



Climate Action Plan

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December 18, 2008

Dear Friends of UCLA:

Thank you for your interest in sustainability at UCLA. This Climate Action Plan is a major step in UCLA's commitment to addressing global climate change and sustainability. The plan describes how UCLA will meet the University of California's policy targets of reducing greenhouse gas emissions to 2000 levels by 2014 and 1990 levels by 2020. Through early actions in energy efficiency and transportation, UCLA has added more than 30 percent to campus building square footage without significantly increasing greenhouse gas emissions. This strong foundation of energy conservation will enable us to set a more aggressive goal and meet both targets by 2012.

This plan also outlines how UCLA will reduce its emissions through stationary and mobile source emissions reductions initiatives, such as lighting and heating, ventilating and air conditioning (HVAC) retrofits and commute reduction strategies, and it also highlights some of our academic and research initiatives. As an institution of higher education, our contribution to solving the global climate crisis goes beyond addressing our own operations. We are educating students to become leaders in sustainability and in conducting cutting-edge research in clean technology.

The past initiatives highlighted in this plan represent years of hard work by staff, faculty, and students across the campus' diverse disciplines and departments. Accomplishing the identified goals and projects in the next decade will require the participation of the entire university community. All of us have a part to play in addressing global climate change and creating a sustainable future for our children and grandchildren. I encourage you to visit <http://www.sustain.ucla.edu/> and find out how you can get involved.

Sincerely,

A handwritten signature in black ink that reads "Gene D. Block".

Gene D. Block
Chancellor

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1 EXECUTIVE SUMMARY

Background

In 2007, in response to growing concern over the impacts of climate change, the University of California Office of the President developed a climate protection section of the UC Sustainable Practices Policy. The UC Policy set three climate change goals for the ten UC campuses:

- Reduction in campus emissions to year 2000 levels by 2014;
- Reduction in campus emissions to year 1990 levels by 2020; and
- Attainment of climate neutrality as soon as possible.

These goals are in parallel with the California Global Warming Solutions Act of 2006 (Assembly Bill 32) and based on the American College and University Presidents Climate Commitment, which the UC President and the UC Council of Chancellor's signed, joining university leaders across the country. The UC policy also calls for UC campuses to draft a Climate Action Plan (CAP) that examines the feasibility of meeting these goals. This document is the Climate Action Plan for the University of California, Los Angeles (UCLA).

UCLA has a decades-long history of pursuing sustainable practices in campuswide operations and has established extensive academic, research, and community outreach programs in climate change and sustainability. By building upon past achievements, this Climate Action Plan (CAP) outlines a comprehensive range of initiatives to advance campus sustainable practices and further reduce UCLA's carbon footprint. The UCLA CAP addresses carbon emission reduction initiatives including behavioral change, energy use and conservation, student and workforce commutes, and air travel. The CAP also examines the feasibility of these initiatives and determines a target for UCLA greenhouse gas (GHG) emissions reductions. Every initiative that is implemented moves the campus closer to achieving the ultimate goal of climate neutrality.

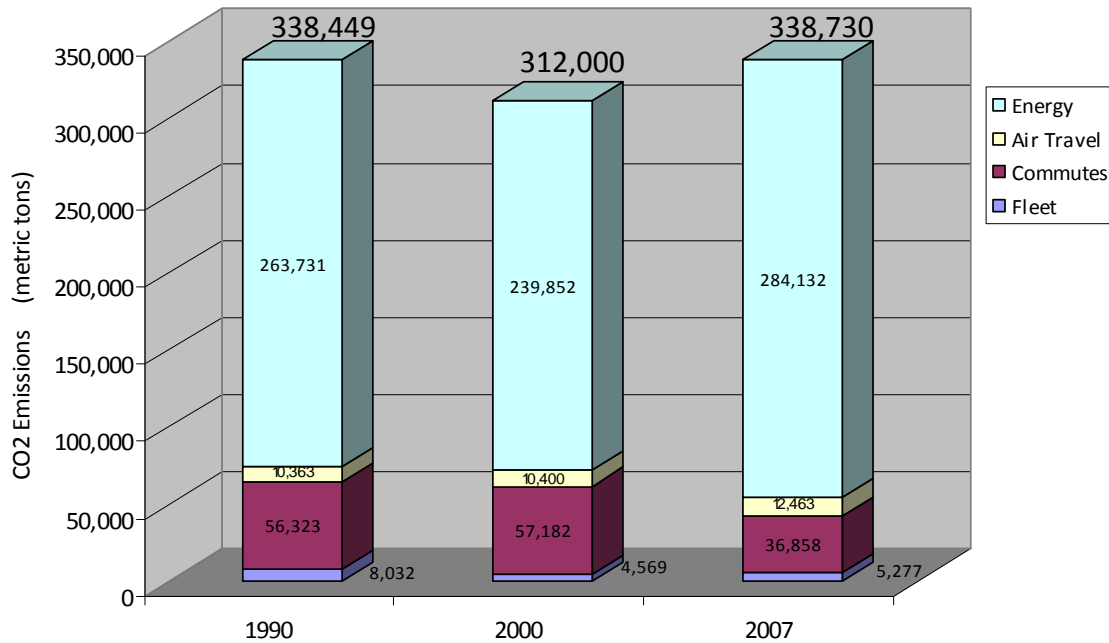
UCLA GHG Emissions Inventory

This CAP analyzes UCLA's GHG emissions according to guidelines for universities set forth by the California Climate Action Registry that address emissions from stationary as well as mobile sources including commutes. The year 2007 is used as a baseline in the analysis, and the CAP examines emissions in the target years of 1990 and 2000.

Well before 1990, energy efficiency and traffic reduction initiatives were pursued by UCLA primarily to reduce energy costs and limit the campus contribution to local and regional traffic and air quality pollution. During the 1990s the campus built a highly efficient Cogeneration Plant that resulted in significant increases in energy efficiency. As a result of this and other energy and transportation initiatives, **UCLA's GHG emissions in 2000 were lower than in 1990 and the emissions in 2007 were only marginally higher**

than in 1990, despite a 34 percent growth in campus square footage and an increase in student and workforce population between 1990 and 2007. See Figure 1-1.

**Figure 1-1
UCLA Overall Emissions – 1990, 2000, 2007**



UCLA GHG Emissions Trend, Business as Usual

For purposes of evaluating the effectiveness of GHG emission reduction potential from planned or future initiatives and programs, UCLA established a “Business as Usual” (BAU) scenario beginning in 2007 and extending to 2020. The intent of establishing the BAU is to illustrate the future emissions of the campus assuming that no additional GHG reduction initiatives are implemented. The model incorporates growth projections for stationary sources, based in part on assumed increases in gross square footage, and growth projections for mobile sources based on estimated campus population growth. Utilizing all of the assumptions and calculations for projected emissions for stationary and mobile sources, the BAU scenario projects a rise to approximately 369,946 annual metric tons of CO2 by 2020; an increase of 31,216 metric tons of CO2 above the 2007 emissions of 338,730 metric tons of CO2.

As a premier institution of higher education, research, and community service, UCLA will continue to advance, and must plan for, additional housing, education, and research facilities. While the campus has a Green Building Program that targets achievement of a

minimum USGBC LEED¹ Silver rating for all new construction and major renovation, increased energy needs to power and air condition new facilities is inevitable, which will result in increases in GHG emissions. Student and workforce population is anticipated to increase and mobile emissions will also increase if transportation initiatives are not pursued.

UCLA Reduction Initiatives

This CAP considers initiatives that focus on reductions in GHG emissions from stationary source energy use (i.e. Cogeneration Plant and purchased utilities) and emissions from mobile sources (campus fleet vehicles, commutes, and air travel). The GHG reduction initiatives described in this CAP fall into three main categories:

- energy use reduction and efficiency;
- mobility – reduction in vehicle miles traveled and utilization of alternative transportation modes; and
- behavioral changes aimed at influencing individual and institutional choices related to energy use and mobility.

Energy initiatives include building system upgrades that improve efficiency of heating and cooling equipment, installation of more energy efficient lighting systems, and inclusion of “green” power and solar energy in the campus’ energy portfolio. Improving the energy efficiency of existing buildings and pursuing alternative energy sources will result in a significant reduction in the GHG emissions of the campus.

Transportation initiatives will increase the number of clean and alternative fuel fleet vehicles, reduce single-occupant commutes to campus, and possibly establish an emissions mitigation fund for air travel, all of which would contribute to a substantial emission reduction potential.

This CAP also recognizes that behavior change is at the core of many of UCLA’s proposed initiatives to reduce GHG emissions. Behavioral change toward more sustainable practices, though difficult to quantify in terms of emissions reduction, is inherent in all GHG emission reduction initiatives. Provision of sustainability education awareness in campus operations continues to positively influence areas such as recycling, purchasing, housing, dining, as well as energy and water conservation. With engagement and support from the Campus Sustainability Committee and a full-time campus sustainability coordinator, a “culture of sustainability” is emerging campuswide.

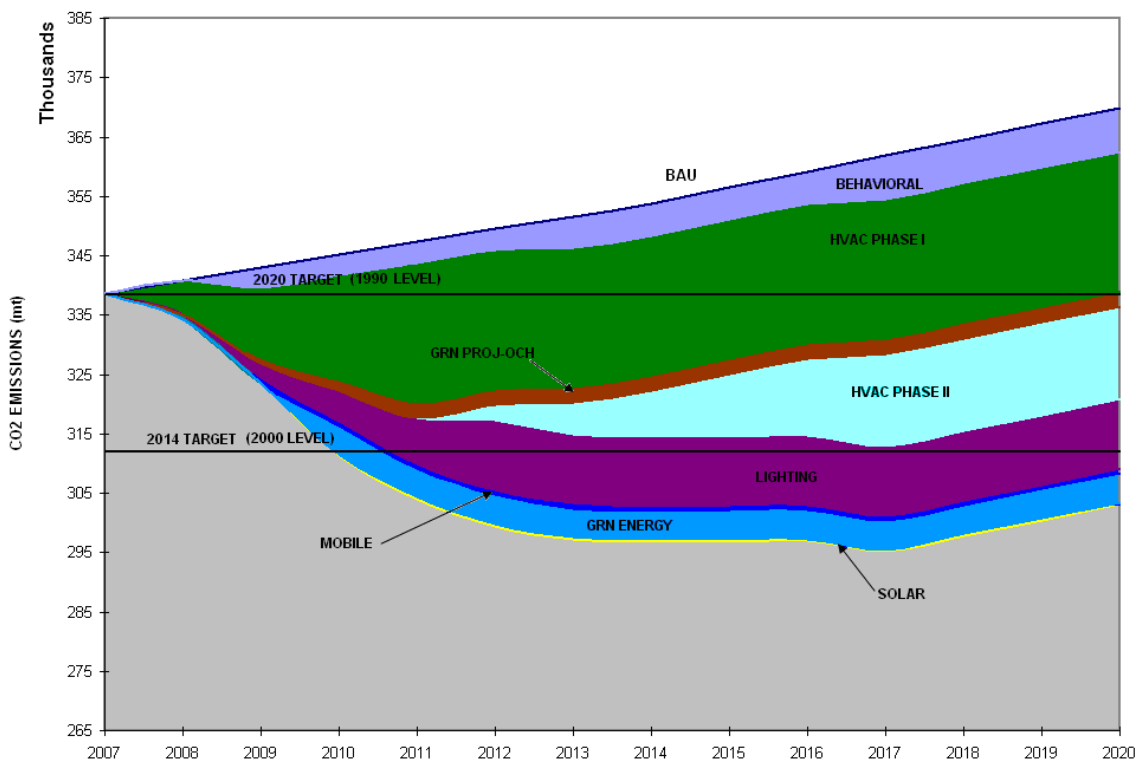
In addition to these initiatives, academic and research initiatives addressed in this CAP will have an enduring benefit by creating new technologies and training students to become leaders in addressing challenges of global climate change for years to come.

¹ United States Green Building Council (USGBC) has developed Leadership in Energy and Environmental Design (LEED) Green Building Program™, which includes four levels: Certified, Silver, Gold, and Platinum.

UCLA Emissions Reduction Target

Based on analysis of the impact of the proposed initiatives, UCLA determined that it is possible to set more aggressive targets for GHG reduction than those outlined in the UC Policy. As a result of early actions and through implementation of the proposed GHG reduction initiatives analyzed in this CAP, **it is anticipated that UCLA will be able to reduce campus GHG emissions below 1990 and 2000 levels by 2012 without use of purchased energy offsets or credits.** See Figure 1-2 below.

**Figure 1-2
“Business as Usual” vs. Potential Emission Reduction Initiatives**



The ability of the campus to set this target is a reflection of the effectiveness of past and existing campus sustainability programs, as well as the far-reaching initiatives proposed in this CAP. Reaching the climate neutrality goal however, will require a paradigm shift in energy production technology and individual behavior – a significant challenge for an energy intensive campus such as UCLA. UCLA can play an important leadership role in supporting and advancing research and educational efforts to accelerate behavioral change and bring new energy technologies to the global marketplace.

Moving Forward

This CAP reflects the first comprehensive examination of the campus' sustainability and GHG emission reduction programs and represents a major step towards advancing UCLA's leadership role as an academic institution in the area of sustainability and as a vanguard of global responsibility. The CAP will provide a foundation for assessing sustainability on campus. UCLA will track progress of these initiatives on an annual basis and will publish updates to the plan every two years. It is anticipated that updates of this CAP will enable consideration of emerging technologies that will propel the campus closer to achieving the ultimate goal of climate neutrality.

With this CAP, UCLA is embracing its responsibility to be a leader in addressing climate change and sustainability. UCLA is not only demonstrating that this can be done in a financially feasible way, but also plans to reach out to and educate the community that it is every person's civic responsibility to participate in activities and behaviors to reduce GHG emissions. UCLA will also take steps to integrate the initiatives outlined in this CAP into the academic and research mission by expanding academic programming and supporting faculty research that stimulates new technologies and student involvement in finding solutions to the global warming challenge. One innovative research initiative will be to pursue the viability of "off setting" UCLA's GHG emissions (towards reaching climate neutrality) by reinvesting in its world-class faculty and students for the specific purpose of researching and developing new technologies to minimize environmental effects of worldwide population growth and economic development.

1 INTRODUCTION

On March 22, 2007, University of California (UC) President Robert C. Dynes, signed the University of California *Policy on Sustainable Practices* (UC Policy), which committed the ten UC campuses to minimize their individual impacts on the environment and charged them to reduce their dependence on non-renewable energy. The UC Policy includes climate change practices with overall goals to develop a long-term strategy to reduce GHG emission to 2000 levels by 2014, 1990 levels by 2020, and achieve climate neutrality as soon as possible while maintaining the University's overall academic and research mission.

The UC Policy was developed in conjunction with the American College & University Presidents Climate Commitment (ACUPCC), a high-visibility effort to address global warming through institutional commitments to reduce and ultimately neutralize GHG emissions while accelerating the research and educational efforts of higher education to re-stabilize the Earth's climate.² The University of California is a signatory to the ACUPCC, thus all ten campuses are required to comply with implementation periods, institutional structures, GHG emission inventory protocols, and guidelines for developing climate action plans as developed by the ACUPCC.

Pursuant to the Policy, UCLA has become a member of the California Climate Action Registry (CCAR) and developed this Climate Action Plan that incorporates protocols to allow for growth adjustment and normalization of GHG data and reporting mechanisms to monitor progress towards the emission reduction goals. Contingencies will also be part of the plan in the event that interim targets require adjustment, or as the plan is periodically revised to accommodate new initiatives and technologies.

This plan was reviewed and approved by the UCLA Campus Sustainability Committee. The committee has three subcommittees, Operations, Academics, and Communication, that contributed to the respective portions of the report. The main analysis was conducted and written by a select task force from the Operations Subcommittee. The committee, formed in 2004, consists of several faculty and administrators from a variety of campus departments, including Student Affairs, Capital Programs, Purchasing, General Services, Housing and Hospitality Services, Staff Assembly, Events Management, ASUCLA, University Communications, and the Chancellor's Office, along with two graduate and two undergraduate student representatives. The mission of the Campus Sustainability Committee is to create a culture of sustainability at UCLA in which the entire UCLA community is aware of, engaged in, and committed to advancing sustainability through education, research, operations, and community service activities.

² Participation in the ACUPCC is voluntary and the requirements established by the ACUPCC are not intended to be legally binding.

2 BACKGROUND - GLOBAL CLIMATE CHANGE

2.1 International and Federal Policy

Information regarding the climatic impact of carbon-based emission from anthropogenic actions has been building for over 50 years at the federal and international levels. In 1959, the U.S. Weather Bureau began monitoring atmospheric carbon dioxide levels from a laboratory in Mauna Loa, Hawaii. Levels were recorded at a mean level of 316 parts per million (ppm), which was above the highest known concentration—300 ppm—found in a 420,000-year-old ice-core record.³

With the increasing knowledge of climate change, the Federal Government enacted the National Climate Program Act (NCPA) in 1978. The act charged the U.S. Congress “to establish a national climate program that will assist the Nation and the world to understand and respond to natural and man-induced climate processes and their implications.”⁴ As a result of the act, President Carter created the National Climate Program Office (NCPO), under the Department of Commerce, to research and measure climate change processes, collect global climatological data, assess the effect of climate change on the natural environment, provide recommendations for action, and coordinate U.S. government participation in international climate research. Despite its early foundation, public understanding of global climate change did not come forth from research generated by the NCPO, but from the United Nations.

In 1991, the United Nations (U.N.) Intergovernmental Panel on Climate Change (IPCC) reported findings on the state of knowledge about global climate change and used this information to advise the 1992 U.N. Framework Convention on Climate Change and the 1997 Kyoto Protocol.⁵ As a result of the Kyoto Protocol, 137 parties, including 36 developed countries (the European Union as a party in its own right), ratified the protocol and are required to reduce greenhouse gas emission to the levels specified for each of them in the treaty.⁶

2.2 State of California Climate Change Policy (Assembly Bill 32)

Governor Arnold Schwarzenegger signed Executive Order S-3-05 on June 1, 2005 thereby establishing GHG emission reduction targets for the State of California. Greenhouse gases include carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Pursuant to this Executive Order, GHG emissions targets were established to attain 2000 levels by 2010; 1990 levels by 2020;

³ Intergovernmental Panel on Climate Change, *Climate Change 2001: Synthesis Report*, pp. 202–203 (2001) as reference in Supreme Court of the United States. *Massachusetts et al. v. Environmental Protection Agency et al.* October 2006.

⁴ National Climate Program Act, enacted September 17, 1978.

⁵ CRS Report for Congress, RL30522: *Global Climate Change: A Survey of Scientific Research and Policy Reports*, Wayne A. Morrissey, April 13, 2000.

⁶ Wikipedia, May 7, 2008, http://en.wikipedia.org/wiki/Kyoto_Protocol.

and an 80 percent below 1990 levels by 2050. Further, the Governor placed oversight responsibilities with the Secretary of the California Environmental Protection Agency (CalEPA) to coordinate the implementation of these target dates amongst several of the State's departments, agencies, and commissions. As a follow-up measure, the California Global Warming Solutions Act (AB 32) was signed by the Governor in September 2006.

The enactment of AB 32 requires the California Air Resources Board (CARB) to adopt rules and regulations by January 1, 2010 that would achieve GHG emissions equivalent to statewide levels in 1990 by 2020. On December 11, 2008 CARB approved the Scoping Plan for AB 32 that proposed a comprehensive set of actions designed to reduce greenhouse gas emission in California, improve the environment, and stimulate the economy. Key elements of CARB's plan for reducing California's greenhouse gas emissions to 1990 levels by 2020 include:

- Expansion and strengthening of existing energy efficiency programs and building and appliance standards;
- Expansion of the Renewables Portfolio Standard to 33 percent;
- Development of a California cap-and-trade program that links with other Western Climate Initiative Partner programs to create a regional market system;
- Implementation of existing State laws and policies, including California's clean car standards, goods movement measures, and the Low Carbon Fuel Standard;
- Targeted fees to fund the State's long-term commitment to AB 32 administration.

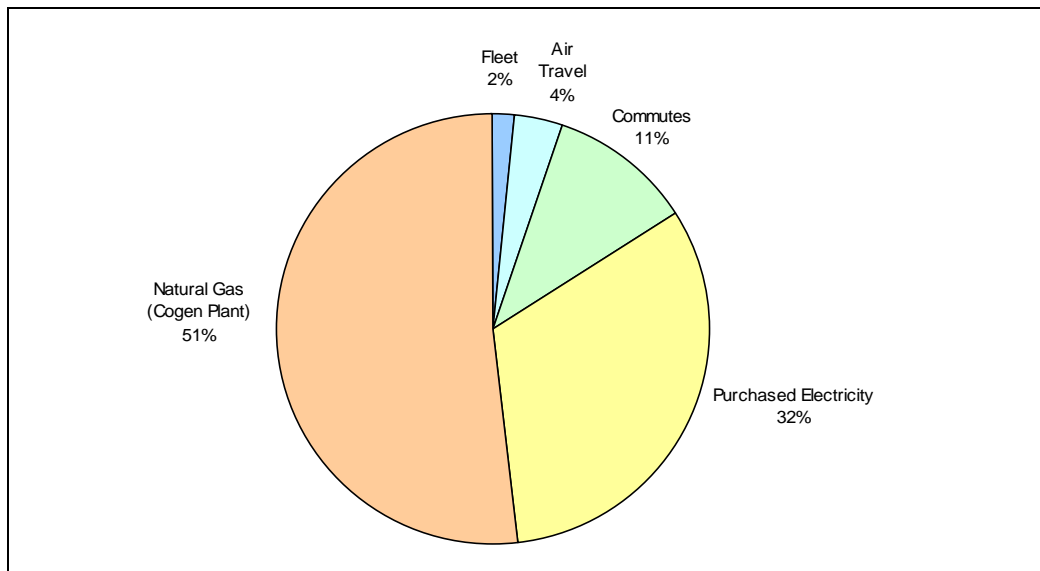
2.3 Kyoto Protocol Greenhouse Gases - CO₂, CH₄, N₂O, HFCs, PFCs, SF₆

As a member of CCAR and a signatory to the ACUPCC, the university has reported all six Kyoto protocol gases as of September 15, 2008. From that report, it was determined that CH₄ (methane), N₂O (nitrous oxide), HFCs (hydrofluorocarbons), and SF₆ (sulfur hexafluoride) were used on campus in quantities that qualified as "de minimus" pursuant to the reporting requirements of the ACUPCC. PFCs (perfluorocarbons) are no longer used on campus, thus, there will be no reporting on PFC gas. Carbon dioxide (CO₂) emissions from energy use/production, Fleet vehicles, commutes, and air travel remain to be the campus' predominant sources of GHG emissions.

3 GREENHOUSE GAS EMISSION INVENTORY 2007 EMISSIONS BY SOURCE

UCLA has reported its 2007 GHG emissions through California Climate Action Registry (CCAR) for stationary and mobile emission sources. The 2007 report includes all emission sources associated with the main campus in Westwood, which includes over 200 research and instructional facilities including a major on-campus hospital, a second major hospital located in Santa Monica, various other off-campus facilities, Fleet vehicles, commutes, and air travel as shown in **Figure 3-1**.

Figure 3-1
Overall UCLA GHG Emissions, 2007



Note: Propane and diesel fuel represent 0.003% and 0.04% of the campus' total emissions, respectively.

3.1 Stationary Emission Sources

Stationary emission sources on the UCLA campus include purchased electricity, purchased natural gas for use in the Cogeneration Plant to produce electricity, natural gas for direct use in buildings (e.g., boilers, heating), diesel fuel for emergency generators, and propane gas for mobile machinery. The calculations used to convert each of these energy types into metric tons of CO₂ emissions are presented in Table A 1 in Appendix A.

3.1.1 Purchased Electricity

UCLA purchases approximately 30 percent of the electricity used on the main campus and nearly all of the electricity used in off-campus facilities from the Los Angeles

Department of Water and Power (LADWP). The electricity used in the Santa Monica Hospital is purchased from the Southern California Edison Company (SCE). The remaining 70 percent of the electricity used on campus is produced by the on campus Cogeneration Plant.

Both LADWP and SCE have undertaken programs to reduce GHG emissions. In response to the Public Utilities Commission (PUC), SCE has committed to increase the percentage of electricity supplied from renewable sources to 20 percent of their overall supply by the year 2010, while LADWP has established similar objectives on a voluntary basis. In addition, SCE has a program entitled *Direct Access*, which allows customers to purchase electricity from an Electric Service Provider (ESP) instead of SCE. Electricity produced by the ESP is transported over the SCE power distribution system for a fee, enabling the end user to purchase green energy in amounts greater than what is available from SCE. LADWP does not have a direct access program, but does offer to supply greater amounts of green power to customers willing to pay additional fees.

UCLA emissions from purchased electricity for the years 1990, 2000, and 2007 are shown in **Table 3-1**.

Table 3-1
CO2 Emissions from Purchased Electricity - Baseline Years

	1990	2000	2007
Electricity Emissions (metric tons)	184,097	60,700	108,257

Source: UCLA Facilities Management, 2008.

Emissions in 1990 were substantially higher than 2000 or 2007 as the year predated the construction of the Cogeneration Plant. Since 2000, purchased electricity has increased up to 30 percent in 2007 as a result of continued construction of new buildings on campus and the associated additional energy requirements.

3.1.2 Purchased Natural and Landfill Gas & Cogeneration Plant Operations

The campus Cogeneration Plant, placed in service in 1994, uses natural gas and landfill gas as fuel sources to produce approximately 70 percent of the campus' electricity needs. Waste heat from the production of electricity, along with additional natural gas, is used to produce steam for campus heating and for humidification, cooking, and sterilization. Steam is also used to produce a portion of the chilled water used to air condition many of the campus buildings. The natural gas used in the Cogeneration Plant is purchased from the California Department of General Services and is delivered through The Gas Company's gas conveyance system. Landfill gas is purchased from SCS Renewable Energy – Mountaingate, LLC and is conveyed to the Cogeneration Plant through dedicated underground piping. Natural gas used directly as gas in other UCLA buildings is provided by The Gas Company. UCLA emissions from natural gas for the years 1990, 2000, and 2007 are shown in **Table 3-2**.

Table 3-2
CO2 Emissions from Purchased Natural Gas - Baseline Years

	1990	2000	2007
Natural Gas Emissions (metric tons)	79,480	178,960	176,227

Source: UCLA Facilities Management, 2008.

Emissions from natural gas increased substantially from 1990 to 2000 following the completion of the Cogeneration Plant in 1994, yet emissions have remained nearly constant between 2000 and 2007 as the Cogeneration Plant is operating at near capacity. Landfill gas, which makes up eight percent of the fuel used in the Cogeneration Plant, is a renewable resource and therefore is not included in the campus' CO2 emissions.

3.1.3 Emergency Generators & Propane

UCLA owns and operates approximately 86 diesel powered electric generators to provide reliable electric power when normal sources become unavailable. The majority of these generators are operated for 15 minutes on a monthly basis for readiness testing while those supporting in-patient care facilities are tested weekly. While detailed records are kept of purchased diesel fuel and operation of the campus emergency generators, this report conservatively assumes that all diesel fuel is combusted on campus in the year purchased. Propane is used to fuel mobile equipment, such as forklifts and similar machinery. The emissions associated with diesel fuel and propane purchases for each of the three baseline years are shown in **Table 3-3** and **Table 3-4**.

Table 3-3
CO2 Emissions from Purchased Diesel Generator Fuel - Baseline Years

	1990	2000	2007
Diesel Fuel Emissions (metric tons)	139	177	145

Source: UCLA Facilities Management, 2008.

Table 3-4
CO2 Emissions from Purchased Propane - Baseline Years

	1990	2000	2007
Propane Emissions (metric tons)	11.344	14.18	11.42

Source: UCLA Facilities Management, 2008.

3.2 Mobile Emission Sources

The campus' mobile source greenhouse gas emissions emanate from several sources, including Fleet vehicles, employee and student commutes, and business-related air travel. Fleet emissions are a small percentage of the total campus GHG emissions at approximately two percent, while commuter emissions are a larger component of the overall campus carbon footprint, at approximately 11 percent. UCLA-related airline travel by staff and faculty also contributes to the carbon footprint, comprising approximately four percent of the campus' total GHG emissions.

3.2.1 UCLA Fleet Vehicles

As shown above, the contribution of UCLA Fleet vehicles (approximately 1,000 vehicles, including buses, vanpool vans, and many specialty vehicles) to total campus GHG emissions is two percent, which in 2007 generated emissions of approximately 5,277 metric tons of CO₂. 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 compressed natural gas (CNG) which is used for the campus shuttle buses.

Table B 1 in Appendix B lists the fuel types, consumption levels, and calculation of the total 2007 Fleet GHG emissions, for each fuel category.

3.2.2 Commutes

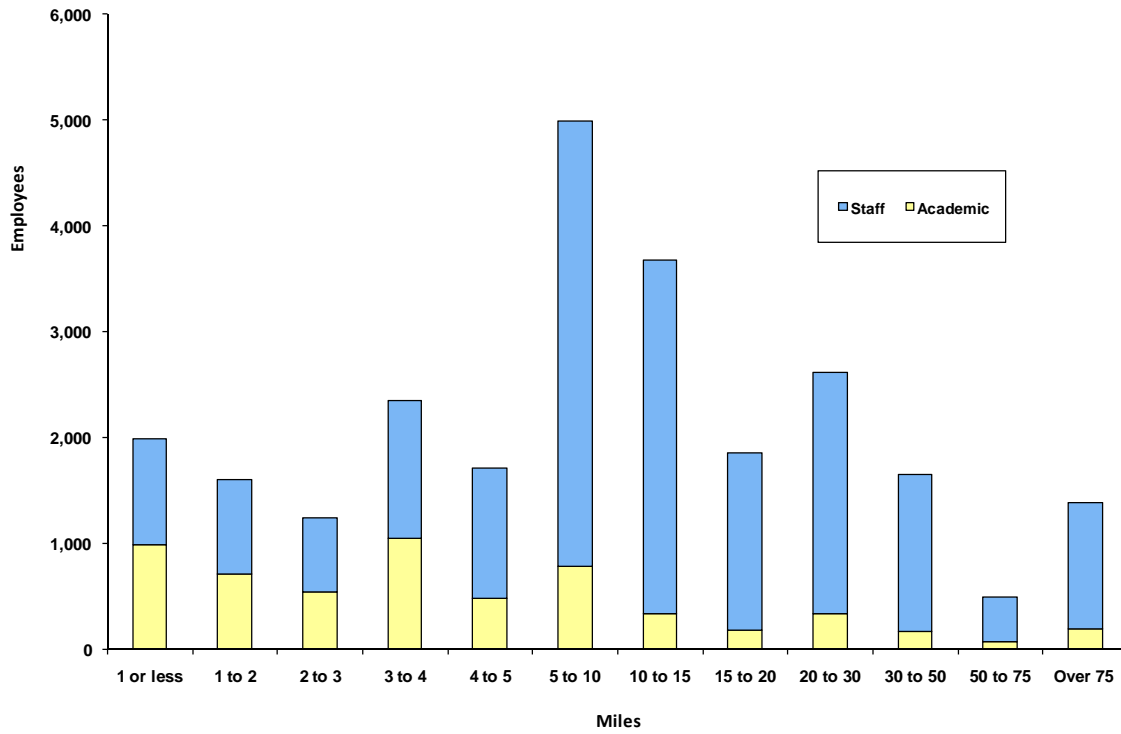
Commute emissions at UCLA are calculated for the two primary campus locations: the main campus in Westwood and the Santa Monica-UCLA Medical Center, located several miles west of the main campus. The commute GHG emissions for the base year- 2007, was approximately 37,000 metric tons of CO₂.

3.2.2.1 Westwood Campus

Commutes make up the second largest portion of the campus' overall GHG emissions at UCLA. Approximately 11 percent of emissions are from commutes to campus each day, including single occupant vehicles, carpools, and motorcycles. Main campus commute GHG emissions were approximately 35,000 metric tons of CO₂ in 2007. Vanpool emissions are included in Fleet emission totals because UCLA owns the vans and the fuel is directly purchased by UCLA for that use.

The large, sprawling pattern of development in the Los Angeles region means that the UCLA workforce is highly distributed over this geographic area and long commutes (90 minutes or more) are not unusual. As shown in **Figure 3-2**, Spring 2008 information regarding employees' home address locations shows that while approximately half of employees live within ten miles, a significant portion of employees live beyond forty miles from campus.

**Figure 3-2
UCLA Employees' Distance from Residence to Campus**



The student population lives closer to campus, on average, than the workforce. A significant portion of the undergraduate and graduate student population live on campus—almost one-third—reducing the number of daily commute trips made by students. Further, students have higher alternative mode usage rates than employees, which reduces the number of vehicle trips coming to and from campus. However, the commuting student population still exceeds 20,000 students where more than 7,500 drive to campus alone and approximately 1,100 carpool.

The resulting GHG emission calculations for commutes are derived from an annual South Coast Air Quality Management District (SCAQMD) employee survey in order to meet the requirements of the AQMD’s Employee Commute Reduction Program. The survey information is then used to develop mode split⁷ data to estimate the absolute number of users of each calculated mode. The calculation also includes the average distance per trip as derived from a geographic information systems (GIS) analysis of both student and employee home address locations, the miles per gallon as estimated from a combination of the national CAFE (Corporate Average Fuel Economy) standards,

⁷ Mode Split refers to the various methods by which a student or employee commutes to the UCLA campus including: bike, bus carpools, vanpools, drive-alone, drop-off, motorcycle, walk, electric vehicles, telecommutes, and compressed work weeks. See Table B 2 in Appendix B.

and the age of the typical vehicle mix in southern California. Total Westwood campus commute emissions for 2007 were 34,639 metric tons of CO₂. Refer to Table B-3 in Appendix B.

3.2.2.2 Santa Monica/UCLA Medical Center

The Santa Monica/UCLA Medical Center (SM/UCLAMC) is part of the UCLA system and employed 1,262 people in 2007. The SM/UCLAMC also conducts an annual SCAQMD employee survey in order to meet the requirements of the AQMD's Employee Commute Reduction Program. These survey results provide the employee mode split assumptions used to determine commute emissions for the SM/UCLAMC. In 2007, SM/UCLAMC commutes resulted in approximately 2,200 metric tons of CO₂. Refer to Table B 4 in Appendix B.

3.2.3 Air Travel

UCLA-related airline travel is estimated to account for approximately four percent of the total campus GHG emissions, or approximately 12,463 metric tons of CO₂ in 2007. Consistent with ACUPCC guidelines, UCLA-related airline travel is defined as travel paid for by the campus. This includes UCLA business-related travel for both faculty and staff, but does not include travel related to personal business or travel paid for by outside entities for business unrelated to the campus.

The 2007 air travel data was compiled from two data sources; the UCLA Travel Office database of recorded flight arrangements made for 2007 and a faculty survey of campus-related air travel. The 2007 survey was undertaken because although UCLA administrative staff specifically use the UCLA Travel Office for flight arrangements, many faculty do not (from the survey results, approximately 74 percent of faculty travel in 2007 was not booked through the UCLA Travel office). The air travel emissions for 2007 are shown in **Table 3-5**.

Table 3-5
Quantifying Air Travel GHG Emissions, 2007

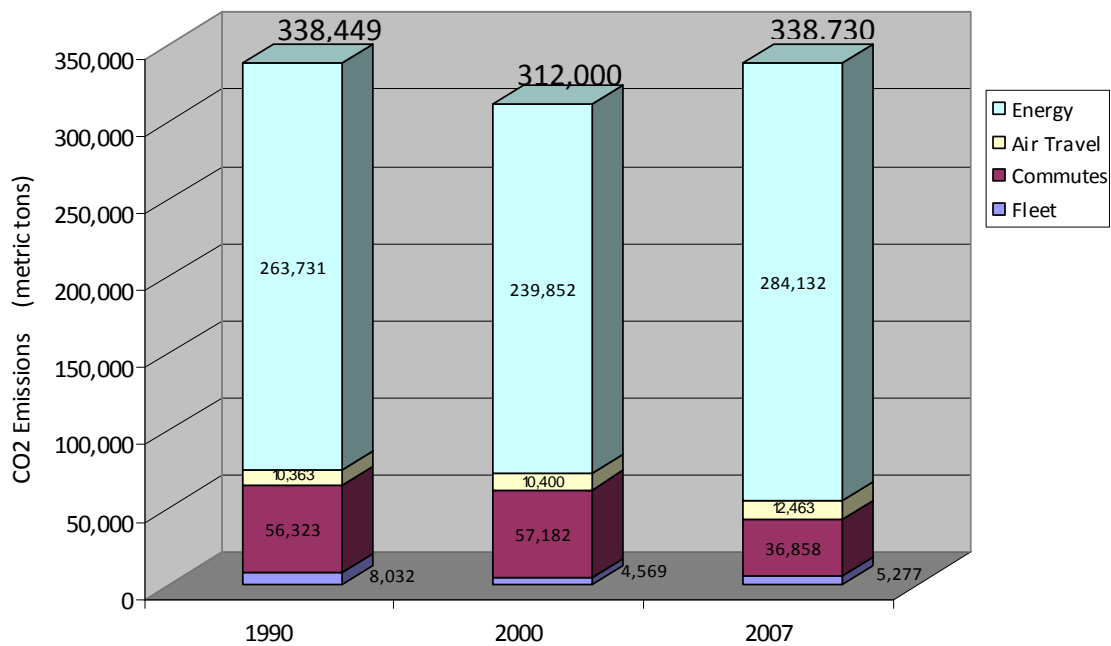
Number of Flights	Distance (miles)	Emissions (metric tons of CO ₂)
39,024	70,792,055	12,463 metric tons

4 1990, 2000 & 2007 EMISSIONS BASELINE

4.1 Baseline Emissions – All Stationary & Mobile Sources

Based on purchased energy (i.e., electricity, natural gas, diesel fuel, and propane), Fleet, commutes, and air travel records during the calendar year 1990, UCLA's emissions were 338,449 metric tons of CO₂, whereas in 2000, UCLA's GHG emissions decreased to 312,000 metric tons of CO₂. In 2007, the campus' GHG emissions rose to 338,730 metric tons of CO₂, slightly above the 1990 emission levels (by 281 metric tons) and exceeds the emission levels in 2000 (by 26,730 metric tons). **Figure 4-1** illustrates the emissions for all UCLA stationary and mobile emission sources for 1990, 2000, and 2007.

Figure 4-1
UCLA Overall Emissions – 1990, 2000, 2007



4.2 Baseline Emissions – Stationary Sources

As shown in Figure 4-1, the campus' stationary source emissions decreased between 1990 and 2000. This reduction of approximately 26,000 metric tons of CO₂ was achieved as a result of the energy efficiency gained from operation of the Cogeneration Plant as compared to prior grid-based purchased electricity. However, stationary emissions began a steady increase from 239,852 metric tons of CO₂ in 2000 to 284,132 metric tons of CO₂ in 2007. Accounting for the increase in stationary source emissions from 2000 to 2007, was the substantial growth in square footage on-campus as shown in Table 4-1.

Table 4-1
UCLA Growth in Square Footage- 1990, 2000, & 2007

Total UCLA Owned Gross Square Footage (GSF)		Change in GSF	Percent (%) Change in GSF
1990	20,217,447		
2000	22,999,011	2,781,564	13.8%
2007	27,080,329	4,081,318	17.7%
	Total	6,862,882	33.9%

Source: UCLA Facilities Management, 2008.

Table 4-1 shows that between 1990 and 2007, the campus square footage grew by 6,862,882 gsf, however, emissions during this same time period only increased from 263,731 to 284,132 metric tons of CO₂ (refer to **Figure 4-1**). Thus, over this 17-year period, substantial gains in energy efficiency were achieved that enabled the campus to increase square footage by 33.9 percent while emissions only rose by 7.7 percent.

4.3 Baseline Emissions – Mobile Sources

As shown in **Table 4-2**, UCLA's Transportation Demand Management (TDM) programs have been extremely effective in reducing commutes to campus, which in turn has reduced GHG emissions. Between 1990 and 2007, commutes were significantly reduced to an estimated 36,858 metric tons of CO₂; well below both the 1990 and 2000 levels. Conversely, airline travel emissions for 2007 increased from both 1990 and 2000 levels. However, the overall mobile source emissions in 2007 were below both 1990 and 2000 levels by 20,120 and 17,553 metric tons of CO₂, respectively.

Table 4-2
Mobile Source Emissions -1990, 2000 & 2007

	1990	2000	2007
Fleet	8,032	4,569	5,277
Commute	56,323	57,182	36,858
Airline Travel	10,363	10,400	12,463
Mobile Source Total (metric tons of CO ₂)	74,718	72,151	54,598

Source: UCLA Transportation, 2008.

4.4 Stationary Source Emissions – Past Progress

In 1990, the UCLA campus had 20,217,447 square feet of on- and off-campus developed space including a hospital, outpatient facilities, several research laboratories, classroom and office buildings, on-campus housing, and parking structures. The UCLA on-campus

hospital and many of the highly technical research laboratories operated 24/7 with significant and continuous energy demands compared to the typical academic buildings that were able to reduce energy usage during evenings, nights, and weekends. During this time, all electricity needed to operate campus facilities was purchased from LADWP. In addition to purchased electricity, the campus operated a central steam plant to provide steam for heating, cooking, individual building air conditioning chillers, humidification and sterilization. While partially fueled by landfill gas, the central steam plant was then nearly 40 years old and designed to less efficient standards. As a result, it used more fuel than modern facilities to achieve the same output.

At UCLA, energy conservation has been actively pursued well before the establishment of AB 32 or the UC Policy. In 1990, environmental stewardship and energy efficiency were fundamental concepts in the development of the Cogeneration Plant. Replacement of the steam plant and chiller system with the Cogeneration plant provided the campus with superior energy efficiency and air quality emission control.

Beginning in 1994, the Cogeneration Plant enabled the campus to generate three products from natural and landfill gas: chilled water, electricity, and steam. Fourteen years after the start of operation, the Cogeneration Plant is still considered a state-of-the-art facility with an overall efficiency of 80 percent at capacity. In comparison, a typical commercial electric generation facility operates at efficiencies of approximately 40 percent.

The backbone of the Cogeneration Plant is a pair of 14.5 Mega Watt (MW) combustion turbine generators fueled by a blend of natural gas and landfill gas from the nearby Mountaingate landfill. The exhaust gases from the combustion turbines are directed to a pair of heat recovery steam generators (HRSGs). The HRSGs can produce up to 117,000 pounds per hour of 650 psig (units of steam pressure) superheated steam. The high-pressure steam is supplied to a 14.5 MW condensing induction/extraction steam turbine generator from which steam is extracted at 150 psig to supply the campus distribution system. High-pressure steam is supplied to two steam driven 5,300 ton centrifugal chillers that supply chilled water to the campus distribution loop. Four single stage 1,500 ton absorption chillers use exhaust steam from the centrifugal chillers to produce additional chilled water for the campus distribution loop. In addition to the Cogeneration Plant's energy efficiency, UCLA worked in close cooperation with the South Coast Air Quality Management District (SCAQMD) to establish a new benchmark emission limitation of 6 parts per million (ppm) for NO_x emissions for facilities of similar size and type.

Other projects in the 1990s included the decommissioning of the West Medical steam plant resulting in a reduction of approximately 1,500 metric tons of CO₂ annually due to the replacement of two aging boilers with a far more efficient boiler and heat exchanger.

In addition, the north campus HVAC System Centralization Project replaced aging chillers in 11 buildings with new energy efficient equipment located in three buildings. The 11 buildings were then cross-connected with the chilled water lines. The effect of the project was a reduction in energy and water consumption along with a decrease in maintenance costs. Additional improvements to building HVAC systems included initiatives that installed high-efficiency motors with variable-speed drives.

In 2002, the campus built and began operation of a Thermal Energy Storage (TES) system. The main feature of the system is a 5,000,000 gallon water tank that also serves as the foundation for LaKretz Hall, which is the campus's first U.S. Green Buildings Council LEED Silver certified building and the home of UCLA's Institute of the Environment. The TES system allows the campus to make and store excess chilled water at night when energy prices are low and then use the stored chilled water to air condition the campus during the day when energy prices are higher. Operation of the TES system and the campus air conditioning system has also been enhanced by upgrading the chiller facility near Boelter Hall and the California NanoSystems Institute (CNSI). Once the location of an older and less efficient chilled water facility using chlorofluorocarbon (CFC) refrigerants, the replacement facility has a 25 percent larger capacity, is more energy efficient, and does not use CFCs. In fact, the main air conditioning system that serves nearly the entire campus is now free of CFCs. In addition to adding needed capacity to the campus air conditioning system, this chilled water facility also increases the efficiency and capacity of the TES, contributing further energy savings. This new replacement system has been in full operation since July of 2006.

During the 1990s the campus also made significant efforts to improve the lighting systems on campus. UCLA converted all exterior lights to high-pressure sodium fixtures and began converting interior lights from T-12 to T-8 lamps with electric ballast that were 25 percent more efficient (the interior lighting program was completed in early 2000).

By 2000, the UCLA campus had grown to include approximately 23 million square feet of developed space which included 5,587,292 square feet of parking structures and newly acquired nearby off-campus buildings. Incorporating energy efficiency into new construction was critical to allow for the square footage growth during a time when energy costs were continuing to rise. The development of the Green Building Program in 2003 has enabled the campus to standardize the design intent of new buildings and renovation of existing buildings to achieve building envelopes that increase energy efficiency and reduce environmental impacts. Section 11.3 describes the program in detail and identifies the number of buildings that have been built or are in a planning stage to be constructed or renovated under this program.

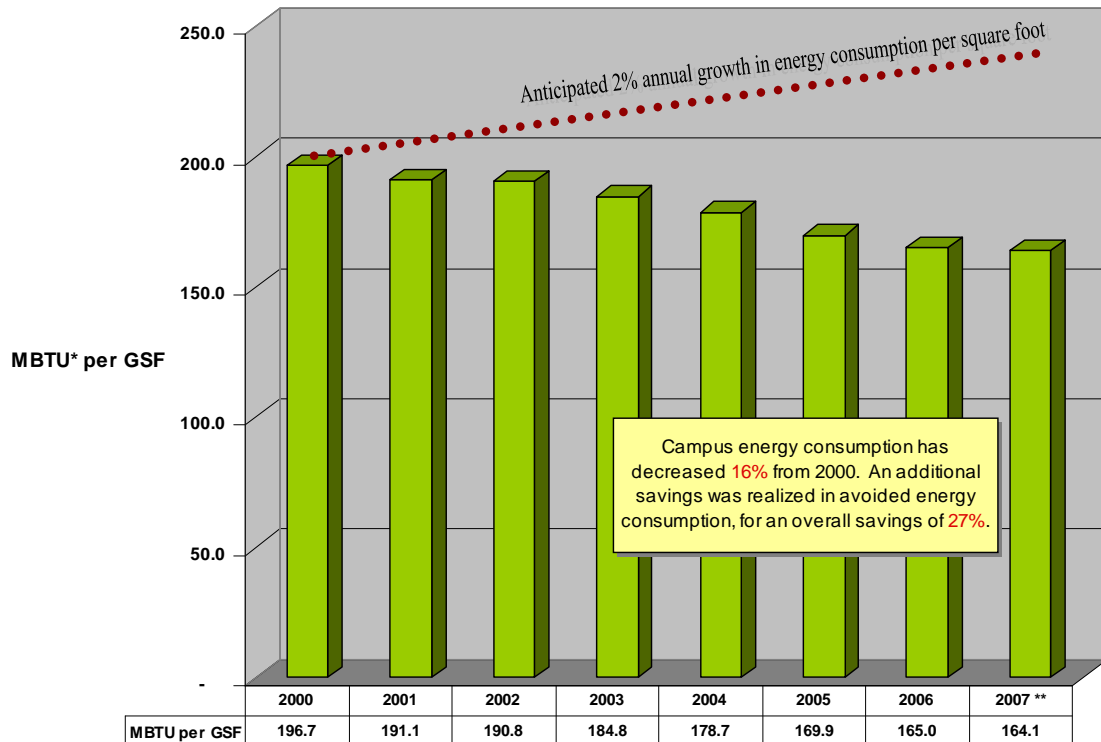
With this long history of energy efficiency initiatives, UCLA anticipates being able to continue to reduce the amount of energy used on a square foot basis, despite overall

campus growth. As shown in Figure 4-2, UCLA's growth-adjusted energy use has declined from 196.7 MBTU/square foot in 2000 to 164.1 MBTU/square foot in 2007. This reduction represents an energy usage reduction of 16 percent per square foot below 2000 usage.

Also shown in **Figure 4-2** is a projection line that represents a two percent annual growth in energy use per gross square foot that was anticipated to occur over the same time frame due to the energy intensification that was the general trend throughout the campus. The intensification was projected to be a result of additional energy intensive laboratory facilities and increased computer use (both campus-owned and personal) and digital equipment in classrooms and laboratories. Taking the two percent energy intensity growth rate into consideration—along with the actual reduction of energy per square foot—the energy efficiency per square foot between 2000 and 2007 increased to 27 percent.

Although the campus is substantially more energy efficient per square foot in 2007, as compared to previous years, the campus' overall GHG emissions have risen due to the increase in square footage. This will be UCLA's challenge: to develop and identify initiatives and programs that will enable the campus to reach the 1990- and 2000-level emission goals. Section 7 discusses current and potential energy efficient initiatives and their GHG emission reduction potential.

Figure 4-2
Energy Use Per Square Foot 2000 to 2007



* MBTU - Thousands of British Thermal Units

** In 2007 the Ronald Reagan Medical Center was using electricity, but was not occupied; thus, its energy use was prorated by one half.

4.5 Mobile Source Emissions – Past Progress

Since the 1980s, significant progress has been made in reducing both commute emissions and emissions from UCLA’s own vehicle Fleet. The first Transportation Demand Management (TDM) programs on campus began in 1984, in preparation for anticipated traffic related to the Olympic Games being hosted in Los Angeles with the Olympic Village located on the UCLA on campus. In 1987, a TDM Plan outlined the need for campus investment in alternative transportation to help relieve congestion and enable campus growth by managing and reducing vehicular traffic demand. The recommended strategies within the plan concentrated on ridesharing but included other actions such as additional on-campus housing. The plan established goals for reducing peak hour and daily vehicle trips and developed strategic actions for increasing the number and quality of alternative options to driving alone.

Subsequently, a well-developed alternative transportation program emerged in the 1990s which included vanpools, carpools, and a campus shuttle. These programs served as the basis for traffic growth limitation commitments in the 1990 campus’ Long Range

Development Plan (LRDP). A vehicle trip cap was voluntarily agreed to with the City of Los Angeles to limit the number of trips to and from campus, with both daily, AM, and PM peak period caps. The campus also voluntarily capped the number of parking spaces to be constructed over the LRDP planning horizon.

Between 1990 and 2002, parking demand declined by 21 percent and peak hour vehicle trips also declined by 27 percent below levels that would have occurred without TDM. Parking inventory remained relatively stable despite considerable campus growth. The trip cap and parking space caps were both so effective that in 2002, UCLA re-committed to maintain both caps through 2010 and committed to expand the extensive TDM programs.

By the late 1980's, the first alternative fueled vehicles using propane were introduced to the UCLA Fleet, which was followed by the replacement of diesel buses with a vanpool fleet powered by gasoline. In 1993, a compressed natural gas (CNG) station was located on campus and by 1998, the entire UCLA shuttle bus fleet was running on CNG. Also in 1998, the Alternative Fuel Vehicle (AFV) Program was created. This program introduced AFV vehicles to campus departments and a key practice was to evaluate all vehicle procurement requests and offer alternative fuel vehicle options.

In 2002, the campus acquired 127 zero emission vehicles (ZEVs), which are ideal to operate in a low-speed campus environment. They continue to be in operation today for passenger and light-duty cargo applications across the campus and have been used in place of internal combustion engine vehicles in many applications.

The reduction in mobile source emissions is largely related to two significant trends: the growth of on-campus student housing and the substantial mode split shifts seen in both the employee and student populations. From 1990 to 2007, employee mode split shifted from drive-alone rates above 70 percent, to a much reduced mode split consisting of approximately a 55 percent drive-alone rate. Student mode split is noticeably different from employees' mode split, as less than 31 percent of commuter students drive alone to campus. This is a reduction of approximately five percent since 2000, when the drive alone rate for students was 36 percent. Besides the decrease in drive alone rates, the commuter student population has decreased due to the provision of undergraduate and graduate on-campus housing from approximately 4,278 in 1990 to approximately 10,744 in 2007.

These combined efforts to reduce commute impacts and green the UCLA Fleet have resulted in a decline in mobile source GHG emissions—where in 2007—emissions were significantly lower than they were in 1990.

5 EMISSION TRENDS – STATIONARY AND MOBILE SOURCES

5.1 Current Stationary Emission Trend – “Business as Usual”

For purposes of evaluating the effectiveness of GHG emission reduction potential from planned or future initiatives and programs, UCLA established a “Business as Usual” (BAU) scenario beginning in 2007 and extending through to 2020 (see **Table 5-1**). The intent of establishing the BAU is to illustrate the future emissions of the campus assuming that no additional GHG reduction initiatives are implemented.

The first premise of calculating the campus’ overall BAU is that energy use, and its subsequent GHG emissions, are related to square footage. Utilizing the association that increases in square footage result in increases in GHG emissions, a ratio of CO₂ per square foot emission factor was calculated for 2007 by dividing the total on-campus square footage by the total stationary emissions, or approximately 1.06 metric tons of CO₂ per 100 gross square feet.

To project future emissions associated with growth in square footage, it was assumed that 2.1 million square feet of new development could occur on-campus between 2007 and 2014. For the time period between 2015 and 2020, it was assumed that another 1.5 million square feet could be developed.

As the campus is made up of essentially four types of building space (Lab/Medical, Housing, Office/Classroom, and parking structures), each with a different energy use, a weighting factor was applied to the projected growth in square footage. A square foot of new Housing space was considered to be the standard energy use; thus, equal to one (1x). Compared to Housing, Office/Classroom space was calculated to use 10 percent more energy (1.1x), whereas Lab/Medical space would use twice as much energy (2x). A square foot of Parking was estimated to use half the energy as a square foot of Housing (0.5x).

The projected square footage was then allocated as a percentage to the four types of space, as discussed above. This allocated square footage was then multiplied by the weighting factor for each type of space, which adjusts the projected square footage to reflect the CO₂ emission intensity of that space type. This adjusted square footage is then divided by the CO₂ emission per 100 square foot factor (1.06) to calculate the estimated CO₂ emissions associated with the assumed square footage growth between 2007 and 2020.

Table 5-1
Stationary Source Emissions, “Business as Usual”

	2007	2014	2020	Emission Increase (metric tons)	% Increase
Stationary Sources	284,132	298,430	316,149	32,017	11%

Source: UCLA Facilities Management, 2008.

5.2 Current Mobile Emission Trends – “Business as Usual”

Similar to the “Business as Usual” (BAU) scenario for stationary sources, the BAU for mobile sources is a projection of GHG emissions from 2007 to 2020 assuming that no future mobile emission reduction initiatives are implemented.

While mobile source emissions were relatively flat from 1990 to 2000 and decreased from 2000 to 2007, the campus is projected to add approximately 1,600 students and employees by 2013. Assuming that employee and student mode splits remain at present levels, the number of drive alone commuters would consequently be assumed to increase, thus increasing commute GHG emission levels. The projected increase in airline travel is also predicated upon the total population growth assumptions. 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.

The estimated BAU CO₂ emission levels for Fleet, commutes, and airline travel are shown below in **Table 5-2**, along with the percent increase from 2007 levels.

Table 5-2
Cumulative Mobile Source Emissions, “Business as Usual”

Use	2007	2014	2020	Emission Increase (metric tons)	% Increase
Fleet	5,277	7,029	8,986	3,709	70%
Commutes	36,858	38,446	38,971	2,113	6%
Airline Travel	12,463	13,074	13,270	807	6%
Total	54,598	58,549	61,227	6,629	12%

Note: Fuel usage from 2000 to 2007 showed an increase of 4.18 percent per year; this percentage was extrapolated to 2014 and 2020 and the resultant GHG levels calculated for the increased fuel use.

Source: UCLA Transportation, 2008.

5.2.1 Fleet Emission Trends - “Business as Usual”

As noted above, UCLA Fleet emissions increased from 2000 to 2007. Part of this increase was due to growth in the vanpool program, where the vans are owned and operated by the campus. While the decrease in single-occupancy vehicle (SOV) trips provided by the vanpool program is beneficial, the GHG emissions from the growing vanpool program are counted as part of the Fleet’s GHG footprint. For the campus overall, unleaded fuel consumption alone grew from approximately 285,000 gallons in 2000 to over 500,000 gallons in 2007. Much of the remaining Fleet has already been “greened” to include low speed electric vehicles as replacements for utility pickup trucks; the campus shuttle bus system operates on compressed natural gas; and Fleet’s Alternative Fuel Vehicle program has been embraced by departments who lease vehicles for business use. However, the increasing consumption of unleaded fuel must be reversed in order to contribute toward meeting the UC Policy GHG emission reduction goals.

To calculate the BAU scenario for Fleet, fuel use and emission projections presented in Table B 5 in Appendix B are based on a trend line calculated between 2000 and 2007 for Fleet fuel consumption levels and associated growth. The growth percentage is calculated to be 4.18 percent. Using this trend to project the BAU scenario forward from 2007, the UCLA Fleet emissions would increase every year out to 2020 to almost 9,000 metric tons of CO₂ over 2007 levels; a substantial 70 percent increase.

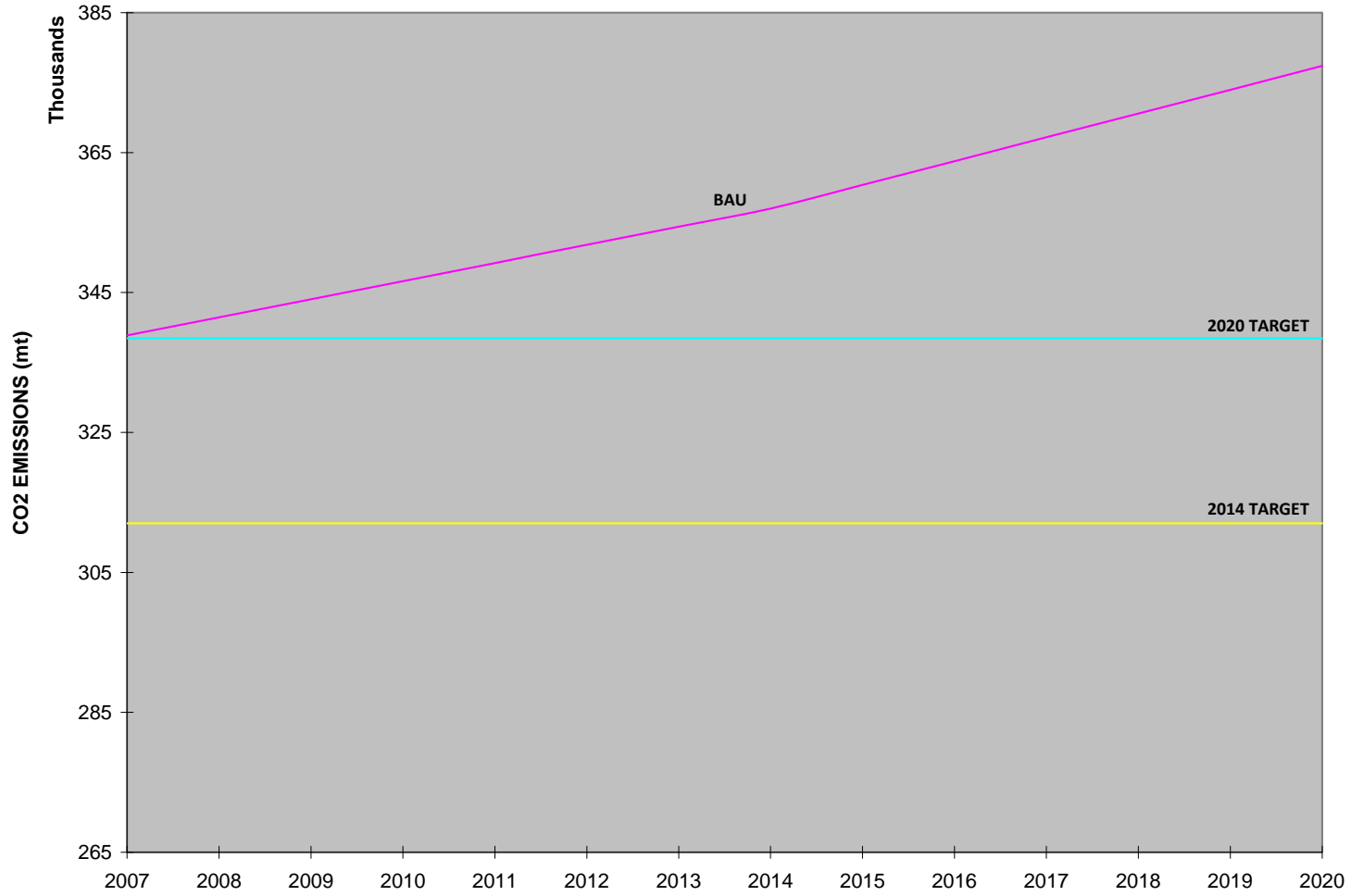
5.2.2 Commute & Airline Travel Emission Trends - “Business as Usual”

Both commute and airline travel 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 UCLA campus community would continue, there would be no changes to the current residential distribution of UCLA employees and students, mode split would remain the same, and those same levels of GHG mobile emissions would be attributable to the projected student and employee population growth. Using these trends, GHG emissions would increase. Airline travel is also likely to continue to grow based on employee population growth. The resulting GHG emission projections for 2014 and 2020 indicate an upward trend for both commutes and air travel associated with the projected increases in employee and student headcount. Refer to Table B 1 in Appendix B.

5.3 Overall Campus Emission Trend – “Business as Usual”

Utilizing all of the assumptions and calculations for projected emissions for stationary and mobile sources, the BAU curve in **Figure 5-1** shows that by 2020, the campus GHG emissions could rise to approximately 369,946 metric tons of CO₂; an increase of 31,216 metric tons of CO₂ above the 2007 emissions of 338,730 metric tons of CO₂.

Figure 5-1
“Business as Usual” - Overall Campus Emissions Trend



6 EMISSION REDUCTION INITIATIVES

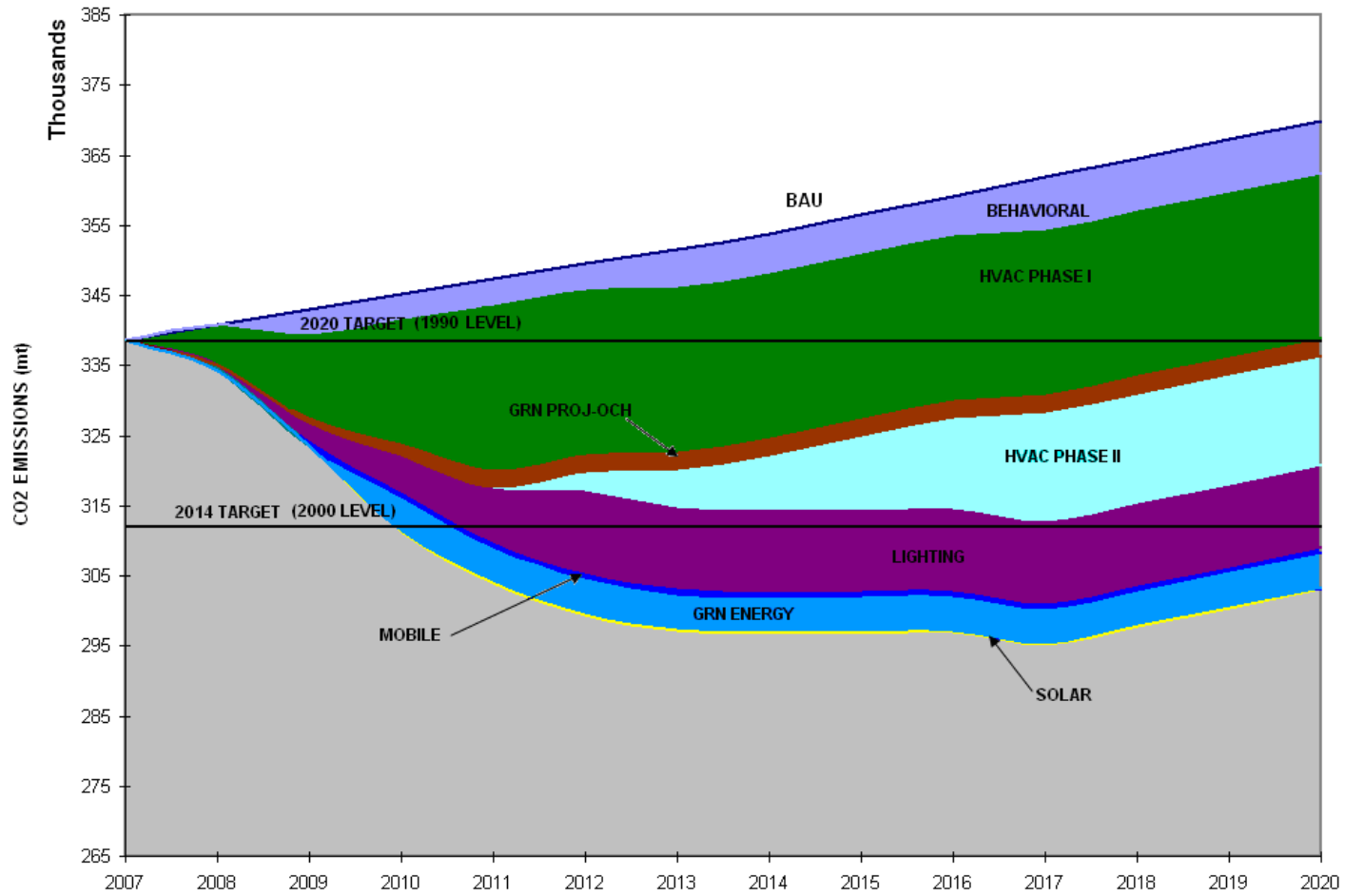
The core development of this Climate Action Plan has been the identification of initiatives that will reduce emissions for both stationary and mobile sources. **Figure 6-1** graphs the emission reduction potential for each initiative as compared to the BAU in relation to the 1990- and 2000-level emission goals. Each current and future stationary source initiative is discussed in Section 7, while mobile source and behavioral change initiatives follow in Sections 9 and 10, respectively. To clearly tie each initiative's description to its corresponding emission reduction line in Figure 6-1, the initiative name is followed by the color of the area that represents its calculated emission reduction potential.

Initiatives that have potential to reduce GHG emissions but are unquantifiable at this time, or their viability remains to be determined, are not shown on the graph, but are discussed in Section 6.2.

The most important conclusion that can be drawn from **Figure 6-1** is that the campus can potentially achieve a reduction of emissions below both 1990 and 2000 levels by the year 2012. Equally important is the long-term effect of all the initiatives that could result in an overall annual emission of 303,750 metric tons of CO₂ by 2020; a CO₂ emission decrease of 34,980 metric tons from 2007 emissions even with assumed growth of population and square footage, and a reduction of 66,196 metric tons below the projected BAU. This reduction is equivalent to taking 12,035 cars off the road.⁸

⁸ EPA, December, 2008. <http://www.epa.gov/OMS/climate/420f05004.htm>

Figure 6-1
“Business as Usual” vs. Potential Emission Reduction Initiatives



7 STATIONARY SOURCE REDUCTION INITIATIVES- CURRENT & PLANNED

7.1 Building Ventilation System Energy Conservation - Phase I (Dark Green area)

In 2008, the campus initiated a program to reduce the ventilation energy usage in a group of approximately 25 buildings all built more than 25 years ago when energy efficiency standards were not part of building code requirements. These buildings were constructed with ventilation systems designed to perform reliably and to provide adequate ventilation under the maximum occupancy anticipated for each building. These systems were not designed to vary the amount of ventilation based on building occupancy or in response to outside environmental conditions. Modifying the ventilation systems to adjust to occupancy, outside air conditions, and building usage cycles is anticipated to reduce ventilation energy demand by 50 percent and total building energy consumption by 25 percent. Installation of new air conditioning equipment would change air and water flows in the buildings from constant volume to variable volume based on outdoor conditions, building occupancy and time of day. The initiative began in 2008 with completion expected by 2011/2012. When completed, this initiative is estimated to save approximately 42,000 Mega Watt hours (MWhrs) annually with a corresponding reduction in CO₂ emissions of approximately 23,500 metric tons per year.

7.2 Building Ventilation System Energy Conservation - Phase II (Turquoise area)

Following completion of the Phase I initiative described above, the campus would propose a Phase II initiative for improving ventilation energy efficiency in an additional 15 buildings that were more recently constructed. This phase is anticipated to occur from 2012 to 2016. The scope of work will be similar to the Phase I described above. As a number of these buildings are laboratories with very high ventilation rates due to fume hoods that exhaust conditioned air, ventilation rates will be adjusted to ensure safety requirements are efficiently met. When completed, it is anticipated that this second phase initiative could save approximately 27,880 MWhrs annually with a corresponding reduction in CO₂ emissions of approximately 15,600 metric tons per year.

7.3 On-Campus Housing Energy Projects (Red area)

Starting in 2009, On-Campus Housing will be initiating four energy conservation projects over a three year period. Two of the projects are similar in scope to the Campus proposals in that they will be installing occupancy sensors and dual wattage lamps in all offices, conference rooms, study rooms, lounges and stairwells throughout multiple residence halls. The second project will convert existing constant volume ventilation systems to variable volume operation as mentioned in Section 6.1. The scope will be identical to the Campus Initiative and will occur in multiple residence halls. The third project will feature a renovation on several kitchen exhaust hoods to variable volume using a combination of infrared smoke detectors, temperature sensors and variable

speed drives. The fourth project will feature a replacement of existing solar hot water heaters with higher efficiency solar panels and will be controlled by an energy management system to maximize energy output. When completed, and taken collectively, these initiatives are estimated to reduce emissions by approximately 2,600 metric tons of CO₂.

7.4 Lighting Efficiency (Magenta area)

As described previously, the campus began a program in 1996 to replace standard fluorescent tubes with more energy efficient models. By shifting from the older T12 style to the T8 style, the energy consumption of each lamp was decreased by 20 percent. Over a period of several years, nearly 600,000 lamps were changed, thereby reducing energy demand by approximately 4.8 MW and reducing CO₂ emissions by approximately 9,500 metric tons annually. The campus is now proceeding with a second phase of lighting upgrades to replace the T8 lamps with newer versions that reduce the lamp wattage usage by a further 12 percent with an anticipated emission reduction of approximately 5,867 metric tons of CO₂.

In a separate initiative, the campus is installing occupancy sensors to control room lighting in offices, storerooms, stairwells and restrooms of 37 buildings. With an anticipated completion in Fiscal Year (FY) 2008/09, the energy savings are estimated to be approximately 2,580 MWhrs per year, which would reduce campus annual CO₂ emissions associated with energy purchased from the LADWP by approximately 1,450 metric tons. The program may be extended in the future to place occupancy sensors in corridors and classrooms.

An additional lighting initiative proposes to change interior lighting in all campus parking structures from high pressure sodium lighting to induction lighting. The initiative is anticipated to achieve an emissions reduction of approximately 3,700 metric tons of CO₂.

7.5 Green Power Purchases (Blue area)

The LADWP is a municipal utility rather than an investor owned utility and as such is not subject to the regulations of the California Public Utility Commission (CPUC). As a result the LADWP is not obligated to have a Direct Access Program. Investor owned utilities are required to allow direct access which enables customers to purchase electricity generated from renewable sources and, for a fee, have that energy delivered for their use. Since LADWP is UCLA's electricity provider, the campus can only purchase green energy provided by LADWP.

The LADWP does provide green power to its customers via two different methods. The first is a program through its general electrical portfolio. In 2006, LADWP publicized that green power comprised 7 percent of its total power sales. UCLA therefore received

green power in this amount as part of the routine purchases. The LADWP has targeted achieving 20 percent green power in its electrical portfolio during year 2010 to voluntarily comply with the CPUC requirement placed on California investor owned utilities. The LADWP also offers to provide green power that is not part of its general electrical portfolio to customers willing to pay a premium added to the regular price of electricity. The current premium is \$0.03 per kilowatt hour or an added \$262,800 for one MWhr for a one year period. UCLA intends to make this purchase, which will reduce campus CO2 emissions by approximately 4,800 metric tons per year.

7.6 Solar Power Production (Yellow line)

The campus will evaluate the potential installation of on-campus photovoltaic solar systems in order to increase on-site renewable power production. Solar power remains very expensive and the campus has determined that investments in energy conservation initiatives (as previously described) yield greater reduction in carbon emissions than can be expected from equivalent investments in solar systems. As **Table 7-1** depicts, solar system installation is 10 times more costly per ton of emissions reduced than energy conservation projects. (See also Table 9-1 in the Financial Feasibility Section). This will change as solar costs decrease and the campus becomes more energy efficient. However, the campus anticipates installing some solar electric generation prior to 2020. Discussions regarding solar power initiatives have already begun with the Los Angeles Department of Water and Power (LADWP).

Table 7-1
Stationary Source Initiatives Cost Effectiveness

Initiative	Initiative Cost After Utility Rebates (\$)	Annual CO2 Reduction (metric tons)	Factor \$/CO2 Annual Reduction (metric tons)
HVAC Phase I	\$13,600,000*	23,500	\$579
OCH Initiatives	\$2,030,000*	2,600	\$781
HVAC Phase II	\$9,600,000*	15,600	\$615
T8 Lamp Watt Reduction	\$360,000*	5,870	\$61
Occupancy Sensors	\$1,630,000*	2,120	\$769
Induction Lighting	\$3,842,000*	3,700	\$1,037
Green Energy	\$2,628,000**	4,800	\$548
Solar (0.25MW)	\$1,826,000*	300	\$6,086
* Cost does not include energy cost savings			
**Over a 10 year period			

Source: UCLA Facilities Management, 2008.

UCLA has several parking structures that could accommodate solar installations. Due to the high cost of solar power installation, as delineated in Section 9, Financial Feasibility,

these installations would probably occur in a series of phases in order to assess viability and effectiveness. Assuming an eventual total 250 kilowatt installation over time, approximately 500 MWhrs of electricity could be expected to be produced with a corresponding reduction of purchased electricity and CO₂ emissions of approximately 300 metric tons. The BAU graph assumes a total solar installation of .25 MW by 2020. At this time third party installation of solar production systems are not allowed in the LADWP service area.

7.7 Cumulative Stationary Source Emissions Reductions

Stationary source GHG emissions at UCLA contributed 83 percent to the overall campus emissions in 2007 and these source emissions would continue to rise under the BAU scenario presented in Section 5. To assess the true effect of the proposed initiatives on the campus' stationary source emissions the reduction potential of the current and future initiatives (discussed above) was compared against the projected BAU increases for stationary source emissions in 2014 and 2020 (refer to **Table 5-1**). With implementation of the aforementioned emission reduction initiatives, stationary source GHG emissions would follow a downward trend and would result in an estimated emission reduction of approximately 58,494 annual metric tons of CO₂ by 2020. See Table 7-2 for a summary of the GHG reductions from these initiatives.

Table 7-2
Stationary Initiatives Annual CO₂ Reduction

Initiative	Completion Date	Annual CO ₂ Reduction (metric tons)	% of Total Reduction
HVAC Phase I	2012	23,500	40%
OCH - Energy Projects	2012	2,600	4%
HVAC Phase II	2016	15,600	27%
Induction Lighting	2012	3,705	6%
Occupancy Sensors	2009	2,120	4%
T8 Lamp Watt Reduction	2012	5,869	10%
Solar (¼ MW)	TBD	300	<1%
Green Energy	Immediate	4,800	8%
Total		58,494	100%

Source: UCLA Facilities Management, 2008

7.8 Future Energy Initiatives

7.8.1 Fume Hood Occupancy Sensors

To provide a safe laboratory environment for researchers and students, fume hoods exhaust a high volume of conditioned air to ensure that toxic air contaminants are not released into the spaces they occupy. Although this is a necessary human health and safety measure, use of fume hoods significantly increases a building's energy use. Fume hoods were initially designed to continuously exhaust the high air volume necessary to protect users regardless of whether users are present. By installing occupancy sensors and regulating the exhaust air flow, the energy usage can be significantly reduced without decreasing safety. This modification has been made in one campus laboratory building and is being evaluated for potential installation in other laboratory buildings.

7.8.2 Appliance Replacement Incentive Program

UCLA is planning to assess the economic viability of offering an incentive program to replace older, energy wasteful refrigerators and freezers with newer, energy efficient units. The program would reduce both energy consumption and campus carbon emissions. The expected benefit for each typical unit is a reduction of 1,300 kilowatt-hours and 1,000 pounds of CO₂ emissions per year. Assuming 1,000 units are replaced, the annual savings could amount to approximately 1,300 MWhrs and approximately 450 metric tons of CO₂.

7.8.3 Dedicated Server Room Consolidations

UCLA is planning to work towards establishing administrative controls to ensure highly reliable environments for computer server systems while at the same time limiting proliferation of systems that place heavy environmental demands on building conditioning systems. The campus would work with academic and administrative departments to provide effective and reliable server locations while at the same time establishing a policy that server and related functions not in those locations would be assured of environmental stability. The program would allow the main air conditioning systems in buildings to be secured or set back during periods of low demand and occupancy while authorized server rooms are provided with continuous and reliable conditioning. By contrast the current server disbursement requires many rooms to be air conditioned. The expected reduction in energy consumption and CO₂ emissions is to be determined.

7.8.4 Policy Changes

UCLA has initiated a campus-wide closure during the winter break (Christmas holiday) period for each of the past four years. During this period the campus shuts down the HVAC in unoccupied buildings and those buildings that do not require temperature stability. The program has reduced campus annual electricity use by 2,000 MWhrs and annual CO₂ emissions by over 1,000 metric tons. Similarly, on summer Sundays, the campus reduces air conditioning and lighting in selected campus buildings, which also reduces campus energy use and greenhouse gas emissions. The campus intends to

expand this program to additional time periods and buildings while continuing to accommodate the needs of the campus academic and research mission.

The campus has also introduced changes to the time schedules and control parameters of building management systems. As approved by former Chancellor Carnesale, the campus has initiated a program to widen the temperature control ranges (a 'normal' temperature range is between 68° to 76°F) and reduce ventilation flow rates during non-class hours while maintaining buildings in a safe condition to be occupied. The campus will also seek to establish a program to completely shut off building ventilation systems during periods of planned non-use. Buildings that accommodate medical care functions, housing vivariums and environmentally sensitive research, as well as those housing artifacts would not be included in this program.

7.8.5 Encourage LADWP's Green Energy Portfolio

UCLA and LADWP are both public institutions and with high visibility in Los Angeles. Both institutions have a desire and responsibility to lead the citizens of Los Angeles in demonstrating and promoting the value of sustainability. UCLA has begun to engage the LADWP to determine if an arrangement can be made to reduce the LADWP contribution to UCLA's GHG emission portfolio by expanding the LADWP production of green energy or by directing a higher percentage of green energy to UCLA. Both institutions and the local population would benefit from a public awareness program encouraging the use of sustainable power. UCLA meets periodically with the LADWP and addresses this subject on a regular basis.

8 MOBILE SOURCE EMISSION REDUCTION INITIATIVES – CURRENT & POTENTIAL (Dark Blue Area)

Because campus mobile source GHG emissions in 2007 were lower than in either 1990 or 2000, the UC Policy goals of ensuring GHG emissions are reduced by 2014 and 2020 have been met for mobile sources. However, initiatives were selected to help ensure that mobile source emissions remain steady or decrease below the 1990 and 2000 baseline levels even as campus activities and population increase.

8.1 Fleet Emissions Reduction Initiatives

The initiatives selected to reduce Fleet GHG emissions (see **Table 8-1**) target vehicle type, vehicle fuel, and vehicle miles traveled. Each of these approaches provides emission reductions, and as a whole, the initiative mix offers the best combination of achievable, cost-effective GHG mitigation. Because the campus operates a centralized fleet management system, it is able to aggressively pursue the turnover of Fleet inventory towards zero emissions vehicles (ZEVs), partial zero emissions vehicles (PZEVs), advanced technology partial zero emissions vehicles (ATPZEVs), and other alternative fueled vehicles (AFVs) that use biodiesel, compressed natural gas (CNG) and/or ethanol. Reductions in vehicle miles traveled (VMTs) stem from right-sizing efforts to reduce overall fleet size, reductions in personal miles allowances for vanpools, and on-campus programs such as the Bike Loaner Program designed to reduce midday vehicle trips.

**Table 8-1
Fleet GHG Emissions Reduction Initiatives**

TIMELINE	INITIATIVE	DETAILS
2010	Increase the <i>Number of PZEV/ZEV/ATPZEV</i> by 20%	Pursuant to UCOP guideline metric IV.d in the <i>Policy on Sustainable Practices</i> .
2014	<p>Increase Fleet PZEV/ZEV/ATPZEV to 40%</p> <ul style="list-style-type: none"> • Hydrogen (ZEV) • Vans conversion (ATPZEV) • ICEs → LSVs (internal combustion engines to low speed electric vehicles) <p>Increase Fleet AFVs Including both the PZEV/ZEV/ATPZEV categories and carbon-based alternative fueled vehicles—to 50%</p> <ul style="list-style-type: none"> • Diesel → Biodiesel/WVO • Flex-fuel (E85) • CNG Hybrid 	<p>Vehicle mix to achieve a 40% PZEV/ZEV/ATPZEV rate will include 88 alternative fueled vehicles that will replace standard, internal combustion vehicles. The additions are spread across vehicle use types. Emissions savings are calculated based on VMT and gas mileage of the replaced vehicles.</p> <p>Flex-fuel and biodiesel vehicle purchases will augment the PZEV/ZEVs.</p>

TIMELINE	INITIATIVE	DETAILS
	<p>Decrease Fleet Vehicle Miles Traveled (VMT)</p> <ul style="list-style-type: none"> • Rightsizing • Increase car sharing (departmental) • Bicycle Loaner Program • IWalk program • Reduce vanpool personal miles 	Besides fuel and vehicles, reductions in VMT are the best way to reduce CO2 emissions.
2020	<p>Increase Fleet PZEV/ZEV/ATPZEV to 70%</p> <ul style="list-style-type: none"> • Hydrogen (ZEV) • Vans conversion (ATPZEV) • Eliminate diesel/replace with biodiesel • ICEs → electric/ renewable/PHEV <p>Increase Fleet AFVs including both the PZEV/ZEV/ATPZEV categories and carbon-based alternative fueled vehicles to 75%</p>	<p>Vehicle mix will include the addition of 293 alternative fueled vehicles (above the 2014 vehicle number) that will replace standard, internal combustion vehicles. The additions are spread across vehicle use types.</p> <p>Flex-fuel and biodiesel vehicle purchases will augment the PZEV/ZEVs.</p>

Source: UCLA Transportation, 2008.

Through implementation of these reduction initiatives, by 2014, the Fleet is projected to consist of 40 percent PZEV/ZEV vehicles and 50 percent AFVs. As compared to the BAU scenario, this Fleet mix would result in a GHG emission reduction of approximately 1,888 metric tons of CO2 cumulatively by 2014. By 2020, the Fleet mix would increase to 70 percent PZEV/ZEV vehicles and 75 percent AFVs; resulting in a total cumulative emission reduction of approximately 4,084 metric tons of CO2 by 2020.

By 2050, it is estimated that the entire campus Fleet would run on non-carbon based fuel.

8.2 Commute Emissions Reduction Initiatives

Reductions in commute emissions would be attained by reducing single occupant vehicle trips to and from campus (see **Table 8-2**). The campus offers a range of alternative mode programs designed to encourage both employee and student commuters to travel to and from campus by means other than driving alone. These programs would be leveraged to induce additional reductions in the drive alone rate.

The campus is also pursuing implementation of the Student Housing Master Plan (SHMP) 2007-2017 that entails continued expansion of on-campus housing for undergraduate and graduate students. The SHMP has a goal to provide a total of 17,682 student beds by 2017 on- and off-campus; an increase of approximately 4,300 beds from those available in 2007. Of the estimated 4,300 beds needed to meet the SHMP goals, it is anticipated that 2,500 beds would be developed on-campus. A project currently in

the planning process would add 1,525 undergraduate beds by 2013. In addition to meeting the growing demand for on-campus student housing, UCLA supports the goal to increase workforce housing for staff and faculty, which currently has an unmet need on campus.

The benefit of housing students and employees on-campus is that it brings these commuters to the doorstep of the campus and largely eliminates their commute carbon footprint. New housing as a potential initiative, plus the aforementioned reductions in SOV percentages, could result in a reduction of commute GHG emissions by approximately 3,919 metric tons by 2014 and another approximately 1,381 by 2020; for a total cumulative emissions reduction of approximately 5,300 metric tons of CO₂.

Between 2020 and 2050, the expansion of the Metropolitan Transportation Authority's Metro Rail system is expected to be extended to Westwood, providing subway service in proximity to campus and potentially providing significant further reductions in the drive alone rate.

**Table 8-2
Commute GHG Emissions Reduction Initiatives**

TIMELINE	INITIATIVE	DETAILS
2014	Reduce Employee Single Occupant Vehicle (SOV) Commuters to 50% <ul style="list-style-type: none"> • Increase alternative mode participation in carpool, vanpool, and subsidized transit passes programs. • Provide accoutrements and support for alternative mode programs. • Telecommuting/telework centers • Expand compressed work week programs 	The 2007 mode split for employees includes a 55% SOV rate
2014 and 2020	Increase Housing On-Campus <ul style="list-style-type: none"> • Increase on-campus housing for students • Provide on-campus housing for employees 	<p>Student housing to potentially increase by 1,525 units by 2013. Other future development proposals would continue to address demand to the extent feasible.</p> <p>UCLA aspires to plan for 500 units of employee housing on campus by 2014 and another 500 units by 2020.</p>
2020	Maintain Employee Single Occupant Vehicle (SOV) Commuters to 50% with anticipated population growth <ul style="list-style-type: none"> • Continue alternative mode participation in carpool, vanpool, and subsidized transit pass programs • Telecommuting/telework centers • Expand compressed work week programs • Metro Rail Expo Line 	The advent of the Expo Rail Line and a rapid bus connection from its most proximate station will assist in maintaining the mode split shift despite any anticipated increase in the employee population.

Source: UCLA Transportation, 2008.

8.3 Air Travel Emission Reduction Initiatives

Airline travel for UCLA-related business or activities is generally unavoidable and is likely to continue to grow. In 2007, airline travel emissions were 12,463 metric tons of CO₂. To meet the 2014 emission reduction efforts, offset-based strategies could be utilized and continued through 2020 (see Table 8-3). These carbon offsets would be part of a locally based, or UC-centric, carbon offset mitigation program. An additional strategy could be possible elimination or reduction in short-haul flights for travel that may be better served by another, less carbon-intensive mode. While a five percent reduction in airline travel is targeted for 2020, potential emission reductions achievable from these initiatives remain to be determined. Strategies include increased teleconferencing and switching from very short-haul flights to other modes (such as for a Los Angeles to San Diego journey).

**Table 8-3
Airline Travel GHG Emissions Reduction Initiatives**

TIMELINE	INITIATIVE	DETAILS
2007	Baseline calculations and trend analysis for staff/faculty air travel	Data from UCLA Travel Office and a faculty business air travel survey
2014	Develop and implement plan for carbon mitigation fund for air travel <ul style="list-style-type: none"> • Review potential take rate • Calculate carbon mitigation savings • Explore UC-centric offset fund 	Carbon offsets through a carbon mitigation fund are the most promising means to offset CO2 emissions within this timeframe ; Increase teleconferencing
2020	Reduce staff/faculty air travel by 5%	Replace short-haul trips with less alternative modes; Increase teleconferencing; continue offsets

Source: UCLA Transportation, 2008.

8.4 Cumulative Mobile Source Emission Reductions

Mobile source GHG emissions at UCLA contributed 17 percent to the overall campus emissions in 2007. Mobile source emissions have dramatically decreased since 1990, with the bulk of that decrease occurring between 2000 and 2007. The construction of on-campus housing contributed to that decline, as did the significant success of UCLA Transportation's TDM programs. This success, particularly during that time period, is marked by the advent and growth of the subsidized transit pass programs, which have encouraged several thousand drive-alone commuters to come to campus via public transit. In addition, the long-standing vanpool and carpool programs also decreased drive-alone commute trips to campus and correspondingly reduced commute GHG emissions.

The success of, and focus on, alternative transportation modes at UCLA continues to provide benefits to the campus, including reductions in traffic congestion, reductions in traveler delay, and reductions in GHG emissions. With implementation of the aforementioned emission reduction initiatives, mobile source GHG emissions would continue in the downward trend seen since 1990, and would result in an overall cumulative emission reduction of approximately 9,384 metric tons of CO₂ by 2020.

9 FINANCIAL FEASIBILITY- STATIONARY & MOBILE SOURCE INITIATIVES

9.1 Stationary Source Emission Initiatives – Financial Assessment

Each of the stationary source initiatives identified in Section 7 have significant emission reduction potential, but they also carry an implementation cost to the campus. The six current and planned initiatives⁹ and their emissions reductions and payback periods are detailed in Table 9-1. It is anticipated that debt financing would enable the campus to implement many of these initiatives and that the principle and interest expenses incurred would be paid back through savings in utility expenditures. The initiatives (excluding green energy and solar) have an average payback of five and a half years once utility provider rebates are factored into the total cost.

Table 9-1
Stationary Source Initiative Payback Periods

Initiative	Project Cost After Rebate (\$)	Annual Energy Savings	Simple Payback (Years)	Annual Loan Cost (5.75% @ 15 years)	Payback (with Interest)
HVAC Phase I	\$13,600,000	\$4,000,000	3.4	\$1,378,000	5.2
OCH - Energy Projects	\$2,030,000	\$581,000	3.5	\$206,000	5.4
HVAC Phase II	\$9,600,000	\$2,654,000	3.6	\$972,000	5.7
Induction Lighting	\$3,842,000	\$830,000	4.6	\$389,000	8.7
Occupancy Sensors	\$1,630,000	\$475,000	3.4	NA	NA
T8 Lamp Watt Reduction	\$360,000	\$1,314,000	0.3	NA	NA
Total	\$ 30,702,000	\$8,540,000	3.6	\$2,945,000	5.5

Solar (¼ MW)	\$1,826,000	\$ 95,000	19.2	\$185,000	NONE
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Green Energy (Annual Cost)	\$263,000
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Source: UCLA Facilities Management, 2008.

⁹ Table 10-1 shows T8 Conversion, Occupancy Sensors, and Induction Lighting as separate initiatives although they are discussed in Section 6.1.3 – Lighting Efficiency as a single initiative. They are discussed separately here to identify their individual cost and emission reduction potential.

The HVAC Phase I initiative began implementation in spring 2008 with an initial \$4.2 million in debt financing. An additional \$12.8 million will be provided in debt financing through the University of California Statewide Energy Partnership Program in the next three fiscal years, for a total expenditure of approximately \$17 million. This initiative is anticipated to take four years to complete (2012) and will result in a CO₂ emission reduction of approximately 23,500 metric tons. The payback period for this initiative, including interest, is 5.2 years.

Upon completion of Phase I, the HVAC Phase II initiative is planned to begin (2012), with an estimated completion in 2016. This initiative would receive \$12 million in debt financing through the University of California Statewide Energy Partnership Program over a period of four fiscal years. This initiative will result in a total reduction of approximately 15,600 metric tons of CO₂. The payback period for this initiative, including interest, is 5.7 years.

The On-Campus Housing initiatives will begin in 2009 and will be completed by 2012. The initiatives will be funded by debt financing through the University of California Statewide Energy Partnership Program. When completed, and taken collectively, these initiatives are estimated to save 1,100 MWhrs annually with a corresponding reduction in CO₂ emissions of approximately 2,600 metric tons of CO₂.

The T8 Lamp Watt Conversion Reduction initiative is being funded by Facilities Management. This initiative began in 2008, will take four years to complete, in coordination with the four-year campus re-lamping cycle, and will reduce campus emissions by approximately 5,870 metric tons of CO₂ through an expenditure of \$360,000. The payback period for this initiative is only a few months.

The occupancy sensor installation initiative is being funded through the Chancellor's Office and Facilities Management. Occupancy sensor installation is anticipated to be complete at the end of calendar year 2009. The payback period for this initiative is 3.4 years.

The induction lighting initiative, which will be funded by debt financing through the University of California Statewide Energy Partnership Program, will result in an emission reduction of approximately 3,705 metric tons of CO₂. The payback period for this initiative, including interest, is 8.7 years.

The purchase of green power from LADWP will result in the increased expenditure of \$262,800 annually to pay the premium dollar value for this electricity, which will be paid through the Campus University Purchased Utility fund. UCLA anticipates beginning these increased purchases FY 2010/2011. This initiative will result in an annual CO₂ reduction of approximately 4,800 metric tons.

Installation of photovoltaic panel arrays on campus totaling 0.25 MW will occur over the next several years. As discussed in Section 7 and shown on Tables 7.1 and 9.1, solar is very expensive compared to energy efficiency measures. Although this source of green power is very costly in relation to the amount of CO₂ reduced, it offers the opportunity for the campus to assess the long-term viability of solar power.

9.2 Mobile Source Emission Initiatives – Financial Assessment

The mobile source emission reduction initiatives discussed in Section 7 have also been assessed for the necessary resource expenditures to realize a cost per ton of CO₂ emission reduction. Potential costs for the initiatives identified for Fleet and commutes are shown in **Table 9-2**.

Table 9-2
Mobile Source Initiative Emission Reduction and Cost per Metric Ton of CO₂

Initiative	Initiative Cost (\$)	Cumulative CO ₂ Reduction to 2020 (metric tons)
Fleet	\$3,709,043	4,084
Commutes	\$5,778,101	5,300
Mobile Source Total*	\$9,487,144	9,384

* Cumulative totals through 2020 (not annual) CAP vs. BAU

Source: UCLA Transportation Services, 2008.

For Fleet, the increase in alternative fueled vehicles (AFV), as a percent of the overall Fleet, means that the cost analysis focused on the cost differential between AFVs and traditional internal combustion engine vehicles. The cost differential was then offset by any fuel expenditure savings. In addition, Fleet cost projections assumed the introduction of significant numbers of hydrogen fuel cell vehicles into the campus Fleet by 2020. The cost forecast for these vehicles will critically impact the emission reduction cost projections; thus this financial analysis assumes hydrogen fuel cell vehicles will be sold at “market” rates by 2016.

For commutes, the emission reduction initiatives specified earlier included decreasing single occupant vehicle (SOVs) commutes and increasing alternative mode use. The percentage reduction in the SOV rate identified for both 2014 and 2020 (see Table 8-2) was applied to the estimated number of commuters, based on the projected population for the same years, and assumed that these alternative mode commuters continued to use this mode through 2020.

Therefore, to achieve a cumulative emission reduction of approximately 9,384 metric tons of CO₂ by 2020, the campus would need to invest \$3.7 million for Fleet initiatives and \$5.7 million for commute initiatives.

It is anticipated that the investments to achieve these emission reductions from mobile sources would be funded through parking revenues, in a similar fashion to the existing campuswide TDM programs.

9.3 Existing Funding for Other Sustainability Initiatives

9.3.1 UCLA's Green Initiative Fund

As a result of the May 2008 undergraduate student elections, the UCLA students voted to approve a referendum that established *The Green Initiative Fund*. This fund is anticipated to generate ongoing financial resources through a \$4.00 fee per quarter per student to finance student, faculty, and staff sustainability initiatives. It is estimated that approximately \$200,000 per year could be collected annually to fund such initiatives related to GHG emissions reduction and sustainability education.

9.3.2 Office for the Vice Chancellor of Research – Strategic Initiatives Group

The office of the Vice Chancellor of Research provides coordinative and financial support for seven broad multidisciplinary foci including the areas of climate change, clean energy, and sustainability. The Strategic Initiatives group supports research in these areas by working with Government and other stakeholders on developing and strengthening UCLA's research enterprise; raising its local, national and international profile, facilitating investment and partnering opportunities, undertaking activities related to the attraction, development and retention of the faculty, and ensuring that UCLA Strategic Research maintains the highest possible level of organizational effectiveness and accountability.

9.3.3 University of California Systemwide Funding Opportunities

The University of California provides many research funding opportunities available to UC faculty, researchers and graduate students in many areas related to climate change and sustainability such as coastal and environmental quality, Energy and Environment, advance transit and highways, natural reserves, sustainable agriculture, and others. For a full list of funding opportunities and the centers that manage the grants visit: <http://www.ucop.edu/research/funding/welcome.html>

9.4 Potential Funding for Sustainability Initiatives

9.4.1 Airline Travel Carbon Offset Fund

Regarding campus business related airline travel, it is clear that while such travel can be reduced, it will remain an important component in meeting the campus' mission of research and education. A common strategy employed to offset GHG emissions from airline travel is a carbon offset fund, also referred to as carbon neutral flying. The funds accrued from a carbon offset fund could be invested into GHG emission reduction initiatives either locally (i.e. at the UCLA campus) or systemwide throughout the University of California campuses. The fund could incorporate one of two methods of

capturing monies to offset travel; (1) each individual would pay a small percentage of their total airline travel expenses (e.g. 3 percent) or (2) pay a fixed, roundtrip fee of \$10. Thus, method one and two could potentially produce contributions of \$165,393 and \$141,685, respectively, to the carbon offset fund¹⁰ annually.

9.4.2 Loan-Based Funds

Sustainability revolving loan-based programs have been implemented at universities across the United States with a focus on reducing GHG emissions. Two such universities are Harvard and University of Michigan, both of which have successful loan programs from which UCLA could model a similar program for the purposes of allocating “off set” monies into research to advance climate neutrality for the campus.

The revolving loan fund provides the up-front capital and the applicant departments agree to repay the fund via savings achieved by initiative-related reductions in utility consumption, waste removal or operating costs. This formula allows departments to upgrade the efficiency, comfort, and functionality of their facilities without incurring any capital costs. For example at Harvard University as of November 2007, initiatives funded by its loan program were projected to save Harvard \$3,847,587 per year with an average initiative ROI of 26 percent.

UCLA may consider similar programs as an alternative to buying “offsets” to reduce campus GHG emissions.

¹⁰ While University business related airline travel is booked through several channels, including popular travel websites, only travel booked through the UCLA Travel Office is considered in the calculations. This travel represents approximately one quarter of UCLA business related travel.

10 BEHAVIORAL CHANGE INITIATIVES- CURRENT & PLANNED (Lavender Area)

Behavioral change is a key component to UCLA's success in meeting and surpassing the 1990- and 2000-level emission goals and this change will need to take place across the spectrum of the campus' academic, operational, and broader institutional cultures. Working towards GHG emission reduction goals will require the effort of every person on campus: faculty, students, staff and visitors. While the capacity to reduce GHG emissions from behavioral changes is inherently difficult to quantify, UCLA will continue to demonstrate its commitment to support a culture of sustainability with strong support for energy and other resource conservation and development of individual behaviors that support sustainable practices. Development of educational and awareness programs to stimulate behavioral change typically require low capital investment up front, but have long-term payback potential that can continue to reduce emissions for generations to come. Behavioral change education for students, faculty, and staff can focus on how individuals use energy and other resources in their daily lives and how they perceive the need to conserve resources for a more sustainable future.

Although the previous sections did not discuss mobile emission reduction initiatives as a behavioral change, these initiatives use education and incentives to drive the behavior change of how students, faculty, and staff get to and from UCLA. UCLA's current and planned behavioral changes are not always quantifiable in terms of their GHG emission potential, but they are far reaching and affect how the campus operates and the knowledge each individual gains regarding the difference they can make on a daily basis in reducing the campus' carbon footprint.

For the purposes of showing the effect these changes have over time and to give behavioral change initiatives representation on Figure 6-1 it was assumed that these initiatives would result in a one (1) percent emission reduction from the total campus emissions from 2008 to 2012, increasing to 1.5 percent from 2013 to 2016, and finally resulting in a reduction potential of 2 percent for 2017 through 2020.

10.1 Lab Energy Efficiency Program (LEEP)

The UCLA Office of Environment, Health and Safety (EH&S) began LEEP to promote energy conservation and efficiency specifically in campus laboratories. UCLA's laboratories comprise only 10% of campus space but 60% of the campus energy demand. In fact, these areas generally use about 2-3 times more energy than areas like classrooms and offices. LEEP aims to inform laboratory researchers about ways they can reduce energy consumption without compromising safety or interfering with their research. By explaining to lab researchers how they can help conserve energy, we encourage a greater part of the campus community to decrease energy consumption, reduce carbon emissions, and protect the environment.

The first project of LEEP is a fume hood competition, which encourages researchers in Molecular Science Building (MSB) to close their fume hood sashes and reduce their average sash height. By reducing sash height of fume hoods, the air velocity decreases, thereby reducing energy demand as well. Fume hoods are particularly important for lab energy conservation since each fume hood uses the equivalent energy to power 3.5 households, and there are about 1,500 fume hoods on campus. During the recent competition in MSB, the average reduction for the building was 1,239 megawatts per year—that is an average decrease of 692.4 metric tons of CO₂ each year.

10.2 Housing and Residential Life Initiatives

Education and programs initiatives to influence behavioral change of the students living in the residence halls are extensive and are designed to encourage the students to modify their behavior in the areas of recycling, energy use, reduced use/waste management, and reuse. One such program is the establishment of a Sustainability Theme Floor in Sproul Hall. The goal of the program is to bring students and faculty together to explore issues such as global environmental change, policy and management of natural resources, sustainable rural and urban environments, and environmental leadership. In addition to the theme floor, numerous programs will be implemented in the Residence Halls for the 2008/2009 academic year; these are discussed in detail in Appendix C.

UCLA Housing & Dining and the Office of Residential Life have developed numerous programs that are already in effect or will be implemented in the residence halls and the dining facilities that are focused on creating behavioral change in the students who live on-campus. These programs and initiatives are as follows:

Fall Quarter – Recycling

- Move In Recycling Round Up – will create large recycling areas in each housing complex area to encourage students to reuse or recycle the boxes and materials they use to move their belongings from home to school.
- Trash Sort Challenge Training and Contests – volunteer recycling advocates will be recruited and trained to conduct a trash sort game to help staff and students learn the ins and outs of UCLA’s recycling program so we improve campus trash diversion ratios to the highest levels attainable. The Trash Sort Challenges will be conducted across the residence hall system and winners will win promotional items that encourage sustainability.
- Sustainability Theme Floor – The newly launched Sustainability Theme Floor will co-sponsorship a film and lecture series with the Education for Sustainable Living

Program. Student-initiated initiatives are anticipated to emerge from this new residential living option.

- City of Los Angeles Zero Waste Initiative – encourage the active participation of UCLA staff and students in the City of Los Angeles’ Zero Waste planning initiative.
- Hazardous and E-Waste Recycling – Help students to appropriately dispose of used ink cartridges, batteries, electronic equipment (cell phones, unwanted or broken appliances).
- Lights Out LA – Encourage staff and students to participate in the regional and national “Lights Out” program where residents turn off their lights for a predetermined two hour period of time.
- Follow the Bouncing Bottle – This program will bring representative of Athens Services (UCLA’s contracted waste management service) to campus to share and discuss with students what actually happens to the trash and recycling that the students recycle. A possible field trip to a Material Recovery Facility and the landfills used by the City of Los Angeles might be offered to interested staff and students.

Winter Quarter – Reduce

- Food Waste Diversion – UCLA Dining is participating in the City of Los Angeles’ Restaurant Food Waste Diversion program where compostable materials are diverted from the waste/landfill stream and sent to composting facilities via Athens Services. The program was introduced to DeNeve Dining Spring 2008 and will be expanded to other Residential Restaurant facilities through the course of the 2008/2009 academic year. The Office of Residential Life (ORL) will be providing education and promotion of the program to students and ORL staff.
- Waste Watchers – The goals of this educational program are to reduce the amount of food taken and not eaten by students, which is then left on their plates and trays then in turn is “trashed.”
- Turn it Down/Turn it Off – This program will try to identify all the ways students and staff can reduce their use of critical utilities like electricity and water. The program will encourage greater use of CFLs and power strips to aid in the reduction of electricity consumption and everyday changes that promote water conservation (e.g., shorter showers).
- Recyclemania Contest – Inter-hall and Inter-floor competition to see which floor/community recycles the most. Long-term educational goals of the program are to encourage the greatest diversion of recyclable materials from the

trash/landfill stream while discouraging the purchase of individual/over packaged products that increase the amount of recyclable materials (e.g., bottled water). The winning floor is rewarded with an ice cream sundae party.

- Composting 101 – Students and staff will be introduced to backyard composting techniques including vermiculture (worm boxes).
- Green Wash 101 – This program will assist students in understanding what the new marketing strategies are related to “green” labeling such as organic, 100% Natural, biodegradable, and Green Seal. Knowing the differences in the labels and the environmental benefits of each will make them more informed consumers.

Spring Quarter – Reuse

- Earth Day Celebration – ORL and On-Campus Housing (OCH) will partner with campus groups to celebrate Earth Day. Potential activities to be included in the event are movie screenings and a fashion show that incorporates recycled and/or found objects.
- Mayor’s Day of Service/Big Sunday – On campus residents will be encouraged to participate in this annual day of community service. Many of the initiatives are centered on cleaning up outdoor public spaces.
- Alternative Spring Break Options – Will encourage residents to consider alternative spring break activities/working vacations that focus on the environment and issues of sustainability.
- Sidewalk/Garage Sale – A large swap meet/garage sale event for residents to sell their unwanted belongings to other students at the end of the academic year. Logistics and details are currently in development.
- Clothes Out – Annual clothes drive event where OCH partners with Goodwill Industries to encourage residents to donate items they no longer want. Cardboard boxes from deliveries of goods shipped to UCLA are saved and provided to residents to role model “reuse” of goods.

10.3 Associated Students UCLA (ASUCLA) Initiatives

ASUCLA is a nonprofit organization that was founded in 1919 to provide student services beyond the ones provided by the University. The \$80 million organization is unusual in that it has a student majority on its Board of Directors, which works with UCLA Administration through a Joint Operating Committee. ASUCLA operates six stores on campus that sell academic materials, supplies, apparel, and accessories. It self-operates

twelve food operations and leases space to four third-party restaurants. In addition to restaurants and stores, ASUCLA also offers student support services, through leased operations such as travel, barber, and post office. The student governments (Graduate Students Association (GSA) and Undergraduate Students Association (USAC)) are also part of ASUCLA.

ASUCLA has pursued a number of sustainability initiatives including energy and water conservation through lighting retrofits, motion sensors, low-flow toilets, high efficiency hand dryers and other measures. Since 1998 ASUCLA decreased electricity consumption by 16 percent, water by 18 percent, gas by 22 percent and chilled water and steam (for heating and cooling) by 37 percent. ASUCLA has also increased purchasing of environmentally friendly cleaning products, and recyclable paper products, and are phasing in sustainable carpeting.

In addition to these operational changes, ASUCLA has a number of initiatives that focus on behavior change:

- Refillable Mug Program- ASUCLA offers incentives to students who bring mugs to ASUCLA coffee houses instead of using disposable paper cups.
- UCLA Shopping Bag- ASUCLA designed a shopping bag with an environmental logo on it that it sells to students at cost. Students who use the bags instead of disposable shopping bags at ASUCLA stores are entered in a drawing to win a gift certificate.
- Think Green- ASUCLA has created a section of the main UCLA store that features environmental products and information.
- Dining- In 2007 ASUCLA opened the Greenhouse, an organic food bar. The restaurant features compostable dining ware. Organic and fair trade products, including food from a local company, Organic to Go, are also offered at other eating locations on campus. ASUCLA is currently investigating the feasibility of a composting program that would educate students and reduce waste.

10.4 Expanding Behavioral Change Education Initiatives

As part of its commitment to sustainability UCLA is considering the following educational initiatives to promote individual behavior change:

- Evaluate and augment UCLA's teleconference capabilities as an alternative to in-person meetings, and develop an air travel/commuting reduction strategy for all campus units. This would include an educational component to either focus on reducing vehicle miles traveled (surface and air) and/or instituting an air travel "green fund" where travelers contribute a certain amount of funding to offset

the emissions from air/surface transportation. Refer to Section 7.3 for more detailed information regarding air travel.

- Provide staff, faculty, and students who are located in “green buildings” with periodic orientation to educate them on how the building operates and how they can manage their interior environment in a less energy intensive way, improve recycling practices, and reduce use of other resources such as water, paper, etc.
- Develop Green Office Workshops. These would be interactive presentations that cover basic, easy-to-implement steps to move offices on a path to environmental sustainability and provide information on how to “green” campus events. The workshops would address the following areas: recycling, alternative transportation, purchasing, and energy conservation. Energy conservation education would focus on individual behavior/choices such as turning off personal computers and other electrical devices at the end of the work day.
- Continue to support development of annual Residence Hall challenges where the residents of each building compete against one another to reduce their energy and water use.
- Use the Daily Bruin, UCLA Today, and other campus print and web-based media to create a series of educational articles explaining the components of sustainability and providing information on professional careers in sustainability.
- Advance campus community participation in the many campus lecture series that bring in high-profile research and business experts to promote education and awareness of sustainability issues.
- Provide the UCLA Orientation Counselors with information they need to inform incoming and transfer students of UCLA’s sustainable practices on campus and in the residence halls.
- Develop sustainability text inserts to be included in the “Guide to Life at UCLA” on the Orientation website <http://www.orientation.ucla.edu/guidetolife.htm#S>
- Create an Environmental Ambassadors program for first-year students living in residence halls who host environmental events and activities that spread environmental awareness to other students in their living areas.
- Develop an outreach program for UCLA students that supports and focuses initiatives for promoting sustainability education and awareness among K-12 students in Los Angeles.

- Develop outreach efforts to alumni and other university partners to expand awareness of sustainability and increase investment/donor opportunities.

11 INSTITUTIONAL CHANGE

Institutional changes are long-term approaches such as systemwide or campuswide policies that institutionalize sustainable practices. Institutional changes include operational changes such as how the campus approaches the construction or renovation of buildings on- or off-campus, what purchasing choices the campus makes, and moving the campus from a commuter school towards a residential campus. These changes are discussed in detail in the following sections regarding the campus' Green Building Program, environmentally preferable purchasing practices, and on-campus housing and dining. Creating dedicated sustainability administration also contributes to ensuring the long term success of sustainability measures.

11.1 Campus Sustainability Committee

UCLA's Campus Sustainability Committee (CSC) is committed to fostering a culture of sustainability by infusing sustainability into core academic and educational programs to ensure that UCLA's students are prepared to face existing and future global challenges. The committee, formed in 2004, consists of several faculty and administrators from a variety of campus departments, including Student Affairs, Capital Programs, Purchasing, General Services, Housing and Hospitality Services, Staff Assembly, Events Management, ASUCLA, University Communications, and the Chancellor's office, along with two graduate and two undergraduate student representatives. The CSC is also charged with establishing collaborations to increase the awareness of sustainability throughout the campus community and engage students, faculty, and staff.

11.2 Sustainability Coordinator

The CSC and campus administration established a full-time Sustainability Coordinator position in 2008. The Sustainability Coordinator role will strengthen existing and establish new linkages among ongoing sustainability initiatives across campus to advance UCLA's leadership in reducing carbon emissions and promoting sustainability practices. Through these linkages, existing programs will be strengthened and new programs established to broaden opportunities for the campus to serve as a training laboratory for students learning to integrate sustainability practices and behavior in their future endeavors and to address the present and future global environmental challenges.

11.3 Green Building Design

In July 2003, The Regents expressed their support for a Presidential policy to promote "the principles of energy efficiency and sustainability on the planning, financing, design, construction, renewal, maintenance, operation to the fullest extent possible, consistent with budgetary constraints and regulatory and programmatic requirements." As part of

the 2003 UC Policy that has since been expanded and revised several times, all proposed new buildings and major retrofits will be required to achieve a minimum Silver rating under the US Green Building Council (USGBC) LEED NC rating system. All campuses are encouraged to achieve higher ratings to the extent practical. In addition, all new buildings and major renovations are required to outperform energy efficiency standards embodied in California Code of Regulations Title 24, by at least 20 percent. Lastly, designs for new and renovated laboratory facilities are required to achieve additional requirements particular to energy intensive laboratory uses as described in the Laboratories for the 21st Century (LABS21) Program. For renovation initiatives that do not replace 100 percent of mechanical, electrical, and plumbing systems, designs are required to meet the requirements under the USGBC LEED for Commercial Interiors (CI). More recently, the UC Policy for Sustainable Practices has been expanded to include a comprehensive “greening” of all campus existing buildings utilizing the USGBC LEED for Existing Buildings (EB) criteria. Since adoption of the UC Policy, several new campus and off-campus new construction and major renovation projects are being designed to achieve these standards as shown in **Table 11-1**.

Table 11-1
UCLA Green Building Initiatives

Building Name	Target Rating
La Kretz Hall	NC-Silver
Life Science Replacement Building	NC-Silver (under construction)
Police Station Replacement Building	NC-Silver (under construction)
Hilgard Graduate Student Housing	NC-Silver (in design)
Northwest Housing Infill Initiative	NC- Silver (in design)
Spieker Aquatic Center	NC- Silver (under construction)
South Campus Student Center	NC- Silver (in planning)
Southwest Housing & Commons	NC- Silver (in planning)
Sproul Hall Renovation	CI- Silver (under construction)
Rieber Hall Renovation	CI-Gold (under construction)
CNSI BSL3	CI-Certified (in design)
GCRC	CI-Certified (in design)
YRL Renovation	CI-Certified (in design)
CHS South Tower Renovation	CI-Certified (in design)
Rieber Hall Dining Renovation	CI-Certified (in planning)
Hershey Hall Renovation	CI-Certified (in planning)
Pauley Pavilion Renovation	CI-Certified (in planning)
Music Building Renovation	CI-Certified (in planning)
Lake Arrowhead Conference Center	CI-Certified (in planning)
Public Affairs Building	EB- (pilot project)

Source: UCLA Capital Programs, 2008.

11.4 Environmentally Preferable Purchasing

UCLA's purchasing process is primarily centralized, but UCLA Campus Purchasing does not have sole jurisdiction over all goods that are ordered for UCLA (distinct purchasing operations are established for the Medical Center as well as the Associated Student operation). However, efforts to create a unified and paperless purchasing and accounts payable system for the campus began in 1989 and a system was implemented in 1993. This system primarily replaced paper processes utilized at that time. Since then, the BruinBuy e-procurement system was implemented in 2001 and currently provides access to 30+ active e-catalogs. Most data entry processes for the campus have moved to web-based entry from paper processes.

Changing what the campus purchases and establishing standards is a process that has reached several significant thresholds in three major areas: 1) recycled-content paper, 2) computer purchases and electronic waste, and 3) energy/water efficient products.

First, UCLA Purchasing has been urging the campus community to buy 30 percent post-consumer waste recycled paper, which is priced similarly to virgin stock through the system-wide contract. The campus' largest single user, Document Services, converted to this paper type after a test run. In 2008, the campus purchases of post-consumer recycled content copier paper have increased from 26 percent to 80 percent.

Second, to meet UCLA's commitment to purchase environmentally preferable computer products and recycle electronic waste, all standard configuration personal computers (desktop/laptop) purchased by the campus meet the standard of Electronic Product Environmental Assessment Tool (EPEAT) Silver or Gold certification and all recyclers of campus electronic waste are required to sign the Electronic Recyclers Pledge of True Stewardship.

Third, to increase energy efficiency, UCLA purchases Energy-Star® rated personal computers, while other Energy-Star® products are purchased whenever possible for both energy and water efficiency.

UCLA sustainable purchasing activities also support and are integrated into the campus' green building program. For example, the campus has a system-wide carpet contract in place to provide the purchase of low-VOC (volatile organic compounds) and recycled-content carpet. Similarly, low VOC adhesives, sealants, paints, and coatings are systematically purchased for new and renovation initiatives of any size throughout the campus. Finally, furniture purchases with foam components that do not contain CFCs or HCFCs and wood furniture and interior finishes certified by the Forest Stewardship Council (FSC) are purchased whenever feasible.

To further the mission of the environmentally preferable purchasing policy, the following potential initiatives could be explored to increase the campus' sustainability efforts:

- Develop a long-range plan to systematically reduce/consolidate the number of vendor-based delivery trips to on- and off-campus facilities.
- Eliminate purchases of polystyrene containers for food or beverage use on- or off-campus. UCLA would also work with vendors to promote use of non-polystyrene packing material.
- Reduce the amount of packing materials used in products purchased and increase the use of environmentally friendly inks.
- Require food and beverage containers and utensils purchased by the campus to be either biodegradable or contain a minimum recycled content and be completely recyclable.
- Eliminate the sale of individual bottled water on campus. This includes vending machines.

11.5 On-Campus Housing and Dining

Since the late 1980's, UCLA has made a significant investment in the provision of on-campus student housing and in the acquisition of some off-campus apartment buildings near campus, to continue the transformation of the campus from a commuter school to a residential campus. This transformation has benefited the campus through the reduction of commuter trips, thus reducing mobile emissions. Providing housing and dining services also has the greater effect of improving the quality of the student experience by creating a supportive and cohesive student community that is integrated with all aspects of campus life.

As of the 2007/2008 academic year, UCLA housed 9,374 undergraduate students on the main campus. According to the Student Housing Master Plan (SHMP) 2007-2017, approximately 2,500 additional beds would be needed to fulfill the on-campus housing goals by 2017. With completion of the currently proposed Northwest Housing Infill Project, approximately 1,525 beds would be available by 2013, reducing the projected shortfall to 975 beds.

In addition to the undergraduate bed spaces, approximately 1,370 single graduate students are housed on campus in Weyburn Terrace. The Southwest Housing Phase II project—which has been deferred and remains in the planning stage—could provide another 400 or more beds.

Off-campus student housing is another component of the campus' housing system, with 2,700 undergraduates, graduates, and students with families living in campus-owned apartments within one to five miles of the main campus. Approximately 900 of this off-campus inventory of bed spaces are located in North Westwood Village, which is

immediately adjacent to the main campus. Lastly, the Hilgard Graduate Student Housing project (currently under construction immediately adjacent to campus) will develop 83 single graduate student beds by 2010.

For on-campus student residents, dining facilities have been integrated into four existing residence halls: De Neve Commons (822-seat capacity), Covell Commons (636-seat capacity), Hedrick Hall (628 -seat capacity), and Rieber Hall (659-seat capacity). Development of the proposed Northwest Housing Infill Project (mentioned above), would add another dining facility with a 750-seat capacity.

As discussed in Section 8.1, the campus is dedicated to developing all new construction and major renovations under the Green Building Design program. Under that program, several housing initiatives are under construction or in the planning stages. Hilgard Graduate Student Housing, Northwest Housing Infill Project, and Southwest Housing Phase II would be designed, constructed, and maintained at a minimum standard of UC-equivalent LEED “Silver” and will strive to achieve a higher rating if feasible. Planned renovations of Rieber and Sproul Hall have the potential to become UC-equivalent LEED “Gold” rated buildings.

Another major advancement in sustainability within on-campus housing is the food waste recycling program that began in the four residential dining facilities in May 2008. The first phase of the program is in progress to capture kitchen and post-consumption food waste to become compostable material, thus avoiding unnecessary exportation of waste to nearby landfills. Phase two of the program will place green waste bins on the floors of the residence halls to capture food waste and food containers. Ongoing initiatives include the recycling of green waste (i.e., landscape and grounds material) through the campus mulching program.

Despite these energy efficiency and waste measures and the behavior change efforts discussed in the previous section, housing and dining facilities do require electricity and natural gas, which contribute to UCLA’s annual GHG emissions; albeit slightly offset by the reduction in mobile emissions from residential students who no longer need to commute to campus. Furthermore, it can be anticipated that GHG emissions from provision of on-campus housing will continue to increase as more facilities are constructed. According to the Student Housing Master Plan, even with construction of the facilities currently being planned, there will remain a shortfall in the number of beds available compared with demand going forward. Additionally, the campus has long recognized the need to develop a program to provide staff and faculty (workforce) housing in an effort to support the campus’ need to recruit and retain top notch faculty and staff to remain competitive among higher educational institutions. With the ever increasing cost of housing in the areas surrounding the campus, not to mention the volatility in the cost of gasoline, the current administration has set as a primary goal, the development of a workforce housing plan to ultimately support provision of workforce housing.

From a regional and statewide perspective, a key strategy for mitigating GHG emissions being promulgated by the State Office of Planning and Research includes the implementation of land use strategies to encourage jobs/housing proximity in an effort to reduce vehicle miles traveled. However, it must be recognized that as UCLA continues to provide housing dedicated to students, faculty and staff, GHG emissions from energy use from new housing facilities will increase with a smaller offset realized from the consequent reductions in commutes. The smaller offset realized from reductions in GHG emissions from UCLA commuters is due in part to the continuing success of the campus Transportation Demand Management programs that have reduced the drive-alone rate to 55 percent campuswide.

12 ACADEMIC PROGRAMS & SUSTAINABILITY RESEARCH

As an institution of higher education, UCLA recognizes its obligation to prepare students to be global citizens who understand and practice living sustainably in addition to supporting and promoting environmentally responsible operations. In order to prepare students and the campus community for these roles, UCLA offers a growing range of climate and sustainability-related educational experiences. These educational experiences can be found not only in courses and degree programs, but also in residential life programs, staff and faculty workshops, resource centers, student groups and peer-to-peer educational programs. UCLA is committed to expanding these efforts in order to foster learning on climate and sustainability issues.

12.1 Existing Courses and Academic Programs

In 2006, UCLA offered over 200 courses focused on or directly related to climate change and sustainability. These courses accounted for more than 3 percent of the entire course selection offered that year and were distributed among one-fifth of the 141 departments on campus. This includes courses such as the Global Environment Freshman Cluster, a 3-course sequence that annually teaches over 170 first-year students about ecology, water quantity and quality, air quality, climate change, energy policy, and regulation in one integrated program.

UCLA has many academic programs dedicated to climate change and sustainability education at both the undergraduate and graduate levels. In addition to the specific programs mentioned here, there are many additional disciplinary major or minor programs offered by departments that address issues related to climate change and sustainability such as those in Earth and Space Sciences, Ecology and Evolutionary Biology, Geography, Civil and Environmental Engineering, and Political Science, just to name a few.

12.1.1 Undergraduate Programs

- Atmospheric, Oceanic, and Environmental Sciences Major: The Department of Atmospheric and Oceanic Sciences (AOS) offers this B.S. degree program which is

designed to be a very flexible program leading to a wide variety of career options, including graduate study in atmospheric and oceanic sciences.

- **Interdepartmental Program in Mathematics and Atmospheric & Oceanic Sciences:** This undergraduate interdepartmental program combines courses from the Mathematics and AOS departments. This program is designed to provide rigorous mathematical training with a comprehensive background in topics relevant to atmospheric, oceanic and environmental sciences. The program is intended to provide particularly good preparation for graduate studies in a streamlined course of study.
- **Atmospheric and Oceanic Sciences Minor:** The minor program offered through AOS provides a formal vehicle for students specializing in other science fields to pursue interests in the atmospheric and oceanic environment. It is designed to be flexible, recognizing that many topics in this field cross traditional disciplinary boundaries.
- **Environmental Science Major:** The Institute of the Environment (IoE), together with the Departments of Atmospheric and Oceanic Sciences, Civil and Environmental Engineering, Earth and Space Sciences, Ecology and Evolutionary Biology, Environmental Health Sciences and Geography, offer an undergraduate major in Environmental Science. This B.S. degree program offers both disciplinary breadth and depth and includes a solid foundation of natural sciences and upper division coursework in nine different departments that focus on understanding environmental issues across earth, atmospheric, life, and social sciences. In addition, students must complete a disciplinary minor which provides in-depth knowledge in one of eight environmental science areas, each associated with a particular UCLA department.
- **Earth and Environmental Science Major:** The B.A. degree program in the Department of Earth and Environmental Science is intended to provide a broad background in Earth sciences that is especially appropriate for students intending to become K through 12 teachers in Earth, physical, or life sciences. It may also be of interest to students who plan careers in environmental sciences, law, government, business, journalism, public health, medicine, or dentistry.
- **Environmental Systems and Society Minor:** This IoE minor is designed for undergraduate students who wish to augment their major program of study with courses addressing the relationships between environmental science and associated social and political issues. The minor seeks to impart a deeper understanding of environmental systems related to air, land, water and biological resources. A main goal of the program is to provide students with a foundation for sound decision making as a professional and a citizen.

- **Conservation Biology Minor:** The Conservation Biology minor in the Department of Ecology and Evolutionary Biology is designed to augment a student's major program of study with courses addressing issues central to the conservation and sustainability of biodiversity and natural ecosystem processes. The minor seeks to provide students with a greater depth of experience and understanding of the role that science can play in developing conservation policy.
- **Geography/Environmental Studies Major and Minor:** Intended to develop and deepen a student's understanding of environmental issues, the Geography/Environmental Studies degree program emphasizes a systems approach to gaining an understanding of major environmental problems facing our society and the world at large. Students gain an understanding of geographical perspectives of human impacts on natural systems, and on the implications of environmental change on local, regional and global human systems.
- **The Education for Sustainable Living Program (ESLP):** ESLP provides education in sustainability to undergraduate students through a student-organized lecture series and on-campus action research. The Action Research Teams are small groups of undergraduate students who work closely with UCLA faculty, staff and administrators to address questions about sustainability on campus.

12.1.2 Graduate and Professional Programs

- **Leaders in Sustainability Certificate Program:** The IoE together with the UCLA Anderson School of Business offer graduate level sustainability education through the Leaders in Sustainability Certificate Program. This program, beginning its second year, enables graduate students from any area on campus to reach out beyond their departmental studies to incorporate interdisciplinary sustainability courses and sustainability-focused community research into their graduate education.
- **Atmospheric and Oceanic Sciences – Climate and Weather:** The AOS department offers a research area in Climate and Weather as part of the M.S. and Ph.D. programs. The program addresses the challenge of a wide variety of problems of compelling scientific interest and increasing social relevance including climate change, greenhouse warming, air pollution, and the ozone layer.
- **Environmental Science and Engineering Program (ES&E):** The ES&E program is a professional doctorate program that provides students the scientific, engineering, and policy skills to translate their research into effective environmental action. The ES&E program uses an interdisciplinary approach to develop leaders in environmental science and policy.
- **Environmental Health Sciences:** The EHS department, in the School of Public Health offers M.P.H., M.S. and Ph.D. and Dr. P.H. degree programs that explore

the relationship between human health and the environment. The program addresses health issues in the workplace and the exposure of ordinary citizens to environmental agents as they move through the many microenvironments of everyday life.

- **Public Policy – Environmental and Natural Resource Policy:** The Department of Public Policy offers a specialization in Environmental and Resource Policy as part of the Masters in Public Policy professional degree program. Students gain knowledge critical for writing laws and regulations, creating new domestic or international institutions, supervising environmental organizations, and operating environmental protection programs and resource management efforts.
- **Urban Planning – Environmental Analysis and Policy:** The Department of Urban Planning offers a specialization in Environmental Analysis and Policy as part of the Masters of Arts in Urban Planning program. The program is concerned with broader questions of environmental policy and the role of environmental issues in the overall planning process in both domestic and international settings.
- **Wells Environmental Law Clinic:** The Clinic offers excellent opportunities for law students to obtain hands-on experience in environmental law. Working with many nonprofit and government agency partners, the clinic has been very successful at training environmental lawyers while helping to protect the environment. Students who take the six-unit environmental law clinical course work on large and small cases, involving both federal and state law.

12.1.3 Student Groups and Organizations

UCLA has a wide range of student groups that focus on climate change and sustainability-related issues. These groups provide student resources, and educational and volunteer opportunities.

- Graduate Student Association Sustainable Resource Center
<http://www.gsa.asucla.ucla.edu/~src>
- Net Impact
<http://uclaandersonnetimpact.blogspot.com/>
- Sustainable Urban Network
<http://www.studentgroups.ucla.edu/sun/>
- E3: Ecology, Economics, and Equity
<http://www.studentgroups.ucla.edu/e31a/eslp.html>
- Bruins for Traffic Relief
- FEED: Forum for Energy, Economics and Development
<http://renewablefeed.googlepages.com/home>
- CALPRIG: UCLA chapter of California Public Interest Research Group

- Green the Greeks
<http://www.facebook.com/group.php?gid=7520008146>
- Rainforest Action Network

12.1.4 UCLA Staff Programs

The UCLA Staff Assembly, as part of their continuing education programming, is offering several sustainability-focused educational opportunities for UCLA Staff members. These include a series of “Learn at Lunch” workshops that focus on sustainability and professional development research projects that address sustainability issues. One professional development team project is currently developing a guide to “greening” offices that will be available in Spring 2009. The guide will include tips for energy use reduction, waste reduction and recycling, and green purchasing.

12.1.5 Educational Events

UCLA engages in many events each year that focus attention on issues of climate change and sustainability. For more about conferences and community events see the Community Outreach section of this report. For the past two years UCLA has held a fall Sustainability Fair highlighting what UCLA is doing to improve its sustainability as well as teach staff and students ways to improve their own sustainability. Every year on Earth Day, several student organizations plan educational events, usually a full day of activities. In January 2008 UCLA participated in the nation-wide climate change solution teach-in, Focus the Nation. This event hosted UCLA faculty-run workshops open to the campus community addressing issues in all areas of climate change. UCLA also participated in another major national teach-in in February 2007, the 2010 Imperative, part of Architecture 2030’s global challenge that calls for new buildings to reduce their GHG by 50 percent by 2010 and be carbon neutral by 2030.

12.1.6 Student Representation

UCLA has a history of shared governance and student participation in important decision-making processes. Campus Sustainability is no exception. There are four official student representatives, two graduate and two undergraduate, on the Campus Sustainability Committee. There are also student representatives on the CSC subcommittees (Operations, Academics, and Communication), on the Transportation Advisory Board, Housing Committee, and many other decision-making committees on campus.

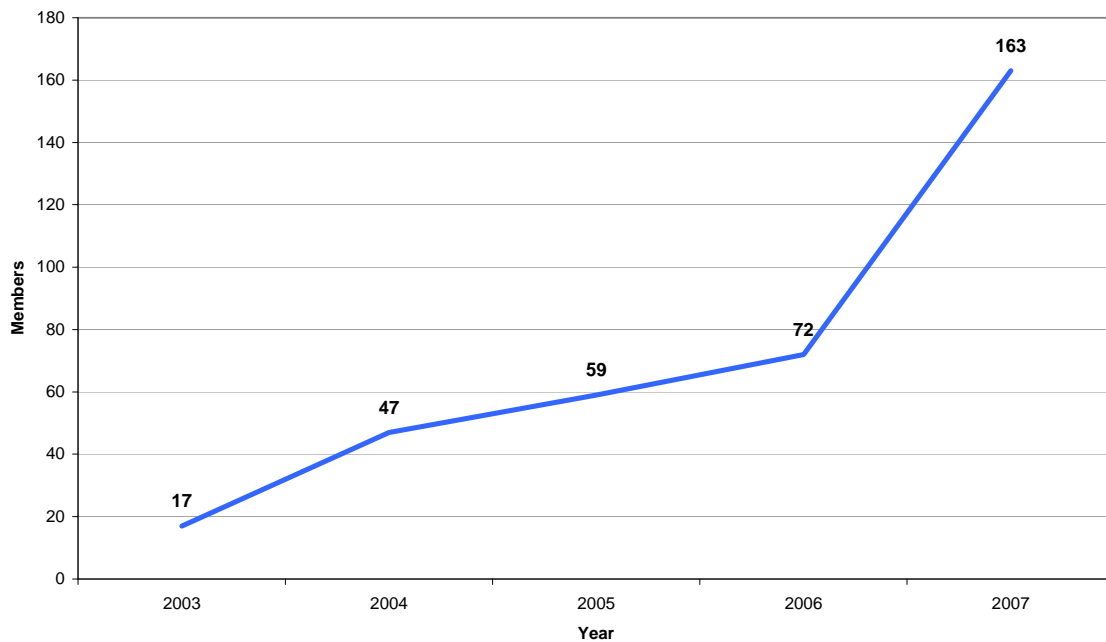
12.1.7 Campus Interest

In 2006, a survey was distributed to all campus faculty and students inquiring about sustainability interest on campus. Of the 2,000 respondents, well over 90 percent felt that sustainability was important. In addition, about 40 percent of the 117 faculty respondents were interested in teaching or performing research related to sustainability and about 90 percent of the student respondents expressed interest in taking courses related to sustainability. The survey respondents, both student and faculty, with

interest in taking or teaching sustainability were distributed in all identified areas of study: Arts & Humanities, Social, Health & Life, Hard Sciences and Grad Professional. This level of campus interest suggests that measures to expand climate change and sustainability programming will be well received by both students and faculty.

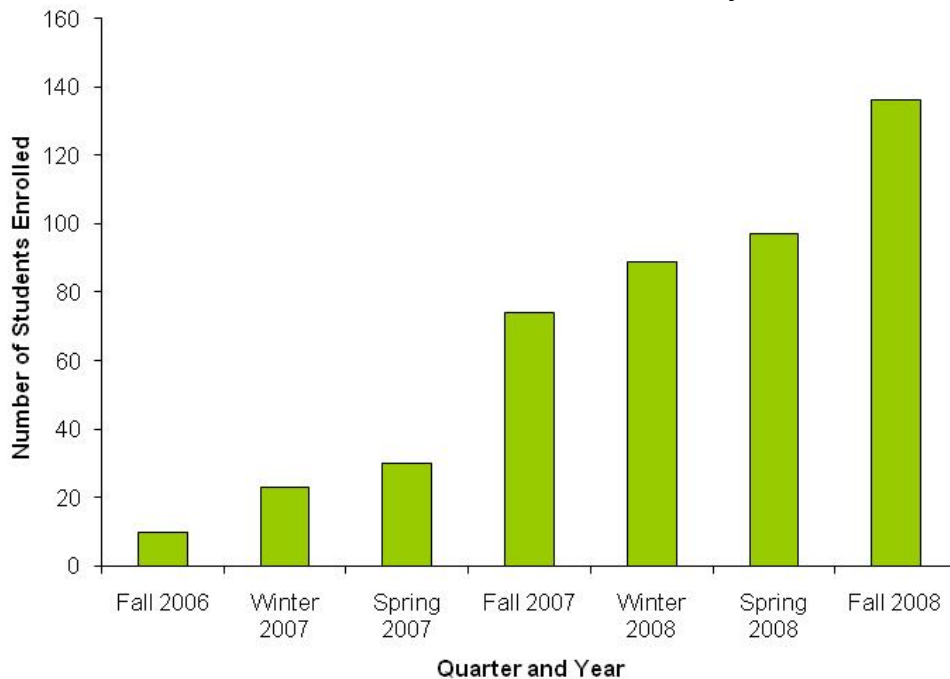
The growth of student groups also reflects the growth of interest in climate change and sustainability among students. As an example, paid membership in Net Impact, the UCLA Anderson School of Management chapter of a national organization dedicated to sustainable business grew at a compound annual rate of 76 percent over the last 4 years. See Figure 12-1. In addition, there has been similarly high growth in the Environmental Science Major since it was first offered in 2006. See Figure 12-2.

Figure 12-1
UCLA Anderson Net Impact Paid Membership by Year



Source: UCLA Anderson Net Impact 2008

Figure 12-2
Enrollment in Environmental Science Major



Source: UCLA Institute of the Environment 2008

12.1.8 Expanding Academics: New Initiatives

As part of its commitment to sustainability and climate, UCLA plans to take several steps to expand on the current climate change and sustainability programming available at UCLA.

- **Sustainability Across the Curriculum Faculty Workshop:** To help expand the current course offerings, UCLA is planning a workshop to provide assistance and incentives for faculty to integrate climate change and sustainability-related material into their existing courses.
- **Expand Education for Sustainable Living Program:** Resulting from the overwhelming success of the Education for Sustainable Living Program, the program is being expanded by making the action research team experiences formal courses in the Institute of the Environment and also extending the research period to 20 weeks (2 quarters) instead of 10 weeks.
- **New Courses:** Several new courses are being scheduled for this year including a renewable energy project management course and an industrial ecology course at the Anderson School of Management, and a course on the Green Economy at the Department of Urban Planning.

- **New Summer Courses:** UCLA Summer Session is planning to offer two new courses; one on Urban Sustainability to provide UCLA students and visiting students an opportunity to understand sustainable practices in Southern California, and one for students traveling abroad that asks them to engage in informal field observations looking at policies, practices, and the effects of sustainability efforts of the cities and people they experience abroad.
- **Laboratory Greening Education:** The Oral Biology Graduate Program is exploring adding a sustainability seminar to their curriculum to teach graduate students and staff researchers ways to conduct research in a more sustainable way.

12.2 Research

As one of the leading public research universities in the world, UCLA is consistently ranked nationally in the top five institutions for research funding with awards in 2007 totaling nearly \$900 million. UCLA's great strength lies in its ability to address significant interdisciplinary research challenges. Research at UCLA has a long tradition of interdisciplinary collaborations including those in the areas of climate change and sustainability. Projects that cross academic boundaries flourish at UCLA, where faculty from a full spectrum of academic departments and professional schools work together on a single university campus. UCLA is committed to facilitating research in the science of climate change and sustainability, technologies to combat climate change and sustainability problems, and in policies that support emerging science and technology.

UCLA currently has over 160 faculty engaged in climate and sustainability-related research. This research covers a wide range of topics critical to mitigating the causes of climate change, including:

- Air Pollution
- Atmospheric Science
- Carbon Sequestration
- Climate Change
- Climate Change Policy
- Conservation
- Energy Production
- Energy Transmission/Storage
- Ocean Research/Coastal Ecosystems
- Solar Energy
- Water Research

Faculty research in these areas is likely to grow in the next few years. In 2006, a survey was distributed to all campus faculty and students inquiring about sustainability interest on campus. About 40 percent of the 117 faculty respondents were interested in teaching or performing research related to climate change and sustainability, many of whom do not currently perform this type of teaching or research.

12.2.1 Research Centers and Groups

In addition to an abundance of world-class disciplinary-based departmental research, UCLA has a wide range of centers dedicated to research in the areas of climate change and sustainability. These centers, encompassing a broad array of academic disciplines, research interests, policy concerns and outreach avenues, are spread throughout campus in units including the Institute of the Environment, Atmospheric and Oceanic Sciences, Geography, Civil and Environmental Engineering, Law, Management, Public Policy, and many others.

12.2.1.1 Natural & Physical Sciences

- **Air Quality and Aerosol Technology Laboratory:** This laboratory facilitates the study of the dynamics of aerosol flow reactors. It is well equipped for the study of particle/gas systems with applications to pollution control and commercial production of fine particles. Instrumentation available includes optical particle counters, electrical aerosol analyzers, and condensation nuclei counters.
Host Unit : Department of Chemical Engineering
www.chemeng.ucla.edu/reschlabs.html
- **Center for Earth Systems Research (CESR):** CESR conducts research in the physics and biogeochemistry of the Earth's atmosphere, cryosphere, and oceans. In addition, CESR is a base for a broad, cooperative effort to develop, test, and apply comprehensive numerical modeling capabilities for the Earth's climate for periods extending over previous millennia, the present, and the coming centuries of anthropogenically induced changes.
Host Unit: Department of Atmospheric and Oceanic Sciences
www.atmos.ucla.edu/cesr/
- **Center for Tropical Research (CTR):** The unifying goal of the senior scientists, postdoctoral researchers, and graduate students at the CTR is to understand the biotic processes that underlie and maintain the diversity of life in the tropics and to advance conservation efforts that protect endangered species and habitats. Core research investigates the impacts of human activities, including climate change, on biodiversity and conservation efforts.
Host Unit: Institute of the Environment
www.ioe.ucla.edu/CTR/
- **Coastal Center:** The Coastal Center addresses problems related to the coastal ocean and land margin bordering Southern California, including wetlands and watersheds.
Host Unit: Institute of the Environment

- Environmental Engineering Analytical Chemistry Laboratory (EEACL): EEACL has been established to provide for identification and quantification of organic and inorganic compounds at trace levels in environmental, biochemical and geochemical samples from atmospheric, aquatic and solid media.
Host Unit: Department of Civil and Environmental Engineering
www.cee.ucla.edu/eeacl.htm

- Joint Institute for Regional Earth System Science and Engineering (JIFRESSE): JIFRESSE is a scientific collaboration between UCLA and NASA's Jet Propulsion Laboratory (JPL) to improve understanding of global climate change and to develop future projections about its effect on regional climates and environments. The Institute serves as a center for multi-disciplinary research focused on the Southern California region including studies of the atmosphere; coastal ocean and land surface; and the physical, chemical and biological interactions among them.
www.jifresse.ucla.edu/default.htm

- UCLA Stunt Ranch Reserve: The reserve is a preserved natural chaparral habitat (naturally burned in 1995) used for research and education. While researchers track the re-growth of vegetation on the charred slopes, facilities reconstruction and University-community outreach are top priorities of the reserve's project and faculty managers.
Host Unit: UC Natural Reserve System (UCLA administration)
<http://stuntranch.ucnrs.org>

12.2.1.2 Technology

- Center for Energy Science and Technology Advanced Research (CESTAR): CESTAR is an interdepartmental research center whose mission is to provide a common focal point for collaboration and synergism among researchers at UCLA involved in energy-related research. Currently CESTAR is organized around four specific energy thrust areas: Fusion Energy, Hydrogen, Materials for Energy Applications, Energy Conversion, and Energy Conservation.
Host Unit: School of Engineering and Applied Sciences
<http://cestar.seas.ucla.edu/>

- Center for Embedded Networked Sensing (CENS): CENS is a major research enterprise focused on developing wireless sensing systems and applying this revolutionary technology to critical scientific and societal pursuits including: development of new measurement tools to identify the sources and fates of chemical and biological pollutants in natural, urban, and agricultural waters as well as using cell phones for applications in areas of public health, environmental protection, urban planning, and cultural expression. One tool CENS has

developed, [PEIR](#) or Personal Environmental Impact Report, helps people measure their individual environmental footprint and exposure to pollutants.

Host Unit: Computer Science Department

www.research.cens.ucla.edu

- **Energy Design Tools - Home Energy Efficient Design (HEED):** Researchers in the Department of Architecture and Urban Design have developed a suite of free easy-to-use energy design software programs including HEED, which shows home owners, builders, and architects how much energy and money they can save by making various design or remodeling changes. Users can easily draw in the floorplan of their house and can select from lists of standard wall and roof construction and different types of windows. The latest version adds new features including allowing changes to electric and gas utility rates plus rates for oil and propane, offering various kinds of operable window shading, allowing thermal mass to be added or removed, and calculating the home's carbon footprint. Climate data is available for over one thousand locations around the world. This climate data can be graphically analyzed using another tool called Climate Consultant.

Host Unit: Department of Architecture and Urban Design

<http://www2.aud.ucla.edu/energy-design-tools/>

- **Water Technology Research (WaTeR) Center:** The mission of the WaTeR Center is to advance technologies of water production in order to develop new and economical alternative sources of potable, irrigation, and consumptive water uses.

Host Unit: School of Engineering and Applied Sciences

www.desalination.ucla.edu/

12.2.1.3 Policy & Law

- **Center for Climate Change Solutions:** The Center for Climate Change Solutions operates at the intersection of science and policy by engaging researchers and decision-makers in the development and communication of effective solutions to the consequences of climate change.

Host Unit: Institute of the Environment

www.ioe.ucla.edu/cccs/

- **Emmett Center on Climate Change and the Environment:** The Emmett Center is the nation's first law school center focused exclusively on climate change. Its mission is studying and advancing law and policy solutions to the climate change crisis and training the next generation of leaders in creating these solutions. It focuses on issues relating to both mitigation (reducing greenhouse gas concentrations in the atmosphere) and adaptation (coping with whatever climate change is inevitable despite our best mitigation efforts), working across

- disciplines to promote research and tools useful to decision-makers locally, statewide, nationally and beyond.
- Host Unit: School of Law
www.law.ucla.edu/home/index.asp?page=2390
- California Center for Population Research (CCPR): CCPR is a cooperative of UCLA faculty who carry out basic and applied research and training in demography. CCPR comprises over 60 active faculty researchers from the disciplines of anthropology, economics, epidemiology, geography, human resources & organizational behavior, law, medicine (pediatrics and psychiatry), population, psychology, community health services, public policy, social welfare, sociology, and urban planning.
Host Unit: School of Public Affairs
www.ccpr.ucla.edu/asp/index.asp
 - Center for Corporate Environmental Performance: The Center for Corporate Environmental Performance coordinates research and teaching on the environmental impact of corporations and market responses to green strategies. The center partners with corporations to improve their environmental performance while remaining competitive.
Host Unit: Institute of the Environment
www.ioe.ucla.edu/ccep/
 - Institute of Transportation Studies: Each year dozens of ITS faculty, students, and research staff collaborate on a wide array of transportation policy and planning studies, ranging from an analysis of the travel trends and transportation needs of immigrants and low-income workers, to the testing and evaluation of innovative fare programs to increase public transit use.
Host Unit: School of Public Affairs
www.its.ucla.edu
 - Lewis Center for Regional Policy Studies: This center promotes the study, understanding and solution of regional policy issues, with special reference to Southern California, including problems of the environment, urban design, housing, community and neighborhood dynamics, transportation and economic development.
Host Unit: School of Public Affairs
<http://lewis.spa.ucla.edu/index5.cfm>

12.2.1.4 Human Health and Environmental Justice

- Center for Healthier Children, Families & Communities: The Center has created a unique partnership of University faculty, students, and researchers; service providers; community organizations; local residents; businesses; and government agencies to: develop innovative and responsive health and social services programs, transform communities into healthier environments for children, and educate the next generation of leaders for careers in community service.

Host Unit: David Geffen School of Medicine, Department of Pediatrics, and School of Public Health

www.healthychild.ucla.edu

- Center for the Study of Urban Poverty (CSUP): CSUP's primary mission is to encourage and facilitate academic research into the causes and consequences of urban poverty and the effectiveness of policies aimed at alleviating poverty.

Host Unit: Public Affairs

www.sscnet.ucla.edu/issr/csup/index.php

- Center for Occupational and Environmental Health (COEH): COEH-affiliated centers and programs seek to expand our knowledge base, provide exceptional training of students to address toxic chemical exposure, global warming, population growth, habitat destruction, and social/psychosocial factors, and to interact with Southern California communities as an interface between the University and the public.

Host Unit: Environmental Health Science

www.coeh.ucla.edu

- Urban Center for People and the Environment: The research focus of the Urban Center for People and the Environment is integrated social-biophysical research on human environmental interactions and their impacts and feedback loops, social justice and urban environmental sustainability through revitalizing and re-naturalizing the urban environment and research and analysis of systems of governance and government for democratic accountability and greater sustainability.

Host Unit: Institute of the Environment

www.ioe.ucla.edu/UCPE

12.2.2 Expanding Research: New Initiatives

As part of UCLA's Strategic Research goals, UCLA is committed to continuing its current efforts to expand research in climate change and sustainability-related fields.

- **Clean Tech LA:** UCLA is leading a consortium of partners that include University of Southern California, California Institute of Technology, the Jet Propulsion Laboratory, the Community Redevelopment Agency of the City of Los Angeles, the Los Angeles Department of Water and Power, and the Los Angeles Mayor's Office of Economic Development, in the creation of an organization dedicated to promoting the development of the clean technology sector in Los Angeles. This consortium has formed a nonprofit organization with the mission of promoting Los Angeles clean tech companies to a global audience. This consortium also expects to compete for hosting the administrative hub of the California Climate Change Institute (CCCI), whose mission, as outlined in recent Senate legislation, will be to provide grant funding for mission-oriented, applied research that results in practical technological solutions and policy recommendations likely to reduce greenhouse gas emissions or otherwise mitigate the impacts of climate change in California.

<http://www.cleantechlosangeles.org>

- **University of California Center for Environmental Implications of Nanotechnology (UC CEIN):** UCLA and 12 collaborating institutions have recently been awarded \$24 million in federal funding to establish the UC CEIN, which will help researchers design safer and more environmentally benign nanomaterials. This center will be housed at the UCLA California NanoSystems Institute and will explore the impact of nanomaterials on life forms and the interactions of these materials with various biological systems and ecosystems.

<http://www.cnsi.ucla.edu>

- **Nano Renewable Energy Center (NREC):** The NREC will focus on the research and development of the latest renewable energy technologies. The primary goal of the NREC is to utilize nanotechnology in the renewable energy research, and to achieve quantum leap progress. The research at NREC will be focusing on these three important categories: (1) Energy Harvesting; (2) Energy Storage; and (3) Energy Management. Initial research activity at the NREC is on high performance and low-cost flexible solar cells based on conjugated polymers; inorganic nano particles; and organic-inorganic hybrid material system. Other research areas, such as energy storage, will emerge as research activities are expanded in the future.

<http://www.cnsi.ucla.edu>

13 COMMUNITY OUTREACH AND OTHER EFFORTS

UCLA has a long history of civic and community engagement, locally and globally. UCLA's faculty, staff and students have collaborated with a wide range of communities on issues of mutual importance. In recent years as the climate crisis has worsened, and community concern for the environment has grown, UCLA has increased its outreach and engagement on climate change and sustainability. UCLA offers continuing education for the community in sustainability through UCLA Extension. Campus institutes and centers host numerous educational events for the community including lectures, seminars, and full conferences. UCLA students engage with the community through internships, client projects, and mentorship. Outreach and partnerships with the community come from all across the campus.

13.1 UCLA Extension

UCLA has one of the nation's largest and most comprehensive continuing higher education programs, which has served the Southern California Community since 1917. In recent years UCLA Extension has offered an increasing number of courses on sustainability-related topics including green building. In June 2008 UCLA Extension offered a full-day conference titled "The Business of Green: What's the Payoff" that featured a number of panels related to climate change.

UCLA Extension has formed a Sustainability Steering Committee and an Advisory Board to guide the development of a comprehensive Global Sustainability Certificate program. This program will encompass multiple disciplines including architecture and design, business, education, landscape architecture, law, marketing, public policy, real estate, science, technology and urban planning.

13.2 Educational Events

UCLA hosts many educational events on topics of sustainability and climate change. These events vary from single speakers and panels to full conferences. Most events are free and open to the public. The events are often hosted and promoted in partnership with community organizations or other institutions. This section highlights some major recent events.

- **California Clean Innovation:** In May of 2008 UCLA hosted the second annual California Clean Innovation conference. This full-day conference, co-hosted in partnership with the UCLA Anderson School of Management, the UCSD Rady School of Management, and Caltech, focused on innovation in sustainable business, policy, and technology. The conference highlighted the latest developments in renewable energy and other clean technologies. The three

universities have committed to funding the annual conference. Local public and private organizations partnered on the conference.

<http://www.cacleaninnovation.com>

- **Opportunity Green:** In November 2008 UCLA hosted the second annual Opportunity Green Conference, organized by Opportunity Green and hosted in partnership with the UCLA Harold and Pauline Price Center for Entrepreneurial Studies and the UCLA Sustainable Resource Center. The two day conference focuses on sustainable business and addressing a variety of topics including sustainable mobility, life cycle analysis, green building and other relevant ways to address climate change for businesses.
<http://www.opportunitygreen.com>
- **Changing Climate, Adapting Law and Policy to a Transforming World:** This full-day symposium in March 2007 was part of an annual series of symposia hosted by the UCLA Evan Frankel Law and Policy Program. It brought together policymakers, legal scholars and environmental experts to address the impact of climate change on law and policy.
- **NorthSouthEastWest:** In March of 2006 the UCLA Institute of the Environment and the UCLA Sustainable Resource Center co-hosted a series of climate change events with the British Council. The central focus was a special photo exhibit on the effects of climate change called NorthSouthEastWest. There were also lectures from leading international climate change scientists and other educational events.
- **Los Angeles Sustainable Business in Action:** This event in April of 2006 featured local leaders in sustainability from different sectors including transportation, building, food, and energy. The event was hosted by the UCLA Sustainable Resource Center, and supported by the UCLA School of Public Affairs, the UCLA Institute of the Environment and the UCLA Anderson School of Management, and a number of community organizations including environmental organizations and business associations. The Mayor's office provided a vision for a sustainable Los Angeles and the panelists discussed how the different sectors will work together to achieve that vision.
- **Lectures, Seminars and Symposia:** In addition to major conferences many of the environmental programs at UCLA offer series of lectures and seminars for the campus and community. The School of Law has a series of lectures on climate change with speakers like California Legislator Fran Pavley, Assistant Attorney General Ken Alex, and Jason Burnett, EPA climate change whistleblower. UCLA Anderson Net Impact and the UCLA Sustainable Resource Center hosts a series called the Energy Forum that addresses renewable energy policy and technology. Past speakers have been policy makers, investors, and executives of renewable energy companies. The UCLA Institute of the Environment hosts a number of

lecture series and events related to climate change, some weekly. The UCLA Sustainable Resource Center also hosts events on a variety of topics related to climate change including carbon trading, sustainable transportation, and green building. Speakers have included award winning authors, political leaders, business leaders, and scientists.

13.3 City of Los Angeles and Los Angeles County Engagement

The UCLA School of Public Affairs (SPA) has established an annual event called SPA day at City Hall where students from the Public Policy, Urban Planning, and Social Welfare departments examine an issue facing the city, interview city officials, and then present their policy recommendations to the City Council. In 2007 the topic was related to sustainable transportation and the issue of bus-only lanes. Students have also engaged on climate change related topics with the city as part of their coursework through multiple quarter-long client projects or class projects, or through internships. For example, in 2006 a Public Policy graduate student made recommendations to the Los Angeles Department of Water and Power on their climate policy based on an examination of local, national, and international policies. A Public Policy student also worked with the City of Los Angeles on Transit-Oriented Development along a new light rail line. This development strategy helps reduce vehicle miles traveled and greenhouse gas emissions.

The School of Public Affairs also has a fellowship program, funded by the David Bohnett Foundation that supports SPA graduate students in year-long internship programs in the Los Angeles Mayor's Office. The partnership with the Mayor's Office helps train the next generation of public servants in Los Angeles by bringing graduate-level policy research fellows onto its staff. In the first year of the program, 2007, an Urban Planning graduate student worked with the Deputy Mayor for Energy and Environment on the city's climate change initiatives.

13.4 Internships

Undergraduate and graduate students from many departments at UCLA engage in internships with local community organizations and businesses. Many of these internships focus on sustainability. During summer of 2008 one graduate student worked with The Climate Registry developing a toolkit to help local governments calculate their greenhouse gas emissions and report to the Registry. Other sustainability organizations where UCLA students have recently completed internships include Clipper Wind Power, Three Phases Renewables, Living Places, Opportunity Green, and Heal the Bay.

13.5 Mentorship

The UCLA Sustainable Resource Center has had discussions with Green Ambassadors and Environmental Charter High School about a sustainability mentorship program.

Graduate and undergraduate students from UCLA would act as mentors for local high school students on environmental topics. In the past, UCLA students have individually volunteered with local schools and organizations to provide mentorship in these areas. For example, in April 2008 in honor of Earth Day, a UCLA graduate student in a concurrent MBA and Masters of Public Policy program spoke at the North Hollywood High School Zoo Magnet about sustainability at UCLA and educational opportunities in sustainability. A formal mentorship program would help institutionalize these types of engagements with the community.

13.6 Alumni

Many UCLA Alumni actively engage in the Los Angeles community and some are leaders in sustainability related organizations and programs. For example, one UCLA alumnus is leading the effort to green the LA Convention Center. Under his leadership the Convention Center will be 100 percent powered by renewable sources. The Convention Center is also the only preexisting center of that size in the nation to earn LEED certification. A UCLA Anderson School of Management alumnus is leading the Infrastructure Academy, a groundbreaking social entrepreneurial partnership with the City of Los Angeles and the Los Angeles Department of Water and Power that addresses the need for youth workforce development. Their recent initiative, Generation Power, trains high school students to conduct home energy audits in the community. The initiative addresses all three pillars of sustainability, ecology, economy, and equity, while reducing greenhouse gas emissions from residential energy use. An alumnus of the Urban Planning program directed a Non-profit called Sustainable Works that teaches students about sustainable living and consults to businesses about going green. Another alumnus is managing the City of Santa Monica's Sustainable City Program. One alumnus founded a company, Simplehuman®, that manufactures sustainable home products. Other alumni are working in green real estate, renewable energy, environmental consulting, environmental law, and other sustainability-related activities.

13.7 Campus Sustainability Tour

To highlight our efforts related to climate change and the ACUPCC commitment, UCLA has also created a sustainability-focused campus tour for prospective students and the community. The tour will be given during orientations and other events, and will also be available online as a self-guided tour. Features of the tour include LuValle Commons, an eatery that was the location of a pilot greening program, La Kretz Hall, our first LEED Certified building, the Cogeneration Plant, and a green roof demonstration on the Public Affairs Building.

13.8 Community Engagement

UCLA programs engage the local community on a number of issues, from health to poverty to education. A number of UCLA's sustainability and climate-related projects

involve engaging and educating the local community. One example is the Stone Canyon Creek Restoration.

When the construction of the Westwood campus of UCLA began in 1927, Stone Canyon Creek carved a deep meandering ravine across the western edge of campus. The creek featured native riparian habitat with sycamore, oak and willow trees that supported abundant wildlife including a colony of acorn woodpeckers. Within a few years, most of the ravine had been filled in and by the 1940's, much of the creek was channeled into underground pipes and the habitat was lost. Santa Monica Baykeeper, a local nonprofit organization with expertise in habitat restoration and community action, has teamed up with the UCLA Institute of the Environment and UCLA Facilities Management to restore a section of the remaining creek. The restoration involves mechanically removing non-native vegetation and then planting native trees and understory plants.

Beyond the substantial ecological benefits of restoring a native ecosystem, this project represents an incredible educational opportunity to engage people of all ages on campus and in the community: toddlers and pre-schoolers from the on-campus daycare center take field trips here; an adjacent section of the creek runs through the University Elementary School where a second restoration effort is being considered; students at the Environmental Charter High School in Lawndale are growing native plants in their nursery and they will come this spring to help plant them and experience a bit of campus life; the area is used for hands-on learning by students in biology, ecology, environmental science, engineering, geography, and landscape design courses, just to name a few; and so far in 2008, 241 volunteers from UCLA and surrounding communities have put in over 600 hours of work during seven work days.

Another example of an initiative involving the community is a new Community Supported Agriculture program, led by the UCLA Graduate Student Association Sustainable Resource Center (SRC). Community Supported Agriculture allows members to buy sustainable farm-fresh, locally grown organic produce for a fraction of the cost of a grocery store or farmers market by creating a direct relationship with farmers. The SRC and the Weyburn Terrace Residents Association developed a relationship with the South Central Farmers' Cooperative to bring fresh produce to campus each week, delivered to Weyburn Terrace (on-campus graduate housing).

13.9 Communications Initiatives

UCLA has a communications plan to inform the surrounding community of its commitment to sustainability and our efforts to address climate change, developed by the Communications Subcommittee of the Campus Sustainability Committee. These initiatives are being publicized through a variety of media, both print and online, and through direct email to the campus community. Table 13-1 summarizes our communications initiatives for the 2008-2009 academic year.

UCLA has a comprehensive public website, www.sustain.ucla.edu, highlighting our sustainability initiatives. The website includes news about sustainability at UCLA as well as news feeds about sustainability in California. The site also includes videos, podcasts, and a calendar of events. The UCLA Graduate Students Association Sustainable Resource Center also has a comprehensive site that lists local organizations and businesses and ways that people can get involved.

In addition to online resources and the initiatives below, UCLA will also be engaging in a number of campaigns related to climate and sustainability including compact fluorescent light bulb, water bottle, and t-shirt give-aways, and online campaigns. We will also be highlighting campus leaders in sustainability through a well-publicized awards program that will honor accomplishments by students, faculty, staff, and alumni.

Table 13-1
2008-2009 Sustainability Communications initiatives

Quarter	Event/Project	Description
Summer	Take A Vacation From the Pump	Program to cut automobile trips to campus sponsored by UCLA Transportation
Fall	Residential Life Sustainability Floor	Sustainability themed floor created by the Office of Residential Life
Fall	Sustainability Fair	Campus-wide fair on sustainability
Fall	Opportunity Green	Green business conference
Fall	Leaders in Sustainability	Interdisciplinary graduate certificate program
Fall	New Sustainability Coordinator	UCLA's first full time sustainability coordinator for the campus
Fall	Co-Generation Plant	The co-gen plant helps UCLA save energy
Fall	TGIF- The Green Initiative Fund	Student initiative passed in 2008 provides funding for student sustainability initiatives
Winter	Climate Action Plan	Publication of the plan
Winter	Education for Sustainable Living Program	Student created lecture series on sustainability, also student action research projects
Spring	Sustainability Awards	Awards highlighting accomplishments of faculty, staff, students, and alumni
Ongoing	Academic Programs	Report on academic initiatives including faculty workshops
Ongoing	Work of the sustainability committees	Report on news from the committees
Ongoing	LEED Buildings	School of Public Affairs will be first LEED EB building and two new construction buildings to be completed soon
On the horizon	Long Range Development Plan	Goal: integrate sustainability into the next long range development plan

14 CLIMATE NEUTRALITY POTENTIAL

Beyond the 1990- and 2000-level GHG emission goals of the UC Policy, there is the long-term goal to achieve climate neutrality as soon as possible while maintaining the campus' overall mission. Climate neutrality means that the campus would have a net zero impact on the Earth's climate by completely reducing its GHG emissions to zero or by minimizing GHG emissions as much as possible and using carbon offsets or other measures to mitigate the remaining GHG emissions.

Although the UC Policy states that the campus will set a target date for reaching climate neutrality, there are many challenges and uncertainties inherent in setting a target date for reaching this goal from the perspective of the campus' current energy use. All the campus' stationary and mobile sources generate CO₂ emissions no matter how energy efficient the machine or facility they power. To reduce the emissions from any of these current sources to zero would require a technological shift in how the world produces power. Alternative sources of non-fossil fuel power such as hydroelectric, wind, solar, geothermal, and nuclear power have reduced the amount of carbon-based fuels used to create electricity, and are typically a part of the energy portfolio of major energy-producing countries; however, it is expected that fossil fuels will continue to be part of the global energy mix for the foreseeable future.

Climate neutrality must rest on the concept that a new non-carbon based energy source will be developed that can economically replace the world's use of fossil fuels. This paradigm shift will require research and development on a global scale, to meet global energy needs and arrest the climate changes created by GHG emissions. This is not achievable by a single institution, city, or country; it is a problem to be solved through cooperation among the world's nations and research institutions.

The UC Policy includes utilization of carbon offsets as one strategy available for achieving climate neutrality. However, as there are currently no reliable ways to measure the emission offsets created by investing in off-campus energy/sustainability initiatives, it would be practical to observe how this option evolves before advancing in this direction.

In place of carbon offsets, UCLA might pursue the viability of "offsetting" campus GHG emissions by investing in UCLA's world-class faculty and students for the specific purpose of researching and developing non-carbon based fuels and developing new technologies to minimize environmental effects of worldwide population growth and economic development. Such investment could be considered as a "climate neutrality fund" used in part to potentially offset the campus' estimated 2020 emission level of 303,750 metric tons of CO₂ that would remain following implementation of the identified initiatives described in Sections 6, 7, and 8.

A potential climate neutrality fund could be based on the market value of carbon offsets, which are typically monies spent to fund emission-reduction projects that build alternative energy sources (e.g., wind farms, biomass energy, hydroelectric installations), energy efficiency projects, or re-forestation projects.

For administration of a climate neutrality fund, a committee or review board made up of UCLA faculty and/or staff would review applications for research funding, award monies, and track the progress of each individual project. Tracking of the research projects could then be presented as an annual report that could be appended to future updates of this Climate Action Plan to inform the campus and the public of campus research efforts toward achieving climate neutrality.

Through implementation of a climate neutrality fund, UCLA could create a means to address climate neutrality while continuing its academic mission to train students to meet the global challenges of climate change.

15 CONCLUSIONS AND CLIMATE ACTION PLAN UPDATES

Through implementation of the emission reduction initiatives - stationary, mobile, and behavioral - described in this CAP, **UCLA can reach the more aggressive target of reducing its GHG emissions below both 1990 and 2000 levels by 2012**, several years before the 2020 target date, assuming that funding levels are assured and unforeseen events do not compromise or delay the planned initiatives.

A key challenge and focus in moving forward toward full climate neutrality will be to identify new funding sources and more importantly, synergies between campus operations and academic/research initiatives that would support educators in using the built environment as the context for sustainability learning and research.

In accordance with the ACUPCC guidelines, the campus anticipates future updates of this CAP to incorporate new initiatives and technologies as they are developed, and allow for a clearer understanding of the uncertainties and opportunities inherent in setting a climate neutrality target date for the campus. This plan will be tracked annually and updates will be published every two years. As technology develops, energy costs rise, and other factors change, it is anticipated that there will be changes in the campus projected emissions and targets for reduction.

UCLA is also initiating a larger strategic sustainability planning process that will address the full integration of carbon emission reduction strategies and other sustainability initiatives in operations, curriculum, research and outreach efforts. The CAP will provide a foundation for the broader assessment and planning process. The campus sustainability process aims to be a catalyst for optimism in advancing solutions to the global climate challenge and achieving stable human coexistence with the natural systems on which society depends.

Appendices

Appendix A – Stationary Source Emissions Data

Appendix B – Mobile Source Emissions Data

Appendix A – Stationary Source Emissions Data

Table A 1
CO2 Emission Conversion Factors by Energy or Fuel Type

Utility	1990	2000	2007 ⁽³⁾
Electricity, LADWP (lbs/kWh) ⁽¹⁾	1.515	1.407	1.238
Electricity, SCE (lbs/kWh) ⁽²⁾	1.067	1.058	0.641
Natural Gas (kg/therm)	5.67	5.67	5.31
Diesel (kg/gal)	9.96	9.96	10.15
Propane (kg/gal)	5.28	5.28	5.74

⁽¹⁾LADWP conversion factors for 1990 and 2000 were supplied by the utility provider.

⁽²⁾All SCE conversion factors are from CCAR.

⁽³⁾All 2007 conversion factors are from CCAR.

Appendix B – Mobile Source Emissions Data

Table B 1
UCLA Fleet Fuel Consumption & CO2 Production, 2007

Type of Fuel	Gallon Equivalents	CO2 Production ⁽⁴⁾ (metric tons)
Unleaded ⁽¹⁾	508,535	4,480.2
CNG ⁽²⁾	118,863	631.2
Diesel ⁽³⁾	16,050	3.1
Bio Diesel ⁽³⁾	330	162.9
Total		5,277.4
<p>⁽¹⁾ CO2 emissions are based on the May 2008 California Climate Action Registry. Burning of a gallon of unleaded gasoline generates 8.81 kg CO2.</p> <p>⁽²⁾ CNG GGE to UNL uses a multiplier of 1.214 (ex: 5,540 Therms / 1.214 = 4,563 Gallons); A therm of CNG consumed generates 5.31 kg of CO2.</p> <p>⁽³⁾ A gallon of biodiesel/diesel consumed generates 9.46/10.15 kg CO2 when burning</p> <p>⁽⁴⁾ Uses the California Climate Action Registry emission factors.</p>		

Source: UCLA Transportation, 2008.

Table B 2

Main Campus Commuter Students and Employees by Mode Split, 2007

Mode*	Percent
Commuter Students	
Bike	4.50%
Bus	19.90%
Campus Express	9.30%
Carpool/Vanpool	5.70%
Drive Alone	31.10%
Drop-off	2.10%
Motorcycle	1.20%
Walk	26.00%
Commuter Employees	
Drive Alone	54.78%
Motorcycle	0.59%
2 person carpool	9.41%
3 person carpool	1.92%
4 person carpool	0.49%
5 person carpool	0.36%
6 person carpool	0.38%
7 person carpool	0.16%
8 person carpool	0.67%
9 person carpool	0.69%
10 person carpool	0.93%
11 person carpool	1.95%
12 person carpool	0.17%
13 person carpool	0.15%
15 person carpool	0.06%
Bus	14.37%
Rail plane	--
Walk	9.55%
Bike	1.30%
Electric Vehicle	0.06%
Telecommute	1.18%
Compressed work week	0.50%
<p><i>*The employee mode split is derived from the annual Air Quality Management District (AQMD) Employee Commute Reduction Survey. This survey is prescribed by the South Coast AQMD's Rule 2202, the purpose of which is to measure the impact of employers' commute reduction strategies, the ultimate aim of which is to reduce emissions of traditional air pollution components by commuting employees. The student mode split is derived from the annual Student Survey conducted by UCLA Transportation each spring.</i></p>	

Source: UCLA Transportation, 2008.

Table B 3
Main Campus Commute Emissions by Source, 2007

Mode Split		SOV	Carpool	Motorcycle	FlexCar ⁽⁵⁾
Percent ⁽¹⁾	Staff+Faculty	54.78%	11.82%	0.59%	
	Student	31.10%	3.50%	1.20%	
Absolute Number ⁽²⁾	Staff+Faculty	11,995	967	129	
	Student	7,529	1,140	291	450
Avg. Distance Per Trip	Staff+Faculty ⁽³⁾	13.7	13.7	13.7	7.5
	Student ⁽⁴⁾	4.5	4.5	4.5	7.5
	All	10.4	10.7	7.5	7.5
Total Trips per Day		2.0	2.0	2.0	0.03
Final Estimate per Day	Participants	19,524	2,107	420	450
	Travel Distance (miles)	396,416.6	18,377.9	6,322.8	101.3
MPG Estimate		20.0	20.0	50.0	25.0
Fuel Consumption (gallons)	Monthly	312,078.0	13,769.0	1,718.3	89.1
	Annually	3,744,936.5	165,228.1	20,619.6	1,069.2
CO2 Production (metric tons)	Monthly	2,668.3	117.7	14.7	0.8
	Annually	32,992.9	1,455.7	181.7	9.4
Total 2007 Main Campus Commute CO2 Emissions (metric tons)					34,639.6
<i>Background/Assumptions:</i>					
Total faculty and staff on campus: 22,268 (UCLA Parking Master Plan, 2008)					
Total commuter students: 24,210 (UCLA Long Range Development Plan, 2008)					
Telecommute: 270 (AQMD Survey)					
Compressed work week: 102 (AQMD Survey)					
Work days per years: 248 days for faculty and staff, 82% days attended (From UCLA TDM Plan Update 2003) and 140 days for students, 3 quarters, 55 days per quarter, 85% days attended.					
⁽¹⁾ From the 2007 AQMD Survey and Student Travel Survey, the student mode split is for commuter students only. Whenever possible, distance of travel and fuel consumption use actual numbers available.					
⁽²⁾ SOVers and Motorcyclers based on the 2007 AQMD Survey and Student Travel Survey mode split and 2007 population figures. Carpool participants based on 2007 parking permit data. Also, note that many UCLA community members do not use modes of travel that emit CO2, i.e. they walk or ride a bicycle.					
⁽³⁾ Estimate from Fall 2006 UCLA Staff and Faculty Residence Analysis, network-based distance.					
⁽⁴⁾ Estimate from the 2007 AQMD Survey, sample size = 748, network-based distance.					
⁽⁵⁾ Estimates based on Flexcar reports, sample size = 75.					

Source: UCLA Fleet Services, 2008.

Table B 4
Santa Monica Hospital Commute Emissions by Source, 2007

Mode Split		SOV	Carpool ⁽⁴⁾	Motorcycle	Vanpool ⁽⁵⁾
Percent*	Employee	68.38%	10.68%	0.57%	0.30%
Absolute Number⁽²⁾	Employee	835	130	7	4
Avg. Distance Per Trip⁽³⁾	Employee	13.7	13.7	13.7	13.7
Total Trip per Day		2.0	2.0	2.0	2.0
Final Estimate per Day	Participants	835	130	7	4
	Travel Distance(miles)	22,873.1	1,786.2	190.7	10.0
MPG Estimate		20.0	20.0	50.0	10.0
Fuel Consumption (gallons)	Monthly	19,381.1	1,513.5	64.6	17.0
	Annually	232,573.2	18,162.3	775.5	204.1
CO2 Production (metric tons)	Monthly	170.7	13.3	0.6	0.1
	Annually	2,049.0	160.0	6.8	1.8
Total 2007 Santa Monica Hospital Commute CO2 Emissions (metric tons)					2,217.6
<i>Background/Assumptions:</i>					
Total employees: 1,262 (From the 2007 AQMD Survey)					
Telecommute: 1 (From the 2007 AQMD Survey)					
Compressed work week: 40 (From the 2007 AQMD Survey)					
Work days per years: 248 days for faculty and staff, 82% days attended (From UCLA TDM Plan Update 2003)					
⁽¹⁾ From the 2007 AQMD Survey, using all-day mode split.					
⁽²⁾ Estimated based on mode split from 2007 AQMD Survey and given population. Also, note that many UCLA community members use modes of travel that do not emit CO2, i.e. they walk or ride a bicycle.					
⁽³⁾ Estimate from Fall 2006 UCLA Staff and Faculty Residence Analysis, network-based distance.					
⁽⁴⁾ CO2 emission from burning fuels based on the May 2008 California Climate Action Registry. Burning of a gallon of unleaded gasoline generates 8.81 kg CO2.					
⁽⁵⁾ Assuming that carpooling cuts down the total commute distance for all carpoolers by 50% since the carpoolers commute together.					

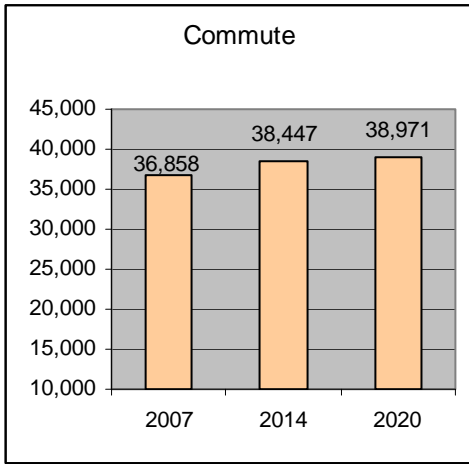
Source: UCLA Fleet Services, 2008.

Table B 5
Fleet Fuel Usage and CO2 Emissions – “Business as Usual”

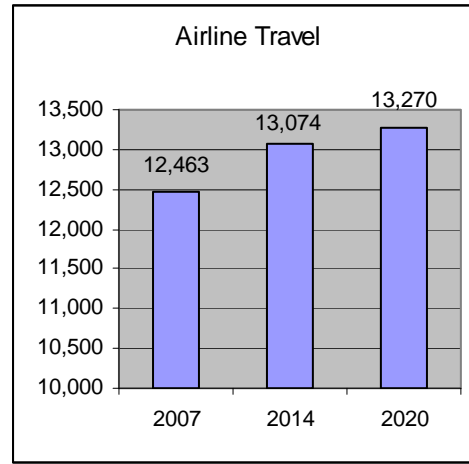
Year	CNG	Unleaded	Diesel	Biodiesel	Co2 Change (Metric Tons)
2007	118,863	508,535	16,050	330	
2008	123,831	529,792	16,721	344	
2009	129,007	551,937	17,420	358	
2010	134,400	575,008	18,148	373	
2011	140,018	599,043	18,907	389	
2012	145,871	624,083	19,697	405	
2013	151,968	650,170	20,520	422	
2014	158,320	677,347	21,378	440	+1,751.4
2015	164,938	705,660	22,272	458	
2016	171,832	735,157	23,202	477	
2017	179,015	765,886	24,172	497	
2018	186,498	797,900	25,183	518	
2019	194,293	831,253	26,235	539	
2020	202,415	865,999	27,332	562	+3,709.0

Source: UCLA Transportation, 2008.

Table B 6
GHG Emission Trends for Airline Travel & Commutes – “Business as Usual”



Values in Metric Tons
Source: UCLA Transportation, 2008.



Values in Metric Tons

Table B 7
Airline Travel Emissions Reductions,
“Business as Usual” vs. Reduction Initiatives

	Base Year	Business As Usual	Business As Usual	Reduction Initiatives	Reduction Initiatives
	2007	2014	2020	2014	2020
Airline Travel Emissions (Metric Tons)	12,463	13,074	13,270	13,074	12,607

Source: UCLA Transportation, 2008.

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