

Sustainable Campus, Sustainable Cities

A UC DAVIS BIG IDEA





A Big Challenge, A Big Vision

Climate change is the defining challenge of our time. While tackling climate change requires many complex actions, there is no question that cutting greenhouse gas (GHG) emissions is the crucial first step—and taking that step in cities is our greatest hope for a more sustainable future. Home to the majority of the world's population, as well as most of global GHG emissions, cities offer powerful opportunities to discover solutions that also improve quality of life.

Cities face unique challenges, however: They have complex and demanding energy needs while serving a high concentration of competing interests and stakeholders. Many of the tools and technologies to operate carbon-neutral cities already exist. But how do different cities implement solutions at scale, and in ways that are equitable, fiscally sound and sustainable for the long term? And how do we prepare the next generation to lead the way in ensuring these solutions take root?

No university is better positioned than UC Davis to provide a viable model for decarbonizing cities.

A Big Opportunity

UC Davis' Big Ideas are forward-thinking, interdisciplinary programs and projects that build upon the strengths of the university to positively impact the world for generations to come.

UC Davis seeks to partner with visionary philanthropists to engage our students in the hands-on process of decarbonizing our campus—the equivalent of a small city. In doing so, we will prepare the next generation of leaders to discover, test, and carry out carbon neutrality solutions that work for cities around the world.

While managing the smart growth of our own city-sized campus and its complex infrastructure, we have built the nation's largest planned zero-net-energy (ZNE) community, a 16-MW on-campus solar farm, and a biodigester that has the capacity to convert 50 tons of organic waste to 12,000 kWh of renewable electricity every day using state-of-the-art generators, diverting 13,000 tons of waste from local landfills each year.

Our world-leading research in sustainable transportation, energy efficiency and high-performance building design leverages our broad interdisciplinary expertise, as well as our industry partnerships and enduring relationships with policymakers in the world's fifth-largest economy.

The Sustainable Campus, Sustainable Cities initiative will engage students in transforming the UC Davis campus into a practical-solutions showcase that demonstrates how cities and large institutions can significantly reduce GHG emissions even while growing.

Students will collaborate with renowned faculty and staff experts to:

- **Implement carbon drawdown solutions through targeted, project-based courses that use our major research university as a living laboratory**
- **Develop and disseminate best practices through satellite campuses, design summits, and partnerships with industry**
- **Take an active role in creating a decarbonization template for application in cities and universities worldwide**

UC Davis' vision is to accelerate urban carbon drawdown, while preparing the next generation of leaders to build global resilience in the face of climate change.

As our campus grapples successfully with the same energy challenges that cities all over the world are facing, we will cultivate leaders who will point the way forward to a brighter and fully sustainable future for all.



THE RIGHT TEAM

One of UC Davis' chief competitive advantages is an established, highly collaborative working group of faculty researchers, facilities management staff and administrative staff. While many universities face the hurdle of internal buy-in, with the partnership of visionary philanthropists who share our commitment to a sustainable future, UC Davis is poised to take the work of the following partners to the next level.

Energy and Efficiency Institute

This alliance of UC Davis research centers focuses on high-performance buildings and lighting, zero-net energy and water, electric vehicles and low-carbon fuels, and sustainable agriculture and food production.

D-Lab

In D-Lab, cross-disciplinary student teams work with international community partners to perform feasibility studies and create low-cost, clean technology prototypes using technical, social, environmental and financial lenses. Practical labs, case studies and guest speakers focus on user-centered and market-based design approaches. Students partner across fields to advance solutions in four key areas: off-grid lighting and micro-power, agriculture, renewable energy and energy efficiency.

Energy Graduate Group

UC Davis' unique graduate group model exemplifies our collaborative spirit of discovery by bringing together scholars from different areas of study who share common research interests. This new group attracts top faculty, students and researchers from around the world who are dedicated to developing and implementing sustainable energy solutions that incorporate technical, social, economic and environmental perspectives.

Office of Campus Planning and Environmental Stewardship

Experienced staff translate cutting-edge research into viable solutions for reducing the campus's carbon footprint while improving quality of life for students, faculty, staff and visitors.

Energy Conservation Office

This team of engineers, technicians, and data and behavioral scientists collaborates to increase building efficiencies while improving occupants' comfort. Financed with energy savings from projects, the office is finding ways to save energy at the building level, so that we can meet carbon neutrality goals.

The Right Place

As an international sustainability powerhouse, UC Davis is the only university with the depth and breadth of interdisciplinary expertise, collaborative culture and physical infrastructure to test and implement fiscally viable emissions-cutting solutions at scale.

The Sustainable Campus, Sustainable Cities initiative, in partnership with the Energy Conservation Office, builds on the work of the Path to Zero Net Energy initiative (PZNE). PZNE spearheads state-of-the-art energy-efficiency and renewable-energy projects for UC Davis and other clients. Projects are student-led and client-driven, conducted in close collaboration with clients, industry partners, faculty and subject matter experts. Successful projects have addressed steam-to-hot-water conversion,

renewable heating alternatives, energy efficiency in buildings, energy auditing, data analytics and bus fleet electrification.

Building on this foundation, this Big Idea is partnering with faculty and students in the new Energy Graduate Group, the Graduate School of Management, and thought leaders across the full spectrum of sustainability research, including those at UC Davis' top-ranked College of Agricultural and Environmental Sciences, College of Engineering, and College of Letters and Science. Synergizing these assets with industry partners and investment networks under the umbrella of the initiative will expand our capacity to execute effective carbon-reduction projects and translate lessons learned into a robust model for cities, research universities and other large institutions.



UC Davis: A Model for Cities

Encompassing 3,500 acres and more than 1,000 commercial, industrial and residential buildings, and hosting more than 60,000 students, faculty and staff in addition to visitors, UC Davis is well-positioned to serve as a proxy city.

We operate our own landfill, wastewater treatment plant, electrical substation and central heating and cooling plant. Many of these systems require significant amounts of energy, making them ideal testing grounds for greater energy conservation, energy efficiency and the use of renewable resources.

	UC Davis	City of Davis, CA
Population	More than 60,000 (day use)	66,000
Housing units	10,000	14,000
Annual budget	\$5 billion	\$200 million
Area	30 km ² <i>(Davis and Sacramento campuses)</i>	26 km ²
Wastewater treatment plant	1.3 billion gallons/year	1.8 billion gallons/year
Solar PV capacity	20MW	16MW
Central cooling and heating plant	Yes (30 miles of pipe)	No
Water use	780 million gallons/year	3 billion gallons/year
Electric and gas energy use	1.65 million Mbtu/year <i>(Davis campus only)</i>	2.2 million Mbtu/year
Electricity cost	\$20 million/year	\$44 million/year
Emissions	160,000 MTCO ₂ e/year <i>(Davis campus only)</i>	180,000 MTCO ₂ e/year



Preparing the Next Generation

Today's students—tomorrow's climate leaders—are our best hope for tackling the urgent challenge of climate change.

Project-based learning and hands-on experience are key to preparing them to be effective leaders in their communities, in their chosen careers, and on the global stage. Evidence shows that project-based learning reinforces the relationship between theory and application, and provides opportunities for students to develop a greater sense of how they can use their UC Davis education to make a difference.

Moreover, UC Davis is part of a vast network of stakeholders—providing students with unique access to gain practical experience with community partners in policy, industry, technology and NGOs. Philanthropic investment in students is essential to ensuring they have experiential learning opportunities of the highest caliber.

The new Energy Graduate Group is gaining national traction as a place where students can partner with faculty to impact the world through technology, policy and industry. UC Davis' energy and transportation research cluster is distinguished as a place where faculty truly work across the disciplines. Through partnerships with the full spectrum of our professional schools and international fellowships, the initiative will ensure our model

Cultivating Change Makers

At UC Davis, we believe that the best hope for the future resides in our students—the innovators, entrepreneurs, humanitarians, artists and visionaries of tomorrow. Supporting students is key to achieving the goals of the initiative and will have a lasting impact for generations to come.

- **Project-based course development**
- **Undergraduate scholarships and internships:**
Starting at: \$100,000
Goal: \$15,000,000
- **Multidisciplinary graduate fellowships:**
Starting at: \$100,000
Goal: \$10,000,000
- **Energy Graduate Group:**
Starting at: \$500,000
Goal: \$5,000,000
- **Graduate School of Management IMPACT Fellows:**
Starting at: \$100,000
Goal: \$2,000,000

takes root in cities and large institutions worldwide.

The importance of drawing top graduate students to UC Davis cannot be overstated. Regarded by faculty as junior colleagues, graduate students are centrally involved in the university's cutting-edge research as well as in undergraduate teaching and mentoring.

Their deep knowledge and immersion in the Sustainable Campus, Sustainable Cities initiative's work will position them to be key ambassadors for our model. Fellowships are

often the most important factor determining the choice of a university for the most talented and accomplished graduate students. Even a small difference in the amount of an award can sway a decision.

Expanding opportunities for undergraduate students is equally critical to our vision for preparing the next generation of climate leaders. Scholarship support plays a vital role in this regard. Because scholarships help qualified and committed students attend and succeed at UC Davis, they are key to producing

the leaders and skilled workforce that will realize a decarbonized future.

This initiative will empower students with a dynamic toolset to develop new financial and decision-making models that attract the capital and stakeholder buy-in needed to drive social-technical solutions to reach carbon neutrality. Teaching undergraduates how to address the social, political, economic as well as scientific challenges of carbon neutrality will ensure that students pursuing any major are well prepared to lead the way.





Cutting-Edge Research for a Decarbonization Template

Building faculty capacity will be critical to mentoring students taking part in the initiative's groundbreaking research, scaling up the carbon neutrality work currently taking place on campus, and spinning it out to the rest of the world.

As scholars of international standing, the holders of endowed chairs and professorships attract research funding and draw top faculty colleagues and students from around the world. Graduate students and junior faculty who are mentored by endowed faculty often take research in new directions and become leaders in their fields. Endowed positions are a decisive tool in attracting and retaining stellar faculty who will expand the global reach of this initiative.

As we prepare the next generation of climate leaders who will move these ideas forward, we also will forge other pathways for sharing the Sustainable Campus,

Sustainable Cities initiative as a scalable, actionable model that other universities can use to partner with cities to adapt to their unique needs. Two pathways in particular will be early priorities:

- **Satellite campuses:** UC Davis is unique in that our Energy Conservation Office is funded by energy savings. Many other universities have similar initiatives but not the funding structure we have developed. Through this program, faculty and energy staff will show other campuses how to leverage their energy savings and partner with cities.
- **Design summits:** The initiative's work will transform our campus into a showcase of best practices. Hosting design summits and conferences will bring the world to campus and provide participants with a vivid proof of concept.

Catalyzing Decarbonization Worldwide

- **Endowed chairs and professorships:**
Starting at: \$2,000,000
Goal: \$10,000,000
- **International fellows:**
Starting at: \$500,000
Goal: \$5,000,000
- **Endowed staff positions:**
Starting at: \$1,000,000
Goal: \$10,000,000
- **Satellite campus program support**
- **Design summit sponsorships**

Innovative Financing for State-of-the-Art Research

A unique focal area of the initiative will be demonstrating the financial sustainability of decarbonizing cities and large institutions.

In collaboration with the Graduate School of Management (GSM), the Mike and Renee Child Institute for Innovation and Entrepreneurship, and the Office of Research, the Sustainable Campus, Sustainable Cities initiative will create new networks to attract capital.

The Child Institute will guide viable carbon-reduction projects through one-day and multi-week Investment Development Clinics (modeled after the GSM's groundbreaking Venture Development Clinics) in order to articulate investment opportunities and identify the investor networks that will help launch projects faster.

This initiative will also engage GSM capstone students with faculty, staff, industry experts and investors to create a portfolio of investments corresponding to the university's Climate Action Plan. Investments in energy projects will pay for themselves and bring cost savings back to the university. The money generated from the projects will be deposited into a new green revolving fund and reinvested in new projects, such as carbon-neutral research houses in West Village.

The initiative will further partner with the Office of Research to secure patents, licenses and IP, and to facilitate the creation of new ventures and technology startups based on university IP and faculty research.

Leveraging the partnerships and networks of the initiative will realize significant savings, thereby providing excellent investment opportunities and allowing savings to be redirected back into the investment portfolio.

Investing in Innovation

A leadership gift will support the creation of a new green revolving fund. This revolving fund will allow for investment in a portfolio of easy, quick-payback projects, as well as longer-term, higher-return initiatives.

The fund will be critical to short-circuiting the first-cost hurdles faced by projects, and a seed capital fund will overcome investment barriers for projects with clear paybacks but high first-cost capital needs.

Below is the investment opportunity overview and investment structure for UC Davis' successful steam-to-hot-water conversion project.

INVESTMENT OPPORTUNITY OVERVIEW

Projected IRR (Gross): **7.5%**
9.7% for investor, 6.5% for UC Davis

Cash On Cash Return
Over 20 Years: **2.6x**
*In the first 10 years:
\$174.45M for investor
\$15.7M for UC Davis*

Projected Net Savings: **\$158M**
Over 20 year period

KEY MODEL FEATURES:

Base Year Cost: **\$37M**
3% annual growth

Operating Cost Reduction: **26%**
*Steam heat loss @ 30%
New system loss @ 4%*

Break Even Point: **10 Years**

PROPOSED INVESTMENT STRUCTURE

UC Davis: **40% Contribution**
\$68.8M over 5 years

Investor: **60% Contribution**
\$103.2M over 5 years

Contributed Capital: **\$172.2M**
1.5x net savings (cash flow)
*University buyout option
exercisable by year 10*

Total Project Cost: **\$172.2M**

Investor Preferred Return: **7%**
7% on contributed capital
*Unpaid balances will accrue for
purposes of calculating preferred return*

Investor Participation: **20%**
*Investor receives 20% of net savings after
return of capital and preferred return*

A Living Lab for Decarbonization

By the year 2025, UC Davis will be an international showcase for carbon-neutrality solutions in action, where:

- Our energy and building infrastructures are carbon neutral—saving tens of millions of dollars per year
- Hundreds of faculty climate experts teach and disseminate best practices in technology, policy, economics and behavior, in partnership with staff experts in energy-efficient operations and campus sustainability
- A zero-emissions bus fleet and other green-commute options demonstrate how to create accessible, affordable and sustainable transportation
- 250 new single-family homes, including three dedicated exclusively to commercialization opportunities and experiential learning, are modeling leading-edge energy reuse practices
- Students and scholars from around the world—from undergraduates to post-doctoral fellows—go to acquire practical expertise working on climate solutions in a state-of-the-art experiential learning environment





An Invitation

Philanthropy has always been key to the university's success in moving great ideas forward. The Sustainable Campus, Sustainable Cities initiative has the vision and the expertise that, with your partnership, will chart a path for more sustainable cities around the globe.

Thank you for your consideration of this exciting Big Idea. We look forward to discussing how your philanthropic goals may be achieved through this transformative initiative.

For more information please contact:

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Ways of Giving

We respect that, for each donor who wishes to provide significant philanthropic support, there are personal, financial and gift planning aspects to consider. We will work with you to realize your philanthropic vision and develop the gift plan that best meets your needs. At your request, we can also work with your tax and financial advisors. Following are various gift types and their associated benefits. You may wish to consider a mix of gift types to help you achieve both your philanthropic and financial objectives.

Cash Gifts

- Are the simplest and most popular giving method
- Are tax deductible in the year they are given

Gifts of Securities

- Include stocks, mutual funds and bonds
- Avoid capital gains taxes
- Provide an income tax deduction for the full fair market value of long-term, appreciated securities

Gifts of Real Property

- Include land, farms, personal residences, and rental or commercial property
- Avoid capital gains tax on appreciated assets
- Provide an income tax deduction for the full fair market value of long-term, appreciated property
- Eliminate property expenses and taxes
- Can provide continued use for life through a retained life estate gift

Bequests and Living Trusts

- Establish the UC Davis Foundation as a beneficiary of your estate
- Provide an estate tax deduction equal to the value of the gift
- Offer flexibility by allowing you to provide for family first

Retirement Plan Gifts

- For current gifts, utilize the IRA Charitable Rollover provision (*for donors aged 70½ and older*)
- Name the UC Davis Foundation as a beneficiary
- Eliminate income tax on the plan distributions
- Preserve the plan's full value for gift purposes

Life Income Gifts

- Include charitable remainder trusts and gift annuities
- Provide potential tax savings on income, estate and capital gains
- Generate income for you and/or your loved ones for a fixed period of time or until your passing
- Distribute the remaining assets to the UC Davis Foundation