and a government mandate of net-zero new construction by 2030 necessitate an evolution in how the College approaches its response to the changing climate. This requires an engagement in an integrated process that reaches beyond green building standards, codes, and mandates, and that identifies sustainable strategies that

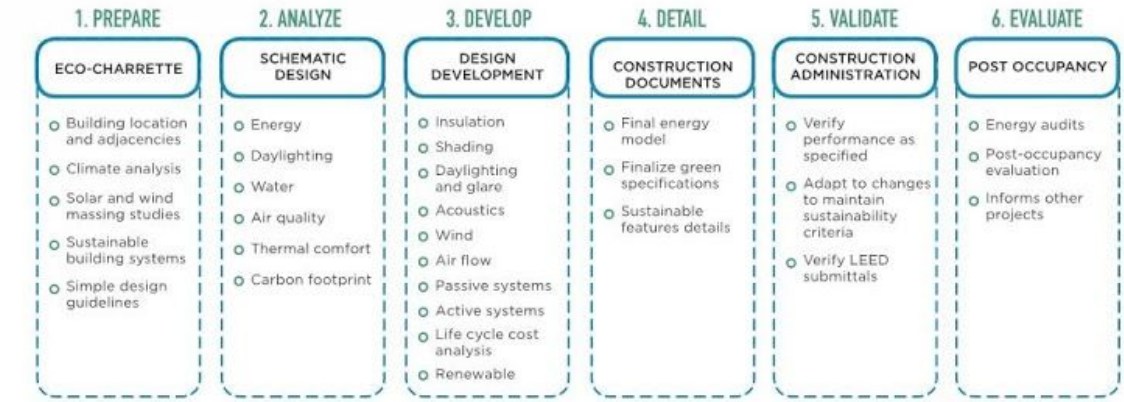
are unique to Mt. SAC. The strategies outlined below could be adopted by the College's various departments in new capital projects or renovations to existing buildings.

Use an Integrated Systems Approach in Building Design

An "Integrated Systems Approach" is a collaborative building design process, resulting in optimized solutions from an engaged team that is committed to the process from start to finish. This process brings all stakeholders of a specific project to the table at the very beginning. Stakeholders include the College, the architect, and the construction manager. Larger projects may include building stakeholders (such as staff and Trustees), consultants (such as a LEED specialist), and tradespeople (electricians, plumbers, and HVAC installers) which can make for a richer, more comprehensive process. Key to the success of the project is a consistent representative, project manager, or champion from the College who stays on for the life of the project. The following six steps of the Integrated Systems Approach will ensure that the building will function as was originally designed and intended.

1. Prepare: During the pre-design phase, the team gathers all available data regarding the project site, climate, and utilities. Sustainability metrics are studied to determine a set of energy, water, and material resource goals. An Eco charrette is held to help the team further understand the College's sustainability goals for the project.
2. Analyze: During the schematic design phase, the team engages in research in which all sustainable strategies are investigated through a series of life-cycle cost analyses, energy models, and LEED credit assessment.
3. Develop: During the design development phase, the team begins to weave a compilation of sustainable strategies together. Strategies are retested to determined their efficacy.
4. Detail: During the construction documentation phase, the team fine tunes sustainable strategies into the construction set of drawings and specifications.
5. Validate: During construction administration, the team validates that the project's sustainable design elements are installed as designed.
6. Evaluate: Once the building is occupied, the effort continues. By conducting post occupancy evaluations, the team will be able to identify what sustainable strategies are effective, and which, if any, require an adjustment. This last step will ensure happier, healthier building occupants, as well as a more efficient facility.

The Integrated Systems Approach diagram below outlines the six step process that, if followed, will ensure the success of green building projects on campus.



Doing Good Design

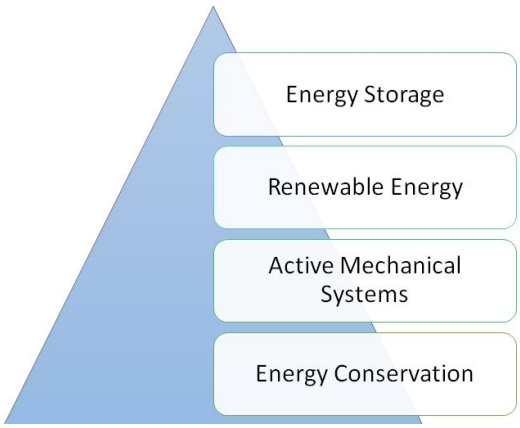
The State of California has stayed ahead of the national pack with stringent and consistent updates to the California Green Building Code, the Building Energy Code, and with the adoption State Net Zero Energy targets. Attempting to stay above this ever-escalating status quo can prove to be challenging and even cost-prohibitive. However, in order to exemplify sustainability leadership in higher education, it is recommended that the College takes a stance of "Doing Good Design"; where good design is synonymous with sustainable design. This includes the adoption and implementation of several key sustainable building design practices for all new construction and major modernizations. These include:

- Performing 15% better than Title 24 Energy Efficient baselines.
- Including 10% recycled content in building materials where feasible.
- Including 10% regional content in building materials where feasible.
- Installing 30-40% more efficient water saving sinks.
- Installing water efficient plumbing fixtures at water closets and urinals. To ensure ease of maintenance, the gallons per flush of these fixtures should not be lower than 1.6.
- Specification of No-VOC interior finishes.
- Ensuring the design of tight building envelope assemblies which limit air infiltration through additional layers of exterior insulation, high performance low-emissivity dual pane glass, and cool roof coatings.
- Specification of light colored paving materials to prevent heat island effect.
- Specification of stormwater saving strategies where feasible.
- Continued use of native and drought tolerant landscaping.

Planning for Net Zero

In order to plan for a sustainable future at Mt. SAC, it is recommended that net zero energy is adequately addressed by the College. In order to achieve this, a four step process to net zero can be applied:

1. Conserve energy. Through passive energy efficiency measures and good building envelope design, 20-30% energy savings could be attained without costly additions.
2. Implement active systems. Right-sized mechanical systems will prevent overuse of energy.
3. Produce renewable energy on site. To offset energy use and plan for a net-zero future, provide infrastructure for net zero on all new construction rooftops and all new parking structures.
4. Invest in energy storage systems. Microgrid and battery energy storage systems will store renewable energy produced during sunlight hours. Rather than sending this excess energy back to the electrical grid, these storage systems will allow the College to use "free renewable energy" during off peak hours.



Life Cycle Cost Analysis (LCCA)

Building and renovating sustainably involves planning and taking into consideration the full life-cycle perspective on buildings. This means assessing both the environmental impact and economic value of a building over its entire lifetime – from extraction of resources to demolition and recycling. LCCA is a tool for determining the economic costs and benefits of specific systems, for example, heating over the lifetime of the building. It is a valuable tool when attempting to improve an operational feature of a building that is related to how that building was designed. It is important to note that construction costs are often not the largest part of the total cost of owning and running a building. The costs associated with maintenance and operations are often higher than construction, so investing in energy efficiency as well as waste and water management can bring significant savings. Other notable benefits, such as significantly improved indoor air quality, can lead to increased productivity and higher work attendance, which can justify an investment in sustainable construction or retrofitting. In order to make the best use of College funds, LCCA is highly recommended for all building projects. This will ensure that not only the best system or strategy is chosen for the life of the building, but that occupants will be more comfortable and satisfied, and saved money may be used for other purposes on campus.

Green Building Standards

Mt. SAC is committed to design all new construction to the United States Green Building Council's Leadership in Energy and Environmental Design (LEED) Silver standards, and is poised to adopt even more rigorous LEED Gold standards. The LEED building standard sets a threshold for sustainable design that results in buildings which are on average 18-39% more energy efficient, 40% more water efficient, and which produce 75% less construction waste than standard buildings. Although LEED certification can result in additional capital costs due to documentation and the certification process, it is also recognized that sustainable performance is best validated through a third party audit. Self-reporting is not reliable enough a process to ensure that a project is performing as originally designed or intended. Therefore, it is recommended that the the College's current protocol for LEED certification is continued: Larger capital projects will pursue official LEED certification, while smaller building projects will use the LEED rating system as a rubric for the design process. All new construction and major renovation, regardless of building size, will abide by California's Energy Code, Title 24. Buildings will aim to exceed the California Energy Code standards by at least 15%.

To advance beyond today's accepted guidelines and standards, it is necessary to consider Green Rating Systems that push beyond LEED. Other third party rating systems include the Living Building Challenge, Net Zero Certification or WELL Building Standard. The Living Building Challenge requires net zero energy as a primary energy goal, rather than as an option like in LEED. The WELL Building Standard focuses on the occupants of a new building once construction is complete, rather than focusing on the design phase of a project. Each rating system has attributes which promote sustainability, health and well being, and efficiency on campus. It is recommended that these ratings systems be considered as potential matches for larger capital projects on campus, or for model buildings such as the planned Nature Center and Sustainability Center.

Building as a Learning Tool and Building Tours

The College currently conducts regular green building and grounds tours of the campus. These tours are are led by students and provide incoming and existing students with a broad understanding of the sustainable practices which the College engages in. It is recommended that these tours are continued and perhaps extended to additional areas of the campus, including the Transit Center (in planning stages), the Agriculture Department, and the athletic fields. In addition, the College may choose to promote its sustainable achievements further through the utilization of displays of campus sustainability projects on LCD monitors in high pedestrian traffic zones, regular social media posts, and virtual tours via the College website or mobile apps.

Implementation of Grants and Funding

Over the past two decades, Mt. SAC has invested in upgrading the campus with energy efficient facilities through the implementation of sustainable design practices. The College has taken advantage of opportunities such as Proposition 39 and utility company incentives to fund retrofits. (Proposition 39, or the California Clean Energy Jobs Act, provides up to $550 million annually through 2018 to help California K-12 schools and community colleges improve energy efficiency and expand clean energy generation in schools.) Mt. SAC has utilized Prop 39 funding to support campus lighting retrofits and upgrades to mechanical units across campus. These energy efficient improvements have proven to have an excellent rate of return, paying for themselves within 5-10 years. The savings gained through these energy efficient upgrades have the potential to pay for additional retrofits around campus.

Local Utility Incentives

Local utility incentives (from Southern California Edison and SoCal Gas) are available to Mt. SAC and should be pursued in order to help offset any costs associated with energy efficiency measures. These incentives are funded through the California Public Utilities Commissions. Large capital projects may be eligible for as much as $150,000. Projects are required to perform at least 10% more efficiently than baseline buildings. With a standard of 15% better than baseline, Mt. SAC's new building projects would be well situated to qualify for such utility incentives.

Hire Sustainable Design Professionals

In order to bring the College's sustainable future to fruition, it is recommended that Mt. SAC engage with design professionals (architects, contractors, engineers) with portfolios of at least five completed Net Zero building projects. This added screening process will increase the likelihood that the building project will be achieve its sustainable design goals, and result in a richer sustainable building stock for the campus.

Commissioning, Enhanced Commissioning and Retro Commissioning of Buildings

Building Commissioning is the professional practice that ensures buildings are delivered according to the Owner's Project Requirements (OPR). There are three common versions of commissioning:

1. Fundamental Commissioning--Per the current California Energy Code, fundamental commissioning is required for compliance, while enhanced commissioning is optional. Fundamental Commissioning includes a review of the Owner's Project Requirements (OPR) and Basis of Design (BOD), incorporation of commissioning specifications, implementation of a Commissioning (Cx) Plan, verification of the installation and performance of the building systems, and delivery of a Cx Report. The building systems which are included in this scope of work include mechanical, electrical and lighting systems.
2. Enhanced commissioning-- builds upon the Fundamental process to include: review of contractor submittals, development of a systems manual, verification of training for building operating personnel, and review of building operations within ten months of substantial completion, and review of systems that go beyond mechanical, electrical and lighting. Enhanced commissioning may also include renewable systems and building envelope for example.
3. Retrocommissioning-- a systematic process to improve an existing building's performance. Using a whole-building systems approach, retrocommissioning seeks to identify operational improvements that will increase occupant comfort and save energy. The process is typically performed on existing buildings which are undergoing upgrades or retrofits.

It is recommended that all new building projects determine which level of commissioning is required for specific projects on campus. Commissioning agents should be engaged early on in order to maximize the benefits of the process. Buildings that are properly commissioned typically have fewer change orders, tend to be more energy efficient, and have lower operation and maintenance cost. The documentation of the commissioning process provides the foundation for correctly benchmarking the baseline energy consumption of the facility. The OPR should be authored by the College, possibly with the assistance of the Commissioning agent. This document should become available in a customizable format in order to allow for new projects to adopt the OPR for its specific needs.

Post Occupancy Evaluations

Post-Occupancy Evaluation (POE) is the process of obtaining feedback on a buildings performance. The value of POE is being increasingly recognised, and it is becoming mandatory on many public projects.

POE is valuable in evaluating running costs, occupant well-being and building efficiency.
Post-Occupancy Evaluations will:

- Highlight any immediate problems that can be addressed and solved.
- Identify any gaps in communication and understanding that impact on the building operation.
- Provide lessons that can be used to improve design and procurement on future projects.
- Act as a benchmarking aid to compare across projects and over time.

It is recommended that post occupancy evaluations be performed on all newly constructed buildings on campus. These evaluations may be conducted by facilities personnel, a third party consultant, the Sustainability Director, or even by faculty and students as part of a green building curriculum.

Energy Star Portfolio Manager and Second Nature Online Tool (SIMAP)

Until a campus wide energy management system is put into place, it is recommended that energy use on campus is monitored through Energy Star Portfolio Manager. This free online tool will allow the campus energy manager to monitor monthly energy use and water use for each building.

Sustainability Indicator Management & Analysis Platform (SIMAP) is another option for the College to consider for the purposes of monitoring and tracking campus performance. The online tool is part of Second Nature's portfolio of online tools. SIMAP, developed by the University of New Hampshire, will allow the College to monitor carbon emissions due to scopes 1, 2 and 3 year after year.

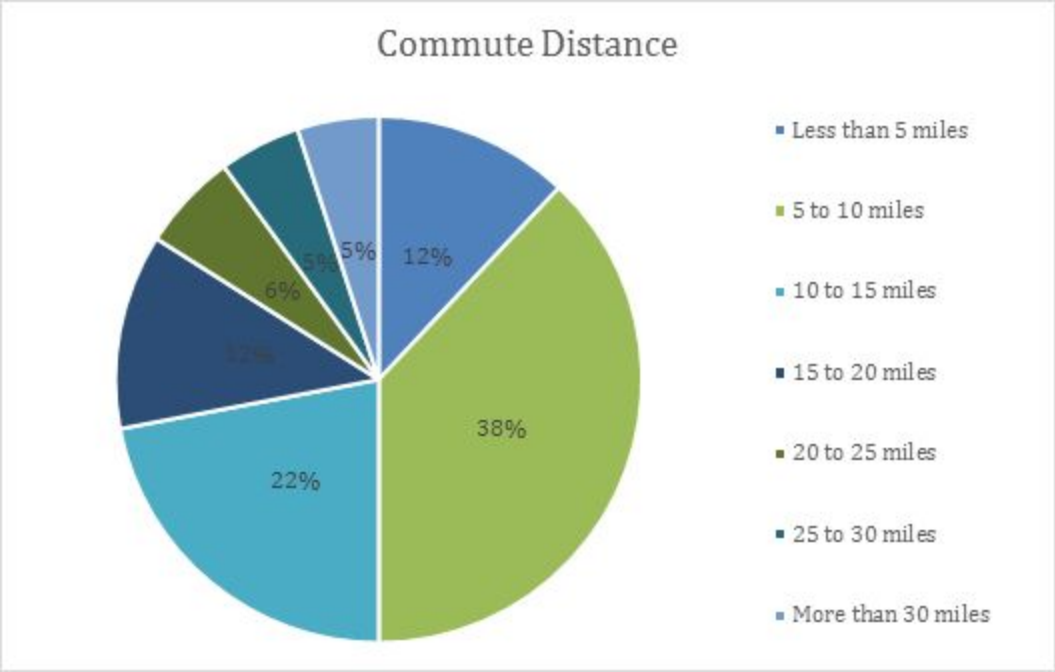
SECTION 7 TRANSPORTATION, COMMUTING, CAMPUS FLEET AND TRAVEL

TRANSPORTATION EMISSION SOURCES

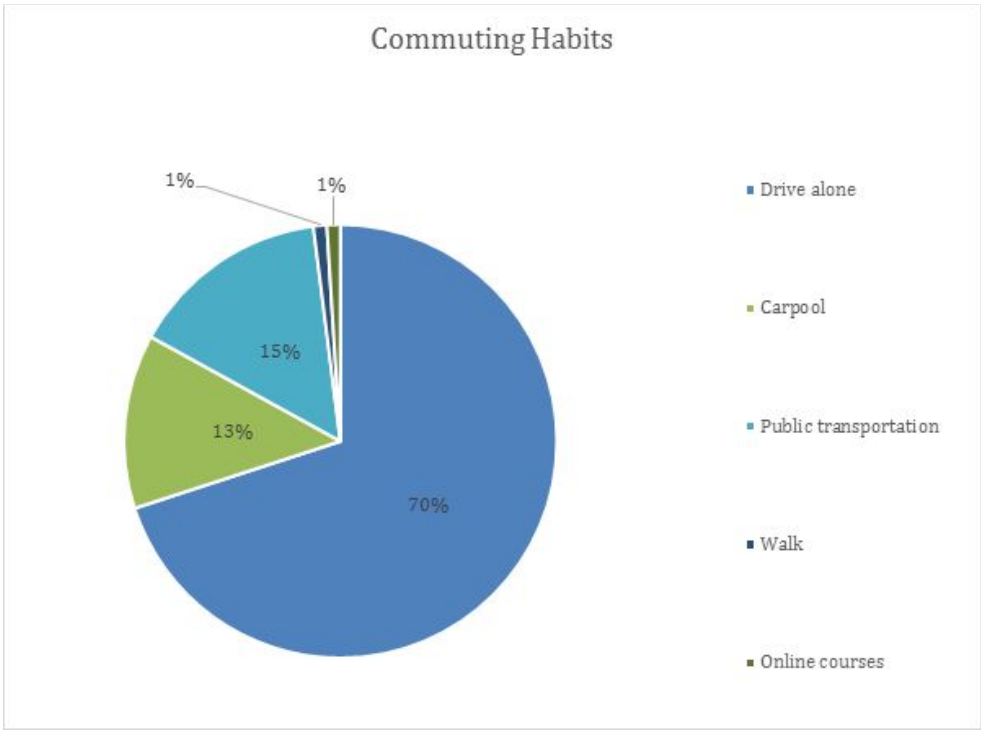
Transportation and vehicle emissions are key contributors to Mt. SAC's greenhouse gas emissions. In 2016 these emissions were 50% of Mt. SAC's total greenhouse gas emissions. These mobile source emissions emanate primarily from employee and student commutes and the operation of campus fleet vehicles.

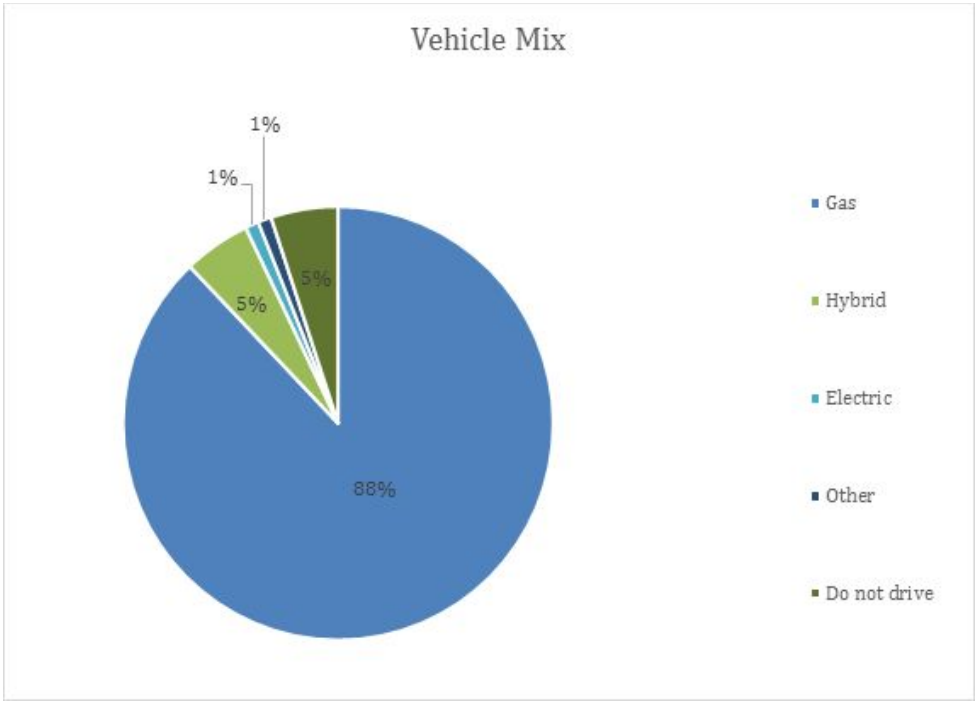
Commuting

Mt. SAC operates as a commuter campus; nearly every student and staff member commutes to and from the campus in some manner. Based on a transportation survey filled out by a total of 2,221 students, faculty, and staff members conducted during the Fall Semester in 2017, the largest percentage of respondents (37%) lived between 5 and 10 miles from campus and nearly all students and employees (83%) lived within 20 miles of the campus. This survey was included as part of the class registration process.



Based on survey data, approximately 70% of the campus population commute on a daily basis and 13% carpool. Of the vehicles used for commuting purposes, the majority (87%) are fueled by unleaded gasoline with smaller percentages of hybrid vehicles (5%), electric vehicles (1%).

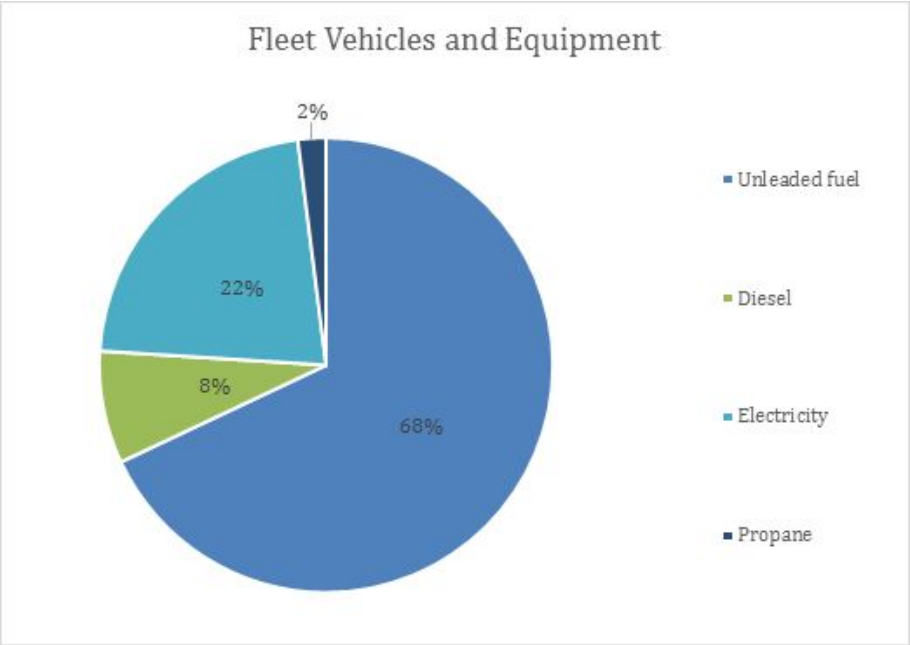




Commutes make up the largest portion of the campus' overall GHG emissions. GHG emissions associated with commuting for the base year 2016 were approximately 32,025metric tons of CO2. Approximately 80% of emissions are from employee and student commutes to campus each day, including single occupant vehicles, carpools, and motorcycles.

Campus Fleet

The campus' mobile source greenhouse gas emissions also include Campus fleet vehicles. Based on 2017 data, Mt. SAC Fleet vehicles and equipment total approximately 242 total vehicles and equipment, including trucks, carts, tractors, and lifts. Most of the fleet's emissions result from the use of unleaded fuel for conventional, internal combustion engine-driven vehicles. However, there are other fuel types used that contribute to the fleet's carbon footprint, including diesel fuel, electricity, and propane. Sixty-seven percent of these vehicles and equipment are powered by conventional gasoline and diesel fuel.



Alternative Modes of Transportation

In addition to single-passenger vehicle and carpool commutes, students and staff at Mt. SAC utilize alternative modes of transportation including public transportation, bicycles, and walking.

Mt. SAC currently offers a bus pass program in coordination with Foothill Transit which serves the campus. In recent years, an average of approximately 13,000 bus passes were distributed annually to students at Mt. SAC. The bus pass program, "Class Pass," is funded by student activity fees, available to all enrolled students who have paid their fees, and allows unlimited rides regardless of their destination. According to Foothill Transit data, five transit lines currently service four stops at the Mt. SAC campus with a total of 390 stops daily. Since 2014, an annual average of approximately 780,000 boardings have occurred at these stops. While boardings at these stops are not restricted to Mt. SAC students and staff, according to the 2017 Transportation Survey, 15 percent of respondents identified using public transportation as their primary mode of travel. It is noted that respondents also identified their primary reasons for not using public transportation, with the top two reasons being schedule constraints and too long of a commute.

Currently, most of the bus lines serving the campus are serviced by compressed natural gas (CNG);

however, Foothill Transit has a program in place to replace their entire fleet with electric-powered buses by 2030.[102]

In 2016, public transportation serving the campus generated approximately 5,568,753 metric tons of CO2, representing approximately 22% of the campus' total GHG emissions.

Additionally, a small percentage of students (1%) identified walking as their primary mode of transportation while an additional 1 percent took only online courses. Mt. SAC offers a large number of online courses, with over 230 courses offered for the Spring 2018 semester including general education core classes, as well as technical and vocational courses.

EMISSION TRENDS- MOBILE SOURCES

Current Mobile Emission Trends – "Business as Usual"

The "Business as Usual" (BAU) scenario for mobile sources is a projection of GHG emissions from 2016 to 2020 assuming that no future mobile emission reduction initiatives are implemented.

The campus is projected to add approximately 1,972 students and employees between the 2016-2017 and 2020-2021 school years, which would proportionately increase mobile emissions. Assuming that the employee and student travel modes between single occupant vehicles remain at present levels, the number of drive-alone commuters would consequently be assumed to increase in proportion with the growth in the student population, thus increasing commute GHG emission levels. The campus' fleet also would have increased emissions, as a larger staff population would result in increased demand for vehicles to conduct campus-related business.

Commute Emission Trends - "Business as Usual"

Commute projections rely on population forecasts for extrapolating emissions growth. To establish the BAU scenario for commutes, it was assumed that the commuting behavior for the Mt. SAC campus community would continue, mode split would remain the same, and those same levels of GHG mobile emissions would be attributable to the projected student and staff population growth. Using these trends, GHG emissions would increase. The resulting GHG emission projections for 2016 through 2050 indicate an upward trend for commutes associated with the projected increases in employee and student headcount.

MOBILE SOURCE EMISSIONS REDUCTION STRATEGIES

The primary objective of this Climate Action Plan is the identification of initiatives that will reduce emissions from both stationary and mobile sources. Initiatives that have potential to reduce GHG emissions, but are either unquantifiable at this time or their viability remains to be determined, are not shown on the graph, yet are identified in this section.

It was assumed that there would be reduction in single occupant vehicles by 1% per annum starting in the year 2020. This is accompanied by a corresponding increase of 1% per annum of commuters who

[102] Electric Program. Foothill Transit. http://foothilltransit.org/news/sustainability/electric-program/

use carpools. This projection may be conservative considering that based on the transportation survey, 62% of the respondents indicated that they are interested in a ride-sharing or carpool-arranging program provided by Mt. SAC. This is also supported by future technologies, such as self-driving cars and electric vehicles that reduce the cost of commutes by sharing a vehicle and its associated costs among multiple individuals as well as reducing the transportation fuel costs. Emission reduction strategies are categorized by phases and are associated with corresponding milestone target years.

Phase 1 strategies, when combined with emission reduction strategies for Scopes 1, 2 and Scope 3 (Solid Waste) aim to result in a **cumulative reduction of emissions of 20% by 2025**.

Phase 2 strategies, when combined with emission reduction strategies for Scopes 1, 2 and Scope 3 (Solid Waste), aim to result in a **cumulative reduction of emissions of 50% by 2035**.

Phase 3 strategies, when combined with emission reduction strategies for Scopes 1, 2 and Scope 3 (Solid Waste), aim to result in a **cumulative reduction of emissions of 100% by 2050**.

Phase 1: 2018-2025

Increase Access to Alternative Modes of Transportation

- Mt. SAC will work with student-run clubs or organizations to develop or utilize an existing web-based or smart phone-based app for carpooling in an effort to increase ride-sharing. This tool will enable use of existing student vehicles for multiple passengers thus reducing the number of vehicles commuting to and from the campus. Along these lines, Associated Students formed a Transportation Committee in Spring 2018 to research, discuss, and support transportation based projects. The goals of the committee are to evaluate and determine the viability of a night tram system as well as a campus wide carpool system for students.

- Electric cars are likely to increase in popularity, and current electric car ownership of campus commuters outpaces available charging stations on campus. Planning for future parking structures and surface lots shall meet or exceed current code requirements for Electric Vehicle Charging Stations (EVCS) based on total number of parking spaces on campus. EVCS are not counted as parking spaces.

- Mt. SAC will provide incentives for carpools and vanpools, such as reduced parking fees and dedicated parking areas.

- Mt. SAC will produce educational materials highlighting the benefits of alternative transportation, fuel costs, as well as additional information regarding alternative modes of transportation such as bus schedules, local car dealerships offering clean energy vehicles, bike routes and infrastructure, and pedestrian-friendly routes. These materials will be available via the college sustainability page, which will also include maps of bike and pedestrian routes and links to transit routes and schedules.

- Mt. SAC will consider a contract with a rental bike program such as E-Bikes or Metro-rental bikes. These bikes will be available for last mile bus connections and for cross-campus travel.

- The current Educational and Facilities Master Plan (EFMP) includes analysis and consideration of campus-wide pedestrian and bicycle mobility throughout campus. This portion of the plan should be expanded upon be expanded upon to create a Bicycle Plan, including a map of existing and proposed

bicycle routes, both on- and off-street. This plan will address issues such as dedicated bicycle paths and lanes throughout campus, enhanced bicycle infrastructure (lockers, lock-ups, showers, maintenance area, parking), electric bike programs, planning of a Bike Center on campus. This plan will also address public safety elements to serve bicyclists and pedestrians, including security lighting, video surveillance, and emergency call boxes.

- Mt. SAC will enhance existing bike infrastructure (lockers, lock-ups, showers, paths, maintenance area, lanes, parking).

- Mt. SAC will partner with local shoe companies and bicycle shops to provide discounts to students to promote bicycling and walking.

Mass Transit Education and Incentives

- Mt. SAC's Sustainability webpage will feature materials related to transit opportunities, including a direct link to Foothill Transit bus schedules and routes, information regarding bus passes, the ability to purchase bus passes online, and overall benefits for using transit including charts and graphs illustrating cost benefits and emissions data. Students, faculty, and staff will be regularly updated with incentives and opportunities via campus communication.

- Actively communicate with Foothill Transit regarding schedule and routes to best serve the student population. This communication will include sharing student data such as geographic distribution and peak travel times.

- Mt. SAC will coordinate with Foothill Transit to provide security at the Transit Center including adequate lighting and cameras.

- Mt. SAC will coordinate with Foothill Transit to develop on-bus bike racks that can accommodate four or more bicycles.

- Mt. SAC will sponsor and promote a contest between student-run clubs and organizations to develop promotional material for ride-sharing, transit, and alternative modes of transportation. Winning materials will be displayed for the semester on the school's website and, possibly, posted near the transit center, electric charging stations, ride-hailing drop-off/pick-up areas, and pedestrian respite areas.

- Consideration will be given to providing bus passes to faculty and staff, to encourage their use of mass transit.

- Mt. SAC will transition to 100% clean energy vehicles with 25% of the fleet being clean energy by 2025. Improvements to the campus fleet could be made by negotiating with local dealerships to secure discounts on clean energy vehicles for its campus fleet.

Phase 2: 2025-2035

Alternative Transportation Infrastructure

To encourage use of alternative transportation during phase 2, Mt. SAC must commit to developing a strong infrastructure by:

- Coordinating with Foothill Transit for construction of a centralized Transit Center on campus

according to the Parking and Circulation Master Plan. The Transit Center will serve as a on-campus transit hub for students and the local community.

- Developing an electric vehicle charging station (EVCS) plan for the campus, to ensure that current code requirements are met or exceeded based on total number of parking spaces on campus. Newly constructed parking structures will include EVCSs to balance current surface lots without charging, and will include power capacity for additional stations to be installed as needed in the future. Additionally, the plan should outline improved infrastructure to increase the number of charging stations and offer charging stations that are powered by solar.
- Consider incentives for electric vehicle uses for campus commuting.
- constructing covered parking to reduce energy for climate control/air conditioning as planned for in the Educational and Facilities Master Plan.
- Encouraging walking and bike through campus by providing shaded/covered seating areas, pedestrian friendly walkways, campus art, and respite areas, as well as designing and implement pedestrian enhancements to provide physical separation from the roadway and vehicle traffic.
- Using signage and developing a map to designate ride-hailing service (Lyft, Uber, etc.) drop-off and pick-up points to encourage students to share the cost of the service.
- Working with local dealerships to secure discounts on clean energy vehicles for students, faculty, and staff.
- Developing a Bike Center on the campus which will offer bike safety and repair classes, online or face to face. Mt. SAC will recruit both student and staff volunteers to run these programs.
- Providing a shuttle service from campus to the nearest Gold Line Station, and exploring shuttles to other popular destinations to consolidate rides.

Reduction in Generation of Vehicle Trips

- Mt. SAC will increase awareness of alternative modes of transportation through increased promotion of bus passes that are already available. Make bus pass information and Foothill Transit's current route and schedule information easily accessible to students.

- Mt. SAC will consider providing financial incentives to employees who do not drive to work. This could consist of a fee for parking passes, or payments for taking public transportation, biking, or walking.

Off-peak Travel Period Scheduling

- Mt. SAC will offer use of the Auditorium/classrooms for entertainment options (show movies, performances) to keep students on-campus between classes.

Improve Campus Fleet and Travel

- Mt. SAC will coordinate with local dealerships to secure discounts on clean energy vehicles for the campus fleet. Mt. SAC will transition to 100 percent clean energy vehicles with 50% of the fleet being clean energy by Year 2035.

Phase 3: 2035-2050

Alternative Transportation Infrastructure

- Mt. SAC will place solar panels on top of all surface parking and roofs of parking structures. The solar panels will make use of unused space and offset campus energy costs.

Enhance Student Distance Learning

For some students, distance learning represents an enhanced access to classes and can reduce the

number of trips to campus for these students, and therefore may have an ancillary result of reducing carbon emissions. Mt. SAC is committed to supporting students' access to distance learning courses to support student completion of their Mt. SAC educational goals, and is therefore committed to expanding distance learning course offerings and increasing in the number of available sections. The campus already provides technical support for faculty and students. To further support distance learning and students' use of technology it is recommended that the campus explore partnerships to enable discounted purchasing programs for computers or tablets, software, and internet service/wifi hotspots for students. Developing a program on campus of short-term loans of wifi hotspots and computers or tablets should also be explored to enhance students' equitable access to technology. Additionally, broad utilization of web-based materials in classes and campus communications, (including Open Educational Resources) can also reduce carbon emissions by reducing paper use and trips to retrieve physical resources. The Distance Learning Committee was consulted in the development of these recommendations, and the Sustainability Coordinator is expected to collaboration with the committee to work towards these recommendations.

Reduction in Trip Length

- Mt. SAC will work with surrounding communities to develop housing opportunities for students and staff near campus.

Improve Campus Fleet and Travel

- Mt. SAC will coordinate with local dealerships to secure discounts on clean energy/autonomous vehicles. Mt. SAC will transition to 100 percent clean energy vehicles with 100% of the fleet being clean energy by Year 2050.

SECTION 8 SOLID WASTE

BACKGROUND

An estimated 130 billion pounds of food are discarded in the United States, amounting to about $160 billion in lost monetary value – the equivalent of $500 per capita. This amount includes 22 million pounds from U.S. colleges, according to estimates by the Food Recovery Network. According to the EPA, 75% of the American waste stream is recyclable, however on average only 30% of total waste is actually recycled. Furthermore, the average college student produces 640 pounds of solid waste each year, including 500 disposable cups and 320 pounds of paper. Even more striking is the statistic which indicates that Americans comprise about 5% of the world's population and annually produce 27% of the world's garbage.

From an environmental perspective, food requires substantial amounts of water, energy and land to produce. For example, one pound of beef requires 1,847 gallons of water, 52 pounds of cattle feed, 260 square feet of land to grow the feed, and releases 20 pounds of carbon dioxide equivalents. Pesticides and herbicides, which are widely used in our agricultural system, endanger the health of farm workers, kill wildlife, and contaminate drinking water. Unsustainable farming practices contribute to soil erosion, salinization and biodiversity loss. Food waste is also the single largest waste stream entering municipal landfills, where its anaerobic decomposition can release methane, a highly potent greenhouse gas.

SOLID WASTE PRACTICE AT MT. SAC

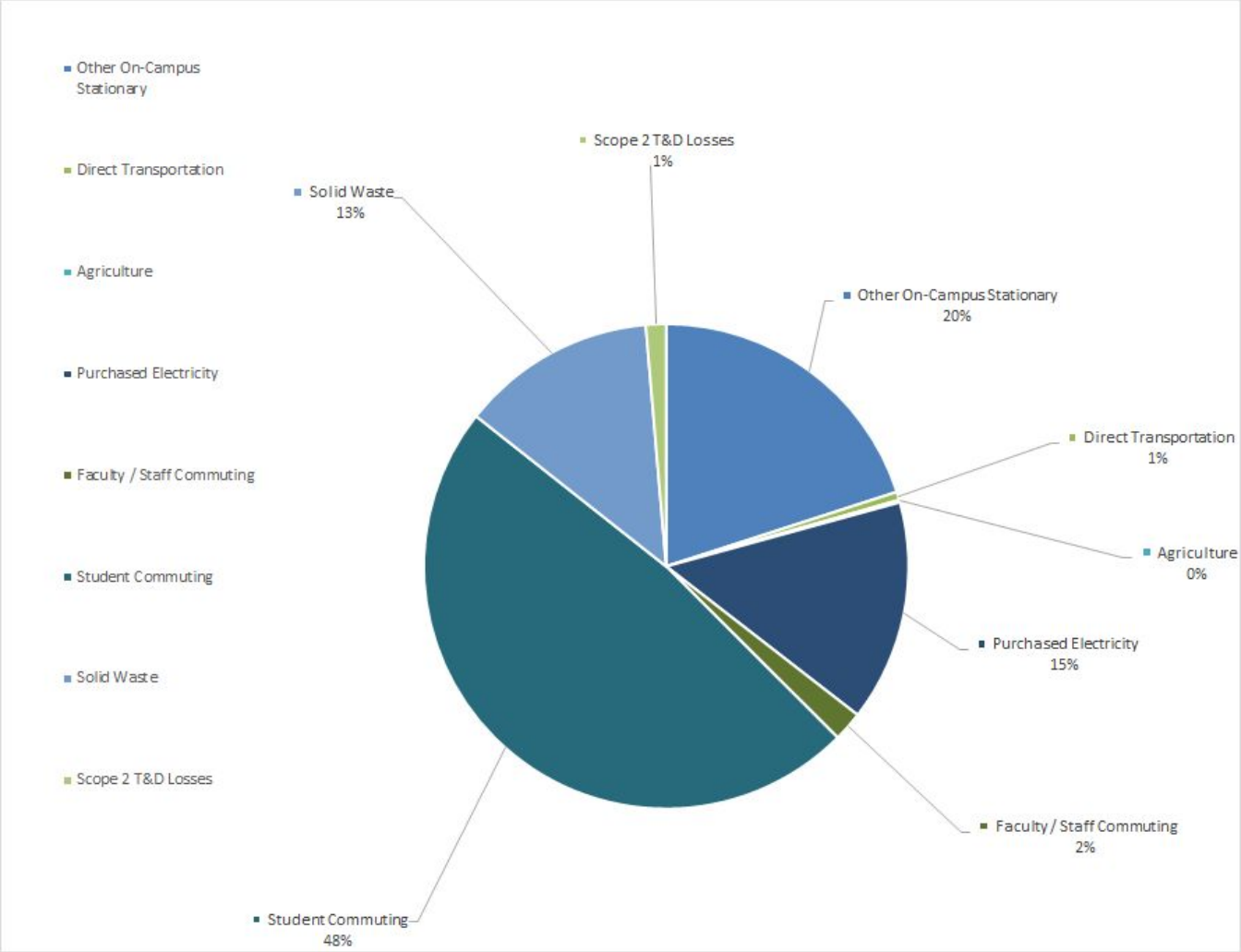
American Reclamation is the waste hauling company for Mt. San Antonio College. Solid waste is taken by American Reclamation and then separated into what can be recycled by South Coast Fibers, a third party recycling agency. The recycled materials are then taken to Covanta Long Beach Renewables and turned into waste energy. These hauling and recycling agencies claim high recycling rates of 70% or greater. At Mt. SAC the great majority of waste that is generated is composed of food waste, wrappers, paper, 4 cardboard, aluminum, plastic, and residuals. The total waste collected by the hauling agencies is provided to the College in a monthly and annual report. These values were included in the total emissions calculations.

Mt. SAC students are currently working on a recycling program uniquely modified to suit the college's needs. The Clean Campus Initiative is a waste collection strategy that utilizes zero-waste stations, an attentive student staff, a responsive marketing strategy that informs the student body about living sustainably, and a collection system in place in order to compost in the future. This project at Mt. SAC initially began as a student proposal for a PepsiCo grant, and after winning the President's Sustainability Awards, became an internship position within Energize Colleges.

Mt. SAC is also in the process of developing plans for in-campus composting that will sustainably turn green waste from the Wildlife Sanctuary, Horticulture unit, Farm, and campus landscaping into a viable resource. Specifically, the draft 2018 Educational and Facilities Master Plan described the following improvement for the Ornamental Horticulture Unit, “A new composting facility would support the College’s mandate to keep all green waste on property.”

Greenhouse Gas Emissions, Scope 3 Solid Waste

In 2016, waste accounted for 13% of the total emissions on Mt. SAC's campus, which is equivalent to 8,314 metric tons of annual waste. Per capita, this equates to 0.11 metric tons of solid waste per student, or 242 pounds of solid waste per Mt. SAC student.



SOLID WASTE REDUCTION STRATEGIES

Considerable progress can be made to achieve a long term of goal of zero waste at Mt. SAC. The following strategies outlines a pathway to Net Zero Waste by the year 2050. Emission reduction strategies are categorized by phases and are associated with corresponding milestone target years.

Phase 1 strategies, when combined with emission reduction strategies for Scopes 1, 2 and Scope 3 (Transportation) aim to result in a **cumulative reduction of emissions of 20% by 2025**.

Phase 2 strategies, when combined with emission reduction strategies for Scopes 1, 2 and Scope 3

(Transportation), aim to result in a **cumulative reduction of emissions of 50% by 2035**.

Phase 3 strategies, when combined with emission reduction strategies for Scopes 1, 2 and Scope 3 (Transportation), aim to result in a **cumulative reduction of emissions of 100% by 2050**.

Phase 1: 2018-2025

Sustainable Food Purchasing

Thirty to forty percent of landfill waste is composed of food waste, therefore the adoption of sustainable food practices will result in a reduction of total landfill waste. The College currently contracts with Sodexo for food services. The timing is good for Mt. SAC to work with Sodexo on improving environmentally sustainable practices, as the company has recently launched a sustainability initiative of their own. Sodexo implements recycling measures such as recycling of paper products and reduction of styrofoam and plastic ware. Food and beverage vending machines are located throughout campus as well. In order to optimize reuse, reduction, and recycling of food items on campus, it is recommended that the College coordinate with on-campus food vendors to establish sustainable policies which include but are not limited to the following:

1. sustainable food purchasing from fair trade, sustainably harvested, and local sources
2. discontinue use of styrofoam and plastic serving ware and replace with compostable ware which can be placed into food trash bin.
3. provide well marked designated receptacles for recycling (paper, aluminum, plastic), compost (food waste and compostable ware), and landfill (rubbage that does not fit into either of the two previously mentioned categories). Sodexo operates separately from the campus and does not currently have recycling-waste bins in the Sodexo operated food service areas. This added feature may incur additional costs and may require a revisit to the contract agreement with Sodexo.
4. A portion of the food waste which is collected could be composted in small batches and diverted to the on campus Farm and used for amendments to agriculture. It is estimated that $100,000 would be required to supply an on site chipper/mulcher to handle this operation, as well as additional staff hours to transfer green waste to the Farm on a daily basis. Any of this waste that is diverted from the landfill will decrease the total emissions.
5. Provide a variety of healthy food and beverage options which are provided within environmentally friendly packaging to students. Consider incentives for students, staff, and faculty for making these choices.
6. Currently a compactor located in the Sodexo food service areas compacts food waste and is picked up once a month. This equipment could be purchased for other non-Sodexo food areas around campus in order to consolidate space.

Revisit Contract with Existing Hauling Agency and Self-auditing

Currently, the hauling agency American Reclamation picks up waste from one main bin per collection area. The bins contain commingled waste. In order to optimize landfill diversion rates of trash hauled away from campus, it is recommended that the College negotiate its policy with the existing hauling agency, in favor of the practice of picking up landfill, recycling, and compostables from separate bins on a weekly basis. (The College currently has plans for a request for proposals to be issued to all interested hauling agencies, including the current agency.) Revised contracts with hauling agencies will likely result in higher costs, therefore additional funding would be required. In addition, the dispatch of three different hauling agency trucks (landfill, recycling, and compost) will add greenhouse gas emissions as

well. The College could work with hauling agencies to determine if clean-fuel trucks are an option, or if it would be possible to offset these additional emissions, such as through renewable energy credits.

Improve Recycling and Waste Receptacles on Campus
Two types of waste containers are currently in use on campus: Blue recycling receptacles for glass, plastic, and paper. Brown landfill waste receptacles are placed adjacent to the blue receptacles.

The following strategies should be considered in order to improve the landfill diversion rates:

1. Maintenance staff are required to lift and replace lids each time trash is collected, which can be an inefficient practice. Alternative receptacles with automatic opening and closing lids would remedy this situation, however would require additional funding.
2. Provide composting bins in addition to recycling and waste bins around campus.
3. Establish "zero waste stations" with composting/recycling receptacles in all food service areas
4. Provide need clear signage that educates the user as to how to dispose of their "waste." For example, signage should inform the user as to whether or not they can throw away food containers that have food on them.
5. Develop and implement a waste-on-campus training program for students and the community. This could be developed in partnership with maintenance, hauling agencies, and students. Student Clubs could champion the marketing effort.

Water Refilling Stations Throughout Campus
Water refilling stations already exist on campus. These stations promote the use of personal thermoses and limits plastic being thrown away or recycle. It is estimated that 4,000 bottles per year per filling station are saved as a result. In order to optimize this result, the College would need to install additional receptacles. Additional funding can be costly to implement at every building, however a phased approach could be used. The cost to install a water fountain is about the same as a water refilling station, at about $1500. It is recommended that an audit is conducted to determine where these stations could go, and where they would be most useful. In addition, it is recommended that the College supply reusable bottles (metal) to students, faculty and staff. These reusable thermoses could be distributed during registration or at club events, and could include a map pointing out locations of water refilling stations.

End Use of Styrofoam, Straws, Plastic Place Settings and Plastic Bottles On Site
Aside from the food service areas run through Sodexo on campus, many staff areas have kitchen areas which are stocked with eating ware. It is recommended that a sustainable purchasing program be put into place that replaces styrofoam and plastics with compostable or reusable options.

Make More Processes Paperless
From course work, to administrative functions, efforts to reduce paper use can make a significant difference in reducing the College's overall solid waste. Currently 765,060 pounds of paper are used annually. Although this paper is composed of recycled content, it would be ideal to reduce the amount purchased and used. Strategies to reduce paper use include presetting all College printers to two sided and printing, providing electronic syllabuses to students each term, as well as examining current practices to identify any processes that can be moved in part or entirely online.

RecycleMania
RecycleMania is a friendly competition and benchmarking tool for college and university recycling programs to promote waste reduction activities to their campus communities. Over an 8-week period

each spring, colleges across the United States and Canada report the amount of recycling and trash collected each week and are in turn ranked in various categories based on who recycles the most on a per capita basis, as well as which schools have the best recycling rate as a percentage of total waste and which schools generate the least amount of combined trash and recycling. With each week's updated ranking, participating schools follow their performance against other colleges and use the results to rally their campus to reduce and recycle more. National recognition is provided to the winning school in each category on the RecycleMania website and in a national press release. Winning schools receive an award made out of recyclable materials, and win the right to host that category's special traveling trophy for the coming year. This free program is an ideal way to promote awareness, participate in recycling and even generate income for the campus.

Furniture Reuse

The College has a large stock of furniture that is used throughout campus. Furniture that has been purchased through bond dollars can only be used for a certain number of years. Once furniture has reached its "end of life," the campus sells old stock to an outside vendor. Additional options for more sustainable reuse of furniture should be explored, including the development of a Reuse Depot, with an online catalog of available items to support on-campus use for items that have not reached their "end of life." The College could contact a the current vendor to see how the two entities could better coordinate furniture reuse efforts.

E- Waste and Hazardous Waste Collections

E-waste is a popular term for electronic products nearing the end of their useful life. Computers, televisions, VCRs, stereos, copiers, and fax machines are common electronic products. Electronic discards are one of the fastest growing segments of our nation's waste stream. Under current regulation, these devices require special handling and can no longer be disposed of in landfills. The City of Walnut is within Los Angeles County and stands to gain from free countywide Household Hazardous Waste and E-Waste collections. It is recommended that Mt. SAC coordinate with the city of Walnut to host a Household Hazardous Waste and E-Waste Day on campus. The parking lot along Temple could provide an easily visible and accessible site for this event. Campus equipment would need to be "wiped" in order to uphold College confidentiality of records. With this process is place, hazardous waste and e-waste from the campus, community and students could all be collected in one location, reducing the amount of waste in landfills, and strengthening ties with the community.

Examples of Electronic Waste (E-Waste) Items:

Alarm Clocks	Digital Thermometers	Appliances
Answering Machines	Exercise Equipment Displays	Radios (all types)
Camcorders	Handheld Electronic Devices	Stereos
CD & DVD Players	Medical Monitors	Telephones
Cell Phones	iPods & MP3 Players	Televisions
Computers	Pagers & PDAs	VCRs
Copiers	Printers & Fax Machines	Video Game Consoles
Digital Cameras	Programmable Kitchen	

Another option would be to engage in the RecycleMania's subdivision, known as the E-cycleMania category. Electronics are not included with the traditional 8-week categories of RecycleMania. Campuses may include the following electronic waste such as computers, printers, and related equipment; consumer electronics; power cords, chargers, and other ancillary equipment.

Phase 2: 2025-2035

Anaerobic Biodigester on Campus-Small Scale

A biodigester is a large, fully enclosed tank into which organic waste is collected. Anaerobic is the absence of oxygen. Anaerobic microbial organisms locked in a sealed environment without oxygen, but with abudnant food and other organic waste material, produce biogas, a methane-rich gas through their digestive process. In an anaerobic biodigester, this natural process of decomposition is technologically sped up to optimal speed and efficiency. The trapped methane gas is then cleaned and used to generate electricity and steam for heating and cooling via a combined heating and power (CHP) or cogeneration system. The biogas also can be directly used to produce steam in boilers for hot water and heating. Leftover organic solid waste can be used as fertilizer, a soil enhancer or be further composted. Small scale biodigesters are coming into the market and are worth consideration. Working with agriculture department, such a biodigester could provide a means of collecting and using food waste in a responsible and educational way. The residual compost could be used on site for crops at the farm and for ornamental landscape around campus. One potential location for this equipment may be behind building 8. Case studies from Stanford or UC Davis should be researched.

Construction Waste Management diversion Goals of 100%

Currently 50% construction waste diversion is California mandate, however 75% diversion has become an industry standard. Working with local hauling agencies and contractors, a diversion rate of 95% is achievable in today's market and by 2035, 100% construction waste management will be highly achievable. Recent examples of construction projects on campus provide proof of this trend. By including this as a requirement in Campus agreements with contractors and hauling agencies, the College will not only reduce the amount of waste going to landfill from its own projects, but it will be setting a new expectation for the building industry as a whole.

Phase 3: 2035-2050

Anaerobic Biodigester on Campus-Large Scale

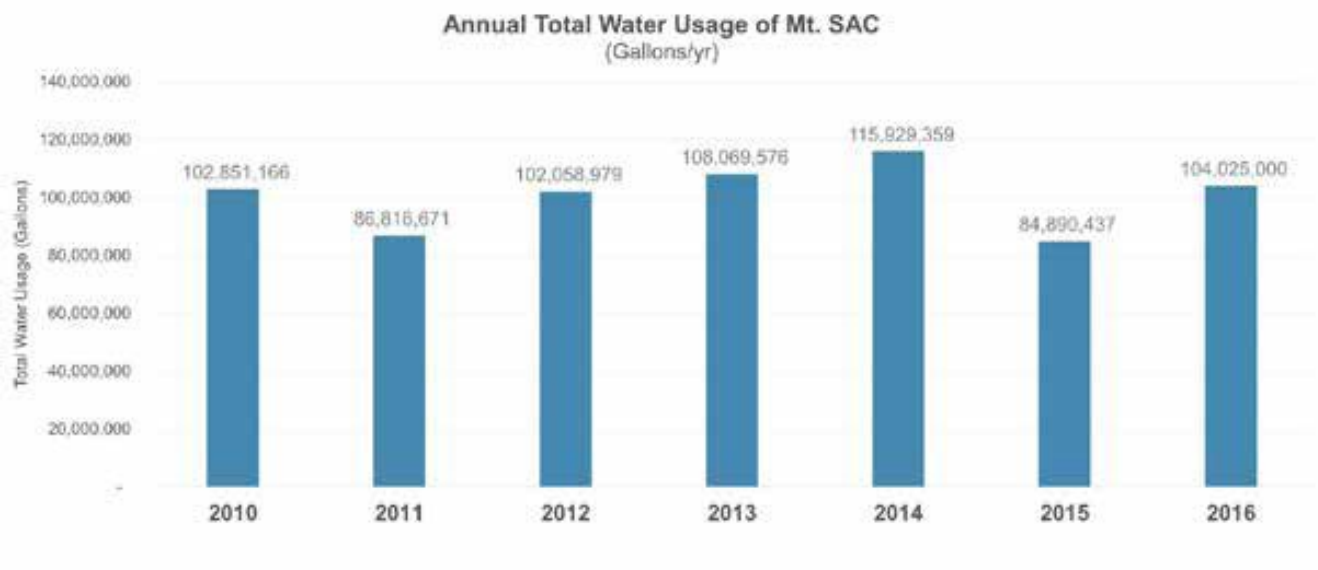
Pending the test fit of the small scale biodigester being proposed during Phase 2, a larger scale biodigester is proposed for Phase 3. This biodigester would be designed to process up to 2,000 tons of manure from the farm's cattle and horses to create renewable biogas. It would have an electric capacity of 64 kW and a thermal capacity of 101 kW. The average annual electricity production of such a unit would be approximately 512,000 kWh; the estimated energy produced is equivalent to providing electricity to 50 US homes a year, or heating 61 homes.

SECTION 9 WATER, WASTEWATER, AND SUSTAINABLE LANDSCAPING

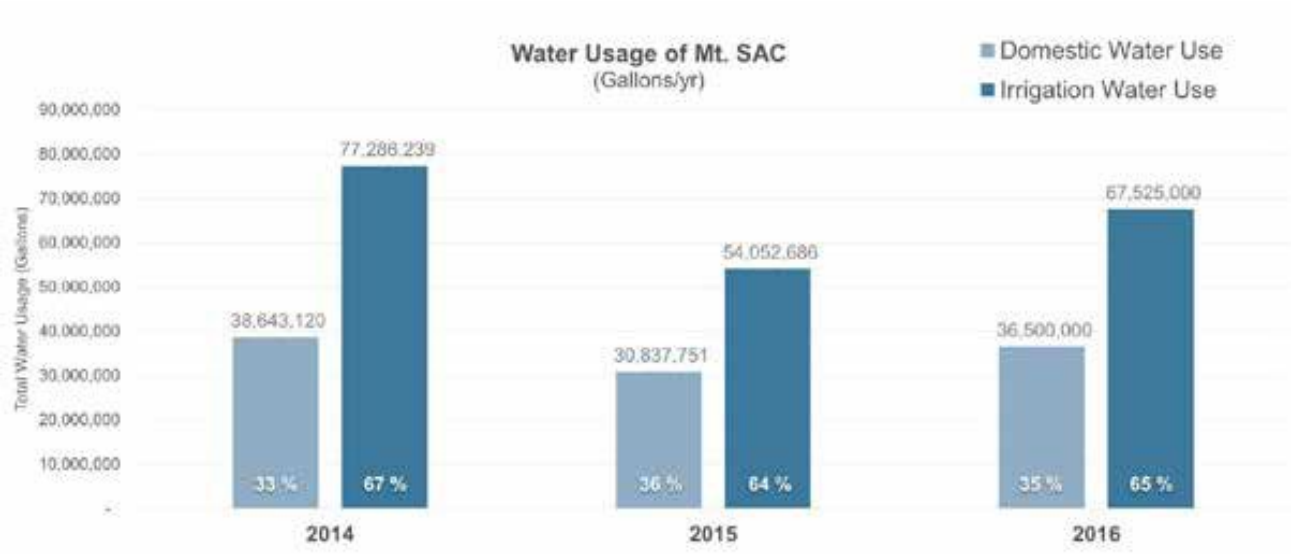
BACKGROUND

Mt. SAC purchases all of its potable water on a wholesale basis from Three Valleys Municipal Water District. As a local water agency, Mt. SAC has the legal right to produce groundwater from its own wells located on campus and has a long history of producing groundwater for its own use. Reactivating three on-campus wells, developing additional groundwater wells, and implementing aggressive strategies to conserve water are the key elements of the College's water use optimization strategy. It must be noted that the production of groundwater is contingent on identifying a feasible and sustainable method of extraction that addresses the depth of the regional water table.

Water use data was collected for both domestic use in buildings and irrigation use. The data presented in the following charts indicate that far more water is being used for irrigation than in buildings.



The College's water use includes on-campus domestic uses, landscape irrigation, athletic field irrigation, pasture and range land irrigation, and wildlife sanctuary uses. Currently the water use on campus is not separated by building or site. Therefore it is challenging to estimate the amount of water consumed by each entity. Looking forward, the College will seek to meter water use at both the site level and the individual building level.



Existing Water Conservation Practices

The College employs the following campus programs to optimize water conservation:

- Water reclamation strategies such as on site stormwater retention areas and bioswales have been employed on campus to capture and divert stormwater to surrounding soils rather that to stormwater lines.
- Technology-based conservation such as motion sensor building plumbing fixtures and weather based landscape irrigation systems.
- Effective Landscaping Design Standards that look at zero water use, or 50% reduction in water use, as compared to an EPA baseline.
- Ongoing Maintenance Programs which include the repair and replacement of building plumbing fixtures which optimize water use to a minimum of 40% water efficiency.

Establish Water Conservation Goals

In order to lay the groundwork for a more water conscious and sustainable future, the following goals are recommended for adoption by the College:

1. Fifty percent reduction as compared to the Energy Policy Act of 1992 standard of building water use.
2. Reduction of the campus landscape water requirement (LWR) by at least 30% from the calculated baseline for the campus's peak watering month.
3. Implement a comprehensive stormwater management plan for the campus that retains on-site stormwater, through infiltration, evapotranspiration, and/or reuse.
4. Monitor and meter water use on campus for buildings and grounds.

WATER CONSERVATION STRATEGIES

The goals outlined above can be achieved through implementation of the following strategies outlined below:

Reduce Storm Water, Sewer Discharges, and Water Pollution

Mt. SAC stormwater infrastructure has not been developed to a consistent level throughout the campus.

For example, the Farm's stormwater infrastructure can be greatly improved. Currently a lack of water pressure results in inefficient irrigation. The infrastructure is in need of upgrading in order to optimize water use. Development prior to the Measure RR building program was not subject to the stricter stormwater management regulations that currently govern Mt. SAC's development.

Mt. SAC needs to implement a comprehensive, campus-wide approach that will reduce its impact on sensitive environments downstream and comply with current regulations. A stormwater pollution prevention plan was approved under the direction of the Facilities Department. This plan aims to address the following:

- Pollutants and their sources, including sources of sediment associated with construction, construction site erosion and other activities associated with construction activity are controlled;
- Where not otherwise required to be under a Regional Water Quality Control Board (Regional Water Board) permit, all non-stormwater discharges are identified and either eliminated, controlled, or treated;
- Site BMPs are effective and result in the reduction or elimination of pollutants in stormwater discharges and authorized non-stormwater discharges from construction activity to the Best Available Technology/Best Control Technology (BAT/BCT) standard

Adopt Sustainable Landscaping Practices

Landscape irrigation requirements are affected by the water needs of particular plants and the use of outdoor space. There are various methods of delivering water to plants in order to accommodate these demands, and consequently, Mt. SAC's landscape incorporates multiple types of irrigation across campus.

Drip irrigation is the most efficient means of irrigating non-turf areas. This form of irrigation delivers low volumes of water directly to plant roots and minimizes losses to wind, runoff, evaporation, and overspray. As a result, drip irrigation uses 20–50 percent less water than conventional pop-up sprinkler systems.

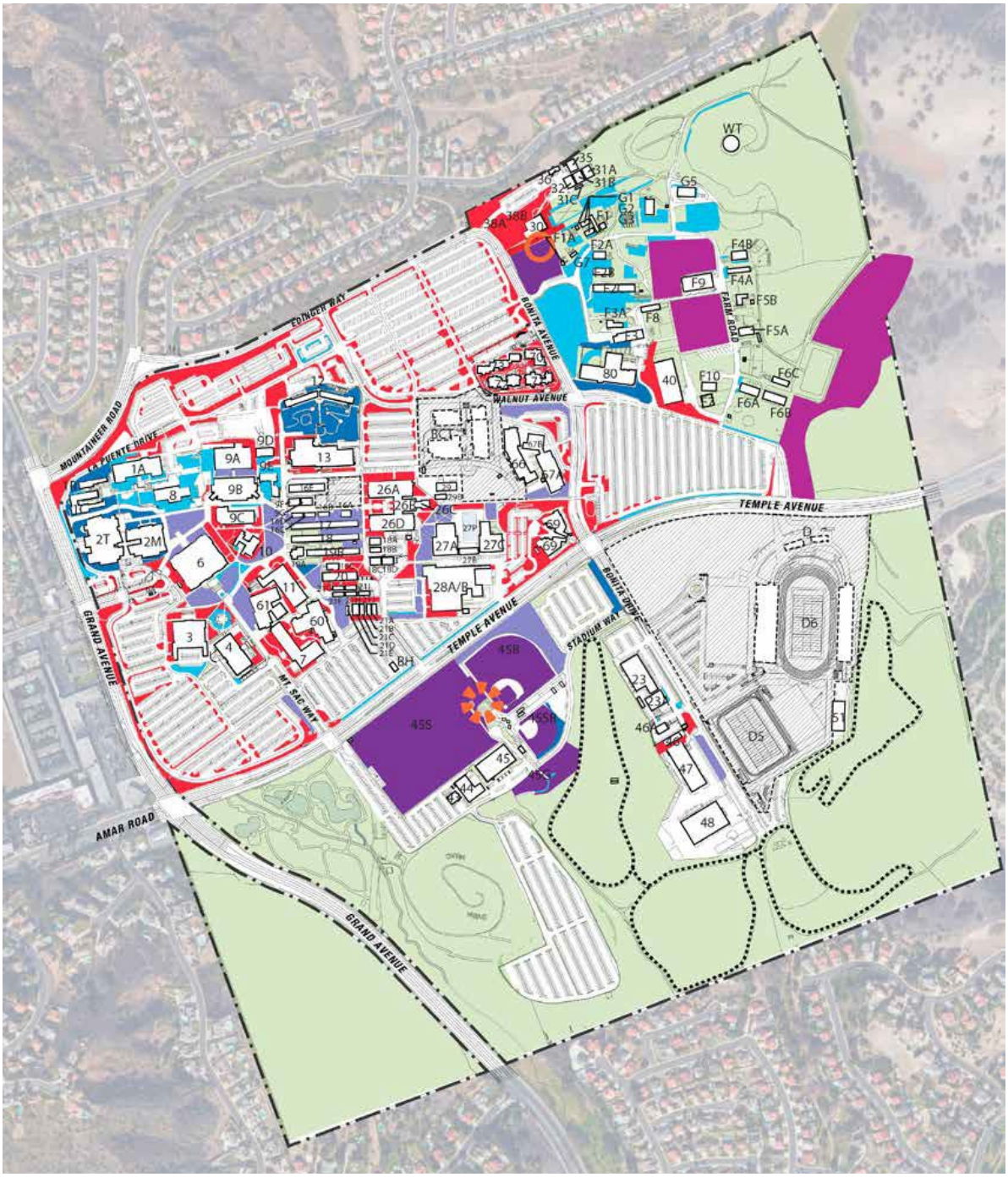
However, drip irrigation is not suitable for all types of plantings and landscape uses. High activity areas such as sports fields and pastures require more water than other areas, and also require different water distribution methods, such as rotors instead of drip. These areas of the campus may require turf for a specific purpose, such as for sports events and agricultural programs. While astroturf is an alternative to turf, it also poses environmental effects which can be adverse such as overheating, perpetuation of stormwater runoff, and emission of VOCs into the air. In lieu of this option, optimizing irrigation for specific and limited turf areas such as the pastures and athletic fields is recommended. While rotors are not as efficient as drip irrigation, some types of rotors are more efficient than others.

Areas that do not utilize the most efficient irrigation type appropriate for the planting type and land use present opportunities to reduce irrigation water use. For example, areas with shrub plantings and spray nozzle irrigation could be upgraded to more efficient irrigation types. Mt. SAC is currently in the process of converting the systems in many of these areas to more efficient methods of irrigation in order to reduce water use. For instance, Mt. SAC's grounds department has addressed barren areas on campus through redesign, installing waterwise plant material, and installing drip irrigation (Building 45 Kinesiology & Mt. SAC Way brick marquees). However, the grounds department currently lacks the funds and staff to complete similar projects in a timely manner. An increase in funding and staff would

greatly help in the renovation of existing landscaping.

Updating Irrigation Systems with Flow Sensors

Mt. SAC received $100,000 from California state funding for upgrades to the 15 year old irrigation system. This was matched by Mt. SAC, therefore a total of $200,000. The campus now uses the MaxiComm Irrigation System. In addition weather sensors were upgraded and 80-90% of controllers were replaced for the the irrigation system at all athletic fields and ornamental landscaping areas. However, despite these upgrades, it is acknowledged that the majority of water use is still due to Mt. SAC's athletics fields, at approximately 100,000 gallons of water per night. This irrigation use could be made more efficient through the implementation of flow sensors which could measure and monitor water use. Approximately 98% of existing master valves and flow sensors in the ground are not working adequately. Additional funding would be needed for the flow sensors as well as additional staff for installing sensors and maintaining the athletic fields. In addition more coordination with IT would be required to capture the digital capabilities of the system. Computers and durable smart devices would also be needed to monitor the systems remotely. Coordination with coaches will also be required to ensure that field conditions are related back to the Grounds department in a timely manner. It is estimated that these upgrades will require $300,000 in funds.



LEGEND

- PROPERTY LINE
- EXISTING FACILITIES
- FACILITIES UNDER CONSTRUCTION
- LANDSCAPE UNDER CONSTRUCTION
- DRIP IRRIGATION (MOST EFFICIENT)
- ROTARY NOZZLES
- RAINBIRD 5000 ROTOR
- RAINBIRD 6500 ROTOR
- HUNTER I-90 ROTOR
- SPRAY NOZZLES (LEAST EFFICIENT)
- SOFTSCAPE WITHOUT IRRIGATION
- CURRENT WEATHER STATION
- FUTURE WEATHER STATION
- CROSS COUNTRY COURSE

REFERENCES

Mt. SAC Facilities Planning & Management and Grounds staff, Jan. 2017

Conducting a Water Audit

An audit would allow the College to determine how much water is being used for various areas of the campus. However, the College's water for both building and grounds is routed through one main. Within the existing system, the College cannot simply subtract out the water for irrigation from the total water use. Flow sensors would be required in order to quantify the use, and then allow Facilities to work backwards to subtract out the irrigation water from the main water utility bill. For new construction, water submeters should be installed to ensure that buildings are meeting a 35-40% efficiency.

Coordination with the Farm and Upgrading of Farm Irrigation

Currently, the Grounds Department does not control the Farm area on campus, where a significant amount of irrigation is being used. The infrastructure at the Farm needs to be updated in order to provide adequate water pressure to the irrigation system. The Rainbird irrigation system is used throughout campus exclusively, except for at the Agriculture building, where a variety of systems is showcased for educational purposes. Coordination between the existing system and the Rainbird campus wide system would be ideal in order to maximize efficiency.

Ongoing Training of Staff

Ongoing training of staff is essential to the future success of existing and new irrigation system put into place at the College. Training sessions have already been put into place, however retraining needs to be conducted. Regional training sessions with Maxicom/Rainbird could be hosted at Mt. SAC. An event such as this would also provide Mt. SAC with an ideal opportunity for demonstrating their water conservation efforts to the community at large.

Ethernet Connectivity to Irrigation Systems

Convert Sherman Park from radio to ethernet (as at the soccer field weather station) to allow for uninterrupted communication between Grounds staff during construction activity. This will allow for closer irrigation coordination between sites and staff.

Upgrade Plumbing Fixtures

Install 35-40% more efficient plumbing fixtures in existing restrooms that work and which are easy to maintain. The College has retrofitted existing sink fixtures with Sloan valves. While these fixtures have been installed successfully, maintenance staff have experienced multiple issues with ultra low flow urinal and water closet fixtures, which tend to clog and stress the existing infrastructure below the campus due to a lack of pressure. It is recommended that plumbing fixture no less than 1.6 gallon flushes are specified to prevent this issue while still preserving water on campus.

Living Machine

The Living Machine is on site, sewage treatment system that can also produce beneficial byproducts, such as reuse-quality water, ornamental plants and plant products—for building material, energy biomass, animal feed. Aquatic and wetland plants, bacteria, algae, protozoa, plankton, snails and other organisms are used in the system to provide specific cleansing or trophic functions. The tidal process operates outdoors in tropical and temperate climates. This system could be installed and integrated into the existing campus landscape, while treating black water to a grey water level. The Living Machine should be situated in a visible location, where it may be used to educate students, staff, faculty and the public about water conservation on campus.

SECTION 10 EMISSION REDUCTIONS AND PROJECTIONS

One core development of this Climate Action Plan has been the identification of initiatives that will reduce emissions for both stationary and mobile sources. Strategies for stationary sources and purchased electricity are discussed in Section 6, while strategies for transportation and solid waste are discussed in Sections 7 and 8 respectively. Water and landscaping are addressed in Section 9. In addition, behavioral change initiatives follow in Sections 11 and 12.

SECTION 11 CURRICULUM, PROFESSIONAL DEVELOPMENT, AND RESEARCH

BACKGROUND

Educating students on climate change, greenhouse gas emissions, environmental sustainability, and climate adaptation can and should be addressed across a diverse range of disciplines at the community college. Sustainability education is more than just transferring knowledge about sustainability issues and how to tackle them. It has a focus on changing mindsets, developing skills in critical and systemic thinking, and enhancing capacity for facilitating change. It is about giving people, communities and organizations, new sets of skills and knowledge, so that they can identify and respond to sustainability challenges, in ways which lead to long-term and sustained change. The related skills and knowledge gained will be vital in the workforce:

> "From business practices to ecosystem management, from community planning to law, from architecture to health care, trained professionals who understand the impacts of climate change and the best practices for responding to them will be vitally needed as communities and citizens face the realities of changing climate." [103]

The Mt. SAC community will be most successful in working towards sustainability and moving the campus towards the commitment of becoming a carbon zero campus if students, faculty, staff, and administrators develop and utilize skills in critical sustainability thinking. Utilizing critical sustainability thinking requires giving consideration to the carbon impact of our actions, work, and decisions, and planning to ensure that the environmental impact is balanced by a greater or equal benefit to the environment.

Sustainability is already integrated into the college mission as a commitment to educating students to "become productive members of a diverse, sustainable, global society," and as a commitment to the community through "active civic engagement." [104] The Institutional Level Outcomes (ILOs) state expectations for students' overall experience with the college. ILO #4 speaks directly to environmental sustainability, "Personal, Social, Civic, and Environmental Responsibility: Students demonstrate awareness and respect for personal, social, civic, and environmental responsibilities." [105]

This section of the Climate Action Plan (CAP) developed from two CAP conferences, which were attended by students, faculty, staff, and managers, and from the recommendations of the Senate Task Force on Sustainability. The Task Force recommendations addressed integration of sustainability into the curriculum, faculty professional development, and research, and were voted on by the Academic Senate in June 2017.[106] The Senate Task Force on Sustainability reviewed hundreds of Climate Action Plans,

[103] Second Nature, Higher Education's Role in Adapting to a Changing Climate, p. 12
[104] College Mission: http://mtsac.edu/about/overview/mission-and-goals.html
[105] Institution Level Outcomes: http://www.mtsac.edu/instruction/outcomes/ILOs_Defined.pdf
[106] Task force recommendations: http://www.mtsac.edu/sustainability/programs-and-initiatives/sustainabilityrec.pdf; Academic Senate meeting minutes, showing approval of recommendations #2-6: http://www.mtsac.edu/governance/academicsenate/minutes/2016-2017/FullSenateMinutesJune12017unapproved.pdf

through the Second Nature Reporting Platform , from various institutions, particularly community colleges, to learn what and how other campuses are addressing the integration of sustainability into curriculum and into professional development. The task force members found that are many different methods used to address integration, depending on the size of the institution, support for the integration and programs, and where the college is in their overall climate action planning and work.

In addition to Climate Action Plans from multiple institutions, the task force reviewed several sources, including the text of the original ACUPCC, the Current Carbon Commitment, Second Nature reports from various colleges across the country, Climate Action Plans from multiple campuses, Second Nature documentation, including *Education for Climate Neutrality and Sustainability: Guidance for ACUPCC Institutions, ACUPCC Implementation Guide,* and *Higher Education's Role in Adapting to a Changing Climate.* Email interviews of staff and faculty at other institutions were conducted by task force members. Task force members also discussed the feasibility of recommendations with the appropriate administrators and coordinators.

There are many choices available to us in creating a more sustainable campus that can function as both a welcoming respite and a stimulating cultural center for the community at the same time as it functions as a learning laboratory and an intentional community for our students, staff, and faculty. If we prioritize sustainability so much can be possible- for our campus and our future. Experiences of other campuses demonstrate that we need to have established mechanisms for the institutionalization of recommendations on curriculum, research, and professional development.

CURRICULUM AND OTHER EDUCATIONAL EXPERIENCES

Current Educational Activities

Mt. San Antonio College has a long history of curricular and educational programming devoted to a range of environmental issues. This plan incorporates past efforts with current planning to aggregate and focus curriculum and educational activities into a coherent and effective experience for students and faculty. A variety of disciplinary courses already includes content on environment and sustainability, but a recent development to focus this effort and content for the benefit of students resulted in the creation of an environmental studies degree, which offers a carefully designed conceptual introduction to the many complex issues implicit in sustainability.

One such example of past and current efforts to aggregate and focus environmental curriculum and student educational activity is the Mt. SAC Wildlife Sanctuary, which was established in 1964 as a ten-acre reserve. With cooperation of faculty, and staff, and management, the reserve has since been expanded to 25 acres. The goals of the Sanctuary are to "restore and maintain a habitat for wild plants and animals of the San Gabriel Valley; provide an outdoor laboratory so that students raised in an urban environment can experience hands-on learning about the natural world; and provide the College and community with an outdoor laboratory for hands-on learning in the natural sciences." [107] The Sanctuary is visited by over 12,000 people per year as part of biology courses and community outreach.[108]

[107] Mt. SAC Wildlife Sanctuary website: http://www.mtsac.edu/wildlife/
[108] Scauzillo, Steve. 28 May 2017. "Mt. SAC Wildlife Sanctuary reaches 50-year milestone, preserves habitat for rare birds." San Gabriel Valley Tribune.

Students have also played a vital role in the sustainability and environmental movement on campus. The Associated Student Senate includes a cabinet position for an "Environmental Senator," and the student environmental action club, Environmental Action Group for a Livable Earth (E.A.G.L.E.), founded in 1989, has acted to advance "awareness around campus of critical environmental issues and promoting action within the student body to protect and conserve natural resources." [109] Students have hosted fairs, events, workshops, and speakers for Earth Day beginning in the early 1990s. Since Spring 2010, Earth Day events have included the Jerry B. Allen Earth Day Lecture Series, which has addressed politics, climate, and environmental issues. Organizers include students from E.A.G.L.E., and faculty from political science and the biological sciences.

A group of students, supervised by Professor James Stone and led by student Carol Martinez, developed a 60-90 minute Sustainability Tour of campus features in 2017. The tour includes a LEED-certified building, an on-campus dining hall, and drought-tolerant landscaping. Students have presented eight guided tours in Spring 2017.

Departmental and Programmatic Planning & Actions

Faculty across campus are working to incorporate sustainability into their curriculum development, as evidenced by the following planning initiatives articulated in the 2018 Educational and Facilities Master Plan, Chapter 3:

Agriculture and Animal Sciences
Expand the curriculum to incorporate contemporary topics, such as perceptions about animal care, urban agriculture, sustainable agriculture, and land use management.

Air Conditioning & Refrigeration
Meet California's Zero Net Energy mandate, which will require retraining in solar energy as well as battery storage and safety.

Aircraft Maintenance Technology
Develop specialized training in battery and electronic technology for the electric airplane industry.

Architectural Technology
Collaborate with Ornamental Horticulture and other disciplines to develop degrees and certificates in Landscape and Architectural Design, Environmental and Sustainable Design, Urban and Regional Planning.

Biological Sciences

- Develop new programs in areas such as sustainability, bioinformatics, and biotechnology.
- Maximize the use of the expanded Wildlife Sanctuary by collaborating with other disciplines to develop a sustainability program.
- Collaborate with other Natural Sciences disciplines to develop an associate degree in Environmental Science.

Earth Sciences

- Revise curriculum as needed to include sustainability and greater use of the Wildlife Sanctuary.

[109] E.A.G.L.E. Facebook page: https://www.facebook.com/groups/mtsaceagle

- Collaborate with other Natural Sciences disciplines to develop an associate degree in

Environmental Science
Develop a career technical education program for students wishing to pursue entry-level positions in geotechnical, engineering geology, and environmental geology.

Electronics and Computer Engineering Technologies
Revise curriculum as needed to incorporate the uses of electronics in fields, such as biomedical electronics and avionics as well as in transportation, such as hybrid vehicles, electric busses, mechatronics, and alternative energy.

Graphic Design And Illustration
Collaborate to develop multi-disciplinary programs, such as Environmental Design, Interior Design for the Consumer, and Commercial Design.

Ornamental Horticulture
- Expand the curriculum to include new or revised topics/courses that incorporate contemporary topics, such as drought and water issues; pesticides and fertilizer regulations; and organic production and sustainable horticulture.
- Use the Farm and its facilities to increase community awareness and experiences, such as completing the Agricultural Literacy Trail.
- As an additional example, the 2015 Farm Addendum to the Educational Master Plan states that "the Agricultural Sciences Department intends to review all course content and certificates to ensure that the curriculum is aligned with the current national focus on the environment." [110]

Future Actions

Incorporate Sustainability into the Educational Experience of all Students.
Encourage students to take classes that incorporate sustainability by establish LEAF designated classes Identifying classes that incorporate sustainability will have several benefits. Our faculty will see that it is possible to weave sustainability ideas into many different subjects. Students will see that not all classes are the same, and may prefer taking a class that addresses sustainability. A robust list of classes will make it easier for students to take a leaf-designated class while at Mt. SAC. Eventually, it may become so commonplace that most students take a leaf-designated class by chance.

Guidelines for Sustainability-Related LEAF-designated Classes at Mt. SAC
The LEAF designation is meant to ease the identification of courses or sections that integrate sustainability into their curriculum. These classes may either be courses for which *every* section is focused on environmental sustainability, (for example, Environmental Politics), or may be courses for which *particular* sections focus on an environmental topic and therefore that section is a LEAF class (for example, a section of college composition that uses readings on climate change and requires essays written on related topics). LEAF classes should be those which will intentionally contribute to students' understanding and practice of environmental sustainability. Interested departments or faculty may request designation, rather than having designation assigned to courses. Details regarding criteria and forms are given in the Appendix on "LEAF Course Designation."

[110] Mt. San Antonio College Educational Master Plan 2008-2009, 2015 Addendum: The Farm. http://www.mtsac.edu/construction/reports-and-publications/images-pdfs/legacy-master-plans/MtSAC_Ed_Plan_Addendum_Revised-050815-Final.pdf

A sustainability-related course section is one in which a particular instructor has chosen to integrate sustainability concepts into the course content. This does not indicate additional work for students. Sustainability is simply used as an intentional context for achieving the same learning goals as other course sections. These course offerings are appropriate for students learning about sustainability for the first time or for those more familiar, to see sustainability issues from a new perspective. Sustainability-related courses may include sustainability as a unique course component or module, or infuse sustainability concepts as appropriate throughout the course.

Many classes currently offered at Mt. SAC meet the criteria for this designation. See Appendix on "Sample Course Candidates for LEAF Designation." Several community colleges have adopted similar designation systems, including the following schools, with their designation name: Delta College ("Sustainability Related" / "S-related"), Glendale Community College ("Environmental Awareness" / "eAwareness"), and Mesa Community College (Sustainability Immersion / "SU").

The Communications Department, with the Climate Commitment Implementation Committee, is currently investigating the possibility of integrating sustainability into Speech 1A. This is being piloted in one section in spring 2018, and discussions will continue following the pilot.

Support and encourage faculty in the integration of sustainability into existing curriculum
Faculty may be hesitant to alter or develop curriculum without support, therefore the Sustainability Coordinator and other participants will produce an online directory of faculty experts on campus and a repository of sustainability-related resources for incorporating such materials, designs, and practices into the curriculum.

Maintain and publicize the President's Sustainability Awards.
This action provides an incentive for students to do work on sustainability and if there is an increase in faculty incorporating sustainability in their classes, their students will have added opportunities to win the awards. See additional discussion of these awards below.

Develop Sustainability-Related Professional Development for Faculty (see below)

Maintain an Online List of LEAF Designated Classes
Reach out to divisions and departments to discover additional classes that currently merit designation. In addition to designation in the schedule, a public list of LEAF designated classes will demonstrate Mt. SAC's commitment to sustainability. Faculty will be able to more easily see what is possible, and students will see what classes are available.

This is already part of many community college's Climate Action Plans, including Austin CC, Broome CC (>70 courses), Cabrillo College (>50 sections), Delta College (dozens of courses), Glendale Community College, Mesa Community College, Quinebaug Valley Community College, Skagit Valley College, and SUNY Orange County Community College (93 courses).

Consider Incentivizing Students to Take LEAF Designated Classes.
While knowledge of sustainability ideas is likely to be an intrinsic good, students may not take advantage of LEAF designated courses without some incentive. Public recognition might also increase awareness of the classes.

Possibilities in other community college's Climate Action Plans include an indicator on transcripts for each relevant class (Delta College), an endorsement on the transcript for Sustainability Studies after a certain number of classes (Tompkins Cortland Community College), and a green cord at graduation for 18 hours of courses in their sustainability pathway (Mountain View College).

Several community colleges aspire to establish either general-education requirements (Bellevue College, Cabrillo College) or graduation requirements (Bergen College) for sustainability. While these requirements have not yet been successfully implemented, Santa Monica College does have a broader Global Citizenship requirement for AA degrees, which can be fulfilled with an environmentally focused course.[111]

Integration into Noncredit Curriculum

As one of the largest noncredit programs at a California community college, students in the School of Continuing Education represent nearly 20% of student FTEs. Noncredit students are enrolled in noncredit courses, and need to be included in sustainability education. The goals of Mt. SAC's noncredit programs are to increase literacy skills, increase access to higher education and employment, and strengthen self-sufficiency. These goals are well matched with the goals of sustainability education. This will require documentation of the current integration and support further integration of sustainability into noncredit Curriculum and collaboration with non-credit faculty to ensure specific needs of their division are met through Climate Action Planning.

Early Introduction to Sustainability New Students

Educational experiences to provide an early introduction to Sustainability at Mt. SAC for students new to the campus will be developed as introduction to sustainability early in a student's Mt. SAC career may help the student incorporate these ideas in the future, encourage related coursework, as well as help shift our campus culture toward more awareness of sustainability issues.

Some institutions are making sustainability information available at their Student Orientations, including Austin Community College, Central Carolina Community College, Chandler-Gilbert Community College, and Des Moines Area Community College.

Institutionalize the Sustainability Tours

Our Sustainability Tours are currently being led by students, most of whom volunteer, but some of whom are employed as Student Assistants. Each tour requires preparation time in scheduling and confirming various presenters and guides, and the tour itself lasts an hour. To develop the tour, students reached out to campus experts, including Ruben Flores (Grounds) regarding landscaping, Mika Klein (Facilities) regarding LEED buildings, Danny Paz (Sodexo) regarding dining facilities, and Melissa Berkley (Technical Services) regarding the production of video clips. CCIC members and Carol Martinez (Student Tour Leader) have been meeting with Andi Sims (Director, Student Life) and Logan Snyder (Associated Students' Environmental Senator) since Fall 2017 to plan the institutionalization of Sustainability tours.

Create a user-friendly calendar on the Sustainability website where users can access tour dates and times, and schedule a group tour. Future potential tour guides will be part of the Green Ambassadors who are to be housed under Student Life following a successful institutionalization of the sustainability tours. The tour guide position will be a paid position.

[111] http://www.smc.edu/AcademicAffairs/Sustainability/Pages/Greening-the-Curriculum.aspx

President's Sustainability Awards
Students have some agency about the specific topics they address for assignments in various classes. Students could choose to address sustainability-related issues for essays, speeches, or other projects, and may be more likely to if initiating sustainability-related topics is encouraged or incentivized. THe President's Sustainability Awards offer monetary prizes for the best examples of students addressing sustainability issues as part of their classes or their campus life. In 2017, awards were given for a project on sustainable dress design, a campus waste initiative, research on mealworms eating styrofoam, and the leadership of an elementary school garden project.[112]

These awares could be institutionalize the by seating oversight of the awards with the Sustainability Coordinator. These awards have been offered and awarded once so far, in 2017. If the awards are to persist over the long term, the work of administering the awards will need to have the responsibility clearly assigned.

Institutionalize faculty leadership role by creating a Sustainability Coordinator.
To integrate sustainability into the curriculum, there must be an individual with responsibility for oversight and an institutionalized role. Among other duties, a faculty coordinator could guide the leaf designation process, sustainability professional development, and support other sustainability-related curricular developments.

Work must be done with the Academic Senate and Faculty Association to establish this Sustainability Coordinator reassignment position. In spring of 2017, the Senate Task Force on Sustainability made, and the Senate passed a recommendation calling for a Sustainability Coordinator. The Academic Senate included implementation of this recommendation in the Senate Goals for 2017-2018. Working towards this goal, the President of the Academic Senate has requested that the Faculty Association include the allocation of release time for a Sustainability Coordinator in their negotiation survey to faculty.

The Sustainability Coordinator shall:

1. Serve a two-year term.
2. Be responsible for representing the position of the Academic Senate on all Sustainability matters.
3. Be the primary faculty contact for questions or concerns regarding the Carbon Commitment.
4. Serve as Chair of the Climate Commitment Implementation Committee.
5. Perform such functions as the President or the Executive Board assign to assist in carrying out the purposes and policies of the Academic Senate with regard to Sustainability and the Carbon Commitment.
6. Mentor and facilitate the college's integration of Sustainability into the curriculum, including maintaining the listing of leaf designated courses and classes.
7. Serve on a professional development governance committee and collaborate with the Faculty Professional Development Coordinator to implement professional development for faculty on sustainability, including identifying or developing materials or curriculum for faculty professional development.

[112] Past winners - Mt. SAC President's Student Sustainability Awards, http://mtsac.libguides.com/sustainabilityawards/winners

8. Present an annual written report to the Academic Senate and write the curriculum component of annual reporting to Second Nature (oversees Carbon Commitment) documenting activities and outcomes.
9. Be responsible for seeing that the President's Sustainability Awards are promoted and awarded annually. (The Coordinator could coordinate the awards themselves, or ensure that there is a faculty member in place to coordinate the process and jury.)

As a faculty reassignment, this position must be negotiated between the District and the Faculty Association. The college President has expressed support for the development of this reassigned position. Because it will be at least until 2018-2019 academic year before this position is established a request for funding through the President's Office for 6 LHE of release time has been requested for this year.

Other campuses with sustainability coordinators include Allegheny College, Austin Community College, Ball State University, Chaffey College, San Antonio College, SUNY Broome Community College, and Wake Technical Community College. Several other campuses have established Directors of Sustainability, often as part of an Office of Sustainability. These campuses include CSU East Bay, Lewis and Clark Community College, Syracuse University, and The George Washington University.

Establish a voluntary online sustainability pledge.
An online pledge available to students and employees could be a low-pressure way to track interest and to educate our community. Several community colleges do this, including Brookhaven College[113], Delta College[114], and Des Moines Area Community College.[115]

Challenges

The Carbon Commitment requires that the Climate Action Plan include "actions to make carbon neutrality and resilience a part of the curriculum and other educational experiences for all students." Our current plan does not include actions to reach all students. Many students can be reached through leaf-designated classes, sustainability tours, internships, research opportunities, and other means, but these methods are not as comprehensive as a graduation requirement or degree requirement. However, this recommendation was not approved by the Academic Senate because of concerns that adding a requirement could potentially reduce degree completion, and because local requirements cannot be put on transfer degrees- so this requirement could not be implemented across all degrees.

At the Fall 2015 opening meeting, Chisa Uyeki and Chris Briggs gave a presentation that attempted to present sustainability as an issue already concerning the entire campus. Deep questions about sustainability are at the core of all academic disciplines. For instance, political scientists ask "What is a sustainable form of government?" Historians ask, "What can past, failed societies tell us about how to avoid a similar fate?" Various scientists ask, "How can agriculture feed everyone, and medicine keep everyone healthy?" Astronomers ask, "Why is our planet so unique? Is it unique? What happened to other planets to make them so inhospitable to life?"

[113] Do Something: Brookhaven College.
https://www.brookhavencollege.edu/aboutbhc/sustainability/pages/do-something.aspx
[114] Commit to Sustainability. Delta College. https://www.delta.edu/sustainability/commit-to-sustainability.html
[115] DMACC Operation Green. Des Moines Area Community College.
https://www.dmacc.edu/green/Pages/welcome.aspx

The presentation seemed well-received, but some Mt. SAC employees (Faculty, Staff, Managers) still oppose many sustainability interventions. Sustainability work is often portrayed as a competitor with other causes, causes like student equity or success. Thus, one major challenge is for Mt. SAC's work toward sustainability, climate neutrality, and resilience to be understood as an effort that is complementary to other causes on campus. Climate neutrality does not have to be an enemy of equity, for example. Yes, electric cars are expensive in some ways, but the economically-disadvantaged are likely to be paying the most for polluted air, by living near freeways and suffering health consequences. [116] [117] There are similar examples for any other cause on campus.

PROFESSIONAL DEVELOPMENT

Current Activities

In Fall 2016, and "Environmental Issues Pathway" was named as a track for the Faculty Flex Day offerings. The pathway included two sustainability-related sessions: "Collaborative Sustainability Planning," by Chisa Uyeki and Chris Briggs, and "Your Wildest Imagination: Outdoor Resources for Instruction," by Jared Burton and Chris Briggs. The pathway demonstrates some campus-wide adoption and institutionalization. Earlier Flex Day offerings included a presentation at the Opening Meeting (Fall 2015), and sessions called "Getting to Zero" (Fall 2015), and "Sustainability and Beyond" (Spring 2016).

A website to increase communication and to orient adjunct faculty to Mt. SAC now includes information about sustainability efforts on campus. Adjunct faculty are directed to information on the Carbon Commitment and integrating sustainability into the curriculum.[118]

Members of the Climate Commitment Implementation Committee developed a sustainability component for the New Faculty Seminar, and presented it in Spring 2018, in combination with a Sustainability Tour led by students. (The event was recorded and is now available as a podcast.[119]) This sustainability component is now part of the seminar curriculum. The New Faculty Seminar is a broad introduction to Mt. SAC for all new full-time faculty. Integration of sustainability into this seminar affords the opportunity for an early introduction to Mt. SAC's Carbon Commitment and leaf-designated courses, and will help establish a culture of sustainability on campus.

Future Actions

Broad Goal: Integrate sustainability into Professional Development.

Rationale: Professional development provides skills building, growth, and learning opportunities for all employees as part of the college commitment to the continuous improvement of instruction, programs, and services. Sustainability is addressed in two areas of the Mt. SAC Professional Development Plan 2016-2018 addresses sustainability in two areas of emphasis: Employ Development: Civic Responsibility

[116] USC Environmental Health Centers. http://envhealthcenters.usc.edu/infographics/infographic-living-near-busy-roads-or-traffic-pollution/references-living-near-busy-roads-or-traffic-pollution

[117] LA Times, 2017. http://www.latimes.com/projects/la-me-freeway-pollution/

[118] The Climate Action Plan & Sustainability. Professional & Organizational Development. http://mtsac.edu/pod/resources/adjunctfacultypage/sustainability/climateactionplan.html

[119] Magic Mountie Podcast. Episode 8: A Talk and a Tour: Faculty, Sustainability, and the Conundrum of Purple Pants. http://www.mtsac.edu/pod/magic-mountie-podcast/index.html

and Instructional Development: Sustainability.[120] The breadth and complexity of professional development needs will be reflective of the complexity of climate action plan. Well deployed professional development will help institutionalize sustainability and provide employees the necessary educational opportunities to support behavior change and move the campus towards climate neutrality.

1. Broad Action: Prioritize Sustainability as a theme for professional development for all employees.

   Rationale: The intent of the campus-wide Professional Development plan is to reflect the professional development needs of all campus employees. As such, it is recommended that sustainability be included as a theme in the 2018-2020 Professional Development Plan to ensure that the professional development opportunities needed to fulfill the actions detailed in this plan are provided.

   Specific Action: Continue communication with POD and the related committees to develop an understanding of the professional development needs and to identify resources to fulfill these needs.

   Specific Action: Create a link to sustainability web resources on the Professional Development resources website.

2. Broad Action: Develop training for Classified staff.

   Rationale: Many of the actions to improve campus sustainability depend upon Classified staff for implementation. These actions will be met with more acceptance and enthusiasm if Classified staff are provided opportunities to learn more about sustainability and the value of the changes being proposed. Sustainability professional development can also trigger innovation and bring new ideas, methods, and possible solutions.

   Action: Classified staff and Managers' Professional development needs related to the campus sustainability initiatives will be identified through communication with the Classified Professional Development Committee and Management Professional Development Committee.

3. Broad Action: Develop and Provide Professional Development for Faculty.

   Rationale: This professional development can utilize the depth of expertise present in the current faculty to both inform and support our Faculty in sustainability-related issues. This could include regular professional development opportunities to inform faculty about current sustainability-related activities in our community, or support for faculty in the development of curriculum which integrates sustainability and resilience. For example, in Fall 2018, a Flex Day session will be offered under the following description:

   > "Towards a Sustainable Campus: Introducing Mt. SAC's Climate Action Plan"
   > Exciting news! Our campus has its first Climate Action Plan, which articulates a path to carbon neutrality for Mt. SAC (as required by the Carbon Commitment we joined in 2014). Beyond mitigation of greenhouse gas emissions, the plan includes strategies for

[120] Mt. SAC Professional Development Plan 2016-2018. http://mtsac.edu/pod/documents/pd_plan_6-7-16.pdf

incorporating sustainability into professional development, curriculum, and community outreach. Support for faculty will include workshops on incorporating sustainability into your curriculum. Come hear about what's already going on on campus and how you can participate in these ambitious plans as we move forward towards becoming a sustainable campus.

4. Specific Action: Support faculty with the development of sustainability-related Student Learning Outcomes.

   Rationale: Student Learning Outcomes (SLOs) are used across campus to motivate the teaching of particular ideas, and to assess student educational achievement. A search for existing SLOs related to sustainability may help illustrate how sustainability ideas are already distributed within our curriculum. A compilation of these examples can serve as templates for instructors seeking to develop new SLOs.

5. Specific Action: Develop curriculum for a Sustainability Certificate for faculty to be offered through Professional & Organizational Development.

   Rationale: A Flex Day presentation on integrating sustainability into the curriculum generated much interest and was well attended. There is continued interest, and a need to support faculty in reworking their classes to address sustainability. This faculty certificate is being developed to support faculty interested in integrating sustainability into the curriculum. The desired outcome of this program is for faculty to integrate sustainability and get their classes certified as leaf courses.

   Action: This certificate course is in development. The proposal for the certificate was developed in collaboration with the Faculty Professional Development Coordinator. (This POD certificate course would introduce sustainability, the climate commitment that Mt. SAC has made, leaf courses, and SLOs for the leaf courses. Workshops could follow where people could work with someone to meet the leaf course criteria for their specific subject (only for people who needed help). The Sustainability Coordinator would create the master list from the applications for leaf courses. If it were done as a Google form, it would actually dump all the info on to a sortable spreadsheet and compile everything in one place.)

   Action: Create a crowdsourced document pulling together techniques that instructors utilize to integrate sustainability through various subjects. (Some instructors on campus have already demonstrated this crowdsourcing function in Canvas courses.) This collection of techniques could serve as a model for other professors and perhaps other campuses.

   Action: Submit Certificate to Salary and Leaves for consideration for professional growth credit.

   Rationale: Professional Development provides learning opportunities for all employees. A Sustainability Certificate can help guide offerings so that faculty learn strategies for integrating sustainability into their classes. A certificate can also help justify allocating Conference & Travel funding.

RESEARCH

Mt. SAC is a community college and its primary purpose is teaching lower-division college classes. While the scope for research is limited, there are a few areas where faculty and students can engage in research. These are outlined below. Below, the broad goal of "supporting sustainability research" is broken into four sections: (1) for research in general, (2) by employees, (3) by students, and (4) for Facilities.

Rationale:
As a community college Mt. SAC is not required to include research as a component of the CAP, however, Mt. SAC has affirmed the important role of student research in higher education, and has made a commitment to support student research on sustainability as part of the Carbon Commitment. Actions towards this goal to date include:

- In 2015, Academic Senate Resolution 2015 – 04 Support of Undergraduate Research was passed. This resolution called for the establishment of an undergraduate research office and a faculty coordinator position to support student research activities.[121] These have not yet been implemented, however, the passage of the resolution established faculty support for undergraduate research.

  Stated support for undergraduate research in this resolution applies to the inclusion of research as an educational component in campus climate actions. "Students who engage in 'high impact' educational practices, especially undergraduate research, show significantly greater learning outcomes than similar students without those opportunities." [122] The establishment of an Office of Undergraduate Research and a Research Coordinator can contribute to this CAP goal by supporting and encouraging participation of faculty and students in research on sustainability through coordinating research opportunities, mentoring student research, and assisting faculty in incorporating undergraduate sustainability research into their curriculum. (This recommendation has not been operationalized to date).

- Establishment of President's Sustainability Awards. (See awards description in Education section).

- In April 2017, our Academic Senate voted on the recommendations of the Senate Task Force On Sustainability. The Academic Senate accepted most of these recommendations, including recommendation #4: "Support sustainability research."

[121] Resolution text: http://mtsac.edu/governance/academicsenate/resolutions/15-04%20Support%20of%20Undergraduate%20Research.pdf

[122] Kuh, G.D. 2008. High-impact educational practices: What they are, who has access to them, and why do they matter. Washington, DC: Association of American Colleges and Universities. Brownell, J.E. and Swaner, L.E. 2010. Five High-Impact Practices: Research on Learning Outcomes, Completion, and Quality. Association of American Colleges and Universities.

FUTURE ACTIONS

Research in General

Goal: Complete an initial campus-community resilience assessment including initial indicators and current vulnerability.

Rationale: The Climate Commitment from Second Nature includes this assessment. It usually includes several sections, including analysis of resilience of social, human, natural, financial, and physical attributes of our campus and community.

Action: Outline a plan for completion of this assessment.

Goal: Work with the Center of Excellence to utilize Labor Market Information to identify economic and workforce needs as related to sustainability and to inform curriculum development and planning for Mt. SAC and community colleges regionally.

Rationale: The Center of Excellence at Mt. SAC is a regional resource, serving 28 community colleges in Los Angeles and Orange Counties and funded by the Chancellor's Office to support labor market analysis for community colleges.[123] These analyses can be used to enable data-driven decision making and curriculum development.

Renewable-energy technologies change rapidly, and are widely considered part of a growth industry. Training students to work in these fields fulfills part of Mt. SAC's mission to serve our community. For example, Cabrillo College runs a month-long laboratory course for students interested in hands-on learning who want to gain the skills needed for work in the booming solar, wind, and other renewable and efficient energy fields. If supported by data from the Center of Excellence, it may make sense to support the development of certificate programs around sustainability, such as through engineering and solar power.

Actions:

- Review Standard Occupational Codes to identify occupations that relate to "green" jobs, and decide other criteria for analysis.
- Cross-reference state data on the growth of "green" jobs to do a similar local analysis.
- Continue discussions with staff at the Center of Excellence to determine other opportunities to incorporate their expertise in support of CAP activities.

Goal: Develop partnerships with other institutions of higher learning and continue to seek opportunities to partner on sustainable research initiatives whenever possible.

Rationale: Interactions with other institutions may allow our students to find opportunities they might not otherwise encounter. This is also a goal of the College of Marin.

a. Action: Reach out to Cal Poly Pomona and other local schools.

[123] Center of Excellence website: http://www.mtsac.edu/business/coe/

Goal: Connect students, staff, and faculty interested in collaborating on campus sustainability projects and develop tools for faculty and students to use in their classes and research.

Rationale: Various members of the campus community may share interests, but be unaware. Connecting these parties can catalyze them to follow through on their goals.

b. Action: Improve existing websites containing information regarding sustainability courses, research, internships, and other opportunities on campus. (Also fulfills objectives in Education section of CAP).

   - Sub-Action: Fund a student intern to collect relevant information and update webpages, similar to what Jonathan Davila did as an intern with Energize Colleges over the summer of 2017.

c. Action: Work with Research & Institutional Effectiveness (RIE) Office to develop tools to track and measure sustainability research projects and funding for those projects.

   - Sub-Action: Contact RIE and Fiscal Services regarding their current tracking of sustainability-related funding sources on campus.
   - Sub-Action (if needed): Develop a definition for "sustainability research projects."

Goal: Establish a sustainability/climate center as a campus hub to promote, store, and display research activities as well as to inform the community regarding actions and progress towards net zero climate goal. This facility could serve as the center for the campus as laboratory activities- putting learning into action.

Rationale: Publicizing research activity can lead to added awareness of projects on campus, and cultivate interest among current students.

d. Action: Encourage the campus to establish such a center. Include in 2018 Educational and Facilities Master Plan for campus. Compile information about examples from other campuses. Begin discussions with appropriate departments and have interested departments include Center in their departmental PIE.

Research by Faculty

Goal: Encourage faculty to include sustainability in their research during sabbaticals.

Rationale: In 2016, Biology Professor Dr. Tim Revell completed a survey of our Wildlife Sanctuary during a sabbatical, and other professors could follow suit. This research could inform other parts of the campus community of unique issues on campus, local resources, or local experts. Another campus that supports sustainability-themed sabbaticals is Glendale Community College.

e. Action: Publicize relevant sabbaticals from the past, and advocate for including them as examples in sabbatical application materials.

Research by Students

Goal: Encourage the use of sustainability issues in student research projects.

Rationale: Students have some agency about the specific topics they address for assignments in various classes. Students could choose to address sustainability-related issues for essays, speeches, or other projects.

For example, science students who conduct research for classes can collect and analyze data on local water quality or biodiversity, or research the feasibility of solar power or bottled water bans. Design students can conduct energy audits or research impact of purchased materials.

f. Action: Publicize the relevant research efforts of current students.

   Rationale: Students may be unaware that it is possible to connect their interests in sustainability to current coursework. Seeing examples from other students may motivate them to undertake projects that they might not otherwise.

g. Action: Publicize our Presidential Sustainability Awards.

   Rationale: Currently, Mt. SAC's Presidential Sustainability Awards encourage students to engage in research on sustainability topics. The stated mission of the awards is:

   > "The Mt. SAC Sustainability Awards are intended to encourage Mt. SAC students to engage in the study and exploration of topics related to sustainability leading to the development of solutions to environmental and interrelated social problems confronting Mt. San Antonio College and the larger society." [124]

   Both Bellevue College (Bellevue College student project fund [125]) and Glendale Community College have similar awards.

Goal: Involve students in research that aids our campus sustainability efforts.

Action: Involve student interns in collecting our greenhouse gas (GHG) emissions data.

Rationale: Our baseline emissions study was performed by interns from Mt. SAC, and that research needs to be done annually.

Similarly, Cabrillo College awarded work-experience units to students who participated in their emissions inventory, and to students who continue to participate in developing and implementing their CAP. Centralia College also uses interns to help collect GHG data.

[124] http://mtsac.libguides.com/c.php?g=604882&p=4192018
[125] https://www.bellevuecollege.edu/sustainability/you/fund/

h. Sub-Action: Propose to secure annual funding for students to act as interns in collecting GHG data.

i. Sub-Action: Establish a training program or training manual to help new interns collect the required data.

Action: Establish internships for students participating in developing and implementing the Climate Action Plan.

Rationale: Some students have chosen to be involved in the Sustainability Committee and Climate Commitment Implementation Committee. However, the time commitment of implementing CAP plans may be more than students can justify without a formal recognition of their time and energy. Internships or some other award may suffice. One student intern has proven helpful in gathering research materials for writing this CAP, and future assistance will be of continued value.

Goal: Enable student participation in the installation of sustainability-related facilities projects on campus, such as landscaping and solar panels.

Rationale: Students often learn the most while completing real-world projects and research. At Cabrillo College, instructors are working on a proposal for student participation in the installation of working, grid-tied PV panels. Students in their Horticulture Department helped install a paver patio, rain gardens to reduce storm-water runoff, living wall panels, and rainwater catchments. Their farm has recently begun to supply organic food to on-campus food vendors.

Action: Explore an agreement with our Facilities Department to allow students to volunteer with particular sustainability-related building and maintenance projects.

Goal: Have students perform energy audits of several of the older buildings on campus.

Rationale: Students can use their knowledge of physics, thermal principles, unit conversions, and architecture to perform an energy audit. This report can then be used to prioritize the maintenance and remodeling priorities for the building. Centralia College has done this with student groups for several years.

Action: Recommend this project possibility to faculty in physics, architecture, interior design, and mathematics.

Research by Facilities

Goal: Have each of our buildings used as learning/living laboratories, where students, staff, faculty and community members may see the energy usage and savings taking place.

Rationale: Seeing live or at least recent data on how a building is used can lead to rapid improvements in efficiency. This data is also a potential resource for student projects, such as those to increase current operating procedures for the building. Colorado Mountain College uses this monitoring and data sharing for these purposes.

Action: Encourage Facilities to implement monitoring and dissemination of each building's energy data.

Action: Create a database populated with actual campus sustainability data. The database should be accessible, transparent, and easy to use.

Challenges

Mt. SAC is a large campus with many stakeholders. Encouraging any particular behavior can thus be difficult. Research may be a relatively low priority for students and faculty, but can be invaluable for all groups on campus, especially for tracking campus progress toward our sustainability goals.

SECTION 12 OUTREACH

The Climate Leadership Commitment compellingly illustrates the reason that the requirement for signatory colleges and universities to reach out beyond their own walls and borders to the residents and organizations that make up the communities of which they are a part is one of the four central pillars of the commitment that signatory schools make. For clearly, climate change is a collective action problem writ large. Ultimately global action will be required to successfully address it. The actions of one institution, state, or nation alone will not save the world from the catastrophic effects of runaway climate change. Yet, it is simultaneously true that there is an important role for leadership in addressing the climate challenge. By taking bold and aggressive action it may be possible for some to inspire others to act. That has been one of the important lessons of history, whether the challenge was winning the right to vote for women, expanding civil rights for African Americans and other minority groups, or developing regulations to limit environmental pollution.

The Climate Leadership Commitment, which is the preamble to the American College and University President's Commitment on Climate that President Scroggins signed in the fall of 2014 and the Carbon Commitment that Mt. San Antonio College is now a signatory to contains the following language:

> "We believe colleges and universities must exercise leadership in their communities and throughout society by providing the knowledge, research, practice, and informed graduates to create a positive and sustainable future. Along with other aspects of sustainability, campuses that address the climate challenge by reducing greenhouse gas emissions and by integrating resilience into their curriculum, research, and campus operations will better serve their students and meet their social mandate to help create a vital, ethical, and prosperous civil society… We urge others to join us in transforming society towards a sustainable, healthy, and more prosperous future." [126]

The Climate Leadership Commitment compellingly illustrates the reason that the requirement for signatory colleges and universities to reach out beyond their own walls and borders to the residents and organizations that make up the communities of which they are a part is one of the four central pillars of the commitment that signatory schools make.

In this section we will examine the role that Mt. San Antonio College currently plays in the broader community it inhabits as well as the policies, institutions and practices that other schools have put in place to foster more robust and sustained relations with their communities. The aim of this comparative case studies analysis will be to determine if there are lessons that Mt. San Antonio College can learn from the practices and institutions put in place at other schools that will enable it to deepen and enhance its own efforts to engage with, to serve, and to work in partnership with the broader community it is part of in the areas of climate change and sustainability. We believe that it is vital that the college enhance its efforts in these areas, not only to prepare ourselves and our communities to manage those effects of climate change that cannot be avoided and to avoid those effects that cannot be managed, but also to prepare for the considerable opportunities and benefits that the transition to sustainable societies and economies around the world promises.

[126] Second Nature, "The Climate Leadership Commitments," p. 2.

CURRENT ACTIVITIES

There are currently three key areas in which Mt. SAC is engaging community members and pursuing partnerships related to sustainability in the community. These are: (1) education programs for students and the community, (2) vocational training and research directly related to supporting green businesses and jobs, and (3) building partnerships to undertake projects related to sustainability. We will examine what the college is doing in each of these areas below.

Educational Programs for Students and the Community

Mt. SAC has sponsored seven annual Earth Day lectures to date, which are promoted to the larger Walnut community as well as to the campus community. These lectures have featured speakers such as Noel Perry, founder of Next Ten, and Tim Carter, President of Second Nature, as well as faculty from UCLA and other area schools and members of local government.

Dr. Deborah Boroch Discovery Day is an annual event sponsored by Mt. San Antonio College, which provides an opportunity for fourth- through seventh-grade students to explore areas of science and math in organized activities on campus. In 2017 the event theme was "Water Is Life," emphasizing the use of science and math to preserve our natural resources. Students were taken to the college's Wildlife Sanctuary to learn about the role of water in its six ecosystems: Meadow, Riparian, Woodland, Swamp, Lake and Pond. They also visited other campus locations to learn about water conservation. In 2016 the theme was Sustainability, and all of the breakout sessions addressed this theme.

Another way that Mt. SAC has promoted education regarding campus practices and design that incorporate sustainability is by creating Campus Sustainability Tours for new and current students, as well as for faculty. In the spring of 2017 President Scroggins provided funding for the development and implementation of these tours. Developed by students, the mission of the Campus Sustainability Tours is to promote awareness of Mt. SAC's current achievements in sustainability, as well as to encourage members of the campus community to become more involved in sustainability-related initiatives. The tours also encourage faculty to utilize sustainability features and initiatives as learning laboratories for their classes. The tours currently take students, classes, faculty groups, and clubs to three different locations on campus: (1) the Mountie Café, where tour guides speak about the campus dining facilities sustainable kitchen, recycling, and water usage; (2) the new Student Success Center building, where tour guides talk about L.E.E.D. architecture and energy efficiency, and (3) an area that serves as an example of drought tolerant landscaping on campus where student tour guides speak about California native plants and drought-deciduous landscaping, as well as water conservation.

The Environmental Action Group for a Livable Earth (EAGLE) club also organized a 50th anniversary celebration for the Wildlife Sanctuary in the spring of 2017, which was marked by President Scroggins' announcement that the college is setting aside additional land to be preserved in perpetuity as part of the Wildlife Sanctuary. The event also honored Craig Petersen, the director of the Wildlife Sanctuary for the past 37 years.

Tours of Mt. San Antonio College's working farm are another form of education that the college provides to local schools that features a significant amount of information about sustainability. The tours are organized through the Agriculture Student Ambassadors and District 48. According to Joyce Ellison, an Administrative Specialist in the School of Continuing Education, the farm hosted 22 different schools or

organizations with 1,262 students and 243 adults in 2015. It hosted 17 different schools or organizations with 973 students and 154 adults in 2016. It hosted 12 different schools or organizations with 345 students and 150 adults in 2017.

Tours of Mt. San Antonio College's Wildlife Sanctuary are yet another form of sustainability education that the college provides to local schools. The tours are organized through the Office of Community Education by Joyce Ellison. According to Ms. Ellison the Wildlife Sanctuary hosted 19 schools or organizations with 755 students and 140 adults in 2015. It hosted 14 different schools or organizations with 441 students and 134 adults in 2016. It hosted 12 different schools or organizations with 345 students and 150 adults in 2017.

Two members of the Climate Commitment Implementation Committee were featured in a Mt. SAC podcast addressing sustainability issues on campus. The podcast is now available online.[127]

Training and Research to Support Green Businesses and Green Jobs

In the spring of 2017 Mt. SAC began working with Strategic Energy Innovations, which partners with Southern California Edison and Southern California Gas. Strategic Energy Innovations sponsors the Energize Colleges program, which creates fellowships and internships related to energy conservation and climate, on college and university campuses across the state. These internships provide substantive work experience to students who are studying and considering energy career pathways, while also significantly reducing energy use through intern-led projects on campus and (where feasible) in the community. The internships also often involve meeting climate-related goals. At Mt. SAC, for example, the Energize Colleges Fellow and interns have been working on gathering data to complete the college's 2016 greenhouse gas inventory. They have also been assisting HMC Architects, the firm hired to author the greenhouse gas mitigation portion of Mt. SAC's Climate Action Plan, to collect data on greenhouse gas emissions in the campus' transportation sector and to update the college's Sustainability Webpage.

The Proterra Corporation has partnered with Mt. San Antonio College to create a non-credit class for individuals looking to further their knowledge in the field of manufacturing zero-emissions buses at Proterra's factory in The City of Industry. Proterra's battery-electric buses help fleet operators abandon fossil fuels, improve environmental quality, and reduce operating costs. The course at Mt. SAC will be called the "Advanced Manufacturing and Electrical Systems Program." This course will span a period of ten weeks with the stated purpose of preparing students for jobs at either the Proterra Bus Factory or another electric vehicle manufacturing facility.

Mt. SAC's Continuing Education department is also developing non-credit certificates in the fields of solar panel installation and green construction. The solar panel installation certificate is expected to be in the curriculum by the Fall 2019 semester. Professor Ignacio Sardinas, Chairman of the Architecture Department, is currently working with Dr. Pablo La Roche of California Polytechnic State University – Pomona to develop a certificate in Environmental and Sustainable Design, with the aim of strengthening ties between Mt. SAC and Cal Poly Pomona in this area. To support this initiative, the Architecture Department is currently in the process of adding the new course Architecture 180: "Science Concepts for Environmental and Sustainable Design."

[127] Magic Mountie Podcast. Episode 8: A Talk and a Tour: Faculty, Sustainability, and the Conundrum of Purple Pants. http://www.mtsac.edu/pod/magic-mountie-podcast/index.html

Sustainability Partnerships With the Community

In the Spring 2017 semester, members of the student group EAGLE joined together with members of other student groups to undertake a park clean-up project. The purpose of the park clean-up project was to build a more constructive relationship between Mt. SAC and the City of Walnut. The park clean-up project included students from over 10 student clubs, political science and biology classes, faculty, and Walnut City Council Member Andrew Rodriguez. Altogether nearly 50 people attended the park clean-up project. All eleven parks were cleaned in the City of Walnut as a result of this project.

The Rhodes Elementary School garden revival project was a volunteer project done as part of a community outreach and support initiative from the Mt. San Antonio College Agriculture Sciences Department. This project came through Agriculture Department Chair, Professor Brian Scott. The project was a volunteer team effort between the Agriculture Student Ambassadors, the Horticulture Club and alumni at Mt. San Antonio College. The goal was to kindle awareness about the importance of plants among elementary school children through the renewal of their garden. The project team had four members on average to twelve members during the final phase. The work involved various tasks from coordination, consultation, project design and estimation to weeding, mulching and turning on the existing irrigation, as well as the transformation of a nonfunctional pond area at the school to a drought tolerant planter. The completed school garden was handed over to the school for maintenance.

WHAT OTHER ACADEMIC INSTITUTIONS ARE DOING

Pitzer College in Claremont, CA

Pitzer College has partnered with the Ontario, California-based community organization Huerta del Valle (HdV) in an effort to reduce the greenhouse gas emissions associated with the College's food waste. Now, instead of generating food waste in the College's dining hall and sending it to the landfill, the waste is collected and transported to Huerta del Valle, where the food is composted. The finished compost is then applied to the campus garden. Pitzer students also recently founded a chapter of the Food Recovery Network on campus, and partnered with the Salvation Army to donate leftover food from the dining hall twice a week. Students have donated over 2,500 pounds of food since the chapter opened in the Spring of 2016.[128]

Pitzer College's Redford Conservancy is committed to a vision "that connects undergraduate students with faculty, alumni, scientists, policy-makers, artists, and other members of the local and regional community, to engage in interdisciplinary and team-based ventures for the wellbeing of the natural and social world". Some examples of Pitzer College's initiatives include: (1) The ReRoom Program, a student-led initiative that aims to promote a culture of sustainability on campus through the collection and reuse of used items donated by Pitzer College residents at the end of each semester. All proceeds from ReRoom sales go toward supporting student sustainability initiatives. (2) The ReSource, a no-cost drying rack and compost bucket checkout program available to students, staff and faculty. (3) The PowerDown Program, an annual, three-week energy reduction competition that occurs on all five Claremont college campuses. (4) The TRIP program, administered by the Office of Human Resources, is a rideshare program for eligible faculty and staff designed to encourage employees to use alternative modes of transportation that reduce greenhouse gases and particulate pollution on campus and in the

[128] Second Nature, "Annual Progress Evaluations," http://reporting.secondnature.org/

surrounding community.[129]

Pitzer College has also demonstrated engagement in public policy advocacy through its decision to divest its endowment of fossil fuel company stocks. Pitzer was the first higher education institution in Southern California to commit to divesting its endowment of fossil fuel stocks.[130]

California State University, Long Beach, CA

CSULB's Center for Community Engagement (CCE) works to connect students and faculty with opportunities to participate in community engagement through service learning projects that meet societal needs, many of which relate to sustainability. For example, the CCE and the "Climate Action & Sustainability at CSULB" course have worked closely with local Long Beach non-profit organizations such as East Yard Communities for Environmental Justice (EYCEJ). Projects engage local communities and raise awareness about the impacts of climate change -- particularly for under-represented communities of color -- so that those communities are empowered to be part of the decision-making processes that directly impact their health and quality of life. Students are also working with the City of Long Beach to support efforts related to resilience planning and research. Expansion of these efforts has primarily been focused on building stronger ties with the CCE and Sustainability Office in order to foster collaboration between the university and the Long Beach community.[131]

Harper College, Palentine, Illinois

Harper College is a member of the Illinois Green Economy Network (IGEN), an organization of 48 community colleges in Illinois working together to grow a greener economy. As part of this organization Harper College is able to participate in IGEN-funded initiatives and programs. It also has the opportunity to collaborate with other member colleges and it receives and can contribute news stories to the network's newsletter which is helping to increase visibility for college sustainability successes statewide and nationally. Harper College has also joined the Chicagoland Network for Sustainability in Higher Education (CNSHE), a network of Chicago area colleges and universities working to advance sustainability in higher education through collaboration and sharing best practices. Harper College participates in quarterly meetings, shares successes in sustainability at Harper College and contributes to regional sustainability advances.[132]

Sacramento State University, Sacramento, CA

Sacramento State Sustainability has developed a partnership with the Capital Region Academies for the Next Economy (CRANE). CRANE is comprised of 17 high schools in the Sacramento and Greater Sacramento Region. CRANE is Career Technical Education, with avenues of learning such as Construction, Manufacturing, Health & Biology, Agriculture & Food Production, IT, and Engineering. The mission of CRANE is to provide students in the Capitol Region rigorous academic and career pathways, which are linked to economic and labor market needs and trends, thus helping students become the next leading entrepreneurial workforce for the green economy. Sac State Sustainability has partnered with schools participating in the CRANE program to provide students with an opportunity to visit the Sac State campus in person and participate in a guided tour throughout campus led by the Sac State

[129] Ibid.
[130] AASHE, "Campus Sustainability Hub," https://hub.aashe.org/
[131] Second Nature, Annual Progress Evaluations, Ibid.
[132] Ibid.

Sustainability team to explore various sustainability projects in action.[133]

Since Agriculture & Food Production is a significant area of interest for the CRANE students visiting Sac State, seeing the university's aquaponics project shows them how to cultivate sustainable agriculture in a closed-loop, zero waste system, while learning how to grow food with minimal water impact. The Capital Public Radio garden teaches students about organic farming in small, urban areas such as a back yard, and how it's possible to grow in all seasons in small planter beds. The LID project teaches students that rain-water capture systems help support thriving ecosystems and natural resources, such as the university's river, by keeping contaminated run-off to a minimum, while replenishing groundwater supply and aiding in water conservation efforts. The composting yard and closed-loop food to fuel Hornet Shuttle system teach students that even waste is a valuable resource. All of this is applicable to learning pathways through the CRANE program and shows that sustainability isn't just an idea, it is an applied approach to operations and can be applicable in various settings, business models, and industries.[134]

Recommendations to Enhance Mt. SAC's Community Outreach Efforts

Based on the preceding comparative analysis of community outreach efforts at Mt. SAC and other schools, although Mt. SAC is doing a considerable amount in the area of community outreach around issues of sustainability, there is a demonstrable need as well as the potential to do more. Though the college's efforts have been rapidly increasing in recent years, efforts have often been sporadic rather than sustained and continuous, driven by individual initiative rather than by a coordinated plan or strategy. Consequently, we recommend that Mt. SAC work with municipal government and community organizations to build institutions to support further engagement with the broader community in each of the three key areas examined above: education programs, vocational training and research, and project partnerships.

Community Outreach Programs:

For educational outreach to the community, the college should seek, where feasible, to model these institutions on the CRANE network of schools in the Greater Sacramento Region.

Specific recommended actions: Designate staff and office to handle organization of all sustainability-related educational programs on campus so that there is one point of contact for these programs and that is all they do. There have been anecdotal complaints about lack of proper organization of some of the tours of the Wildlife Sanctuary in the past and this likely has to do with overburdening of staff that has other duties. Also the Farm tours are supposed to be handled by a different office and staff than the Wildlife Sanctuary tours presently, which seems like a recipe for confusion.

Vocational training and research:

Similarly, the Illinois Green Economy Network illustrates the potential for community colleges to work together to speed the transition to the green economy by providing training for green jobs and for entrepreneurs interested in creating green businesses.

[133] Ibid.

[134] Second Nature, Annual Progress Evaluations, Ibid.

Specific recommended actions: Task the business department on campus with conducting an inventory of all green businesses in the Mt. SAC region and surveying them regarding labor force needs that Mt. SAC can provide. Also task an office or department on campus with contacting other schools in the region and exploring possible opportunities for collaboration with regard to meeting training and labor force needs of green businesses as well as research needs of green businesses. Consider further study of the Illinois Green Economy Network to glean lessons concerning the creation of a consortium of regional schools and businesses that can work together with policy makers to develop the green economy and sustainable society of the 21st century.

Project partnerships

Finally, the Center for Community Engagement at CSULB illustrates the potential for building partnerships between academia and community organizations working on issues of sustainability and environmental justice. Pitzer College's Redford Conservancy provides another model in this area.

Specific recommended actions: Hire a Sustainability Director and task them with regularly meeting with municipal sustainability officers in the Mt. SAC region (e.g. Melissa Barcelo and Chris Vasquez in Walnut Municipal government and Marlene Carney in the Irwindale Chamber of Commerce)

Sustainability Center

We propose that Mt. SAC establish a Sustainability Center on campus. This center would be responsible for assisting ongoing work coordinating educational tours on campus (such as Sustainability Tours or through the Agricultural Literacy Trail) and doing community outreach for sustainability-related events (such as Earth Day events and the Dr. Deborah Boroch Science Discovery Day). The center could continue the work currently being done by Joyce Ellison in the Department of Continuing Education and by student clubs to ensure better organization and a single point of contact for all schools and organizations wishing to schedule Sustainability Tours. This center should also play a proactive role in publicizing tours and educational programs to area schools, organizations, and members of the community.

The creation of a Sustainability Center on campus and the hiring of a full time Sustainability Director can be used to build relationships with municipal government and community partners over time in the areas of green jobs and joint sustainability projects. By defining the Sustainability Director's duties to include sitting on community boards related to sustainability and meeting regularly with Sustainability Directors at other schools with an interest in partnering on sustainability projects, Mt. SAC might begin to lay the foundation for an institutional infrastructure in the future that would enable it to play a more robust role in educating the broader community, building the green economy, and working on local sustainability projects with other community partners. By laying the foundation for this institutional infrastructure in the five year period after the completion of its first Climate Action Plan Mt. SAC can play the pivotal role in facilitating the transition to the just and sustainable society that the American College and University Presidents' Climate Commitment envisions for it.

SECTION 13 MEASURE AND REPORT PERFORMANCE

As with any successful program, the ongoing progress and performance of Climate Action Plan activities must be monitored and compared to goals to assess progress. This will require hiring of the Sustainability Director and release time for the Sustainability Coordinator, as well as the continuous participation of the Climate Commitment Implementation Committee, college staff, and other participants in the process. To communicate results and ensure transparency and accountability, the results of CAP activities will be communicated to the larger campus community on a regular basis.

The following section describes the planned process for measuring and reporting sustainability activities and achievements.

MEASURING PERFORMANCE

To monitor Mt. SAC's progress towards its sustainability goals, the CCIC plans to the following key metrics at the regular intervals described below.

Component	Performance Metric	Frequency
Total Energy Use	Change in total annual electricity and gas use.	Annual
Energy Use Intensity	Change in total annual electricity and gas use per student/staff/faculty and/or per conditioned square foot.	Annual
Renewable Energy Use	Change in total annual renewable energy use and/or percent of total annual energy use that is generated from renewable sources	Annual
Water Use	Change in total annual water use.	Annual
Water Use Intensity	Change in total annual water use per student/staff/faculty.	Annual
Waste Diversion and Management	Percentage of waste diverted and increase or decrease from the previous year.	Annual
Transportation Efficiency	Total VMT reduced or number of single occupancy vehicles reduced.	Bi-Annual
Greenhouse Gas Emissions	Total and change in annual campus GHG emissions in tonnes CO_2e.	Bi-Annual
Greenhouse Gas Emission Intensity	Total and change in campus GHG emissions in tonnes CO_2e per student.	Bi-Annual
Green Curriculum	Number of leaf-designated courses. Number of students enrolled in leaf-designated courses. Number of faculty in sustainability-related trainings. Number of students using online sustainability pledge (if established).	Annual
Avoided Costs	Total dollars saved as a result of sustainability actions.	Annual*

*Only after establishing a system (such as GRITS[135]) for tracking savings.

[135] Green Revolving Investment Tracking System. GRITS - Sustainable project management made easy. http://www.gogrits.org/

REPORTING PERFORMANCE

In order to keep the campus community informed of the progress of the CAP activities, the CCIC will post events, progress, and links to submitted reports on the Mt. SAC sustainability website at http://mtsac.edu/sustainability. Additionally, the Sustainability Director will summarize activities, metrics, and progress towards goals in an bi-annual report, which will also be available publicly on the sustainability website.

Mt. SAC will submit the campus GHG inventory and Climate Action Plan to the Second Nature reporting system. To increase transparency, Mt. SAC will also seek to participate in the Sustainability Tracking, Assessment, and Rating System (STARS) to evaluate the overall campus sustainability.

APPENDIX: CALIFORNIA STATE CLIMATE REGULATIONS

California State Climate Regulations

State of California Executive Order S-3-05

Executive Order S-3-05 was signed by the Governor of California in 2005, thereby identifying the California Environmental Protection Agency (Cal/EPA) as the primary state agency responsible for establishing climate change emission reduction targets throughout the state. The Climate Action Team, a multi-agency group comprised of various state agencies, was formed to implement the Executive Order S-3-05. Shortly thereafter in 2006, the team introduced GHG emission reduction strategies and practices to reduce global warming. These measures are aimed at meeting the Executive Order's long term goal of reducing GHG emission to 80 percent below 1990 levels by 2050.

Assembly Bill 1493 (The Pavley Bill)

Assembly Bill 1493, widely known as "The Pavley Bill", was passed in 2002 and authorizes CARB to establish regulations to reduce the GHG emissions from passenger cars and light trucks by 18 percent by 2020 and 27 percent by 2030 from 2002 levels. This aggressive bill was temporarily blocked by the US EPA in March 2008 and later received a waiver of approval for implementation throughout California in June 2009.

Low Carbon Fuel Standard (LCFS)

The Low Carbon Fuel Standard (LCFS) was established in January 2007 by Executive Order S-01-07 and requires California fuel providers to decrease lifecycle fuel carbon intensity of transportation fuels by 10 percent from 2007 levels by 2020.

California Renewables Portfolio Standard

The California Renewables Portfolio Standard (RPS) was established in 2002 under Senate Bill 1078 and mandated that electrical corporations increase its total procurement of eligible renewable resources by at least 1 percent a year to reach a goal of 20 percent electricity generation from renewable resources. These goals were accelerated in 2006 under Senate Bill 107, which mandated that at least 20 percent of the total electricity sold be generated from renewable resources by the end of 2010. The RPS was further extended in 2008 by Executive Order S-14-08, which required that 33 percent of total electricity sales be generated from renewable resources by 2020. In April of 2011, this RPS standard of 33% renewable by 2020 was enacted into law through final passage of Senate Bill X 1-2 (Simitian) and extended to apply to both public and investor owned utilities.

Senate Bill 97

Senate Bill 97, passed in 2007, required the Governor's Office of Planning and Research (OPR) to develop and recommend amendments to CEQA Guidelines for addressing GHG emissions related to land use planning. The amendments to CEQA were approved and became effective in March 2010, thereafter requiring all CEQA documentation to include and comply with the new amendments established for addressing greenhouse gas emissions.

Senate Bill 375

Senate Bill 375 was passed in 2008 to reduce GHG emissions caused indirectly by urban sprawl throughout California. The bill offers incentives for local governments to execute planned growth and

development patterns around public transportation in addition to revitalizing existing communities. Metropolitan Planning Organizations (MPOs) work with CARB to reduce vehicle miles traveled by creating sustainable urban plans with a comprehensive focus on housing, transportation, and land use. Urban projects consistent with the MPO's Sustainable Community Strategy (SCS) can bypass the CEQA's GHG emission environmental review. This provides developers with an incentive to comply with local planning strategies which support the State's greater effort for overall emission reduction in the land use and transportation sector.

Assembly Bill 341

Starting July 1, 2012, businesses and public entities, including schools and school districts that generate four cubic yards or more of waste per week and multifamily units of five or more will be required to recycle, if they are not already doing so. AB 341 also establishes a statewide goal of 75% diversion of solid waste to landfills. The purpose of this new law is to reduce greenhouse gas emissions by diverting commercial solid waste to recycling efforts and expand opportunities for additional recycling services and recycling manufacturing facilities in California.

Regional Air Pollution Control Districts (APCD) and Air Quality Management Districts (AQMD)

In 1947, the California Air Pollution Control Act was passed and authorized the creation of Air Pollution Control Districts (APCDs) and Air Quality Management Districts (AQMDs) in every county. APCDs and AQMDs are tasked with meeting federal and state air pollution requirements set by the Clean Air Act and can develop regulations to achieve the necessary public health standards, though these regulations need approval from CARB and the US EPA. APCDs and AQMDs have jurisdiction over businesses and stationary sources of emissions and can offer varying levels of outreach, grants, and CEQA review and technical assistance to interested public and private parties. The APCDs and AQMDs do not have the authority to regulate mobile air pollution sources, which is the responsibility of CARB, and must defer to state or federal regulations provided by the California Air Resources Board and the U.S. Environmental Protection Agency.

Appendix: Leaf Course Designation

Background:
Mt. SAC is committed to sustainability. In 2014 President Scroggins signed the American College & University Presidents' Climate Commitment; part of this pledge calls for integrating sustainability into the curriculum and making it a part of the educational experience for all students.

Colleges and universities have the unique opportunity and responsibility to advance knowledge, understanding, and commitment among students who will be future leaders. As such, we have a crucial role in the development of a sustainable society.

Guidelines for Sustainability-Related ("Leaf-designated") Classes at Mt. SAC:
A sustainability-related course section is one in which a particular instructor has chosen to integrate sustainability concepts into the course content. This does not indicate additional work for students. Sustainability is used as context for achieving the same learning goals that the other course sections are also working towards. Additionally there may be a sustainability-related student learning outcome established for this section. These offerings are appropriate for students learning about sustainability for the first time or for those more familiar, to see it from a new perspective.

Sustainability-related classes may include sustainability as a unique course component or module, or infuse sustainability concepts as appropriate throughout the course.

Sustainability education is more than just transferring knowledge about sustainability issues and how to tackle them. It has a focus on changing mindsets, developing skills in critical and systemic thinking, and enhancing capacity for facilitating change. It is about giving people, communities and organizations, new sets of skills and knowledge, so that they can identify and respond to sustainability challenges, in ways which lead to long-term and sustained change.

A widely accepted definition of sustainable development was given by the World Commission on Environment and Development in 1987. The Commission defined sustainable development as "forms of progress that meet the needs of the present without compromising the ability of future generations to meet their needs."

The American Association for Sustainability in Higher Education (AASHE) further identifies three elements of sustainability: economic sustainability, social sustainability, and environmental sustainability. The relationships among these three elements must be considered to ensure the long-term viability of our communities and our planet.

Ideally, a Sustainability-Related class would advance all three components listed below; however, including a single component is also sufficient. The course instructor need not teach specific content in the component areas, but it can help to introduce and emphasize the interconnectedness among them.

Environmental sustainability is a state in which the demands placed on the environment can be met without reducing the environment's capacity to allow all people and supporting ecosystems to flourish indefinitely. This includes the ability to manage the use of renewable and non-renewable resources so

that we will continue to have natural resources necessary to support a healthy life and healthy environment in the future.

Social sustainability is the ability of a social system, such as a community or a country, to satisfy human needs and to function at an acceptable level of social well-being and satisfaction indefinitely. It involves the harmonious evolution of a civil society with culturally- and socially-diverse groups seeking improvements in the quality of life for all segments of the population.

Economic sustainability is the state in which individuals, corporations, and political units take actions related to natural, human, and financial resources so that responsible decisions are made regarding long-term social and environmental impact.

It is difficult to discuss one aspect of sustainability without recognizing the interdependencies among the three components described above. The following list provides examples of sustainability issues that might be addressed in classes at Mt. SAC. Many other topics could also be relevant to your courses. As you read the list, consider how each topic includes aspects of environmental, social, and economic sustainability.

- Urban regeneration and community development
- Cultural diversity
- Alternative energy sources
- Water safety and water scarcity
- Transportation
- Ecology, ecosystems, and biodiversity
- Pollution and waste
- Climate change
- Peak oil and other non-renewable resources
- Carbon footprinting
- Education systems and workforce development
- Corporate responsibility
- Employee health and safety
- Human rights, social justice, race and gender equity
- Social support systems
- Labor rights
- Civic engagement, community involvement, and governance
- Globalization, consumerism and ethical trade
- Wellbeing and health equity
- Natural resource depletion
- Sustainable agriculture and food security

How can environmental sustainability, social sustainability, and economic sustainability be interconnected in the classroom? Here are some examples:

Connections among people, planet, and profit:
Show this six-minute video: “Sustainability at Delta College.” https://youtu.be/2RzqCv2UZJs (Permission granted by Donna Giuliani.)

Health equity, consumerism, food security, pollution & waste:

Although many people don't think they have a voice when it comes to the foods that are produced and the prices that are associated with those foods when they enter a grocery store, they are misled. When we go to the grocery store and purchase a food item we are voting for the food when it gets scanned (wellbeing and health equity). It is no secret that many Americans are voting strongly for fast and unhealthy foods. When the demands for these foods are apparent, the prices for food produced in large quantities can be reduced. This makes it difficult for healthy foods with a shorter shelf-life to remain at a lower cost (consumerism). It is increasingly difficult for areas of poverty to have access to healthy foods as well (food security). When faced with feeding a family, a person might opt for the $1 menu versus higher-priced produce because of the quantity of food they are able to purchase. When food is mass-produced, it also has an effect on our environment. These effects include waste run off (pollution and waste) from large animal feeding operations.[136]

Natural resource depletion, corporate responsibility, and social justice:
Overfishing in North Atlantic led to depletion of cod and Canadian law banning cod fishing for 10 years (environmental). Large corporate trawlers had disturbed spawning grounds in efforts to get all the fish for immediate profit, ignoring the fact that when the fish were gone, profits would disappear (corporate responsibility). Local families that fished sustainably for generations were denied their livelihood and way of life (social).[137]

Courses designated as sustainability-related may contain the following components:

- Integration of basic and applied knowledge from multiple disciplines, including the natural and social sciences, to analyze human-environment interactions.
- Analysis of the tradeoffs or benefits involved in managing resources for the social, economic, and environmental welfare of current and future generations.
- Development of alternative strategies for the use of natural, human, and fiscal resources that are compatible with the constraints on these resources.
- Implementation of practical solutions to socioeconomic and environmental challenges, including those that relate to energy, technology, ecosystems, social transformations, food systems, policy, and governance.

Sustainability-related classes may SEEK TO achieve the following where applicable:

- Enable students to identify and articulate existing sustainability threats and challenges related to the course subject area.
- Promote critical thinking and problem solving as responses to existing and potential sustainability issues related to the course subject area.
- Encourage students to make cross-disciplinary connections among the environmental, social, and/or financial aspects of sustainability as they pertain to the course subject area.
- Advance discussion about sustainability topics within the students' field of study and their future careers.
- Encourage examination and reflection on personal attitudes and habits, and inspire students to integrate sustainability concepts into their own personal actions.

[136] Renée Hoppe, MS, CSCS. Delta College. reneehoppe@delta.edu.
[137] Janis Kendziorski. Delta College. jwkendzi@delta.edu.

This form is used by faculty requesting sustainability-related "leaf" designation. Leaf designation will apply only to the specific course sections requested (see options below) and will continue for these sections until an instructor requests that it be removed.

Instructor name: _____

Instructor email: _____

Semester and Year leaf designation should begin: _____

Division: _____

Course name: _____

Indicate in the appropriate box below which course sections should receive the leaf designation:

- ☐ All sections taught by ALL instructors
- ☐ All sections taught only by the instructors listed (include yourself):
- ☐ Other (please explain):

Sustainable actions allow people to meet the needs of the present without compromising the ability of future generations to meet their own needs. Actions can have environmental, social, and/or economic impact.

Which of the following components of sustainability will be included in your course? (Check all that apply):

- ☐ Environmental: (ecosystems, natural resources, etc.)
- ☐ Social: (social well-being, civil society, etc.)
- ☐ Economic: (long-term impacts of financial decisions, etc.)

Describe specific sustainability issues that relate to your course content:

How will you integrate sustainability into your course?

Will you incorporate consequences of unsustainable practices into your course? If so, how?

Describe or provide at least one meaningful assignment related to sustainability that you will include in your course. Explain your method for assessing the student's grasp of the concepts.

If you have questions, please contact our Sustainability Coordinator.

Side notes regarding the LEAF designation form:

Delta College initiates designation by means of an online form submitted by the instructor to an Academic Sustainability Coordinator. Formal designation as “Sustainability Related” continues until the instructor requests that the designation end. This designation is also section-specific.

The designation process is designed to encourage legitimate compliance. An instructor seeking designation completes the form themselves, and receives no benefit for the designation, and therefore has little incentive to falsely claim the designation. If the designation becomes less meaningful in the future, the definition of significant may merit more discussion.

Appendix: Sample Course Candidates for LEAF Designation

The classes listed are examples which could get LEAF designation as they are, but would require department initiative to do so.

- **AGAG 1: Food, Land Use, & Politics:** "Surveys the world's food producing systems in terms of economic, political, and cultural forces. Emphasizes ethical, sustainable food producing agriculture."
- **AGOR 35: Plants for Southwest Climates:** "Identification, growth habits, culture and ornamental use of annuals, perennials, groundcovers, shrubs, trees, cacti, and succulents which are native to California and the Southwest, or drought tolerant in Southern California."
- **AGOR 62: Irrigation Principles and Design:** "Special emphasis is given to water conservation."
- **AGOR 63: Irrigation Systems Management:** "Systematic approach to water conservation in landscapes."
- **AGOR 64: Irrigation - Drip and Low Volume:** "Conservation of water in landscapes by utilization of drip and low-flow irrigation practices."
- **AIRC 67: Energy Management:** "Includes theory for sustainable Green Building Technologies with introduction to Energy Star Buildings and LEED programs."
- **ARCH 202: Design Level 4 - Advanced Project:** "Fourth level architectural design studio focusing on sustainability, energy efficiency and environmental conservation. Emphasis is on critical thinking and problem solving involving material selection, envelope design, advance space planning and the development of designs from complex building programs."
- **BIOL 1: General Biology:** "Major principles and concepts, including cellular biology, energy relationships, biological systems, heredity, evolution and ecology for non-science majors." (Some sections emphasize sustainability issues.)
- **BIOL 3: Ecology and Field Biology:** "Emphasizes evolutionary relationships; ecology including animal behavior, communities, ecosystems, wilderness and wildlife preservation, and population dynamics."
- **BIOL 6: Humans and the Environment:** "Ecological concepts to aid understanding the Earth's environmental crisis and determining courses of action to correct the problem. Emphasis will be placed on specific problems of population, pollution, preservation of wildlife and wilderness, and open space. A historical appraisal of human attitudes toward the land and of the necessity of developing a new land ethic."
- **BIOL 6L: Humans and the Environment Lab:** "Investigates major principles and problems of humans and the environment in the field and in the biological science laboratory."
- **BIOL 25: Conservation Biology:** "Concepts of conservation biology for natural resources, including biogeography, biodiversity and extinction, environmental law, public lands, and conservation organizations. Emphasis on strategies important to addressing biological conservation and sustainable management of natural and managed ecosystems."
- **ECT 70: Elements of Construction Management:** "Construction processes, terminology, and procedures. Topics include construction careers, building systems, sustainability, quality control, management, and scheduling of resources."
- **ENGL 1A: Freshman Composition:** Some sections that utilize sustainability-related readings and research topics.
- **GEOG 1: Physical Geography:** "Study of the natural processes creating the Earth's physical environments with emphasis on the inter-relationships of natural processes and systems."

- **GEOG 2: Human Geography:** "Human geography with emphasis on critical areas of inquiry and research. Focus on the interconnections of place and process in several sites around the globe."
- **GEOG 8: The Urban World:** "Geographical analysis of past and current patterns of world urbanization. Emphasis is on city origins, growth, development, and current problems."
- **GEOG 30: California Geography:** "Includes an examination of the physical processes that shape the landscapes of California, the interaction of humans with these physical processes (particularly the importance of water), and the cultural and social landscapes that have evolved as a result of this human-environment interface."
- **GEOL 9: Environmental Geology:** "Human interactions with the geological environment for non-science majors. Relevant aspects of the geological environment and the problems currently caused by humans as they use the earth and its resources. Geologic hazards, including earthquakes, volcanoes, landslides, floods, subsidence. Emphasis on geological viewpoints concerning waste disposal, pollution, geothermal energy, fossil fuels, and mining. Geologic practices related to sound land management, conservation of resources, and protection of the environment."
- **HIST 1: History of the United States:** Some sections that utilize sustainability-related readings and research topics.
- **ID 29: Interior Design Studio I:** "Analysis and application of design concepts to interior environments. Focuses on the creative process of identifying, evaluating and solving design problems while incorporating universal and sustainable design in a studio environment."
- **ID 39: Interior Design Studio II:** "Focuses on the creative process of identifying and solving design problems incorporating universal and sustainable design."
- **LIBR 1: Information Resources and Research Methods:** Some sections that utilize sustainability-related readings and research topics.
- **POLI 10: Environmental Politics:** "Global environmental problems including an analysis of political theories and comparative policies in the emerging field of environmental politics."
- **VOC AGG 01: Food Production, Land use & Politics - A Global Perspective:** "Surveys the world's food producing systems in terms of economic, political and cultural forces. Emphasizes ethical, sustainable food producing agriculture."

Appendix: Climate Commitment Implementation Committee Purpose And Function

(Governance Committee – Reports to President's Advisory Council)

Purpose
The Climate Commitment Implementation Committee exists for the purpose of: (1) providing education about the Climate Commitment (formerly known as the American College and University Presidents' Commitment on Climate – ACUPCC) and (2) overseeing the sustainable implementation of the requirements of the ACUPCC Carbon Commitment, which Mt. SAC is a signatory to (below):

- Raising awareness within the campus community and the broader community about climate change and the institutional and cultural changes that need to be made to adapt to unavoidable climate change, on the one hand, and prevent unmanageable climate change, on the other.
- Supporting the incorporation of sustainability and climate change across the curriculum.
- To work with the Mt. SAC Sustainability Committee to increase awareness about sustainable lifestyles, forms of economic production and development.
- Promoting compliance with laws and regulations affecting greenhouse gas emissions and sustainable use of resources.

Function
The Climate Commitment Implementation Committee reports to the campus President and chief academic and business officers and is responsible for overall development, coordination, and supervision of regular greenhouse gas inventories as well as the development and implementation of a climate action plan which will serve as a blueprint for Mt. SAC's achievement of neutrality in greenhouse gas emissions over a specified period of time. The committee will also recommend steps to meet other requirements of the ACUPCC.

1. To serve as the primary advisory body to the President's Advisory Council regarding the American College and University Presidents' Climate Commitment.
2. To ensure completion of a greenhouse gas emissions inventory within one year of signing the ACUPCC and at least every other year thereafter.
3. To develop a climate action plan that will make recommendations regarding the development, implementation, and facilitation of: (1) the achievement of zero net greenhouse gas emissions; (2) integration of sustainability into the curriculum and research & professional development; and (3) sustainable use of resources.
4. To facilitate communication and study of best practices in the area of sustainability and rapid and widespread assimilation of this knowledge.
5. To make greenhouse gas inventories, the climate action plan and progress reports publicly available.
6. To promote economic practices on campus and within the broader community, including purchasing and investment policies that are in alignment with sustainability and the goal of net neutrality in greenhouse gas emissions.
7. To promote outreach to the broader community on issues of climate change, greenhouse gas emissions reduction and sustainability.

Appendix: Recommendations Regarding Divestment

Development of a Mt. SAC Investment Policy on Sustainability
The American College and University Presidents' Climate Commitment, which President Scroggins signed in the fall of 2014, includes the following requirement: "Establish a policy or a committee that supports climate and sustainability shareholder proposals at companies where our institution's endowment is invested." Schools around the country, including Harvard University, Duke University, and many others, have developed comprehensive socially-responsible investment policies that include environmental sustainability as one factor.

What follows is a short survey of what other California schools have done in this area.

Foothill-De Anza Fossil Fuel Divestment Policy

RESOLUTION

Environmental Sustainability is critically important to the Foothill-De Anza Community College District, the state of California, and the nation. Reducing carbon dioxide emissions from the burning of fossil fuels is central to this objective. The District is committed to stewardship of the environment and to reducing the District's dependence on nonrenewable energy sources.

As an auxiliary organization of the Foothill-De Anza Community College District, the Foothill-De Anza Foundation Board of Directors is committed to sustainability. As such, the Foundation Board will cease any new direct investments in fossil fuel companies. Furthermore, the finance company will direct the Foundation's current asset managers to minimize investments in commingled assets that include fossil fuel companies. Finally, the Foundation will divest from any current fossil fuel holdings by the end of our current fiscal year, June 30, 2014. We define "fossil fuel companies" as companies with the greatest holdings of unburned carbon reserves of coal, oil and gas. In practice, we currently are using the top 200 companies on the Carbon Tracker list as published by the Fossil Free website.

University of California System
On September 10, 2014 the University of California announced a series of measures to make UC a national leader in sustainability. Among the measures are recommendations to:

1. Allocate $1 billion over five years for direct investments in solutions to climate change.
2. Adhere to the United Nations-supported Principles for Responsible Investment (PRI), the largest university and the first public American university to do so.
3. Establish and implement a framework for sustainable investment with the goal of completion by the end of the current fiscal year.
4. Integrate environmental, social and governance factors as a core component of portfolio optimization and risk management. Evaluate all strategies for achieving these goals as soon as practical, including whether to use divestment.

California State Assembly
In September of 2015 the California Assembly passed SB 185 calling on CALSTRS and CALPERS to divest holdings in coal-related financial assets. It is expected that legislation calling for divestment from all fossil fuel stocks will be introduced in the state senate in 2018.

Student Senate for California Community Colleges
At its Fall 2015 General Assembly the Student Senate for California Community Colleges passed a resolution calling on the California Community Colleges system to divest from fossil fuel companies. The resolution reads as follows:

Resolved, That the SSCCC calls upon the California Community Colleges system to divest from the 200 worst polluters as compiled by the Fossil Free Indexes and to invest in clean, renewable energy instead.
Resolved, That the SSCCC calls upon local student senates to pass full fossil fuel divestment resolutions asking their local California Community College Boards of Trustees or Foundations to divest.
Resolved, That the SSCCC calls upon the California Community Colleges Chancellor's Office and the California Community College Board of Governors to fully divest from fossil fuels and implement a position directly related to sustainability.
Resolved, That the SSCCC create and champion a new campaign to realize a "Fossil Free CCC".

Relevant Mt. SAC Institutional Values
Revised College Mission Statement: Mt. San Antonio College is committed to providing quality education, services, and workforce training to students who aspire to become productive members of a diverse, sustainable global society… Mt. San Antonio College is committed to serving those in our community to improve economic achievement, advance civic engagement, and enrich aesthetic and cultural experiences.

Institutional Learning Outcomes: Recognizing and respecting the beliefs, opinions, and values of other individuals and cultures. Being informed about and participating in local, state, national, and global communities. Evaluating environmental conservation and sustainability.

Proposed Sustainable Investing Policy

Whereas the fossil fuel divestment movement has become the largest divestment movement in history with over $6 trillion in assets currently pledged to be divested from fossil fuel companies[138];

Whereas San Francisco, Oakland, and six other cities and counties in California in addition to New York City have announced that they have filed lawsuits against fossil fuel companies to sue for damages related to climate change, and Paris, Los Angeles, and other cities have announced that they are also considering suing fossil fuel companies for damages related climate change;

Whereas the International Renewable Energy Agency (IRENA) released a study in January 2018 showing that renewable prices will be "on par with – or even cheaper than – the cost of fossil fuel-generated electricity by 2020"; and

Whereas the Carbon Tracker Initiative raised the possibility that fossil fuel investments could become stranded assets due to the declining costs of renewable forms of energy or increasing regulatory costs imposed on fossil fuels, the Climate Commitment Implementation Committee recommends the adoption of the following policy; now, therefore, be it

[138] Fossil Free. https://gofossilfree.org.

Resolved, that the Mt. SAC Foundation will seek to invest in a manner consistent with its professed values of global environmental sustainability and civic engagement as an institution of higher education. Specifically, it will seek to address the issue of social responsibility in its investment decisions by balancing its fiduciary responsibility to maximize returns on its investments with ethical and social stewardship of its investments. The Foundation Board will be sensitive to the issue of social responsibility when making investment decisions. It will monitor and take into account a wide variety of information and consult with other campus stakeholders when appropriate to help it to determine what investments should be considered socially responsible. In carrying out its socially responsible investment policy, the Board will continue to give specific instructions to its investment managers about investing or not investing in particular products, companies, and countries.

In accordance with this policy, the Foundation will not invest in companies that pursue production in an egregiously environmentally destructive manner or that pose a clear existential threat to the sustainability of ecosystems. As an expression of that commitment, the Foundation will not invest in fossil fuel stocks unless or until fossil fuel companies cease drilling and mining for new fossil fuels and begin to commit the majority of their monies to intensive research and development in as well as rapid building of renewable energy capacity. This policy is consistent with the findings of the U.N. International Panel on Climate Change fifth assessment report which states that 80% of existing fossil fuel reserves must remain in the ground if socially-destabilizing climate change is to be avoided. It is also consistent with the call from the Sierra Club and a host of other environmental organizations that maintain that a shift to 100% renewable energy is possible and is necessary to avoid socially destabilizing climate change.

Transition to this sustainable investment policy will take some time, and therefore is likely to occur in stages. Local decisions regarding local funds are simplest to make, and should occur first. Larger actions, such as working to eliminate fossil-fuel investments within employee retirement systems (CALPERS and CALSTRS), are likely to take a bit longer, and will benefit from thorough analysis.

APPENDIX: CARBON CALCULATIONS SPREADSHEETS, 2014-2016

MODULE	Summary					
WORKSHEET	Overview of Annual Emissions					
UNIVERSITY	Mt SAC Community College					
Select Year -->	2014	Energy Consumption	CO_2	CH_4	N_2O	eCO_2
		MMBtu	kg	kg	kg	Metric Tonnes
Scope 1	Co-gen Electricity	-	-	-	-	-
	Co-gen Steam	-	-	-	-	-
	Other On-Campus Stationary	747,744.0	39,645,386.9	3,543.6	70.9	39,755
	Direct Transportation	5,023.0	361,560.9	64.0	22.0	370
	Refrigerants & Chemicals	-	-	-	-	285
	Agriculture	-	-	3,527.9	42.4	101
Scope 2	Purchased Electricity	68,269.1	11,192,628.3	155.1	218.6	11,262
	Purchased Steam / Chilled Water	-	-	-	-	-
Scope 3	Faculty / Staff Commuting	14,459.2	1,038,904.6	192.5	65.7	1,063
	Student Commuting	351,125.9	25,228,637.0	4,675.4	1,596.1	25,821
	Directly Financed Air Travel	-	-	-	-	-
	Other Directly Financed Travel	-	-	-	-	-
	121	177.9	34,701.2	0.3	0.4	35
	Student Travel to/from Home (OPTIONAL)	-	-	-	-	-
	Solid Waste	-	-	332,568.0	-	8,314
	Wastewater	-	-	-	-	-
	Paper	-	-	-	-	1,045
	Scope 2 T&D Losses	6,205.7	1,017,414.5	14.1	19.9	1,024
Offsets	Additional					(134)
	Non-Additional					-
Totals	Scope 1	752,767.0	40,006,947.8	7,135.6	135.3	40,511
	Scope 2	68,269.1	11,192,628.3	155.1	218.6	11,262
	Scope 3	371,968.8	27,319,657.3	337,450.4	1,682.1	37,302
	All Scopes	1,193,004.9	78,519,233.4	344,741.1	2,036.0	89,075
	All Offsets					(134)
					Net Emissions:	88,941

MODULE	Summary					
WORKSHEET	Overview of Annual Emissions					
UNIVERSITY	Mt SAC Community College					
Select Year -->	2015	Energy Consumption	CO_2	CH_4	N_2O	eCO_2
		MMBtu	kg	kg	kg	Metric Tonnes
Scope 1	Co-gen Electricity	-	-	-	-	-
	Co-gen Steam	-	-	-	-	-
	Other On-Campus Stationary	908,390.4	48,162,859.0	4,304.9	86.1	48,296
	Direct Transportation	4,757.7	341,276.5	65.9	22.4	350
	Refrigerants & Chemicals	-	-	-	-	-
	Agriculture	-	-	4,296.8	46.9	121
Scope 2	Purchased Electricity	48,623.1	7,971,692.2	110.5	155.7	8,021
	Purchased Steam / Chilled Water	-	-	-	-	-
Scope 3	Faculty / Staff Commuting	15,221.5	1,093,462.4	203.7	69.5	1,119
	Student Commuting	373,051.7	26,798,795.5	4,992.9	1,703.4	27,431
	Directly Financed Air Travel	-	-	-	-	-
	Other Directly Financed Travel	-	-	-	-	-
	121	620.1	120,946.1	1.2	1.4	121
	Student Travel to/from Home (OPTIONAL)	-	-	-	-	-
	Solid Waste	-	-	332,568.0	-	8,314
	Wastewater	-	-	-	-	-
	Paper	-	-	-	-	-
	Scope 2 T&D Losses	4,419.9	724,630.1	10.0	14.2	729
Offsets	Additional					(124)
	Non-Additional					-
Totals	Scope 1	913,148.1	48,504,135.5	8,667.7	155.3	48,767
	Scope 2	48,623.1	7,971,692.2	110.5	155.7	8,021
	Scope 3	393,313.2	28,737,834.2	337,775.9	1,788.4	37,715
	All Scopes	1,355,084.4	85,213,661.8	346,554.0	2,099.5	94,503
	All Offsets					(124)
					Net Emissions:	94,379

MODULE	Summary					
WORKSHEET	Overview of Annual Emissions					
UNIVERSITY	Mt SAC Community College					
Select Year -->	2016	Energy Consumption	CO_2	CH_4	N_2O	eCO_2
		MMBtu	kg	kg	kg	Metric Tonnes
Scope 1	Co-gen Electricity	-	-	-	-	-
	Co-gen Steam	-	-	-	-	-
	Other On-Campus Stationary	240,678.0	12,760,747.6	1,140.6	22.8	12,796
	Direct Transportation	4,757.7	341,276.5	65.9	22.4	350
	Refrigerants & Chemicals	-	-	-	-	-
	Agriculture	-	-	3,540.7	43.3	101
Scope 2	Purchased Electricity	57,173.0	9,373,433.2	129.9	183.1	9,431
	Purchased Steam / Chilled Water	-	-	-	-	-
Scope 3	Faculty / Staff Commuting	16,633.0	1,194,571.7	223.9	76.3	1,266
	Student Commuting	404,123.6	29,023,838.9	5,439.6	1,854.2	30,759
	Directly Financed Air Travel	-	-	-	-	-
	Other Directly Financed Travel	-	-	-	-	-
	121	119.5	23,298.8	0.2	0.3	23
	Student Travel to/from Home (OPTIONAL)	-	-	-	-	-
	Solid Waste	-	-	332,568.0	-	8,314
	Wastewater	-	-	-	-	-
	Paper	-	-	-	-	-
	Scope 2 T&D Losses	5,197.0	852,048.9	11.8	16.6	857
Offsets	Additional					(120)
	Non-Additional					-
Totals	Scope 1	245,435.7	13,102,024.0	4,747.2	88.4	13,247
	Scope 2	57,173.0	9,373,433.2	129.9	183.1	9,431
	Scope 3	426,073.1	31,093,758.4	338,243.5	1,947.5	41,220
	All Scopes	728,681.8	53,569,215.6	343,120.6	2,219.0	63,898
	All Offsets					(120)
					Net Emissions:	63,778