



UCSB Sustainability

Action today for tomorrow

**UNIVERSITY OF CALIFORNIA
SANTA BARBARA**



At the University of California, Santa Barbara, we aim to research, create, and implement solutions for a more sustainable future. We want to motivate all UCSB students to integrate sustainability into their future professions thus embedding sustainability throughout the workforce. We foster a culture of sustainability through campus-wide projects, program development, and promoting the sustainability work of staff, faculty, and students – our greatest renewable resource. UCSB strives to capitalize on our position as an institution of higher education to ensure all students understand the interconnectedness of environmental, economic, and social systems, and to communicate that we each have a role to play in sustainability.

More specifically, we envision that all members of our campus community will have access to healthy food and lifestyles and will be able to meet their needs without negatively impacting others. UC Santa Barbara strives to do business with companies that are integrating sustainability into their strategic planning and operations, including assisting their workers in meeting their own needs.

In order to achieve this vision, UC Santa Barbara continues to prioritize and monitor the implementation and progress of its sustainability initiatives. We encourage and coordinate the efforts of our faculty, staff, and students who are on the front line of positive change by working with all sectors of the campus community, we look forward to helping UCSB maintain its leadership role and attain its shared vision of a sustainable future.

Mo Lovegreen
Director, Campus Sustainability, UCSB

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UC Santa Barbara is Building a More Sustainable Campus



Leadership in Energy and Environmental Design (LEED) certifications are given by the US Green Building Council (USGBC) to recognize institutions for their remarkable efforts to identify and implement practical and measurable green building design, construction, operations and maintenance solutions. The LEED program distinguishes its recipients as those who demonstrate “leadership, innovation, environmental stewardship, and social responsibility.” UC Santa Barbara seeks to provide education and use its resources to transform the campus design, development, construction, and modification process to ensure an environmentally responsible built environment.

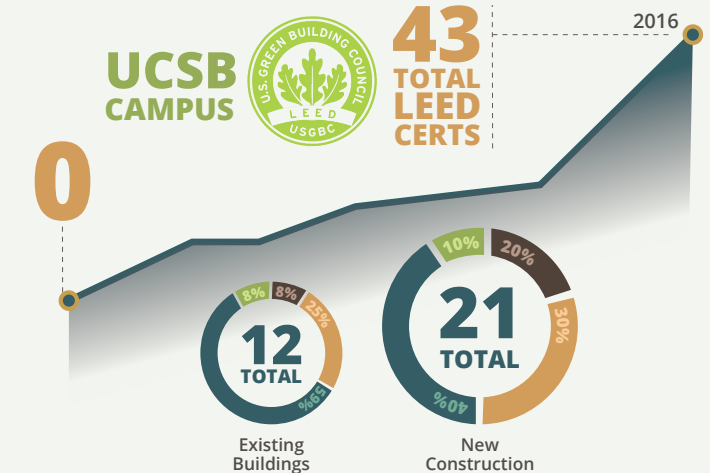
UCSB currently holds 33 LEED certifications. The campus also increased the LEED minimum rating on campus for new buildings (approved after July 1, 2012) from Silver to Gold, demonstrating UCSB’s effort to go above and beyond what is required to advance the efficiency of its built environment.

In 2015, Sierra Madre Villages became the first residential complex in the UC system to attain Platinum certification, the highest possible rating for sustainable design under the category “LEED for Homes.” UCSB is the only campus in the system with any “LEED for Homes” certifications. Sierra Made Villages consists of six residential buildings. Of its 151 apartments, 115 are

available to student residents and 36 are reserved for faculty and staff. These apartments incorporate best-practice environmental features, including sustainable construction, energy efficiency, water conservation, and indoor environmental quality.

Currently, UC Santa Barbara is working to finish construction on San Joaquin Apartments and is targeting LEED Platinum certification with Gold as a minimum.

UC Santa Barbara’s pursuit and attainment of these LEED certifications exemplify its dedication to making its campus and the surrounding world more energy efficient. These commitments show that the campus leads by example, and is an inspiration to other campuses and communities globally.



RESEARCH PROFILE The TomKat UC Carbon Neutrality Project



DR. DAVID AUSTON
DIRECTOR OF THE TOMKAT UC
CARBON NEUTRALITY PROJECT
AT UCSB

The TomKat UC Carbon Neutrality Project is developing solutions to mitigate climate change by capitalizing on the vast resources and researchers within the University of California (UC) system. The goal of the Project is to support innovative multidisciplinary research projects that will substantially accelerate progress of the University of California Carbon Neutrality Initiative. The TomKat UC Carbon Neutrality Project was launched by UC Santa Barbara's Institute for Energy Efficiency (IEE) in partnership with the National Center for Ecological Analysis and Synthesis (NCEAS) to help advance the University of California's system-wide goal to achieve zero net scope 1 and 2 greenhouse gas emissions by 2025. Funding for this project was made possible by a gift from the TomKat Foundation together with supplemental funding from the University of California Office of the President.

The TomKat Project solicited proposals from working groups to address topics such as technology assessments, energy efficiency, communications strategies, economic incentives, behavior modification, and other potentially high impact topics. Two working groups were chosen to work on this initiative. The first focuses on transitioning the UC campuses away from the reliance on natural gas as an energy source by performing techno-economic analyses of natural gas alternatives. The second working group is developing

strategic communications to build stakeholder support for the necessary actions and changes necessary to meet the ambitious goals of the University of California Carbon Neutrality Initiative.

The Natural Gas Exit Strategies working group is evaluating options for eliminating natural gas as an energy source at University of California. This group is specifically investigating how energy efficiency, biomethane, and electrification can reduce and replace natural gas consumption at the University of California and move UC towards a net carbon future.

The Communications Strategies working Group is developing a plan for strategic communications to help the University of California achieve its carbon neutrality goals. This involves identifying key UC decision-makers, conducting audience research, and performing message testing to determine the most effective methods of engagement for different audiences.

Both Working Groups draw on the extensive intellectual resources of the ten campuses and the affiliated national laboratories of the University of California system, as each utilizes dynamic interdisciplinary teams of faculty, students and operations staff that are both synergistic and interactive.

UC Santa Barbara is Striving for Carbon Neutrality



UCSB recognizes the importance of reducing emissions. In November of 2013, UC President Janet Napolitano announced an initiative to achieve complete carbon neutrality in University of California operations by 2025. In the Fall of 2015, ahead of the UNEP 2015 Conference of Parties (COP 21) in Paris, Chancellor Henry Yang signed a pledge affirming UCSB's commitment to carbon neutrality by 2025.

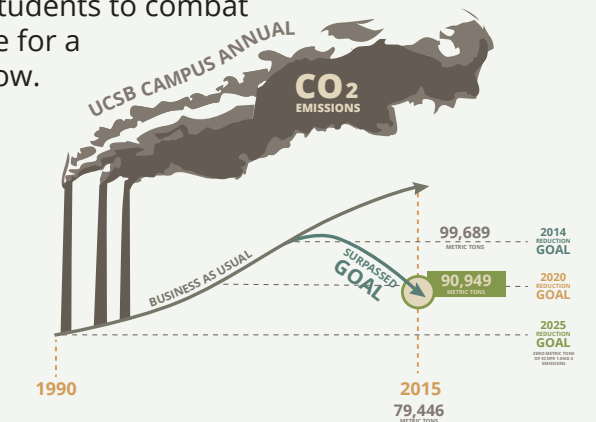
UCSB has already made tremendous strides towards reducing emissions. In 2014, the campus' greenhouse gas emissions from its two major sources of energy; natural gas and electricity, were 6 percent lower than they were in 1990. The University is also investing in renewable energy, as our campus is home to nine on-site solar PV systems, ranging in size from 2kW to 424 kW; the aggregate capacity of these systems is 673 kW DC. In addition, the university entered into a multi-site solar PV Third party Power Purchase Agreements (PPAs) with SunPower to expand solar electricity another 5,320 kW DC (9,546,186 kWh annually), the system is already partially online and should be fully complete in 2018. Together, the current solar on campus and under construction compose 10% of the total electricity demanded.

The university has partnered with the State's Investor Owned Utility companies to form the Strategic Energy Partnership. The partnership was created to reduce reliance on fossil fuels and is doing so through

implementation of lighting and HVAC efficiency projects and upgrades of building systems. In 2011, 2012, and 2014, UCSB was recognized as "climate efficient" as part of the Southern California Edison (SCE) Cool Planet Project, which is awarded to SCE business customers for their environmental leadership in carbon and energy management.

Meanwhile, student funding has made possible Student Affairs' Zero Net Energy Initiative. The initiative's purpose is to result in zero net purchases from the electrical grid for all eight Student Services buildings, including the heavily visited Student Resource Building, and Recreation Center. The 425 kW photovoltaic array funded by the initiative that sits on top of Parking Structure 22 generates enough energy to offset the Student Resource Building's yearly 600,000 kWh energy consumption.

The UC Santa Barbara campus will continue to work alongside its students to combat climate change for a better tomorrow.





**DR. LEILA
CARVALHO**

RESEARCH PROFILE DR. LEILA CARVALHO

The legitimacy of climate change is frequently debated among politicians although scientific research proves the phenomenon to be very real. Dr. Leila Carvalho, a professor in the Department of Geography at UCSB, researches climate variability in monsoon regions. Large seasonal winds produced by changes in atmospheric pressure and precipitation patterns are called monsoons.

A monsoon is a seasonal change in the direction of the prevailing, or strongest, winds of a region. Monsoons often bring to mind intense rain storms, but equally intense dry spells can also result from a monsoon.

Dry and cool air from the winter season forms dry monsoonal wind. The dry winter monsoon blows from the northeast. Summer monsoons are formed by warm, moist air from the southwest Indian Ocean. Monsoons are found in numerous regions such as Asia, India, Australia, Africa and the Americas.

Carvalho, a native of South America, studies variations and extremes in the region's climate. One important factor that influences climate change is the natural resource needs of their growing population.

Tropical South America has experienced rapid increase in temperature in recent years. The increase in anthropogenic greenhouse gases and land-use and change are among the most important factors responsible for this rapid warming.

The replacement of forest by pastures have major impacts on the release of greenhouse gases into the atmosphere which contribute towards climate change. São Paulo, a heavily populated city in Brazil, is vulnerable to these environmental changes. High temperatures and variability in rainfall cause São Paulo to experience intense dry weather. "In the years of 2013 through 2015, there was an extreme drought in São Paulo," Carvalho says. As a response to the drought, residents in São Paulo would experience water cutoffs repeatedly. The shortage in available water forced the government to use the city's emergency reserves.

Access to water was only available at odd times of the morning and remained blocked throughout the day. Over time, these inconveniences created tensions among neighbors and led to fights over water access. Additionally, the unprotected storage of water by the population resulted in a dramatic increase in mosquito-borne diseases such as dengue in the city.

If the precipitation patterns in South America are not taken into consideration, then more water shortages will occur in the future. Among the most consistent projections of climate change in South America by the end of the 21st century is the intensification of dry conditions over Eastern Brazil, whereas wet conditions would prevail over western areas. Dr. Carvalho along with her students have shown additional evidence that these changes are already occurring and influencing the

frequency and intensity of extreme events (drought and floods) in populated areas of South America. Carvalho predicts that, "In the future, a large percentage of the South American population will experience dry conditions because of the movement of precipitation." Carvalho believes that "decision-makers need to understand this better." Studying the patterns of precipitation will help politicians implement preferable water management practices for the people. "Precipitation is the most difficult variable to measure because it is not constant in time," Carvalho concludes.

To protect South Americans from experiencing such unfavorable circumstances again, politicians will need to invest in improved data coverage and better environmental policy to support sustainable agriculture and land-use.

A few of Carvalho's students study weather variability in the subtropical region of South America and in the Andes mountains. Most recently, Carvalho has started a project that studies fire weather regimes in Santa Barbara. One of Carvalho's students will join the project with their research on the gusty winds in the Santa Barbara area.



UC Santa Barbara is Building a More Sustainable Food System

UC Santa Barbara aims to be a community where there is equitable access to healthy and sustainable food to nourish and sustain ourselves, our families, and the environment.

Students have been at the forefront of food justice issues at UCSB, starting the Associated Students Food Bank in 2011. In July 2014, UC President Janet Napolitano announced the UC Global Food Initiative (UC GFI), a university system-wide effort to identify innovative best practices in all aspects of the food system locally and globally. Through this initiative, a survey discovered that 42% of students who participated in the survey identified as food insecure.

Residential Dining Services offers workshops and educational events during Sustainability Week, Sustainable Seafood Day, Nutrition Week, and Earth Day. In addition, through the Food, Nutrition, and Basic Skills program, 26 departments and organizations have come together to share information on kitchen skills, cooking and nutrition, budgeting and planning, and a connection to our food system. FNBS was co-founded by the University Center, Health and Wellness, AS Food Bank, and UCSB Sustainability. Over the past year, 463 students participated in workshops.

UC Santa Barbara also aims to support our local farmers and the local environment. In fiscal year 2015-2016, both Residential Dining Services and UCen Dining exceeded the UCOP goal of 20% sustainable food by 2020. Under UCOP policy, food that is locally grown, organic, or third party certified to protect animal or human welfare, is considered sustainable.

UCSB Residential Dining Services procured 30% sustainable food and UCen Dining increased the sustainable food spend to 40% in their operations.

Residential Dining and the University Center Dining are working to expand the use of humane certified products and to integrate more vegan and vegetarian offerings. Through a partnership with UC GFI Fellow Audrey Horn, the University Center Dining has piloted the use of vegan mayo and humane certified chicken products. Residential Dining continues to host three Green Mondays (vegetarian menu) per quarter in three dining locations.

It is important for us to have a strong connection to our food system. UCSB offers field trips to local farms, hosts the Gaucho Certified Farmers' Market, and sources from local farmers where possible. 40% of the produce from Residential Dining traveled less than or equal to 250 miles, and 33% traveled less than or equal to 150 miles from campus. Additionally, all Residential Dining Services and UCen owned operations are Green Business certified.

Students have the opportunity to grow their own food on campus. The Edible Campus Program grows citrus trees in Storke Plaza, tends vertical hydroponic gardens at the recreation center, and is launching a student farm. All the produce harvested will be donated to the Associated Students Food Bank. Students can also have their own plot at the Greenhouse and Garden Project or at one of Housing, Dining & Auxiliary Enterprises (HDAE) community resident gardens.



What is the world's favorite beverage besides water? Not coffee, not soda, but tea. The hot, brewed, and refreshing beverage is the most consumed drink on the planet. In fact, tea (*Camellia sinensis*) transcends all other drinks with its dominating presence in many different cultures across the globe. Despite its extraordinary popularity in the 21st century, tea in Western culture would not be as remarkable without the labor of Indians on British tea plantations in the 1800s. Dr. Erika Rappaport, a professor of History at UCSB, studies the history of tea to explore the history of industrial agriculture and global marketing.

English commercial trade with India began long before the cultivation of tea. However, Rappaport states that it was in the 1820s, while fighting a war with Burma, "a few members of the East India Company discovered tea growing in Assam," a then independent state in Northeast India. From that point forward, the East India Company and private corporations used Assam and the labor of Indian indentured servants to produce tea for global markets.

The East India Company's first step towards global tea trade started with the development of tea plantations. Plantations were quickly established in Assam but were initially unproductive because of the land's unsuitability for tea. "The method of cultivation the British introduced, the large-scale plantation, required abundant cheap labor, something that did not exist in Assam and surrounding regions," Rappaport says.

Indentured servitude proved to be the best solution to this issue. Like recent studies such as Gunnel Cederlöf's "Founding an Empire" on India's North-Eastern Frontiers and Rana P. Behal's "One Hundred Years of Servitude: Political Economy of Tea Plantations in Colonial Assam", Rappaport argues that, "British planters used the power of the colonial state to secure the land and labor necessary to produce cheap tea on a massive scale." As a result, indentured laborers cleared vast tracts of land to plant *Camellia sinensis*. Trees were planted to provide the plant with shade. Tea gardens were nourished with fertilizers (e.g. manure) to stimulate rapid growth. Additionally, the tea plant was planted on clear, elevated hills for drainage purposes. After a few decades of environmental manipulation, Assam produced prosperous tea gardens ready for consumers.

Due to its expensive price, tea was initially reserved for the upper class in Europe. In the mid-to-late 1800s, mass production of tea resulted in cheaper prices, making it more affordable for other classes. In no time, tea drinking became part of the everyday life of the average, specifically British, European. "What is really unique about tea is that the growers in India, Ceylon, Java, Sumatra, and growing areas in Africa, instituted a tax on exports to pay for global advertising campaigns from the 1890s to this day," Rappaport says.

Tea was heavily advertised in major markets in Europe, North America, Africa, India, and the Middle East. Interestingly, British tea brands like Lipton and Twinings, which were created in the 18th and 19th century, remain the most popular brands in the world today. In 2015, the British Broadcasting Corporation News (BBC) revealed the poor living and working conditions tea plantation workers in Assam are subjected to. The tea workers grow tea for multinational companies such as Lipton and Twinings but are paid the equivalent of \$1.50 a day which is drastically lower than the minimum wage in Assam. A year later, BBC reported that the living and working conditions in Assam remain the same. Though these conditions have not changed for tea workers, reports from BBC help raise awareness about the negative consequences of mass tea production and the truth of the tea industry overall.

UC Santa Barbara is Implementing a Zero-Waste Policy



UCSB's Facilities Management, Housing, Dining & Auxiliary Enterprises (HDAE), Associated Students Recycling, and The University Center all play integral roles in managing UCSB's waste infrastructure and various programs.

Together, their goal is to make UCSB a zero waste (95% or better diversion from landfill) university by 2020 through ensuring waste management programs and practices that effectively promote the reduction, reuse, composting, recycling, and repurposing of items, as well as encouraging the rebuying of recycled material.

January 2017 marked the launch of the UC systemwide Zero Waste Communications Campaign, #MyLastTrash. The goal of the #MyLastTrash campaign is to change the campus community's behavior around how they handle and reduce waste. UCSB has already planned several events around monthly themes including electronic waste, compost, waste reduction, and upcycling.

UCSB has already made significant reductions in waste generation through diversion programs including composting. In 2009, UCSB's HDAE piloted the De La Guerra Composting Project. This project resulted in a 90% reduction of food waste from the dining commons sent to the landfill. Following this success, HDAE has extended its composting efforts to include all four dining commons.

In addition, a larger Compost Pilot Project (CPP) was launched in the winter quarter of 2012 with the help of grant money from The Green Initiative Fund. The project's groundbreaking initiative transforms food waste on campus into compost to foster a complete food-to-food cycle. The UCSB Associated Students (A.S.) Recycling Program added six compost bins to in-place recycling receptacles on the main campus to divert the university's food waste from the landfill. Now our campus offers a compost service for both pre- and post-consumer food scraps. BPI-certified compostable packaging and compost receptacles are located at major dining facilities on-campus.

UCSB has also remained committed to practicing and promoting responsible recycling measures. The A.S. Recycling Program employs route riders that service bins across the campus, including 100 bins for landfill, recyclables, and office pack. Recently, UCSB has replaced several conventional waste receptacles with solar powered waste compactors in more trafficked areas like The Arbor.

RESEARCH PROFILE DR. SANGWON SUH

From the toothpaste we use to the food we eat, chemicals are everywhere and encountering them is inevitable. Since people are exposed to these substances daily, examining chemicals before the products that contain them enter mass production is critical. The Artificial Neural Network (A.N.N.), a tool created by scientists, rapidly screens chemicals for their human health and environmental impacts. Dr. Sangwon Suh, a professor at the Bren School, discusses the importance of A.N.N. especially in the process of chemical manufacturing.

Understanding the potential human health risks of chemicals is a complex task requiring multiple approaches and techniques. The Chemical Life Cycle Collaborative (CLiCC), a web-based tool aiming to do just that, uses more than a dozen such techniques, one of which is A.N.N. Through the simulation of artificial brain cells, A.N.N. is designed to behave much like a human brain. A.N.N. observes a chemical's molecular structure and identifies hidden patterns to predict potential challenges. "There are certain patterns in a chemical that affect human health more than others," Suh says. A.N.N. predicts the toxicity of chemicals after they have been released into the environment. Like humans, experience is the only way A.N.N. can learn. Trial and error teaches A.N.N. how to detect which chemicals are hazardous and which are not.

A.N.N. stores this information as artificial neurons. Some A.N.N. may use hundreds of thousands of artificial neurons called units (input, output and hidden). Input units are

responsible for learning and collecting information from the external world. Output units are responsible for reacting to the received information. Hidden units are the layers found in between input and output units. Together, these units make up the artificial brain, which is what enables A.N.N. to carry out its functions successfully.

One of A.N.N.'s functions is to provide chemical manufacturers with early warnings about chemicals that may be harmful. Another function is to operate as "an assessment tool for chemical life cycle assessment," Suh says. Life cycle assessment (LCA) evaluates the environmental impact of chemicals from their beginning to ending stages of productivity. Dr. Suh, as well as other scientists, uses A.N.N. to estimate the impacts of chemicals on humans and the environment.

Despite the progress with A.N.N., the pace in which LCA is conducted cannot keep up with the pace in which new chemicals are designed and developed. Chemical manufacturers rarely have enough time to go through all the animal and toxicity tests necessary. Consequently, the absence of a complete examination poses a risk to the environment, and particularly to the manufacturers who develop such materials. Suh states that "it is in the favor of the manufacturers to understand the environmental impacts of chemicals before they are released." With A.N.N., manufacturers should be able to screen chemicals faster. Over time, A.N.N. lead to a decrease in the amount of toxic chemicals put into the environment.

DR. SANGWON
SUH





UC Santa Barbara is Working to Use Less Water

UCSB has continued its rich history of implementing and institutionalizing water conservation and efficiency projects and programs on campus.

UCSB's water use statistics demonstrate its dedication to water conservation and sustainability. Potable water use on campus in 2016 decreased for the third year in a row, despite increases in our campus population. Water consumption for the 2015/16 academic year dropped 18% below UCSB's three-year baseline (FY2005/06, FY2007/08).

UCSB continues to utilize recycled water, which is produced by Goleta Sanitary District and provided to the campus by the Goleta Water District. In the Goleta Valley, this source of water is underutilized and unstressed, and UCSB remains a leader not only in the use of this water, but in pioneering this source as a means to augment potable water consumption in new applications. In FY 2015/16, over 90% of campus was irrigated with recycled water.

UCSB is also finding new innovative uses for recycled water. When finished in 2017, two new 6-story Tenaya Towers at San Joaquin Apartments that include (58) 3-bedroom, 2-bath apartments with up to 348 bed spaces, will be dual-plumbed with a recycled water system. This is estimated to save over 600,000 gallons

of potable water per year. Given the ongoing drought conditions that are still severe in the Santa Barbara County area, the San Joaquin project was designed to maximize the use of recycled water for both irrigation (standard practice at UC Santa Barbara) as well as for toilet flushing within the residential buildings.

In addition to expanding the recycled water infrastructure, UCSB has also focused significant efforts on reducing laboratory water use. In 2016 UCSB distributed and installed closed-loop cooling for 63 benchtop condensers in campus research laboratories, decreasing water usage by 47,000 gal/year per unit. The Campus also replaced three water-cooled vacuum pumps with oil-cooled vacuum pumps, estimated to save over 2,000 CCF per year.

UCSB also continues to educate students and staff about how to save water by taking shorter showers, turning off water when brushing teeth, and for all residents and staff to report any leaks for signs of wasted water (irrigation overflow, timers off, etc).



**DR. KUM-KUM
BHAVNANI**

RESEARCH PROFILE DR. KUM-KUM BHAVNANI

Women in developing countries are taking charge of their communities to initiate the social change they want to see. In Tehri, India, a spirit of resistance takes over as women protest the construction of the Tehri Dam in the Bhagirathi River. The Bhagirathi River is a tributary of the Ganges River, which is commonly known as “the lifeline of India” says Vandana Shiva, an Indian environmental activist. Water, food, transportation, and spiritual healing are all clear reasons why the Ganges is truly a matter of life and death to those who depend on it. Dr. Kum-Kum Bhavnani, a UCSB Sociology Professor, displays the compelling experiences of women who aim to protect the Ganges River in the 2006 documentary “The Shape of Water”.

In the film, several women express their outrage towards the Tehri Dam. For three years, they fasted and protested in hopes of convincing the Indian government to halt the dam’s construction. The Tehri Dam is responsible for displacing approximately 100,000 people from their homes. Being among those who have lost their homes, the women demand that the government do something to resolve the problem. As compensation, the Indian government promised the residents jobs but the women reveal that their families have not been offered any.

The Ganges River plays an influential role in the lives of Indians. Farmers rely on the river for fertile land to grow crops. Hindus seek spiritual rejuvenation from the Ganges and bathe in the river to wash away impurities.

Since the completion of the Tehri Dam, the water quality of the river has deteriorated. Additionally, the potential of dangerous earthquakes has increased because the dam is located on an active fault. Even with these issues, the dam continues to face new development and is under construction for its 1000 MW pumped storage plant.

“The Shape of Water” transitions from India to other regions where women confront social inequalities through community bonding and activism. Bhavnani introduces a unique style to the documentary by not appearing in the film, thus allowing the women to share their own stories uninterrupted. ‘The Shape of Water’ presents the lives of several women in Senegal, India, Brazil, and Israel who prove that they have the power to change their own situations and “aren’t victims who need to be rescued,” Bhavnani states. Whether it is in Brazil where women tap trees for rubber in the Amazon Rainforest or in Palestine where a group of Jewish and Arab women called “Women in Black” practice civil disobedience against the Israeli Occupation, ‘The Shape of Water’ is inclusive in its representation of diverse women living around the world.

As a professor, whose teachings focus on women, culture development, and globalization, Dr. Kum-Kum Bhavnani uses ‘The Shape of Water’ as a medium to detail her research. Instead of lecturing about the lives of women in the Third World, Bhavnani explicitly shows them. Through ‘The Shape of Water’, Bhavnani makes the women teachers, and audiences their students.



UC Santa Barbara is Building a More Sustainable Campus

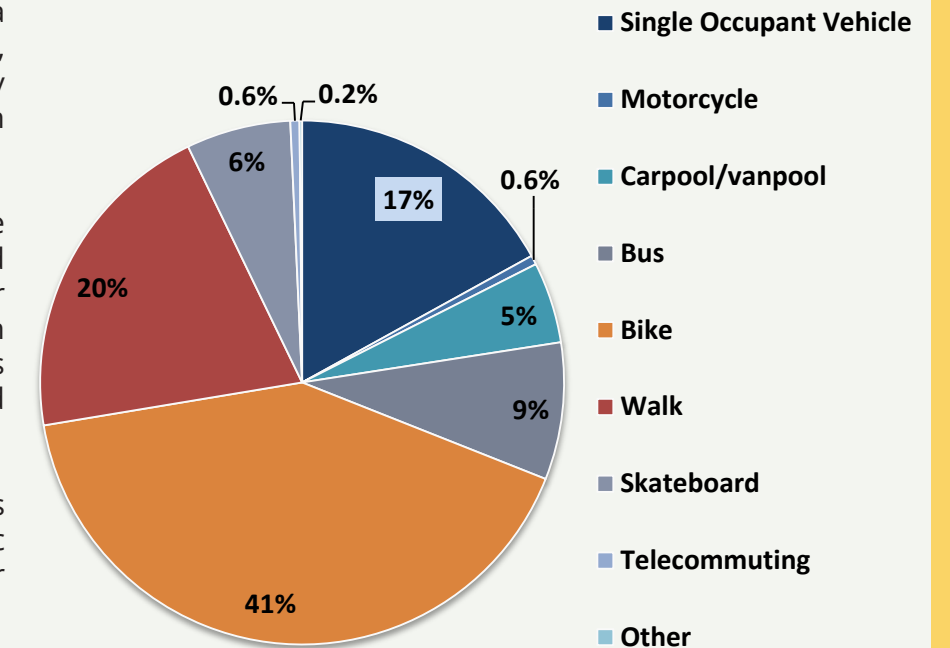
The University of California, Santa Barbara has one of the highest levels of human-powered commuters of any university in North America. UCSB's two-mile radius main campus parking restriction, combined with favorable weather, encourages the majority of campus-commuters to travel between their residences and UCSB without a motor vehicle. i.e. Skateboard/Kick Scooter 6%, Foot 20% and bicycle 41% (Total 67%).

All registered students get unlimited-access to Santa Barbara's transit buses for use between UCSB, Isla Vista, Goleta, Santa Barbara and Carpinteria. Approximately 10% of our campus population rides the bus each weekday.

Our campus developed extensive bicycle infrastructure in the 1970s. This infrastructure includes our Associated Students Bicycle Shop, 8 bicycle roundabouts, and over 7 miles of Class I bicycle paths. The League of American Bicyclists has long recognized UCSB bicycle achievements with both a gold level Bicycle Friendly Business award and gold level Bicycle Friendly University award.

UCSB currently has 28 Electric Vehicle charging spaces and the wiring in place for an additional 115 Electric Vehicle charging spaces to meet future demand for Electric Vehicle Supply Equipment.

UC Santa Barbara continues to be a leader and catalyst in terms of human mobility options, advancing alternative fuels, and carbon-neutral vehicle deployment. UCSB has a well-established Alternative Fuel program operating within the Transportation Services Fleet Department. As a result, our number of alternative fuel vehicles has more than doubled over the last 10 years.



RESEARCH PROFILE YI WEN

Currently, transportation accounts for 40% of California's CO2 emissions. In response, Governor Edmund Brown Jr. issued an executive order to establish 1 million zero-emission vehicles (ZEVs) in California by 2020. Governor Brown further required that the 1 million ZEVs be supported by infrastructure, competitive costs, and easy accessibility for consumers. A team called GO-Zero, tasked by Governor Brown to address this goal, involves the collaborative work of several students from the UCSB Bren School of Environmental Science & Management (Bren) who are developing plans for the installation of workplace charging stations for ZEVs.

One of these students is Yi Wen, who along with his colleagues, has been conducting interviews with local and multinational companies to understand what potential barriers prohibit businesses from purchasing workplace charging stations. Based on the companies' responses, Wen and his partners are proposing the best strategies for the Governor's Office of Business and Economic Development (Governor's Office).


The majority of the businesses that they interviewed mentioned cost, parking control, and employee demand as potential barriers for workplace charging adoption. For cost, companies without workplace charging stations indicated that outside funding or a subsidy program to combat expenses would encourage them to install chargers. A strategy that Wen and his partners are proposing to overcome cost is the First Charger Rebate Program. The First Charger Rebate Program would give companies 50% off equipment and labor costs for their first installation. GO-Zero anticipates that a discount

will encourage businesses to install their first charger, hopefully resulting in future purchases of additional chargers. When GO-Zero proposes this strategy, the estimated cost is believed to be \$22-25 million to install the first 10,000 chargers.

Another potential barrier is parking control. Companies with offsite parking suggest that parking for ZEVs would be out of their control since parking lots are owned by the city. However, if their employees demanded it, they would consider petitioning or working with the city to install stations. Another strategy is the City Electric Vehicles Readiness Plans (CERR) where cities can apply to receive funding for parking lots from the California Energy Commission.

The last significant barrier for workplace charging stations is the lack of employee demand. Businesses mentioned that because most employees do not own ZEVs, there has not been a need to install workplace charging stations. Wen points out that there are several programs in place to address the lack of demand such as the Federal Electric Vehicle Tax Credit, where all electric and plug-in vehicles receive income tax credit from the government.

With these strategies in place, Wen predicts that more small-sized businesses will install workplace charging stations. Large companies like Google, Microsoft, Apple and Adobe may not need financial help from GO-Zero but local businesses do. The Governor's Office "cannot solely depend on companies like Google and Apple to meet the goal of 100,000 charging stations," says Wen. Therefore, the inclusion of small businesses is highly-valued and necessary.



BREN STUDENTS YI WEN (CENTER), KATHRYN COLLINS, TORI GREENEN, ADRIENNE HARRIS AND HEATHER MARTIN ARE THE MEMBERS OF THE GO-ZERO PROJECT TEAM ADVISED BY DR. SARAH ANDERSON AND DR. JAMES FREW AT BREN.

UC Santa Barbara is Building a More Sustainable Campus



It is estimated that almost 40% of higher educational institutions' operational greenhouse gas emissions result from their supply chains, that is, from the production of the goods and services purchased by the campus. This staggering quantity is not currently measured by most Universities due to the sheer difficulty in obtaining and aggregating the data, hence these scope 3 emissions are not calculated as part of the UC Climate Neutrality initiative. In an effort to move beyond what is required by policy to instead what is deemed necessary for a sustainable future, UCSB's Procurement Services hired a Sustainable Procurement Analyst. This analyst works to incorporate the UC Sustainable Practices Policy into the purchasing framework, work with contracted suppliers to identify sustainable product offerings and programs that reduce waste and emissions, and contributes a life cycle perspective to the procurement of goods and services on campus.

Since 2012, UCSB Procurement has strived to implement its own Sustainable Procurement and Use Practices Policy into daily operations. In 2013, an electronic procure-to-pay Software as a Service (SAAS) was implemented, dramatically reducing paper usage from printing purchase orders, quotes, and invoices across campus. UCSB exceeds the UC requirement of using 30% recycled content in all office paper, reporting that 35% of all paper purchases in FY 2015/16 were over 70% recycled content, Forest Stewardship Certified Mix,

or Recycled. Furthermore, over 50% of all electronic purchases met the Electronic Product Environmental Assessment Tool's Gold rating, certifying that these products achieved the highest sustainability standards in regard to resource, toxic materials, and end-of-life management.

Through the bidding and contracts process, procurement supports and enables large scale sustainability and energy efficiency projects, including a multi-site solar PV Power Purchase Agreement (PPA), solar thermal pool heating, sustainable bee capturing, recycling programs, and a sustainable coffee contract. Sustainability criteria is weighted a minimum of 5% in all requests for proposals (RFPs), but in many circumstances is given weight up to 45%.

UCSB continues to serve as an active member of the Sustainable Purchasing Leadership Council, a nonprofit organization whose mission is to recognize and accelerate leadership in purchasing practices that promote a sustainable future, through participation from buyers, suppliers, and advocates across the country. In February of 2017, UCSB Procurement joined the newly reconvened UC-wide Sustainable Procurement Working Group to assist the development of purchasing objectives, initiatives, and projects related to social, environmental, and economic sustainability.



**DR. ROLAND
GEYER**

RESEARCH PROFILE DR. ROLAND GEYER

The moment Apple announces the release of the latest iPhone, consumers flood stores ready to purchase it. Oftentimes, consumers do not need to purchase new cell phones since most already own useful ones. This is a classic example of consumerism where a cell phone's life span is cut short because of the consumer's desire to receive an updated phone. The average smart phone has a life span of only 1.5 to 2 years before it is replaced and tossed away. According to Dr. Geyer, a professor at the Bren School at UCSB, the easiest way to reduce the environmental impact from cell phones and other electronic products is to upgrade them less frequently.

Almost 20 years ago, Dr. Geyer studied reuse and recycling at a business school in France called INSEAD. Geyer soon came to the realization that he was more interested in the environmental benefits of reuse and recycling rather than their profitability. In pursuit of this passion, Geyer decided to attend the University of Surrey in the South of England to learn how to measure environmental product performance through life cycle assessment (LCA).

As an LCA expert, Geyer studies the life cycle of manufactured goods in an effort to minimize wastes and emissions. Recently, Geyer and his PhD student Trevor Zink collaborated with UC Davis computer scientists, Frank Maker, Rajeevan Amirtharajah, and Venkatesh Akella, to compare the environmental impacts of repurposed and refurbished cell phones. Repurposed smartphones are used phones that are reprogrammed to serve different functions. Whereas, refurbished phones are used as phones again. The computer scientists "wrote software for the HTC Magic and Nokia N80 smartphones" to create an app called ePark for repurposed phones that "function as a purpose-built personal in-car

parking meter." In-car parking meters are used widely at UC Davis for campus staff parking at the university, similar to the way UCSB's Transportation Alternatives Program uses in-car parking meters. When compared to the refurbished phone, the repurposed phone was found to have less environmental impact in terms of acidification, global warming, human toxicity, atmospheric ozone depletion, and photochemical ozone creation potential, suggesting that repurposed phones are more environmentally-friendly than refurbished phones.

However, if repurposing used cell phones is not feasible, the latter route is still a good option. Refurbished phones are often sold in developing countries in Africa, Asia and Latin America. Refurbishers inspect used phones for issues and fix them accordingly. Repurposed and refurbished phones are inexpensive and help consumers manage and reduce their electronic waste.

After a cellular phone has been used to its fullest ability, it should be recycled. Used phones contain hazardous materials like arsenic, copper, mercury and lead which is why their disposal is a great concern. Luckily, the Cell Phone Recycling Act of 2004 requires all retailers in California to safely dispose cellular phones. Retailers are obligated to accept used cell phones from consumers as well as make information about cellular phone recycling options known to the public. This system aims to limit the number of used phones that end up in landfills. Recycling cellular phones is another easy way to limit environmental impact by recovering valuable materials and cutting down on hazardous waste. The three R's for cellular phones are therefore; Reduce waste by avoiding frequent upgrades, Reuse by repurposing or refurbishing, and dispose cell phones safely by Recycling.



UC Santa Barbara is Building a More Sustainable Campus

In planning a future that includes an excellent physical environment for coming generations, we are researching and developing solutions to our most threatening environmental problems. At the same time, we are educating the next generation of leaders that will truly embrace a sustainable future.

UCSB finds importance in offering opportunities to underrepresented populations on our campus for coming together and addressing sustainability challenges. UCSB is an officially designated Hispanic-Serving Institution and achieved a very high score in the Diversity and Affordability section of the STARS rating system for its commitment to diversity, and increasing its pool of underrepresented scholars.

The campus has a zero waste goal for 2020 and continues to strive to reduce our up front purchases (and the packaging they are delivered with), reuse as much as possible on-site, and continue to enhance the sustainability elements included in procurement contracts. We continue to expand our already successful composting and recycling program.

The campus is working to achieve the goal of becoming carbon neutral in our campus operations by 2025. Towards this effort, UCSB is expanding its energy efficiency projects and is piloting a Utility Conservation Reinvestment Fund that will allow us to capture the savings from these projects and re-invest them in additional efficiency projects that reduce our environmental impact.

Our 2010 Long Range Development Plan (LRDP) identifies and describes the physical development needed to achieve the campus' academic goals through 2025. One of the LRDP goals is to meet the campus community's housing need and reduce transportation impacts by housing 100% of additional students on or near campus. The campus has already completed Sierra Madre and the San Joaquin expansion using the LEED program.

Finally, as part of a sustainable future, UCSB promotes the well-being of humankind. A sustainable food system is dependent on the accessibility of healthy, fresh, and local options.

With all of these initiatives and many others, UCSB is taking action today to create a sustainable tomorrow.

Join the Movement!

UC Santa Barbara's leadership position as the greenest public university is attributed to the sustained commitment of students, staff, and faculty over many decades. As sustainability becomes increasingly critical to the University's mission of teaching, research, and public service, we seek to partner with alumni, parents, and friends to transform green initiatives on campus. Your generosity creates opportunities for student internships in sustainability, innovative research and instruction by faculty, the development of alternate energy sources, and the evolution of a water-wise and food-rich campus. To learn more about getting involved or making a gift please visit www.sustainability.ucsb.edu/get-involved-giving/. Together we can build a bright future for UCSB and the world.

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**VISIT OUR WEBSITE AT:
WWW.SUSTAINABILITY.UCSB.EDU**

Inquiries regarding the University's equal opportunity policy may be directed to Ricardo Alcaino, Director and Title IX Coordinator, of the Office of Equal Opportunity & Sexual Harassment/Title IX Compliance Office, which is located at 3217 Phelps Hall, Santa Barbara, CA, 93106-2060 or call 805-893-2701. If you require this information in another format due to a disability, please contact (805)839-7025 or Jennifer.Lofthus@ucsb.edu.