

# University of California Santa Cruz

## Climate Action Plan

October 2011



*“As Chancellor, I am personally committed to sustainability. It is vital for the long-term future of the campus and for the long-term future of planet earth...Sustainability is really a way of thinking about everything that we do.”*

*- George Blumenthal, 2008 Annual Campus Earth Summit*

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## Executive Summary

The University of California Santa Cruz (UCSC) is an institution steeped in a tradition of sustainability and respect for the environment. Recently, this innate dedication has translated to actionable policies and programs, particularly in the field of climate change and greenhouse gas (GHG) reduction.

Specific programs and policies guiding action related to climate change include the American Colleges and Universities President’s Climate Commitment (ACUPCC), The University of California Office of the President (UCOP) Policy on Sustainable Practices and the regional Climate Action Compact.

The goals associated with each policy, and UCSC’s current progress towards reaching the goals are described in Table 1: UCSC Guiding Policies on Climate Change. The campus community is making clear progress towards achieving its goals, but continued actions are needed.

Table 1: UCSC Guiding Policies on Climate Change

Program	Reduction Guidelines/Goals	Outcome	Achieved / On Target
ACUPCC – President’s Climate Commitment 2007	Establish a date for achieving carbon neutrality	TBD	In process
	Implement project-level goals <sup>1</sup>	Project-level goals met in accordance with guidelines	Yes
UCOP – Policy on Sustainable Practices 2010 <sup>2</sup>	2000 levels by 2014	13,700 MtCO <sub>2</sub> e reduced <sup>3</sup>	In process
	1990 levels by 2020 (AB32)	25,300 MtCO <sub>2</sub> e reduced <sup>4</sup>	In process
	Establish a date for achieving carbon neutrality	TBD	In process
Climate Action Compact 2007	Conduct GHG Inventory	Baseline and Annual Inventory	Yes
	Establish a Climate Action Plan with Targets	CAP approved and publically available	In process

<sup>1</sup> A list of detailed project-level targets and goals is provided in Chapter 4.

<sup>2</sup> UCOP Policy on Sustainable Practices was originally adopted in 2003 and updated in 2006, 2008, 2009 and 2011. The 2011 version is available at <http://www.ucop.edu/ucophome/coordrev/policy/sustainable-practices-policy.pdf>

<sup>3</sup> Reduction estimates are based on a 2007 inventory baseline.

<sup>4</sup> Reduction estimates are based on a 2007 inventory baseline.

## Emissions Methodologies and Results

Emissions calculations from UCSC include direct (scope 1) and indirect (scopes 2 and 3) sources. Emissions from 2007 – 2009 and the baseline years of 1990 and 2000 are shown in Table 2.

Table 2: Emissions Calculations (MtCO<sub>2</sub>e)

<b>Emission Sector</b>	<b>1990</b>	<b>2000</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>
Stationary Sources	16,989	19,681	22,872	24,081	24,045
Purchased Electricity	4,136	8,383	16,912	10,393	11,183
Mobile Fleet	1,701	1,733	2,266	2,212	2,151
<b>Scope 1 and 2 Total</b>	<b>22,826</b>	<b>29,797</b>	<b>42,050</b>	<b>36,686</b>	<b>37,379</b>
Mobile Non-Fleet	25,830	27,122	24,160	23,353	23,468
Air Travel	6,856	9,158	11,420	11,863	10,681
<b>Scope 3 Total</b>	<b>32,686</b>	<b>36,280</b>	<b>35,580</b>	<b>35,216</b>	<b>34,149</b>
<b>Total</b>	<b>55,512</b>	<b>66,077</b>	<b>77,630</b>	<b>71,902</b>	<b>71,528</b>

Two campus growth scenarios, shown in Table 3, are used to project business as usual (BAU) emissions, representing an upper bound and a lower bound emissions for 2014 and 2020. Using two scenarios illustrates the range of potential future emissions.

The upper bound BAU estimate was based on the UCSC 2005 *Long-Range Development Plan* (2005 LRDP). The 2005 LRDP proposes a 3-quarter average full-time equivalent enrollment of 19,500 on campus (graduate and undergraduate). As a result of the ongoing budget crisis, it is unlikely that in 2020-21 UCSC will enroll the number of students accommodated by the 2005 LRDP (i.e., these figures represent an "upper-bound" estimate).

Lower-bound estimates are based on the 2009-19 *Capital Financial Plan (CFP)*,<sup>5</sup> which represents budgeted enrollments (i.e., the number of students for whom UCSC receives State general funds). The CFP assumes no growth in budgeted enrollments through 2014-15, followed by a 1% increase in consecutive years through 2019-20. UCSC is currently overenrolled relative to the 2007-08 budget, and will very likely remain just slightly over 2007-08 levels into the foreseeable future. As a result, the CFP estimates represent lower-than-actual anticipated enrollments, (i.e., a "lower bound" estimate). (For more detail regarding projections see Appendix A.)

Under both scenarios, enrollment figures included in the respective documents were used when calculating transportation related sectors and the building outside gross square footage (OGSF) was used for calculating stationary sources and purchased electricity.

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<sup>5</sup> University of California Santa Cruz Capital Financial Plan 2009-2019. March, 2010  
<http://planning.ucsc.edu/capital/2009-19cfp> Last visited July 1, 2011

Table 3: Projected Business-as-Usual Emissions (MtCO<sub>2</sub>e)

Emission Sector	Lower Bound BAU		Upper Bound BAU	
	2014	2020	2014	2020
Stationary Sources	24,101	25,181	27,622	32,834
Purchased Electricity	17,821	18,620	20,424	24,278
Mobile Fleet	2,266	2,390	2,593	2,898
<b>Scope 1 and 2 Total</b>	<b>44,188</b>	<b>46,191</b>	<b>50,639</b>	<b>60,010</b>
Mobile Non-Fleet	24,160	25,483	27,645	30,901
Air Travel	11,420	12,042	13,067	14,606
<b>Scope 3 Total</b>	<b>35,580</b>	<b>37,525</b>	<b>40,712</b>	<b>45,507</b>
<b>Total</b>	<b>79,768</b>	<b>83,716</b>	<b>91,351</b>	<b>105,517</b>

Based on the information provided above, the remaining emissions reduction needed to meet campus targets are shown in Table 4.

Table 4: Remaining Reductions (MtCO<sub>2</sub>e)

Year	From 2009 Levels	From Projected Lower Bound BAU	From Projected Upper Bound BAU
2014	5,452	13,691	25,274
2020	15,017	27,208	49,007

### Reduction Projects and Programs

Staff, faculty and students from multiple departments are working together to ensure UCSC meets its reduction goals. Although work is still needed to reach our reduction targets, significant achievements have been made since 2007, when the first GHG inventory was completed. Examples include: the Carbon Fund, green building certification, energy retrofits, and trip reduction projects such as Zimride and Zipcar.

In order to achieve the target reduction goals of 13,700 MtCO<sub>2</sub>e by 2014 and 25,300 MtCO<sub>2</sub>e by 2020 (from 2007 levels), a multitude of actions are needed. Proposed projects and programs to further reduce emissions include energy efficiency projects, transportation, education and outreach.

### Next Steps

With guiding policies established, emissions inventories complete and many reduction policies complete or planned, UCSC is well positioned to continue reducing emissions. However, dedication to continue this commitment will be needed to ensure that reduction targets are met. Monitoring of progress and responding to changing regulations will be an ongoing process. With that consideration, this Climate Action Plan is a preliminary report that will be updated in early 2012 to reflect new methodologies, a comprehensive reductions strategy, as well as new and updated data.

# Chapter 1: Background and Guiding Policies

## Sustainability at UCSC

UCSC has long been a beacon of sustainability for the community as well as for other colleges and universities. The UCSC sustainability vision states:

*“UC Santa Cruz **strives to integrate sustainability into every aspect of research, teaching, and public service.** Sustainability is our way of thinking about everything we do in research, teaching, planning, building design and construction, renovation, purchasing, landscape, energy, water, waste, product consumption, emissions, transportation, etc. Sustainable practices support ecological, human, and economic health and viability. Sustainability means meeting present needs without compromising ecosystems or the prospects of future generations to meet their own needs. Through its historic commitment to the environment, UCSC will become a steward of our community and a leader in advancing global sustainability.”*

This vision statement applies to the entire campus and many stakeholders are integral to ensuring its success. In 2007, the campus established a Sustainability Office to coordinate, initiate and manage sustainability projects throughout the campus. The efforts of this office, as well as the multitude of other departments, are integral to the institutionalization of sustainability policies throughout campus.

## American Colleges and Universities President’s Climate Commitment (ACUPCC)

In 2007 UCSC along with other UC-system schools, were founding signatories to the ACUPCC. ACUPCC policies state a commitment to three main steps on the part of each participating college or university:

1. Initiate the development of a comprehensive plan to achieve climate neutrality as soon as possible.
2. Initiate two or more tangible actions to reduce greenhouse gases while the comprehensive plan is being developed.
3. Make the action plan, inventory and periodic progress reports publically available by providing them to the Association of the Advancement of Sustainability in Higher Education (ASHEE) for posting and dissemination.

## University of California Office of the President - Policy on Sustainable Practices

In 2003, under direction from the Regents, The University of California President adopted the Policy on Sustainable Practices. The Policy was updated each year from 2006 through 2009 and is currently being updated again.

The most recent version (2009) describes sustainability guidelines in the fields of Green Building, Clean Energy, Climate Protection Practices, Transportation Practices, Operations, Recycling and Waste Management, Purchasing Practices and Foodservice Practices. The guidelines related to Clean Energy and Climate Protection are the most relevant to climate change. These policy guidelines state:

1. Clean Energy
  - a. The University will initiate progress towards a level of grid-provided electricity purchases in 2004 by purchasing 10 percent of grid-supplied electricity from renewable sources, subject to funding availability, and will track progress annually toward achievement of the year 2010 goal.
  - b. Campuses will provide strategic plans for implementing energy efficiency projects by identifying opportunities to incorporate energy retrofit projects into major building

renovations as funding is available, and to initiate standalone retrofit projects as justified by future energy savings.

2. UCOP Climate Protection Practices

- a. Each UC campus will pursue individual membership with The Climate Registry (TCR).
- b. The Climate Change Working Group will develop protocols to allow for growth adjustment and normalization of data and accurate reporting procedures. The Climate Change Working Group will monitor progress toward reaching the stated goals for GHG reduction, and will evaluate suggestions for programs to reach these goals.
- c. Each UC campus will complete a greenhouse gas emissions inventory annually. To comply with CCAR (or TCR) and ACUPCC requirements, inventories should contain emissions from the six Kyoto greenhouse gasses, including: direct and indirect emissions outlined in the ACUPCC implementation guide and CCAR or TCR general reporting protocol; air travel paid for by or through the institution; and commuting to and from campus on a day to day basis by students, faculty, and staff. All UC campuses will report their updated emissions inventories through the ACUPCC on-line reporting tool at least biennially.
- d. Each campus will update its action plan for reducing emissions to 2000 levels by 2014, 1990 levels by 2020, and becoming climate neutral as soon as possible, biennially.

**Climate Action Compact (CAC)**

In 2007 UCSC became a founding signatory to the CAC, a Monterey Bay regional compact to collectively address GHG emissions. The charter statement of the CAC is: “to develop effective collaborative, solutions for the reduction of greenhouse gas emissions from our communities, municipal services, transportation infrastructure, business and energy providers necessitates active collaboration among groups and aggressive steps taken towards a low carbon future.” This compact will reduce the Monterey Bay Region’s contribution to Climate Change and benefit members by:

1. Providing a neutral forum for city and county government agencies and special districts to learn from each other and from others about climate protection programs.
2. Establishing a dialog among members that will lead to innovative solutions to current hurdles and reduce the need of individual members to research all areas of climate mitigation and adaptation.
3. Supporting members who take actions to address GHG emissions and support the success of those actions throughout the region.
4. Helping address funding and other resource limitation necessary for all members to achieve their reduction goals.

The CAC is important to UCSC for fostering community relations, meeting our sustainability and climate change commitments and participating in collaborative approaches to addressing regional and global challenges.

**California Assembly Bill 32: Global Warming Solutions Act, (AB32) and associated Cap and Trade Regulations**

Passed by the California Legislature in 2006, AB32 establishes a greenhouse gas reduction program with the goal of achieving 1990 emissions levels by 2020. A key component of the reduction strategy is a Cap and Trade Regulation and mandatory reporting requirement. If (or when) UCSC exceeds the 25,000 MtCO<sub>2</sub>e emissions thresholds, we will become mandatory participants.

## Chapter 2: Reporting and Requirements

While, methodologies to calculate current, historic and projected GHG emissions continue to evolve and develop, the basic approach remains the same. Emissions from 2006-2009 were reported using the Climate Action Registry Reporting Online Tool (CARROT), which was developed by The California Climate Action Registry (CCAR). Beginning in 2011, emissions will be reported using Climate Registry Information System (CRIS), which is managed by The Climate Registry (TCR). In addition, UCSC reports its GHG emissions to the ACUPCC. Certain criteria pollutants are also reported to the Environmental Protection Agency and the California Air Resources Board (CARB). (See Appendix B for reporting details).

In accordance with TCR (and CARB) guidelines, UCSC reports emissions as three different categories, or scopes.

- Scope 1 – All direct GHG emissions. This includes emissions from activities that UCSC owns or controls such as vehicle fleet, manufacturing, stationary combustion to produce electricity, and fugitive emissions (i.e. refrigerants and solid waste landfills).
- Scope 2 – Indirect GHG emission associated with the consumption of purchased or acquired energy. For example, emissions that are used in campus buildings but originate from a power plant are Scope 2 emissions.
- Scope 3 – All other indirect emissions not included in Scope 2. This includes emissions resulting from employee, student and visitor commutes or waste generated within the campus but disposed of outside its boundaries.

Categorizing the emissions into the three different scopes prevents double counting among entities regulated under the AB32 Cap and Trade Regulation. For example, electricity used by UCSC from PG&E is captured in Scope 2 but the energy producer (PG&E) accounts for the energy use as Scope 1.

The ACUPCC and TCR, as reporting registries, have different requirements. ACUPCC requires Scope 1, 2 and 3. However, TCR requires Scope 1 and 2, but Scope 3 is optional. ACUPCC also requires reporting the carbon emitted through the production of purchased goods, which is optional under TCR.

Charts 1-4 detail the differences between the reporting requirements for each sector.

The fact that these registries distinguished between required and optional emissions sources prompted careful consideration by the campus regarding which emissions to measure and report. It was agreed that all required emissions are reported in addition to non-fleet mobile sources (e.g., commuters, delivery vehicles, etc.) and air travel are included, even though these are considered optional elements by the TCR.

Including optional mobile source elements nearly doubles the UCSC GHG inventory, setting a much higher target for emissions reductions. While this makes the UCSC climate reduction challenge much more difficult, including these elements represents a more accurate – and responsible – depiction of the campus carbon footprint.

Given the extraordinary difficulty in producing reliable estimates, GHG emissions associated with purchased goods are omitted. However, because vendors and manufacturers continue to improve (and provide) estimates of their products' carbon footprints, UCSC may consider reporting emissions associated with purchased goods in the future.

Chart 1.

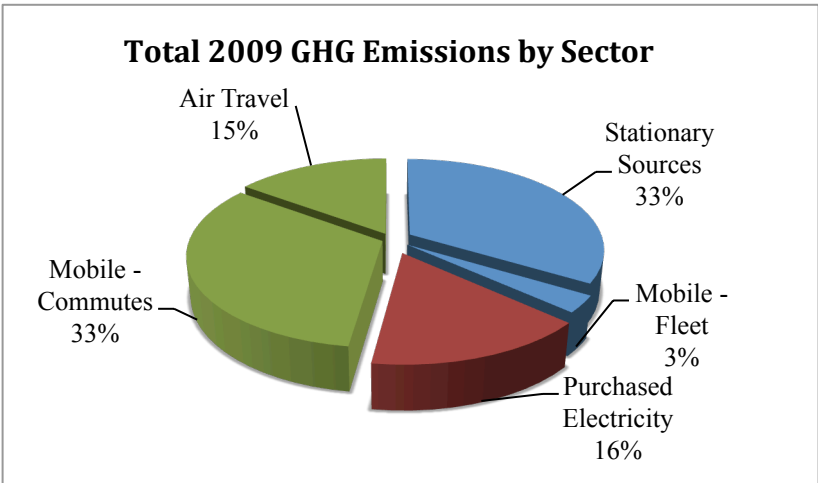


Chart 1 shows total campus emissions in 2009 by reporting sector.

In all charts, the blue sectors indicate scope 1 emissions, red – scope 2 and green-scope 3. The sections highlighted in yellow indicate which sectors are covered under each of the reporting requirements

Chart 2.

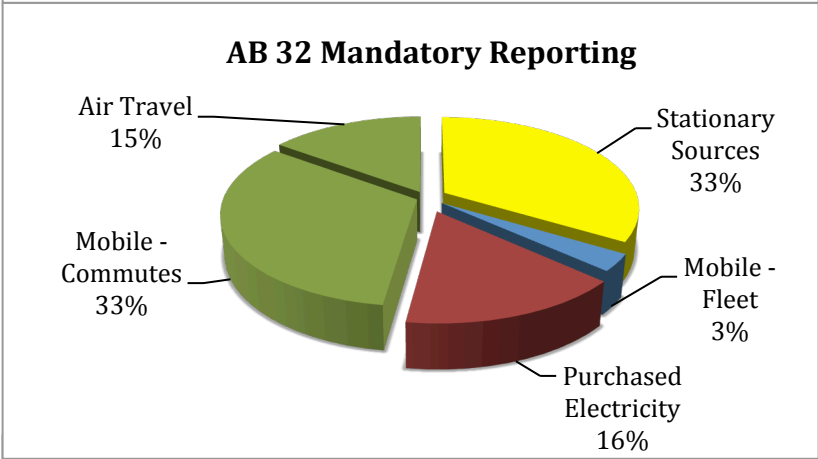


Chart 2. highlights stationary sources, the sector relevant for AB32 reporting (shown in yellow). Emissions are above 10,000 MtCO2e, which is the threshold for mandatory reporting to CARB, but below 25,000 MtCO2e, the mandatory threshold for regulation.

Chart 3.

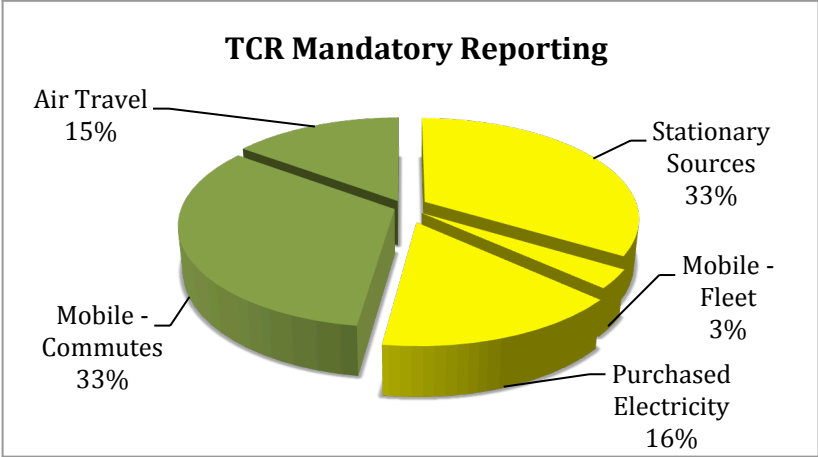


Chart 3 highlights reporting requirements under The Climate Registry. Sectors in yellow are mandatory to report. UCSC voluntarily reports the green sectors (Air Travel and Mobile Commutes) to TCR.

Chart 4.

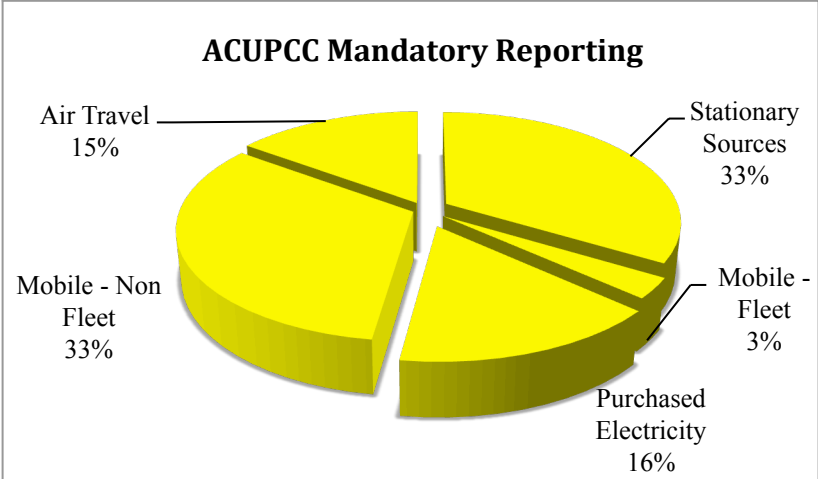


Chart 4 indicates the ACUPCC reporting requirements, which covers all sectors. The ACUPCC reporting requirements are the same as the UCOP reporting requirements.

## Chapter 3: GHG Emissions Results and Detailed Methodology

UCSC emission results are detailed in Table 5: Summary of UC Santa Cruz Greenhouse Gas Inventory. The data presented in years 2007-2009 are based on actual data collected and monitored during the same years. 1990 and 2000 data are based on a combination of data collected during those years and regression analysis. 2014 and 2020 emissions projections are based on 2007 emissions and campus growth projections described in the 2009-19 Capital Financial Plan and the 2005 Long Range Development Plan and are further explained below. (Refer to Appendix A for additional details.)

Table 5: Summary of UC Santa Cruz Greenhouse Gas Inventory (MtCO<sub>2</sub>e)

UCSC Greenhouse Gas Inventory Summary (metric tons CO <sub>2</sub> e)						Business As Usual (Growth Adjusted Projections)			
						Low Estimate (CFP)		High Estimate (LRDP)	
Year	1990	2000	2007*	2008	2009	2014	2020	2014	2020
Stationary Sources	16,989	19,681	22,872	24,081	24,046	24,101	25,181	27,622	32,834
Purchased Electricity	4,136	8,383	16,912	10,393	11,183	17,821	18,620	20,424	24,278
Mobile - Fleet	1,701	1,733	2,266	2,212	2,151	2,266	2,390	2,593	2,898
Mobile - Commutes	26,830	27,122	24,160	23,353	23,468	24,160	25,483	27,645	30,901
Air Travel	6,856	9,158	11,420	11,863	10,681	11,420	12,045	13,067	14,606
<b>Totals</b>	<b>56,512</b>	<b>66,077</b>	<b>77,630</b>	<b>71,902</b>	<b>71,529</b>	<b>79,768</b>	<b>83,720</b>	<b>91,351</b>	<b>105,519</b>

\* 2007 is used as the base year for data analysis.

The reductions in emissions needed to meet the Campus' goals are determined by subtracting the 2014 Lower and Upper Bound BAU emissions from 2000 emissions and 2020 BAU emissions from 1990 emissions. The reductions needed to meet the targets are summarized in Table 6.

Table 6: Reductions Remaining to Meet Targets (MtCO<sub>2</sub>e)

Year	Lower Bound BAU	Upper Bound BAU
2014	13,691	25,274
2020	27,208	49,007

The following sections describe how data from each sector was collected and analyzed.

### Stationary Sources and Purchased Electricity

GHG emissions from stationary sources and purchased electricity for the years 1990 and 2000 were calculated using campus energy use records. At peak, the campus consumes just over 8 MW of electricity daily, the campus Fackler cogeneration plant produces 2.6 of these 8 MW of electricity. The remainder is purchased from an energy provider, currently PG&E.

The emissions produced by the cogeneration plant and campus boilers constitute the stationary source component of the Campus' direct, Scope 1, emissions. In 2009, these stationary sources represented 33.6% of campus GHG emissions.

The campus purchases and burns about 2.5 million therms of natural gas each year in its central boiler plant and purchases 42 millions kWh of electricity from an energy provider (currently PG&E). Emissions from purchased electricity are indirect, or scope 2, emissions.

Until December 31, 2007, UC Santa Cruz purchased its electricity directly from Arizona Public Services Energy Service (APSES), which delivered power from generating stations that included coal-fired power plants. Since GHG emissions data were not available from APSES, UCSC used the Western Electricity Coordinating Council (WECC) average estimates for GHG emissions from California's electrical portfolio in 2007. The 2007 WECC estimates 875 pounds of CO<sub>2</sub> are generated per megawatt hour produced. Since January 1, 2008, UC Santa Cruz has been purchasing power from PG&E, who reports their GHG emissions rate to CCAR and TCR.

In 2007, PG&E reported its GHG emissions rate at 489 pounds of CO<sub>2</sub> per megawatt hour. Consequently, 2008 GHG emissions were 44% lower per MWH than in 2007 due to the lower emissions factors. Therefore the 5,728 MtCO<sub>2</sub>e drop in emissions in 2008 is the result of change in energy provider, and is not a permanent reduction that resulted from on-campus projects or programs.

In January 2012 UCSC will return to a direct access provider, this will likely result in an increase in emissions. The source of campus energy clearly has an impact on emissions and the campus is working with UCOP to develop a system-wide plan for energy independence.

### **Mobile Source Emissions (Fleet)**

Mobile source (fleet) emissions include all campus vehicles (including vanpools, Campus Transit buses and bike shuttles) as well as equipment such as generators, chainsaws, mowers, etc. Emissions from these sources are estimated from fuel consumption.<sup>6</sup> Fuel consumption for fleet vehicles that are fueled on campus is monitored with the fuelmaster program. Fuel consumed by fleet vehicles that are fueled off campus are tracked using a campus credit card managed by fleet services and used exclusively for fueling vehicles, known as the Voyager card.

In some cases an increase in fleet emissions is the result of emissions reductions projects. For example, van pools, Campus Transit buses and bike shuttles may result in an increase in fleet emissions but reduce other mobile source emissions.

### **Mobile Source Emissions (Non-fleet)**

CO<sub>2</sub> equivalent emissions were calculated for all traffic to and from the university on a yearly basis.<sup>7</sup> This is beyond what is required for mobile source emissions reporting by TCR, which only requires reporting for campus fleet vehicles. This analysis includes faculty, staff, and student commutes, as well as occasional visitor traffic.

In 2009, total emissions from mobile sources at UCSC were 25,619 metric tons. While the largest percentage of emissions comes from single occupant vehicles (SOV), this percentage, as well as total trips, has decreased since 1990. Traffic counts indicate a steady reduction in trips since from 2005. This can be attributed primarily to an increase in multiple occupant vehicles (MOV, or carpooling), use of public transit, and a dramatic increase in bicycle trips. In recent years, bicycle ridership grew faster than student enrollments: Transportation and Parking Services (TAPS) staff estimate that 771 riders commuted daily to campus in 2003, 1,000 in 2007 and 1,818 in 2008. Bike shuttle programs also contribute to higher bicycle ridership. For example, in fall of 2007, 151 riders used the bike shuttles daily; in fall of 2008, usage increased to 240 passengers per day.

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<sup>6</sup> Zipcars are not considered part of the campus fleet and are therefore included in the non-fleet vehicle counts.

<sup>7</sup> Fleet vehicles are not included in the traffic counts to prevent double counting.

Mode split percentages are based on closed cordon visual observations of vehicles entering and leaving campus. Visual observations offer a more precise method of determining the modal split (than a survey for example) because it includes trips made by non-campus affiliates for performances, sports events, or drop-offs. Percentages used for 2007, 2000, and 1990 are based on Fall 2007, Spring 1997, and Spring 1991, respectively, because these were the only years for which mode split data were available. The total vehicle trips, however, are based on data for the actual year of reporting, and trips by vehicle category are calculated using the mode split percentages and the total vehicle trips.

Average miles per gallon for single and multiple occupant vehicles (22.1, 19.4, and 18 for 2007, 2000, and 1990 respectively) were taken from yearly values for national-level average fuel efficiency. The figure for motorcycles (50 mpg) is based on a value used in the UCLA assessment, which was the methodology agreed to by UCOP and was widely agreed as representing the best MPG data for motorcycles. Values for trucks and transit vehicles (8 mpg) are based on the expert opinion of parking and transportation staff.

Average trip length for all categories except transit buses and campus buses are based on the 2003 Master Transportation Study for Santa Cruz, which estimates the average commute in the City of Santa Cruz at 6 miles.<sup>8</sup> We use 10 miles as the average trip length since the campus is slightly farther from the city center, however we aim to improve this estimate using GIS-based analysis of campus affiliates' home address. Daily miles traveled were converted to yearly miles using a 250 day work year, and gallons of fuel was converted to metric tons of CO<sub>2</sub> using emission rates for different fuel types from Clean Air-Cool Planet ([www.ca-cp.org](http://www.ca-cp.org)).

UCOP has recently released a uniform calculation method for emissions from UC commuting; UCSC methodology will be updated to reflect the new methodology in the next CAP update.

### **Air Travel**

The ACUPCC requires estimates of GHG emission from air travel. Unfortunately, tracking campus air travel represents a considerable undertaking, because 1) air travel reimbursements are co-mingled with other post-travel data, and 2) the Purchasing (FAST) office maintains post-travel data on original paper forms, thus any inquiry requires examining potentially thousands of paper records. Given these limitations, the Council opted to sample four months of air travel reimbursements in 2007, from which an annual estimate could be derived.

Post-travel forms for January, April, July and October of 2007 were reviewed as a sample. Travel was mostly for conferences and field research, largely by campus faculty and graduate students. UCSC administration and faculty carried out the rest of the air travel for attending meetings and speaking engagements. An expansion of the four months sample suggests that year 2007 air travel emissions amounted to approximately 11,420 metric tons of carbon equivalents.

A sample of travel data including total air travel cost, hours in flight, and total miles of all trips during the sample months was evaluated. If the itinerary was missing partially or completely, but still included departure and arrival destinations (i.e. LAX to Singapore), Internet sources (e.g., <http://www.orbitz.com/> or <http://www.webflyer.com/travel/milemarker/>) provided the mileage data necessary to calculate emissions.

The Clean Air Cool Planet calculator was used to estimate total GHG emissions from campus air travel during the four sample months. This method is consistent with the UC system approach.

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<sup>8</sup> "City of Santa Cruz Master Transportation Study, Final Report" dated July 23, 2003, prepared by Fukuji Planning & Design.

Importantly, no records of air travel are available for 1990 and 2000. Using the 2007 data, the Council extrapolated 1990 and 2000 figures based on the UCSC campus student population in those years and vehicle trips to campus. Obviously, the errors in these estimates may be significant; however, paper records for 1990 and 2000 no longer exist, so it may never be possible to obtain more reliable estimates of air travel in those years.

## Chapter 4: Reduction Strategies

Reductions strategies will address all sources of emissions including: energy use, mobile emissions, behavior related emissions, etc. Reductions from certain types of projects are inherently easier to estimate and track (such as energy efficiency projects), while the results of others, (such as behavior change) are more difficult to estimate. As a result, the estimated reductions are subject to change either as technology and/or as data gathering improves. Some information may not be available until after a program or project is implemented.

A sampling of projects is described in Table 7 and provides rough cost and emissions reductions estimates. In addition to the proposed projects listed here, many projects have already been implemented, such as the Zipcar program and multiple energy efficiency updates. A few of the projects listed below have already undergone feasibility studies and have specific figures associated with them. However, in order to maintain consistency and clarity, all projects are categorized as low, medium or high, ranges are as follows:

- Estimate Reductions: Low = <100MtCO<sub>2</sub>e, Medium = 100-500MtCO<sub>2</sub>e, High = >500MtCO<sub>2</sub>e.
- Costs: Low = < 50,000, Medium = 50,000 - 250,000, High = >250,000.

Table 7. Reduction Strategies

<b>Reduction Projects and Program</b>					
<b>Project/Program Title</b>	<b>Project/Program Details</b>	<b>Relative Estimated Reductions</b>	<b>Total Cost</b>	<b>Administrative Feasibility</b>	<b>Anticipation Completion Date</b>
<b>Energy</b>					
Strategic Energy Plan Projects (Total)	Includes 26 energy efficiency projects under the Strategic Energy Partnership	High	Low	High	2012
Renewable Energy Generation	Install/Upgrade renewable energy generation facilities including cogeneration/ solar/ fuel cell / etc.	High	High	Low-High	2014-2025
Switch Energy Provider	Source purchased energy from a direct access provider rather than PG&E	TBD	Low	High	2011
<b>Mobile</b>					
Increase Vanpool service	Identify options for eligible riders with flexible schedules	Medium	Medium	Medium	TBD
Increase capacity and frequency of bike shuttles	1 new route	Low	Medium	High	TBD
Saturday shopper shuttle	1 new route	Low	Low-medium	Medium	TBD
Improved Bike Infrastructure	Additional parking, routes and safety programs	Low-High	Low - Medium	Medium	TBD

Zimride (behavior change)	Encourage use of the Zimride, rideshare program	Medium	Low	High	TBD
Replace transit fleet with more fuel efficient vehicles	Systematically replace older vehicles with higher emissions with more efficient buses	Medium	High	High	TBD
Bike share	Campus program to allow people to share bikes throughout campus	Low	Low - Medium	Medium	TBD
<b>Student Affairs</b>					
Carbon Fund Projects	9 projects approved to date (5-2011)	Low	Medium	High	Ongoing
Revolving Loan Fund	In development	TBD	Low	High	2011-2012
Green Campus Activities	Energy efficiency and carbon reduction projects	Medium	Low	High	Ongoing
<b>Offsets</b>					
LEED Offset Requirements	Carbon offsets needed to meet green building requirements for specific campus buildings	Medium	Low	High	Ongoing
<b>Cooperative Projects</b>					
Climate Action Compact	Work with regional partners to address climate change mitigation	Low	Low - High	Low-High	Ongoing

## Chapter 5: Next Steps

In the coming year (2011-2012), UCSC staff, in coordination with students and faculty, will further develop the reduction strategies to include cost estimates and more accurate anticipated emissions reductions. Improvements in data collection and methodology will also be incorporated.

Specific actions will include:

- Comprehensive quantification of completed, existing and proposed reductions programs and projects.
- Identify additional reduction measures for campus consideration.
- Review impacts related to updating the cogeneration system and the long-term electrical master plan.
- Identify any possible regulatory effects that may impact the campus financially and otherwise. (i.e. AB32 compliance).
- Develop mechanisms by which to appropriately value all types of reduction projects, including those addressing behavior change and educational programs.
- Incorporate improved data collection systems and new emissions data updates. Express the data clearly through charts and graphs.
- Develop impact and response scenarios associated with future mandatory reporting requirements.
- Revise mobile source emissions (fleet and non-fleet) to reflect methodology changes that have been implemented after 2008.
- Update air travel emissions as new information and methodologies become available.
- Incorporate impacts from a new direct access provider.
- Incorporate policy changes from UCOP regarding energy procurement.
- Investigate options for achieving carbon neutrality in accordance with ACUPCC and UCOP policy. (Identify possible dates for reaching carbon neutrality and outline reduction strategies to reach that point.)
- Develop policy for updating baseline data.
- Coordinate data available and reported on a fiscal year with data available and reported on a calendar year.

Following the completion of these activities, the Climate Action Plan will be updated. The anticipated completion date for the updated CAP is academic year 2011/12.

## Appendix A – Emission Projections Calculations

Projected emissions are based both on emissions factors derived from 2007 in conjunction with campus growth projections, as well as current projections identified in other UCSC planning documents. The 2005 LRDP building program and enrollment were used to develop the upper bound scenario. The 2010-2019 Capital Financial Plan (CFP) and budgeted enrollments were used to develop the lower bound scenario.

Table A-1: Emissions Projection Factors shows the projected growth in both student population and Outside Gross Square Footage (OGSF) of all building on campus.

Table A-1. Emissions Projection Factors

<b>Actual and Projected OGSF and Student Population 2014 &amp; 2020</b>				
	Outside Gross Square Footage		Student Population	
	CFP	LRDP	CFP	LRDP
2007	5,572,695	5,572,695	15,246	15,246
2014	5,872,219	6,730,000 <sup>1</sup>	15,260	17,445
2020	6,135,359	8,000,000	16,081	19,500

The numbers in Table 1 were then multiplied by the following factors, which represent the OGSF from 2007 and the emissions percentage per OGSF from 2007.

### Calculation Factors

2007 total OGSF	5,572,695
2007 mtCO <sub>2</sub> e/OGSF (stationary)	0.004104
2007 mtCO <sub>2</sub> e/OGSF (electricity)	0.003035

Then, using these calculation factors the projections could be determined for purchased and stationary electricity. For example, the upper-bound 2014 stationary sources projections were calculated by multiplying .004104 (the emissions factor for stationary sources) and 6,730,000 (the 2014 OGSF based on LRDP projections) to derive the upper-bound projections.

Transportation projections were made using a similar method, however rather than using the OGSF factors, student population projections from the same planning documents were used. For example, in order to determine lower-bound fleet emissions projection in 2020, 2007 fleet emissions (2,280) were divided by the 2007 CFP student population (15,246) and then multiplied by the 2020 student population projections (16,081).

This methodology was based on readily available data that is updated frequently. This approach is also consistent with of UC – campuses. Improvements in methodology will continue to evolve as additional resources become available.

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<sup>1</sup> 2014 enrollment and building space were estimated by interpolating between 2007 and 2020 (the LRDP does not provide interim estimates).

Reporting Schedule  
and  
Detailed Description ACUPCC Reporting Requirements

Reporting Entity	Reporting Deadline	Verification Deadline	Additional Information for Deadlines	Data Reported	Reporting Tool Used	Mandatory/ Voluntary	UCSC staff responsible for reporting	UCSC Departments involved
The Climate Registry	Sunday, July 31, 2011	Thursday, December 15, 2011	Biannual Verification	Scope 1 and 2	CRIS (formally CARROT)	Mandatory	Reporting Team	PP
ACUPCC	GHG Reporting - 9/15/2011	N/A	N/A	Scope 1,2, commuting and air travel	Internal through second nature / AASHE and ACUPCC	Voluntary	Climate Action Manager	PP
	CAP - 5/15/10	N/A	Progress Reports completed every two years				Climate Action Manager	
California Air Resources Board	Friday, April 1, 2011	Saturday, October 1, 2011	Verified Tiannually	Cogeneration Facility and all scope 1 emissions if over 25,000mtco2e	TCR	Mandatory	Reporting Team	PP
Environmental Protection Agency	Friday, September 30, 2011		Submit a Certificate of Representation and complete registration to Electronic Greenhouse Gas Reporting Tool (e-GGRT) by August 1, 2011	Cogeneration Facility	e-GGRT	Mandatory	Reporting Team	PP

Policy	Reporting Requirement
ACUPCC	Within 2 months of their Implementation start date, signatories are committed to submitting information on the institutional structure for developing their climate action plans, including designating the institutional liaison and the two tangible actions that will be implemented before the end of year 2;
	Within 1 year, signatories are committed to reporting the results of their GHG emissions inventories;
	Within 2 years, signatories are committed to submitting their climate action plans;
	Within 3 years and at least every other year thereafter (years 5, 7, 9 etc.), signatories are committed to updating their GHG emissions inventories;
	Within 4 years and at least every other year thereafter (years 6, 8, 10 etc.), signatories are committed to submitting narrative reports describing progress in implementing their climate action plans.
UCOP	Each UC campus will complete a greenhouse gas emissions inventory annually. To comply with CCAR (or TCR) and American College and University Presidents Climate Commitment requirements, inventories should contain emissions from the six Kyoto greenhouse gasses, including: direct and indirect emissions outlined in the ACUPCC implementation guide and CCAR or TCR general reporting protocol; air travel paid for by or through the institution; and commuting to and from campus on a day to day basis by students, faculty, and staff. All UC campuses will report their updated emissions inventories through the ACUPCC on-line reporting tool at least biennially.
	Each campus will update its action plan for reducing emissions to 2000 levels by 2014, 1990 levels by 2020, and becoming climate neutral as soon as possible, biennially.
CAC	Complete a greenhouse gas emission inventory and a climate action plan.
	Participate in regional projects
AB32	Any institution with over 25,000mtco <sub>2e</sub> are required to report their emissions to CARBin accordance with regulation.