Strategic Communication to Achieve Carbon Neutrality within the University of California

Report of the TomKat Strategic Communication Working Group

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Preface

The University of California's Carbon Neutrality Initiative (CNI) is a response to the existential threat of human-induced warming of the global climate. Carbon dioxide (CO_2) emissions from the burning of fossil fuels are the main cause of climate change, a global phenomenon with widespread harmful—potentially devastating—effects. Although no institution alone can halt global warming, local entities can lead the effort by cutting their own emissions and demonstrating technologies and behaviors that others can emulate and adapt to their own conditions.

Historically, the State of California has been at the forefront of efforts to manage environmental pollution, including greenhouse-gas emissions, and its policies and technologies have been widely adopted elsewhere. The University of California (UC) system has played a significant role in California's climate leadership. Its researchers are at the forefront of climate science and technology as well as the design and evaluation of policies and strategies for targeted climate action. In 2007, all 10 UC chancellors signed the American College and University Presidents' Climate Commitment, pledging to "set a target date for achieving carbon neutrality as soon as possible," thus taking a leadership role in shaping a sustainable society[1]. In keeping with its legacy of energy and climate leadership, and its three-fold mission of research, teaching and public service, UC President Janet Napolitano launched UCs Carbon Neutrality Initiative in 2013, setting 2025 as the target date for net-zero UC carbon emissions from on-campus combustion and purchased energy (i.e., Scope 1 and 2 emissions)[2]. The goal of the UC Carbon Neutrality Initiative (CNI) is to reduce emissions and use the university's extensive infrastructure as a setting for applied research to demonstrate how deep decarbonization can be achieved practically within very large, diverse, and complex institutions.

To provide oversight, research, and recommendations for the CNI, UC President Janet Napolitano convened experts from across the university, including faculty, students, administrative leaders, and operations staff. The primary advisory group is the Global Climate Leadership Council (GCLC), formed in 2014. The GCLC subsequently established an Applied Research Working Group which, in early 2016, formed the Task Force on Carbon Neutrality Financing and Management to study the barriers impeding progress toward the goal and to recommend potential solutions. The Task force identified internal UC communication as a critical gap, and recommended that well-planned strategic communication around the CNI be initiated.

In early 2016, the TomKat Foundation made a grant to the UC Santa Barbara Institute for Energy Efficiency to establish the TomKat UC Carbon Neutrality Project, a research effort to develop solutions to two of the most challenging aspects of achieving carbon neutrality. The TomKat Natural Gas Exit Strategies Working Group explored how to eliminate campus reliance on natural gas, the main source of on-campus CO_2 emissions. The TomKat Strategic Communication Working Group, whose research and recommendations are the subject of this report, has researched ways to improve communications and foster broad-based awareness and participation in UCs Carbon Neutrality Initiative.

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Executive Summary

Introduction

The University of California (UC) has pledged to achieve net-zero carbon emissions from on-campus operations and purchased energy by 2025. This Carbon Neutrality Initiative (CNI) is in keeping with UCs legacy of energy and climate leadership, and its three-fold mission of research, teaching and public service. Through the CNI, the university's extensive infrastructure will serve as a setting for applied research to demonstrate how deep decarbonization can be achieved within a very large, diverse, and complex institution. The CNI's success requires that high-level participants have the knowledge and authority to act, and also that the UC community make it a priority. Strategic communication is essential to developing this knowledge and support.

In early 2016, the TomKat Foundation made a grant to the UC Santa Barbara Institute for Energy Efficiency to establish the TomKat UC Carbon Neutrality Project, a research effort to develop solutions to two of the most challenging aspects of achieving carbon neutrality: natural gas exit strategies and communication. The TomKat Strategic Communication Working Group, whose research and recommendations are the subject of this report, has researched ways to improve communications and foster broad-based awareness and participation in UCs Carbon Neutrality Initiative. We addressed recommendations from the CNI Finance and Management Task Force and also benefited from the recommendations of the parallel TomKat Natural Gas Exit Strategies Working Group.

We investigated attitudes toward the CNI among students, faculty, staff and administrative leaders across all campuses; and developed a plan that UC can use to build the needed understanding and motivation. Our working group included experts in communication, education, political science, public opinion, psychology, sociology, engineering, sustainable design, and public policy as well as energy and sustainability practitioners. As a first step, we identified and defined the primary UC audiences related to the CNI. Working with those audiences, we then identified concerns, potential barriers, and opportunities; and developed recommendations.

Key Findings

1. Potential champions of the CNI need concrete and actionable information about measures to achieve carbon neutrality, including the pros and cons of each.

2. Administrative leaders are expected to take the first steps, and to facilitate but not mandate. The campus communities want to have a voice.

3. Significant tradeoffs such as inefficiencies, inconveniences, and diversion of resources, that may compromise teaching, research, or patient care are viewed as undesirable.

4. Local solutions are highly valued, including on-campus energy efficiency and renewables. Market-based mechanisms such as offsets are viewed with skepticism, especially if they divert resources from on-campus measures.

5. Decision making needs to weigh organizational, psychological, and sociocultural considerations together with economic and technical factors to develop carbon solutions that foster engagement.

CNI Strategies

Given the magnitude of UCs system-wide emissions, reducing emissions to net zero will require all campuses to engage in multiple strategies, including investments in infrastructure both on and off campus, as well as market-based solutions. UC is addressing four main areas:

- reducing campus demand for energy,
- planning growth around net-carbon-neutral construction,
- replacing high-carbon energy by investing in renewable solar, wind, and biogas energy
- supporting projects that prevent greenhouse-gas emissions elsewhere, or sequester carbon dioxide.

In addition, presenting UC as a living laboratory, or "collaboratory" for carbon neutrality is gaining support. This concept was articulated in the Bending the Curve report published by UC in 2015, and in the 2017 CNI

Finance and Management Task Force report. The TomKat Natural Gas Exit Strategies Working Group strongly recommended pursuing and communicating solutions that are scalable or forge new paths.

Prior Work

Our research and recommendations expand on findings from the CNI Finance and Management Task Force, whose report emphasized that the transition to carbon neutrality will hinge on securing broad internal support, and that it must respect campus autonomy. They identified three types of concerns that may account for the lack of broad-based support. The first addresses how to take the actions that the UC community will support. The CNI competes for scarce resources on campuses, there is uncertainty about which actions to take, and the connection between carbon neutrality and the university's core mission is unclear. The second area concerns framing. CNI branding is uninspiring, and the goal seems impersonal and does not engage the broader UC community. Third is acceptance of specific top-down decisions. The university's response to the student-led divestment campaign made some student groups wary of participating in university-led climate-change efforts; and many campus stakeholders are dismissive of using offsets to achieve carbon neutrality.

Up to now, UCs communication program has focused more on external audiences, with building support for the CNI goals by engaging faculty, students and staff across UC campuses being secondary. The UC Office of the President (UCOP) Marketing Communications has focused on increasing external awareness of UC as a global leader on climate change solutions and clean energy, and increasing external awareness of UCs efforts to achieve carbon neutrality, as a model for other institutions and municipalities and as a source for scalable solutions.

Opportunities

1. Students, faculty and staff who participated in our research were generally supportive of sustainability initiatives, and thought UC should exert leadership. Even though they did not feel they knew enough about the initiative or what next steps to take, they want to help make changes.

2. Many staff are already invested in achieving the CNI goal and only need stronger engagement on the part of campus leaders and the community, additional administrative support, or resources to help them advance toward the goal.

3. Linking carbon neutrality to themes such as social justice, health, responsibility, or leadership can be effective in tapping into what matters most to audiences on some campuses.

4. Most everyone we surveyed wanted more data about energy use and placed a high value on transparency of information and progress toward goals. Providing such information could be a relatively straightforward communication adjustment.

Research Design

Our working group undertook five main areas of research.

1. **News analysis.** We analyzed campus news coverage, focusing on how campus-sustainability and public-communication offices portray the CNI and integrate it with other sustainability themes.
2. **Administrator interviews.** We interviewed administrative staff and managers, focusing on campus-level CNI decision making and implementation. These data provided insight into perceptions of the CNI's costs and benefits, effective communication and engagement, and opinions about the role of UCOP versus campuses in the CNI.
3. **Faculty survey and interviews.** We used surveys and interviews to explore faculty attitudes and perspectives. Faculty play a critical role in campus initiatives like the CNI because of their involvement in campus decision making, interaction with students, leadership in relevant research, and thought leadership in regional, state, federal, and global forums.
4. **Focus on students.** We assessed student attitudes and perspectives using surveys, a workshop, and focus groups. Student support brings visibility to initiatives they value, and UC students have a long history of driving institutional and social change.
5. **Data visualization tests.** To understand best approaches to data visualization that will be used support engagement with the CNI, we assessed data needs and tested design concepts for campus energy dashboards that can help connect individual actions to broader goals.

All participants in our research were self-selected, and many were already involved in actions to address environmental or sustainability issues. Results thus inform strategic communications for the CNI, although we do not consider them to be generalizable to represent the perspectives of all UC students, faculty, and staff.

Findings

Achieving the 2025 goal of system-wide carbon neutrality will mean engaging the UC community at all levels, across administrative leaders, faculty, students, staff. Our findings point to considerable communication challenges underlying the present lack of engagement in the CNI.

News analysis

At present, limited information about the CNI is reaching the broader campus community, and coverage of the CNI does not associate it with the larger university mission. Public-communication offices, which host the majority of sustainability-focused news stories, often frame articles in terms of research discoveries or awards. Stories on sustainability-office web pages, though fewer, more often mention carbon neutrality. Overall, only 22% of analyzed stories that contained carbon-neutrality themes mentioned carbon neutrality explicitly, with energy efficiency and conservation being featured prominently and market-based mechanisms rarely appearing. Opinion pieces were also rare.

Administrative interviews

Administrative staff involved with campus-level CNI implementation saw energy efficiency and on-campus renewables as the most-important carbon-neutrality opportunities. They expressed concern about the challenges of transitioning away from natural-gas-fueled combined-heat-and-power plants (also called cogeneration plants). Most respondents were also concerned that market-based offsets would divert funds from energy efficiency or on-site renewables projects. However, many would support locally purchased offsets as a funding mechanism for on-campus projects. Most respondents saw potential for improved communication and engagement around the CNI but voiced concern that the goal, the operational strategies for achieving it, and its relationship to the UC mission and values remain poorly defined. Alignment of the CNI with the institutional mission (research, education, public service, and, for medical campuses, patient care) was considered critical to the success of the initiative. Staff also viewed higher prioritization of carbon neutrality by campus leadership as a linchpin to the CNI's success.

Faculty survey and interviews

Most faculty who participated in our studies had some understanding of actions that can be taken to reduce campus carbon emissions; however many were not familiar with the CNI. In addition, Scope 1 and 2 emissions, the subject of the CNI, are less salient to many faculty than other (Scope 3) campus emissions, such as travel. Faculty expressed strong support (including openness to spending more money) for UC taking a leadership role in climate change and environmental issues. They saw carbon neutrality and sustainability as the right thing to do, and representative of "who we are;" and they viewed universities as uniquely equipped to address such issues. Faculty placed high value on the education and research mission of the university, and most expressed a willingness to personally take actions that align with it. Faculty also suggested leading by action by making campuses "living laboratories" to test emission-reduction strategies, share best practices and engage the public. Faculty expressed a preference for consultative, collaborative decision making over top-down CNI management. They indicated that that better management and communication around campus facilities and operations would be essential if positive changes to campus infrastructure are to be made.

Key Recommendations

1. Create a campus-based, system-wide collaboratory to provide applied-research and education opportunities that align the CNI with the university mission. Actively engage faculty, staff and students so as to motivate broader involvement in carbon reduction solutions.

2. Develop information-rich communication resources that give CNI champions a big picture view of potential solutions and empower them to share ideas and engage others in creating solutions.

Focus on students

Many of the students who participated in our research were among those already engaged with sustainability and climate issues. However, their familiarity with, and understanding of, the CNI was relatively limited. Most respondents expressed a need for more actionable information about the various strategies being pursued or considered. Key motivations for student support of actions to reduce campus carbon emissions include the need to address climate change and a desire for UC campuses to demonstrate leadership. Students viewed development of renewable energy on or near campus very favorably. They also expressed strong support for campus-infrastructure improvements and purchase of low-carbon goods and supplies. Support for market-based emission-reduction strategies was much lower, but improved when linked to specific projects. Students who expressed support for campus emissions reduction were also very likely to indicate that it is important for UC to divest from fossil-fuel companies. Students also perceived behavior-change and awareness-raising activities as important strategies for achieving carbon neutrality and questioned why these were not key elements of the overall UC strategy.

Recommendations

Our findings lead us to two overarching recommendations: 1) use the CNI to create a campus-based, system-wide collaboratory that provides applied-research and education opportunities that align with the university mission, and 2) develop information-rich communication resources for campuses to help them better engage and to empower potential CNI "champions." These and other recommendations are described below.

Administrative leadership and communication

To become an administrative and operational priority, the CNI needs to be aligned with the UC mission, communicated clearly, and adopted by administrative leadership, particularly at the chancellor and vice-chancellor levels. A clear, economical, and pragmatic path to net-zero-carbon operations needs to be articulated by each campus, including financing strategies that work synergistically with other campus priorities. A key challenge for administrators will be to shift the "CNI narrative" from focusing almost exclusively on success stories, to more-balanced communication that frankly addresses tradeoffs and challenges, particularly the ambitious 2025 deadline and the likely need for offsets and other market-based measures that some stakeholders find problematic. Campus leaders will need communication tools to address the tradeoffs resulting from costs, particularly if such costs could affect students, teaching, or research. They must also be prepared to clearly communicate the strategy for carbon credits and offsets, including what they are, why they are important, and plans to ensure they are aligned with the UC mission.

Internal Decision making and communication

Consultative, deliberative planning and decision making will be more effective in engaging the wider campus community than top-down directives. Campuses should develop an overarching platform and specific strategies for effective internal communication that focus on consultation, deliberation, and engagement with the wider campus community. We recommend that administrative leaders and project managers provide forums that give campus community members a chance to weigh in on specific actions that are being considered to help achieve carbon neutrality. Campuses should better leverage student government and organizations, the academic curriculum, special events, internships, and research opportunities as venues for engagement. Finally, students should be provided with clear pathways to get involved in planning and decision making related to energy use and carbon reduction.

Information and data transparency

Our research indicates that few members of campus communities have even a basic understanding of carbon neutrality, including sources, and types of emissions (e.g., Scopes 1, 2, 3), UCs carbon neutrality goals, or the strategies that their campus is pursuing to achieve carbon neutrality. Further, many are skeptical about how much it will cost and how it will be financed. Campuses and the Office of the President need to make fundamental information about carbon neutrality available that defines carbon neutrality in the context of UCs initiative and frankly acknowledges the challenges, costs, funding sources, budget impacts, and other issues associated with it. A CNI Fact Sheet (see Appendix 6.3.2) has been prepared as the resource and starting point for this approach.

We recommend adopting a standard of data transparency that gives students, staff, and faculty access to current, distributed, disaggregated information on campus energy use and potential paths to carbon neutrality. Overall, campuses can create an active, community-driven learning environment by including data and information about what can be improved as well as what has already been accomplished. Robust interactive tools for understanding campus energy data, including energy dashboards, can help administrators manage internal CNI communication and empower CNI champions and end users. Campuses should provide data on personal and institutional energy use that students, faculty, and staff can adapt the data to their needs. Campuses can also accompany data with interpretive visuals, stories on campus energy use, sources, solutions, and actionable tips for improving energy sustainability. We also recommend that UC continue research on how to engage the campus community with the CNI, and develop a way to reliably assess progress toward campus carbon-neutrality goals through data collection.

Messaging and story development

We recommend de-emphasizing the term "carbon neutrality" and emphasizing pragmatic paths toward a carbon-free campus, such as reducing departmental and individual energy use. Prioritize development of campus communications around three key areas. First is sources of carbon emissions, along with candid descriptions of the magnitude of the challenge. Second, address pros and cons of potential emissions-reduction strategies and tradeoffs, including offsets, renewable energy credits (RECs), and other market-based mechanisms. Third is frank acknowledgement of costs and financing options, including potential impacts on student costs. The approach should involve making more-effective use of campus media to create awareness and involvement by empowering potential champions with information that enables them to more effectively engage their own communities within their campuses. This can include targeted support for those already producing communication materials on campuses, such as:

- supporting sustainability officers in producing CNI-related news content,
- generating carbon-neutrality stories with discovery and profile themes,
- developing editorial coverage about challenges that need to be overcome to achieve carbon neutrality,
- providing information on market-based strategies and other less-frequently covered carbon-neutrality topics to those who write sustainability-themed stories for campuses, and
- providing carbon-neutrality angles for other stories.

We found that students are interested in learning about and making changes to their habits and lifestyle that support the goals of the CNI. We recommend further exploration of opportunities to increase CNI engagement and motivate individual-level behavior change through data transparency and broader on-campus sustainability events such as the Cool Campus Challenge.

Mission alignment

Our central communication recommendation is that campus and UCOP communications expand coverage beyond discoveries and profiles to highlighting the ways in which campuses serve as “living labs”, or collaboratories, that actively develop inspiring, pragmatic, scalable solutions. Moving to a framework that places emphasis on the collaboratory and alignment with the university’s core mission also provides an opportunity to place less emphasis on the term “carbon neutrality.” This directly addresses critical tensions within the university community. For example, students already engaged in environmental issues want to see the CNI as part of a complete commitment to reducing climate and environmental impacts. Yet putting a strictly “green” or environmental frame on the CNI may dissuade individuals who value other campus priorities over carbon neutrality. Communicators should work with related initiatives and seek alternate ways to talk about carbon neutrality by reframing solutions and impacts. For some audiences, it would be more effective to connect the CNI to other UC environmental, social justice, and health initiatives, as well as to divestment and to a broader commitment to a sustainable future.

The Collaboratory

The collaboratory approach is based on the premise that engagement of the campus community is essential for a transformative initiative such as achieving carbon neutrality. It frames carbon neutrality as an opportunity and not as a mandate, by offering an approach that 1) actively engages the campus community to pursue campus-based solutions, given known constraints, 2) spans multiple campuses to draw in a wider swath of

potentially interested individuals, and 3) remains true to the net-zero-carbon goal while potentially allowing a more-flexible timeline to resolve extreme challenges, such as campus natural-gas use.

This approach goes beyond typical branding and one-way communication and provides an explicitly inclusive, dialogue-based, engagement-centered platform for meaningful development and exchange of ideas. It highlights each individual campus as a "collaboratory" where ongoing research and case studies provide replicable and scalable solutions for UC and external organizations. Within such a collaboratory, potentially scalable modifications to campus infrastructure or administrative processes would be pursued as "experiments" to reduce carbon emissions, and members of the campus community would be engaged in designing, implementing, observing, and documenting the process. This emphasis on community-driven monitoring, goal setting, and program development to reduce impacts is foundational to the collaboratory approach.

Focus on "campus energy solutions"

The UC collaboratory should position carbon neutrality within a broader sustainability context (Figure 1). Within this framework, we suggest making "campus energy solutions" the core focus to have the greatest impact on the CNI. A programmatic focus on campus energy solutions may help set aside confusion around the broader terms "carbon neutrality," and "Carbon Neutrality Initiative," which may be perceived as excessively challenging for the university. Focusing on campus energy solutions would highlight how actions to achieve carbon neutrality are linked to other sustainability goals, and it would focus the community on the immediate, tangible challenges of transforming energy sources and uses on campus. Additionally, because the phrase "campus energy solutions" doesn't have a specifically environmental connotation, it has the potential to engage those in the UC community who are less inclined to invest in strictly environmental goals, while also embracing those for whom the broader sustainability goal is a path to engagement with carbon neutrality and campus energy solutions. Using the collaboratory to develop scalable solutions for organizations outside UC is also an important feature that can promote external engagement and longer-term support.

Applied-research projects developed in the collaboratory will augment the work on energy solutions that is already occurring on UC campuses in the following ways:

1. Collaboratory research would focus on campus-level energy infrastructure, procurement, management, and energy-use behaviors.
2. It would partner university staff and researchers in designing, implementing, and studying changes to the university's infrastructure and practices.
3. It would be explicitly interdepartmental and interdisciplinary at all stages of research design, implementation, and evaluation.

Collaboratory project criteria

Each collaboratory project should have the dual goals of 1) improving campus energy procurement and use, and 2) taking a leadership role in society by providing tested and documented solutions that other organizations and institutions can adopt.

The following criteria for collaboratory projects focus on energy management but can be applied more generally. Many of these criteria are already present on campuses.

1. Project teams should be transdisciplinary and cross operating units, bring together staff, students, and faculty, and bridge gaps between energy-management, facilities-management, and sustainability functions.
2. Projects must include applied social- or behavioral-science components in the research, design and observation phases. This human-centric approach will help ensure that solutions are ultimately adopted and that impacts on human behavior and well-being are documented.
3. Work should focus on one of several strategic areas relevant to carbon emissions, such as monitoring, on-campus or off-site renewable-energy generation, efficiency retrofits, revolving-energy funds, offsets or other market-based programs.
4. Projects should be potentially scalable to other campuses, regions, the state, or more broadly.

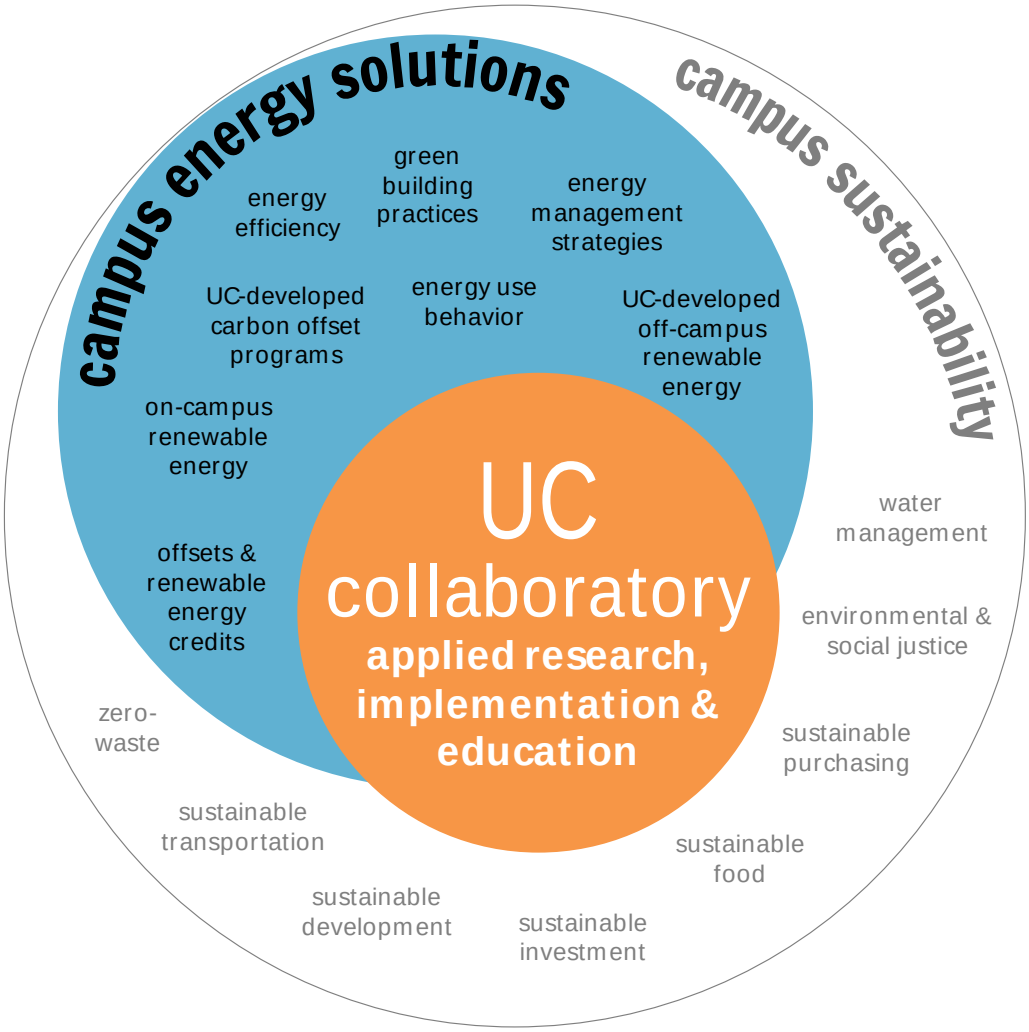

Figure 1. Relationship of the proposed collaboratory to energy solutions and broader sustainability themes on campuses and across the university.

5. Each project must articulate a clear rationale and quantify the degree to which it will contribute to a specific campus goal (e.g., reducing carbon emissions). It should estimate budgetary impacts, explain benefits to campus operations, and describe how outcomes will inform campus planning.
6. Results should have application beyond one campus and should be communicated beyond traditional academic publications (e.g., news release, interview, open data, etc.).
7. Project data must be made available to all campus units and delivered in a way that subsequent projects can build upon. Ideally, data will be made a part of an ongoing data-transparency project for campus energy, available outside as well as inside UC.
8. Student involvement through research fellowships to undergraduate and/or graduate students will enable them to work with campus staff in sustainability, energy-management, communication, and other operating units.

We recommend that the collaboratory be a clear initiative with an applied-research agenda and opportunities for engagement through classes, energy-management projects, data management, communications and other aspects of the CNI. We envision using the collaboratory and associated projects as the focus of a larger communication campaign that aims to develop a foundational ethos for UC as an active, community-driven learning space. We suggest a communication strategy and messaging campaign to support the collaboratory that focuses on these values provides tangible opportunities for engagement.

1. Introduction

1.1. UCs Carbon Neutrality Initiative

At present, the University of California has multiple challenges to overcome in order to meet its Carbon Neutrality Initiative's 2025 carbon-neutrality goal[3]. Meeting the challenge of carbon neutrality will require sustained efforts by multiple parties or stakeholder groups within UC. No single part of the UC community has the capacity to meet the CNI commitments without cooperation from other members of the community. Although a successful carbon-neutrality initiative requires high-level participants who have the authority to act, support from all sectors of a university campus is necessary if the CNI is to be implemented in a way that is consistent with the university culture of shared governance and collective decision making. Communicators seeking to enable change must view change within a university as an inclusive process and recognize the diverse characteristics within the community[4]. The TomKat Strategic Communication Working Group was formed to assess and recommend communication strategies for the UC community.

1.2. TomKat Communication Working Group's Approach

The working group brought together experts in communication, education, political science, public opinion, psychology, sociology, engineering, sustainable design, and public policy as well as energy and sustainability practitioners. Its primary goal has been to develop a strategic communication plan that the University of California can use to build the awareness and participation necessary for the university to achieve its carbon neutrality goal.

The working group initiated planning in August 2016. In late October, it developed its research approach for a year-long effort to develop a strategic communications plan. Audience research and analysis started in January 2017 and continued through August 2017.

In developing the strategic communication plan, the group:

1. Identified and defined the primary UC audiences for information related to the UC Carbon Neutrality Initiative (CNI); (See Chapter 3.)
2. Identified concerns and potential barriers that members of the UC community have expressed about the CNI; (See Chapter 3.)
3. Developed a set of recommendations to address the concerns and barriers relating to the CNI. (See Chapter 4.)

1.3. Context for Communication Planning

Strategic communication within the UC community will be an essential component of a successful pathway toward UC carbon neutrality that embodies the values and priorities of that community. To achieve their carbon commitments, campuses will need to build upon their ongoing energy efficiency and carbon reduction activities and initiate new activities, such as changes to campus infrastructure, incentive programs that reduce energy demand, off-campus investments, and carbon offsetting programs. The short timeline and variety of needed actions will require high levels of coordination, both within individual campuses and across the UC system. Most measures to reduce fossil-fuel emissions or energy use will also require some degree of financial investment by UC campuses. Without a solid and adaptive plan for communication between campus stakeholders and decision makers, about goals, priorities, strategy options, and tradeoffs, it is unlikely that the necessary levels of investment and coordinated action will be achieved.

The Carbon Neutrality Finance and Management Task Force presented a vision for UC carbon neutrality that involves individuals from all segments of the UC community in communicating their preferences to campus decision makers[3]. These decision makers, in turn, act on community feedback and prioritize changes to campus operations, budgeting, and long-term planning that enable achievement of the carbon neutrality goal. While many carbon-neutrality actions have been implemented or already receive support across different parts of the community, the goals of the CNI are not a consistently high priority system-

wide. While the CNI represents a pathway to achieving climate-action goals that resonate with the UC community, as well as California's bold leadership in addressing climate change, its top-down nature stands in contrast to the grassroots origins of other progressive initiatives at the UC, such as the UC-wide Fossil Free movement. In the absence of an initial groundswell of student and faculty support, the CNI has struggled to capture the wider attention of students and other members of the campus community. Events such as the Cool Campus Challenge, Carbon Slam, UCOP-run focus groups on campuses, and campus-based climate-curriculum workshops for faculty have helped raise awareness of energy efficiency and other sustainability issues, but failed to secure longstanding support for the CNI. Sustained campus-based efforts to engage campus communities in the CNI have yet to emerge.

Many students, faculty, staff, and administrators at University of California campuses feel that UC has a responsibility to take a leadership role in addressing climate change. However, within universities attitudes and values and, hence, levels of support for different types of projects often differ among campus subpopulations[5]. Achieving broad-based support for a path to campus carbon neutrality will require a plan for addressing the differing perspectives and preferences of the various segments of the campus community[6]. One approach to meeting this need is the so-called "Living Laboratory" – a research, teaching and learning, and innovation testbed – in which the participation of all stakeholders lies at the heart of the process[7]. In this context, when communicating about the different programs and actions that could be integrated into the campuses' carbon neutrality strategies, UC will need to provide information about trade-offs that may impact resources, infrastructure, and opportunities that are valued by the various segments of the UC community.

UC campuses have already been taking actions that reduce their carbon emissions, and many members of the community support taking the lead on this issue, but a strategy is needed to engage these groups in collaborative efforts (Figure 2). Due to the present national political climate, the UC population may be predisposed to taking more-aggressive actions than they would have in the past[8]. These include actions to demonstrate that California and the UC system are leaders on environmental issues and have the power to take action that counters political resistance to climate action. UC can also take actions that highlight the role of universities in solving problems that other public institutions are not ready to tackle or are constrained from addressing. An important part of the CNI is the potential for the UC community to embrace being a "living laboratory for learning and adapting" and for "the art of the possible," sharing scalable solutions with others[9].

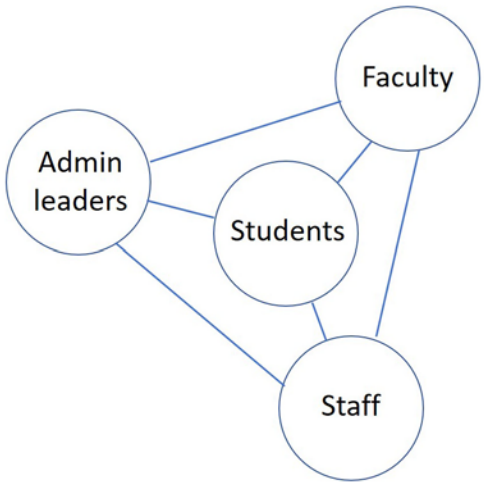

Figure 2. Synergy among CNI stakeholders. A basic premise of the working group is that awareness and synergy across UC is key to the success of UCs Carbon Neutrality Initiative.

In order for UC to be an effective global leader on carbon neutrality, it is essential that we have an informed and engaged body across our campuses. Our students and employees need to be part of CNI solutions in order for the UCs leadership on this challenge to be successful and credible. Engagement across an organization is a key step toward creating a culture where investments in carbon-neutrality or climate adaptation can succeed*. Students, faculty, administrative leaders and the many other employees across campuses can all influence the direction of the CNI. Priority audiences for CNI engagement include not only those in university leadership positions, but also employees who are engaged in their home communities and graduates who will shape the future of our society.

* See for example "Inclusivity and Ownership" and references therein, at secondnature.org.

2. Background

2.1. Context for Study

In response to calls for environmental policy, sustainable development, and more recently, climate-change mitigation, national and international institutions[10], cities[11], businesses[12], and college campuses[13] have taken steps to 'green' their practices. Attaining a sustainable society without societal communication about sustainability is viewed as impossible[14]. Within this context we consider strategic communication and engagement around carbon neutrality in the context of a public higher-education system. Our research approach and lessons learned have implications for other private and public institutions interested in reducing their carbon emissions.

2.1.1. Best Practices in Communication and Engagement

This report focuses on communication around carbon-neutrality solutions. While there may be less division within the UC community regarding whether climate change is happening and requires action, there remain differences of opinion regarding which specific climate solutions should be pursued and how such actions should be prioritized relative to other UC programs and activities. Just as research over the past decade has informed communication practice around climate-change communication, more-recent research is addressing needs and ways of communicating different types of climate mitigation/energy solutions and options in different sectors[15]. Still, attitudes within UC over carbon-neutrality strategies are part of the larger societal debate on climate solutions in the context of climate change. A May 2017 poll by the Yale Program on Climate Change Communication found that in the United States most registered voters support a range of policies to promote clean energy and reduce carbon pollution and dependence on fossil fuels; but a much smaller number would act to urge their elected representatives to reduce global warming[16]. The nation's polarized political atmosphere over climate change and other issues that are labeled by some as "environmental" has made it increasingly difficult to talk about climate solutions.

Given the diversity of perspectives within the UC community, framing carbon neutrality from a variety of perspectives will help make the initiative more salient to different audiences across the UC. Selecting and implementing the best actions the UC can pursue to address climate change is challenging, as there is no single solution that will appeal to all members of the university community. Regardless of which programs, technologies, or funding structures are chosen, some individuals can be expected to oppose those solutions due to differences in what they value. Communication research is investigating how messages about climate change might be framed and how more-substantive behavioral engagement can be promoted by taking these values into consideration[17,18]. For example, framing climate change as a public-health, inequality or other immediate concern may increase support for climate-change action among individuals who are disengaged or not personally impacted by climate change[19,20]. By reframing the message beyond the traditional environmental context for climate change, it may be possible to broaden support for climate-change action. Given the broad, general support for climate action within the UC community, of greater concern for communications is the support for specific types of projects. It has been shown that a priori beliefs on the technical effectiveness of an opportunity are more important than market beliefs driving investments[21]. That is, there is a belief that policies can overcome market efficiencies for proven, reliable technologies. However, multiple researchers and practitioners have noted that framing is only one component of effectively communicating with individuals. Other central factors in effective communication aimed at engagement are: 1) behavior, or how we get from x to y, 2) emotions, reflecting how we are emotionally engaged, and 3) systems, or how we design a better world or solution[22].

Carbon neutrality communication within the UC community will only lead to engagement and effective action if it is focused around appropriate concepts and information. Despite the UC community's greater awareness and support for climate action, whether or not they engage with UC climate-change solutions will depend in part on which solutions are pursued, the tradeoffs these solutions pose, and how the issues surrounding these tradeoffs are framed. Research presented in this report supports the notion that endorsement of the need for action to address climate change is already much higher among members of the UC community than the public at large. This suggests that efforts to raise awareness about climate

change within the community are less crucial than communication about the specific solutions and actions needed to realize the goals of the initiative.

Beyond choice of content and framing, the communication approach adopted for engagement with the UC community will play an important role in the impact communication efforts will have. In contrast with a one-way "broadcast" or "transmission" model of communication, a "dialogic" method seeks to understand disparate viewpoints and focuses on developing and supporting an inclusive conversation around the topic. This approach has been used on other university campuses to successfully foster trust and garner support for sustainability[23]. For the University of California Carbon Neutrality Initiative, such an approach could promote a sense of openness surrounding the CNI and encourage stakeholders to get involved and work with campus leadership to select and implement the types of action that make the most sense for their campus.

Effective CNI communication should provide appropriate opportunities for engagement. Abundant empirical evidence contradicts the notion that simply providing information and opportunities for dialog will be sufficient to promote widespread changes in behavior. The assumption that knowing more about a problem will translate into action to address the problem is often associated with the "information deficit model" noted above, and has been critiqued for not addressing human psychology and decision making[24]. For example, in the case of college students, there is no significant relationship between knowledge of sustainability and willingness to engage in sustainable behaviors[25]. The perceived effort, impact and feasibility of sustainability actions are all important[26]. Thus, while the dialogic model is a promising approach for communication between those working on the CNI and the broader UC community, even dialogic efforts that are focused primarily on raising awareness or providing information are not, on their own, likely to result in the types of behavior change and value prioritization that will be necessary for the UC to achieve carbon neutrality. Rather[27], studies suggest that participatory approaches, in this case engaging the university community in defining as well as implementing solutions, can have several advantages.

There is considerable evidence that sustainability behavior change is most effective when focused at the community level, such as through "community-based social marketing" (CBSM). CBSM centers on removing barriers to a desired behavior while at the same time revealing or enhancing its benefits[28]. Once barriers and benefits are identified, CBSM incorporates social marketing tools such as commitments, social norms, social diffusion, prompts, and incentives into a comprehensive behavior change strategy. While community-based social marketing has historically been used to promote behavior change related to healthy lifestyles, environmental behavior change is increasingly being addressed from a community level[23,29]. Informed by understanding gained through inclusive opportunities for dialogue and information sharing between those leading CNI-focused activities and the rest of the community, a community-based social marketing provides a strategy for identifying and implementing the types of efforts that do result in behavior change.

2.1.2. Implementing Change in Universities

In order to understand how UC can reach carbon neutrality, it is important to understand how change can occur on a college campus. Research on how and why change occurs in organizations has proposed practical methods to bring about a desired change. Universities have been the target of much of this research due to the growing societal pressure on higher education to adapt to a changing world[4]. Universities tend to share a number of attributes that should be taken into consideration for effective change management, including their interdependent organization, value-driven mentality, and shared governance, i.e. the roles that members of the campus community have in guiding the operation of the institution[30,31].

The University of California has a long tradition of shared governance whereby administrative leaders, faculty, students, and staff share in the responsibility for guiding the operation and management of the university, while preserving the authority of the university's governing Board of Regents to set policy. The Academic Senate, composed of faculty from across the UC system and supported by professional staff, determines standards and criteria for admission and degrees and is responsible for supervising all courses and curricula[32]. The Senate is advisory to the chancellor on budget and other resource issues. Each of these entities, therefore, has a part to play in steering UC in times of change. For an initiative like the CNI

that will impact all aspects of the campus community, finding ways to involve all parties who have a role in shared governance is crucial.

The barriers that a university encounters towards implementing changes typically stem from either a lack of awareness, the organizational structure, or a lack of resources[33]. If stakeholders are not aware of the desired change, they cannot value it or factor it into decision making. Similarly, if a university's structure hinders transparency and collaboration, or if agents of change are not well supported, then it is difficult to gain momentum for a desired change.

Case studies of institutions of higher education have revealed that barriers to change are not felt equally across universities. Not only do barriers differ between universities in different locations and having different development histories; those barriers are easier to overcome for some universities than others, possibly depending in part on location, campus makeup and access to resources. To help identify and overcome university-specific barriers requires an in-depth barriers analysis of the university's culture[34]. While an organization's culture can be a difficult concept to define, it is an amalgamation of the individual values, processes, and goals of the entities that make it up[35]. Cultural analysis has identified six different cultural types that tend to arise on university campuses: collegial, managerial, developmental, advocacy, virtual, and temporal cultures[36]. These cultures tend to arise from differences in values and goals across departments and positions. Understanding how these cultures work together to influence change management requires an analysis of how decisions are made on any given college campus[4,36]. Successful implementation of change within the UC system, therefore, will require attention to governance norms, variations in values and cultures within the university, and constraints in terms of resources and organizational capacity.

2.2. UC Carbon-neutrality Strategies

There are a number of promising strategies that together can enable the UC system to reach its goal of carbon neutrality for Scope 1 and 2 emissions by 2025. Given the magnitude of UCs emissions, achieving carbon neutrality will require pursuing multiple strategies that involve investing in infrastructure both on and off campus, as well as market-based solutions. It is not possible to reduce emissions to net zero through the pursuit of any single strategy. UC is addressing four main areas to reduce emissions to net zero*:

1. **Plan and manage growth to minimize carbon intensity.** UC has the potential to expand using net-carbon-neutral buildings that emit net-zero carbon, and net-carbon-positive buildings that actually decrease overall carbon emissions from a campus. Such facilities also offer significant research, educational, inspirational and promotional value. All-electric design is more financially feasible for buildings such as housing facilities and may require further development for energy-intensive laboratories and medical centers.
2. **Reduce campus demand for energy.** Regardless of how clean the UCs energy procurement is, cutting down on overall energy consumption is both essential and operationally sound. Individual campuses can accomplish this by installing low-energy systems in buildings. Implementing best practices for central energy management can reduce heating and cooling of unoccupied rooms. Energy-efficiency projects completed to date have saved campuses money through lower utility costs. On a more distributed level, finding ways to reduce individuals' energy use promises to be an effective strategy as well. Possible approaches to achieve this include campaigns to alter energy behaviors and promoting the use of shared spaces to decrease the number of low-occupancy office and lab spaces around campus.
3. **Replace high-carbon energy with low-carbon energy**. A straightforward way to acquire low-carbon energy sources is to invest in renewable energy, primarily solar, wind, and biogas†. Construction of renewable energy infrastructure may take place on or off campus. Supporting regional projects that

* Adapted from Overcoming Barriers to Carbon Neutrality: Report of the Carbon Neutrality Finance and Management Task Force. University of California Office of the President. August 1, 2017

† Biogas, or bio-methane, is a combination of gases (mostly methane and carbon dioxide) that are produced through decomposition of organic waste. Biogas can be captured (e.g., from landfills) and burned as a substitute for natural gas. Biogas is considered a renewable energy source.

increase the grid's proportion of renewable energy can also be an effective strategy. UC is now a wholesale energy provider, supplying about 14% of UCs on-campus electricity use through low-carbon sources like solar. A multi-campus Energy Services Unit manages these programs.

4. **Mitigate by supporting projects that prevent emissions of carbon dioxide (CO_2) or other greenhouse gases elsewhere, or sequester CO_2 from the atmosphere**. UC may also invest in projects that do not specifically target emissions originating from UC campuses, but instead focus on reducing emissions elsewhere. Two types of opportunities exist: 1) developing UC-managed carbon offsetting programs, and 2) purchasing carbon offsets through programs managed by others. By supporting these projects or purchasing offsets, the UC system is able to claim the right to these emissions reductions and use them to compensate for emissions related to use of energy on campus. Offset purchases could include sequestration projects, e.g. reforestation.

Two figures provided by the UC Office of the President Office of Energy and Sustainability[37] illustrate the complexity of potential CNI measures and the potential for varying degrees of support, opposition or indifference among campus audiences. Figure 3 is a solutions overview, which suggests that the greatest leadership recognition and potentially the greatest cost are associated with measures involving electrification of campus operations. Measures that are labeled as offsets are lower in cost; however, in some cases offsets may deviate from the spirit of the CNI or the values of the UC community. Of potentially comparable cost to offsets, but with higher leadership potential, are energy efficiency, low-carbon growth, and various renewables.

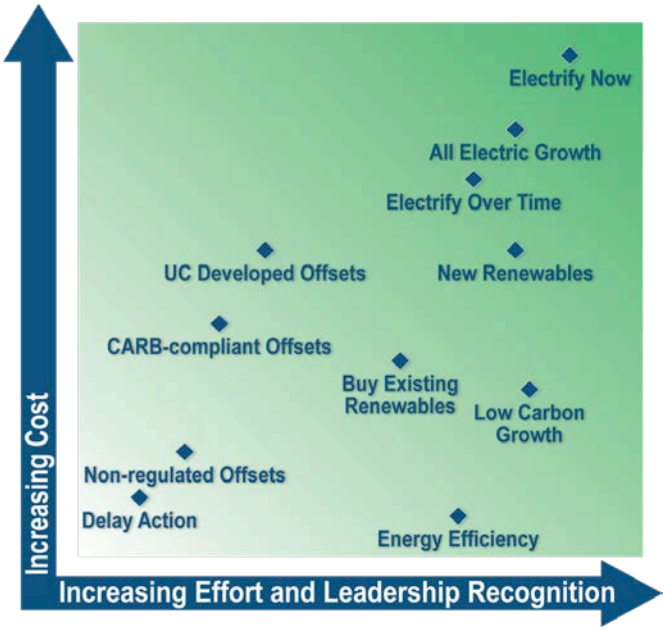

Figure 3. Tradeoffs between cost and effort. Carbon-neutrality solutions overview indicating the tradeoff between effort and leadership versus relative costs of types of emissions-reduction approaches (Source: D. Phillips, TomKat Communications Working Group Presentation).

While UC is continuing to assess overall strategies and options involving these measures, it is instructive to examine one scenario that includes a mix of these measures (Figure 4). This also identifies candidate measures that can be used to assess stakeholder support. Note that in the scenario shown in Figure 4 only a small fraction of UCs 2025 CNI goal is met by on-campus energy efficiency and on-campus solar. These on-campus projects plus off-campus renewable energy generation through the new UC Energy Services Unit[38] and biogas renewable energy investments together provide about 25% of the total. Under this scenario, short-term renewable-energy credits and offsets provide the balance. Use and acceptance of offsets varies, though a general acceptance of use in the regulatory markets is evidenced by organizations being allowed to meet a percentage of their obligations under California's Cap-and-Trade program[39] through approved carbon offsets. In the voluntary markets, there is less clarity on the value and quality of available renewable energy credits (RECs) and offsets. Selection offsetting programs and the degree to which these market-based measures should be relied upon.

2.3. Links to Other UC CNI Activities

The research and recommendations of the TomKat Strategic Communications Working Group were done in the context of related activities.

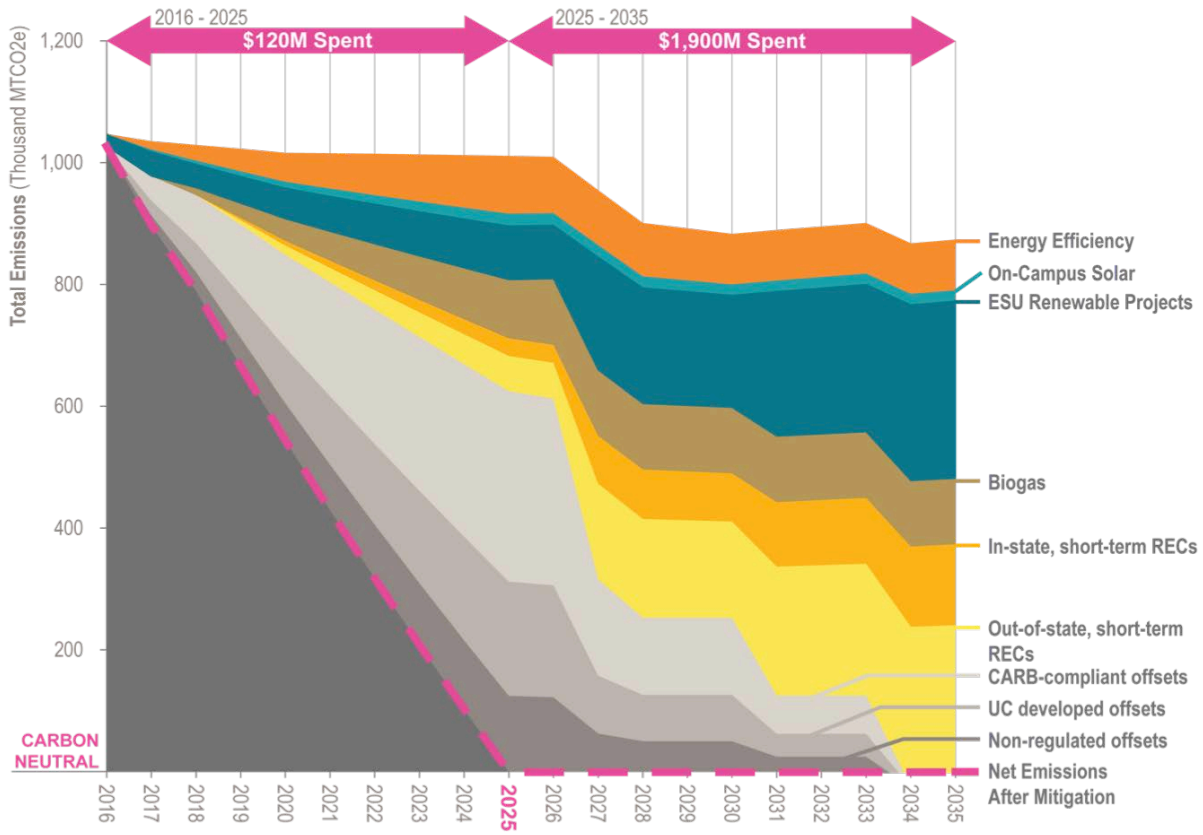

Figure 4. Sources of carbon savings. This stacked area chart shows how the relative reliance on different carbon-neutrality measures will change over time. Source: D. Phillips, TomKat Communications Working Group presentation, October 25, 2016).

2.3.1. Follow-up to Task Force Report

Through its Applied Research Working Group, the Global Climate Leadership Council formed the Task Force on Carbon Neutrality Financing and Management in the spring of 2016. The Task Force included faculty, staff, and students with expertise in energy and sustainability, construction, environmental law, finance, facilities operations, administrative services, and capital planning. UC President Napolitano asked the Task Force to identify the organizational barriers to achieving carbon neutrality by 2025 and to prioritize and recommend ways to overcome these barriers. Two key conclusions presented in the Task Force report[3] were:

1. The successful transition to carbon neutrality ***hinges on securing broad support*** for the initiative among senior administrators, faculty, and students.
2. The way in which carbon neutrality measures are implemented must ***respect campus autonomy*** in charting their own progress toward carbon neutrality, while providing campuses with the leadership, tools, and authority to accomplish their goal.

The recommendations of the Task Force acknowledge the CNI strategy outlined above (section 2.2) and identify economic and financing strategies that campuses should adopt. Primary among these is to account for the cost of carbon (shadow price), integrate this cost into utility budgets, and link those budgets to a revolving fund for investments in energy-efficiency retrofits. The report also includes recommendations on communication:

> *To ensure that carbon neutrality becomes a reality, the university needs to effectively communicate the goals, benefits, and methods of reaching it in such a way that all stakeholders are well-informed and motivated to achieve it. Well-planned strategic communication and change management efforts are needed to:*

- *Foster acceptance for the recommendations of this Task Force among those directly responsible for implementing them.*
- *Garner broad support among students, faculty, and staff, who exert a critical influence upon leadership to make carbon neutrality a priority.*
- *Elicit participation in individual behaviors that contribute to carbon reduction goals and personal attitudinal change.*

In the course of its study, the Communication Workgroup of the Task Force identified several reasons why the Carbon Neutrality Initiative does not yet have broad-based support:

- Scarce resources. Many other staff and funding needs compete with carbon neutrality.
- Knowledge gap. Uncertainty about which actions to take to reach carbon neutrality results in stagnation and deprioritization of the goal. Uncertainty about costs and funding options for moving toward carbon neutrality adds to this stagnation.
- Values not activated. The connection between carbon neutrality and the university's mission is unclear and distances the initiative from the community's values.
- Branding. "Neutrality" as a goal is uninspiring.
- The goal seems impersonal. Technical methods for achieving carbon neutrality, such as electricity and gas purchase strategies, do not engage the broader stakeholder audience. The social cost of carbon and social benefits of carbon neutrality need to be more effectively communicated.
- UC divestment experience. The university's response to the student-led Fossil Free UC campaign has made some student groups wary of participating in future campaigns and climate change efforts.*
- Offsets. Many campus stakeholders are dismissive of carbon neutrality plans that include the use of offsets.

2.3.2. Follow-up to Natural Gas Working Group Report

In their report from a year-long study, the TomKat Natural Gas Exit Strategies Working Group concluded that the University's current carbon-neutrality goal is ambitious but attainable[40]. With natural gas abundant and relatively inexpensive, and two-thirds of UCs Scope 1 and 2 greenhouse-gas emissions coming from on-campus combustion of natural gas, finding alternatives must be central to any deep-decarbonization strategy. They identified a promising short-term path and a potential longer-term path. The working group recommended that campuses immediately increase the pace and scale of deep-energy-efficiency projects, focusing on four areas: 1) replacing lighting, 2) developing continuous data to guide building operations (monitoring-based building commissioning), 3) adjusting air flow to labs based on air quality and occupancy (smart labs), and 4) upgrading heating, ventilation and air conditioning units.

The group next recommended that each campus's net savings from energy-efficiency projects be re-invested toward carbon-neutrality goals under a stand-alone financial unit on each campus. This approach facilitates more stable planning and longer-term energy investments. For meeting the short-term 2025 goal, UC campuses, through the energy governing board, have committed to develop new off-campus biogas projects that are expected to generate enough biogas to compensate for up to 50% of current UC natural-gas use, if available at or below the 20-year average price, at a cost of approximately $7 per million BTU. Although investing in biogas generation and sale, as a means to compensate for emissions due to natural gas burned on campuses, would mean much higher overall supply costs, this strategy provides campuses with the flexibility to implement biogas projects that mitigate their natural gas demand, while also reducing risk and managing costs through diversification of fuel portfolios.

While recommended as a short-term strategy, over the longer-term biogas is expected to play a smaller niche role in UCs decarbonization. That is, UC will develop and sell biogas projects to meet the 2025 goal, and it is expected that further biogas development will not be cost competitive with natural gas. The working group recommended a long-term strategy of electrifying end uses that currently depend on natural gas and obtaining electricity from carbon-free energy sources. Electrification strategies will be campus

* An important difference is the bottom-up nature of divestment, versus top-down nature of the CNI.

dependent, based in part on 1) presence of central steam vs hot water, 2) relative ability to use lower-temperature water (e.g., from heat pumps) vs. higher-temperature water, and 3) distributed vs central natural gas uses on campus. Greater energy storage capacity will also be needed.

These recommendations provide key components of a potential pathway to carbon neutrality for some, possibly all, UC campuses. While such new investments represent a small fraction of overall campus budgets, allocation of the funding necessary will only be possible with support from across the campus community. The recommended strategies of aggressive energy efficiency improvements, reinvesting some of the saved energy costs in new biogas projects, and longer-term investments in electrification provide a starting point for dialogue and engagement on campuses and across the UC system.

The natural-gas working group strongly recommends pursuing solutions that are transferable and scalable or that forge new paths whenever possible, and to document and communicate the results. This strategy is also supportive of the concept of UC as a living laboratory for carbon neutrality, a concept that was articulated in the Bending the Curve report[9]. The Task Force report suggests a two-part approach. The first is attending to what is doable now, e.g., energy efficiency, while gaining the experience to make longer-term measures, e.g., electrification, feasible. This will involve a process of extensive measurement, assessment, and adaptation. The second part of the approach involves transparency, extensive documentation, and outreach so that the UC community can be aware of university efforts. Externally, UC can serve as an example. If UC can make data and information on its energy systems, costs, and use readily available, this can enable the university to more quickly benefit from new information, technologies, and experience.

2.3.3. UCOP CNI Communication Effort

Following the launch of the Carbon Neutrality Initiative in November 2013, UCOP Marketing Communications devised three goals to promote and assist the work of the initiative:

1. Increase external awareness of UC as a global leader on climate change solutions and clean energy (including related topics, such as adaptation and resilience, public health, and climate justice).
2. Increase external awareness of UCs efforts to achieve carbon neutrality as a model for other institutions and municipalities and as a source for scalable solutions.
3. Build internal support for the goals of CNI among UC campuses, and increase personal engagement by faculty, students and staff.

The two external goals arise from UCOP Marketing Communications' overarching purpose: to build public awareness of UCs value and its impact on the lives of people in California and beyond. As such, the first two goals have received the majority of attention to date.

The first goal is addressed on an ongoing basis by UC Newsroom articles, external media pitches, and amplification of UCOP and campus news stories via social media (main UCOP channels; UC Climate Solutions on Twitter; UC Green on Flipboard) and email (Fiat Lux newsletter). Partnerships with Vox (Climate Lab video series) and Discovery have proven successful at extending the reach of UC content far beyond what can be achieved with owned channels.

Efforts to address the second goal include "Bending the Curve," starting with the 2015 symposium and executive summary, followed by the full report, a multi-campus course that has been taught at UC San Diego since 2015 and will be available at most UC campuses in 2018, and resulting media coverage.

While internal communications have been a smaller part of the UCOP Marketing Communication program thus far, there are some notable exceptions, including the Cool Campus Challenge in Fall 2015, which encouraged students, staff, and faculty to pledge personal actions to reduce their carbon footprints through energy conservation and adopt other sustainability actions in a friendly competition. In addition, the annual CNI Student Fellowship program funds communications fellows each year across the UC campuses with the goal of raising student awareness.

3. Research Results

3.1. Synopsis of Findings

The working group undertook five main areas of research. 1) Editorial content analysis. We conducted an analysis of campus news coverage that focused on how sustainability offices and public communication offices portray the CNI and integrate it with other sustainability themes. 2) Administrator interviews. We interviewed administrative staff and managers focusing on campus-level CNI decision making and implementation. These provided insight into: a) perceptions of costs and benefits of implementing the CNI, b) effective communication and engagement, and c) opinions about the ideal role that UCOP should have in helping each campus reach carbon neutrality. 3) Faculty survey and interviews. We used surveys and interviews to explore faculty attitudes and perspectives. Faculty can play a critical role in large, campus-wide initiatives like the CNI because they are involved in campus decision making, they interact with students in and out of class, and many undertake research related to carbon neutrality. 4) Student surveys, workshop, and focus groups. With students, we used surveys, a workshop and focus groups to explore attitudes and perspectives. It is recognized that student support helps bring visibility to initiatives they value, and UC students have a long history of driving institutional and social change. 5) Feedback for energy information design. To understand best approaches to data visualization to support engagement with the CNI, the Working Group tested design concepts for campus energy dashboards. Participants in our research were self-selected, and many were already involved in actions to address environmental or sustainability issues. Results thus inform strategic communications for the CNI, however, may not represent the perspectives of all UC students, faculty, and staff.

3.1.1. Responsibility and Reward for Action to Achieve Carbon Neutrality

Faculty and students who participated in our research saw campus and systemwide administrators as bearing the primary responsibility for carbon-neutrality actions on campuses. They saw high prioritization by leadership as enabling and reinforcing higher prioritization by others on campus. Overall, research participants expected administrators to 1) promote sharing of data and information about campus energy use and carbon neutrality strategies, 2) help with acquiring needed funding and partnerships, 3) coordination support for inter-campus collaboration, and 4) a structured system for chancellor-level reporting on progress. Students, in particular, expressed a desire for greater transparency and access to data related to expenditures and the effectiveness of those expenditures.

While administrators were viewed as bearing primary responsibility, both faculty and student participants also generally supported the idea that everyone on campus bears some responsibility for reducing campus carbon emissions. Because carbon neutrality actions generally require coordination and shared vision among multiple actors at the campus and system levels, both clear potential for recognition and reward for all actors when goals are achieved and clear alignment between responsibility and capacity to achieve goals were viewed as essential.

3.1.2. Expectations for Decision making Related to Carbon Neutrality

Both faculty and student participants indicated strong expectations for inclusive, consultative and deliberative processes for making decisions regarding which emissions reduction or compensation strategies to pursue on their campuses. Student participants identified 'ownership,' participation in decision making, and confidence that their actions will have an impact as important motivators for the actions and activities they choose to pursue.

3.1.3. Campus Stakeholder Knowledge About the CNI And Emissions Reduction Strategies

Even though the students and faculty who participated in our research are among those already engaged with sustainability and climate issues, their familiarity with, and understanding of, the CNI was relatively limited. Most faculty surveyed and interviewed had some understanding of actions that can be taken to reduce campus carbon emissions, and a few had considerable knowledge about this topic. Many were not

familiar with the CNI, and the sources of emissions that the CNI is focused on are less salient to them than are other categories of campus emissions (e.g., commuter transport). Among students, even those who were already familiar with the CNI or engaged with environmental issues saw a need for more information or anticipated a benefit from deeper understanding of CNI goals and strategies. Students, in particular, saw a need for clear, actionable information about the various carbon neutrality strategies being pursued or considered.

3.1.4. Limited Sources of Information About Campus Carbon Neutrality Strategies

In general, the carbon neutrality goal and the variety of strategies needed to achieve the goal do not feature prominently in news stories that are produced by campus public communication offices and sustainability offices. While public communication offices generally produce more sustainability-themed news stories than sustainability offices, news items produced by sustainability offices are more likely to feature information about carbon neutrality.

Overall, campus news stories that mentioned carbon neutrality provided limited and sometimes ambiguous information about steps campuses can take to achieve carbon neutrality goals. Among stories that did cover strategies for campus carbon neutrality, renewable energy, and energy efficiency or conservation featured prominently; meanwhile, market-based mechanisms such as renewable energy credits, cap and trade, and carbon offset programs very rarely appeared, and were entirely absent in sustainability-themed news at many of the UC campuses.

3.1.5. Perceptions of Obstacles and Capacity to Achieve Carbon Neutrality

As a group, faculty respondents were cautiously optimistic about the effectiveness of their own, and the UC system's actions to achieve carbon neutrality for UC by 2025. However, a substantial number of faculty were quite pessimistic about reaching this goal.

Ambiguous relationship between the CNI and the institutional mission

Alignment of the CNI with the institutional mission of research, education, public service, and patient care is considered critical to the success of the initiative. Many research participants voiced concern that the goal and its relation to the UC mission and values remain poorly defined. To these respondents, clear and transparent communication with campus stakeholders about the synergies and tradeoffs between the CNI goals and UC mission is considered fundamental to broad engagement with and support for the goals of the CNI.

Lack of capacity for change in campus operations

Many faculty expressed negative opinions about how campus facilities and operations are currently managed, and they expressed little confidence that changes to campus operations would be done in an efficient and productive manner. They felt that better organization and communication are essential if any changes to campus infrastructure are to be made. Campus energy managers, sustainability officers, and administrators we interviewed generally did not consider technical issues to be the primary barriers to achieving carbon neutrality. Nonetheless, campus dependence on cogeneration plants and the need to work with outdated and inefficient infrastructure are recognized as significant challenges.

Siloed management structure and norms

Siloed roles and responsibilities are seen as a critical barrier to the coordinated and collaborative effort considered essential to progress toward carbon neutrality. Without better coordination, there is concern about needlessly duplicated effort, disparate (and sometimes conflicting) goals and metrics of success for different units. Further, lack of norms and venues for inter-departmental and inter-campus communication/collaboration is perceived as a fundamental obstacle to unifying efforts across a siloed management structure.

Campus budgeting and growth priorities

The high priority placed on campus growth – in particular, expansion of the research and patient-care infrastructure – is seen as a barrier to achieving carbon neutrality. Capital planning was identified as a key locus of activity to ensure that such campus growth does not magnify existing challenges to reducing campus emissions. Campus energy managers, sustainability officers, and administrators perceived carbon-

neutrality programs to be especially vulnerable to budget issues, with budget shortfalls easily leading to loss of the staff and know-how critical to implementing CNI projects.

3.1.6. Tradeoffs to UC Mission as Critical Determinants of Support

While the students, faculty, and staff who participated in our research were generally very supportive of actions to lower campus carbon emissions, this support diminished somewhat when potential tradeoffs were brought to mind. Faculty respondents place high value on the education and research mission of the university, and indicated that they will be less likely to support actions they perceive as detracting from that mission. Students who participated in our research were split on whether a student fee should help fund energy sustainability initiatives on campus, reflecting the high priority many students place on education affordability.

3.1.7. Perceptions of Campus Emissions Reduction or Compensation Strategies

On-campus measures

The faculty, staff, and students who participated in our research generally viewed on-campus energy efficiency projects and on-campus renewable energy development very favorably. Staff involved with campus-level CNI implementation saw energy efficiency and on-campus renewables as the most important opportunities for making progress toward carbon neutrality. Highly visible on-campus installation of emissions-reducing technologies are seen as providing opportunities for community engagement, in addition to their primary purpose of reducing energy consumption and/or carbon emissions.

Off-campus measures

Across the groups who participated in our studies, support for market-based emission-reduction strategies such as Renewable Energy Credits (RECs) and carbon offsets was much lower than support for on-campus measures. Many staff involved with campus CNI implementation did not see market-based carbon offsets as a viable strategy because they would divert funds from efficiency or renewables-focused projects. Many of these same individuals would, however, support offset-type funding mechanisms for on-campus projects or offset purchases if they were from local projects. Among student respondents, support for offset purchases was higher if information about these projects was expected to be transparent and linked to specific projects.

Behavior change

Perspectives on the value of engaging the broader campus community in achieving carbon neutrality were mixed. While many saw campus-wide communication and engagement as effective strategies, others were skeptical that the types of small behavior changes typically achieved through such campaigns would have any substantial impact if larger energy-procurement issues weren't addressed first. Students, in particular, perceived behavior change and awareness-raising activities as important strategies for achieving UC carbon neutrality, and questioned why they were not represented as key elements of the overall UC strategy.

Divestment

Students who expressed support for campus emissions reduction were also very likely to indicate that it is important for UC to divest from fossil fuel companies.

3.1.8. Motivations for Campus Stakeholder Engagement

Faculty and students who participated in our research were often those already involved in sustainability-related actions, and they reported feeling motivated by a desire to address climate change and to demonstrate that UC campuses can take a leadership role on environmental issues. Faculty respondents, in fact, expressed openness to spending more money to achieve such goals and willingness to personally take actions that also align with the research and education mission of the university.

3.1.9. Avenues to Broader Stakeholder Engagement and CNI Prioritization

Transparent information and data sharing to inform participatory decision making

Students who participated in our research saw an important role for transparent sharing of actionable information about potential strategies for carbon neutrality and sharing of data about campus carbon emissions, energy sources, and energy use in engaging campus stakeholders. Both faculty and students expected that such information would be provided in the context of a deliberative decision-making process that takes into account faculty, staff and student priorities and concerns. At the same time, some administrators and those responsible for implementing carbon neutrality actions expressed concerns about presentations of energy use and emissions data that might encourage comparisons that are inaccurate or unfair.

Agency, perceived efficacy and social support

Student participants expressed a need for the freedom to create and direct their own activities, and saw systems for supporting long-term communication and collaboration as key to student engagement and effectiveness. While many student respondents anticipated personal benefits and social approval for actions focused on campus energy sustainability, they also reported a need for support from student peers in order to make this type of action a priority.

Alignment with existing stakeholder priorities

Students who participated in our research expressed the most interest in engaging with carbon-neutrality-related activities that also provide hands-on opportunities for career development, such as authentic research opportunities, group work with a diversity of participants, paid internships, and class credit. Faculty interviewed suggested leading through action by making campuses "living laboratories" to test strategies for reducing emissions, communicate publicly and engage communities with issues related to climate change, and share resulting insights and best practices for mitigation of campus emissions.

3.2. Research Design and Rationale

We used multiple complementary methods to gain breadth and depth of insight into how the University of California community perceives the Carbon Neutrality Initiative and relates to its goals and strategies.

3.2.1. Editorial Content Analysis

Analysis of campus news coverage focused on how sustainability offices and public-communication offices portray the CNI and integrate it with other sustainability themes.

We analyzed the content of campus news stories published online by campus public communication and sustainability offices that focused on energy and sustainability topics related to carbon neutrality. We used this approach to gain a broader understanding of how the UC Office of the President and individual campuses have communicated about the CNI and related topics that would prepare someone to understand the CNI. While internal stakeholders may often be considered secondary audiences for these communications, it is likely that this externally-focused communication exerts and agenda-setting effect[41] within the organization, indirectly defining the kinds of topics and campus activities that are deemed most valuable.

Identifying the major themes in news coverage provides insight into which aspects of the CNI or carbon-emission issues, in general, have been communicated broadly, and which aspects are less prominent or ignored in communication efforts. Through this research, we were also able to characterize the types of stories and themes that are consistently the focus of climate-action-related communication. Findings from this analysis are described in section 3.2, with further details reported in Appendix 6.2.1

3.2.2. Administrator Interviews

Interviews with administrative staff and managers focused on campus-level CNI decision making and implementation.

We conducted semi-structured interviews with energy and facilities managers, sustainability officers, and key operations administrators on each campus to gain insight into 1) their perceptions of costs and benefits of implementing the CNI, 2) their thoughts on effective communication and engagement, and 3) their opinions about the ideal role that UCOP should have in helping each campus reach carbon neutrality.

We focused on these administrators, project facilitators, and decision makers because they manage important campus resources that are needed to move the initiative forward. Findings from this effort are described in section 3.3, with further details reported in Appendix 6.1.1.

3.2.3. Faculty Surveys and Interviews

We used surveys and interviews to explore faculty attitudes and perspectives.

Faculty can play a critical role in large, campus-wide initiatives like the CNI because they are involved in campus decision making, they interact with students in and out of class, and many undertake research related to carbon neutrality or other sustainability initiatives. Like administrative leaders, key faculty are also thought leaders on campus and in local, state and global communities. Faculty may also be impacted by CNI measures, as many carry out research that contributes significantly to the carbon emissions on their campuses. For this reason, we did both in-depth and broad-scale research on faculty opinions and perceptions through a survey and a series of interviews. Our survey questions were designed to elicit information about CNI-relevant attitudes, behaviors, and values, willingness to accept tradeoffs to achieve carbon neutrality, and preferences for various possible strategies their campuses could pursue to achieve the goal. We complemented the survey with a small number of semi-structured interviews designed to explore the context for the faculty attitudes and preferences identified through the survey. In addition to exploring further how faculty sentiments were prioritized or associated, we engaged interviewees in conversation about university decision making. Then, by integrating survey and interview results, we were able to gain a general sense of faculty perspectives on the issue and also to identify specific visions faculty had for CNI goals and implementation, regardless of their technical expertise on the initiative. Findings from this effort are described in section 3.4, with further details reported in Appendices 6.1.3 and 6.1.4.

3.2.4. Student Surveys, Workshop and Focus Groups

With students, we used surveys, a workshop and focus groups to explore attitudes and perspectives.

Students are the central constituency of the UC system, and their engagement is critical to the success of any initiative. Student support helps bring visibility to initiatives they value; and UC students have a long history of driving institutional and social change. Thus, we focused considerable effort on understanding students both broadly and in depth, through two distinct survey efforts, two focus groups, and a workshop. These complementary approaches allowed us to evaluate how UC students — primarily those already engaged on some level with environmental issues — feel about the CNI as well as more general strategies for reducing campus emissions. The approach also provided insight into the motivations and barriers associated with these students' attitudes and behaviors. Prior research involving UCSB students had found that while the majority of the student body was not willing to commit effort to the issue beyond signing a student petition, student leaders who were actively involved in organizations and governing bodies had potential to serve as important change agents.

Our research was designed to both broaden and deepen existing insights into UC students' knowledge, attitudes, and behaviors. To this end, we 1) piloted a survey focused on characterizing knowledge, attitudes, and willingness to engage with carbon neutrality, 2) surveyed members of the Associated Students of the University of California government group to uncover barriers to action on the issue through a coordinated student government resolution, 3) conducted focus groups with environmentally-engaged students at two campuses to explore student identities, values, attitudes and motivations relevant to the CNI and to observe their responses to specific messaging strategies, and 4) a workshop for CNI students fellows and interns that provided insights into the types of information and support these highly engaged students need to be successful agents for change on their campuses. Taken together, our findings can be used to inform strategies for supporting students already engaged or interested in the CNI.

Findings from these efforts are described in section 3.5, with further details reported in Appendices 6.1.4, through 6.1.8.

3.2.5. Interviews to Inform Energy Dashboard Design

To understand best approaches to data visualization to support engagement with the CNI, we tested design concepts for campus energy dashboards in an interview format.

Studies have found that concern for the environment has the potential to motivate facility occupants to conserve resources such as energy or water, but often the average person has a hard time connecting their individual actions to environmental impacts[42,43]. A study at Oberlin College in Ohio found that when college students were provided with high-resolution, real-time data on their energy use as well as education and incentives, they were motivated and empowered to reduce resource use in dormitories. Researchers found that the accessibility of the data inspired students to think about their personal resource use in ways that extended beyond the confines of the study.[44]

Research was conducted to develop and test possible data-visualization designs for a campus energy website and dashboard that was under development at UC Santa Barbara. The UCSB website and dashboard are intended to provide real-time and historical energy use and source data, along with information to help UCSB students, staff, and faculty to engage and learn about energy use and energy sustainability on their campus. This research, which was conducted in collaboration with UCSB energy management staff*, involved presenting respondents with a variety of campus energy data visualizations for them to interpret and react to. Interviews about energy use on campus were also used. From these interviews, we were able to synthesize content and representation guidance for energy dashboard design and also articulate a theory of change for implementation of campus energy dashboards as a strategy for achieving carbon neutrality.

Findings from this effort are described in section 3.6, with further details reported in Appendix 6.2.2.

3.3. Analysis of Past Communication and Editorial Content

An analysis of university internal media coverage was conducted to determine how these communication channels influence perceptions of the initiative and how they might be used to support the initiative.

3.3.1. Data and Analytic Approach

Our search for news stories and press releases focused on collecting all online stories with themes relevant to carbon neutrality that were published between January 2016 and March 2017 by 1) UC campus sustainability offices and 2) UCOP and UC campus public communication offices. We started by collecting all news and blog items from campus sustainability websites and all articles from public communications sites archived under index terms such as “Sustainability,” “Environment,” “Sustainability and Energy News,” “Environment/Energy,” and “Environment + Climate.” We also collected all stories retrieved through queries for the terms “sustainability,” “carbon neutrality,” and “carbon neutral.” This initial search yielded 1,058 sustainability centered articles (Figure 5).

We then removed articles that were not about sustainability or carbon emissions. Most of these were about other specific sustainability topics, such as food, water or waste, but made no reference to carbon emissions. Of the 390 relevant articles, 34 were duplicates of or links to other articles in the set, so the total was reduced to 356 unique articles before coding began.

We a developed a code to filter news stories focused on some aspect of sustainable energy, energy or fuel efficiency, carbon footprint or carbon neutrality, or other activity with a focus on Scope 1, 2 or 3 emissions (see Appendix 6.2.1 for a full description of selection criteria). Two-hundred forty of the 356 stories were randomly selected for further analysis, and each of the 240 selected stories was analyzed to identify the main, overarching categories using an open-coding process[45].

* Student work on this project was supported by funding granted through The Green Initiative Fund (TGIF), a student fee-supported program to promote sustainability actions at UCSB.

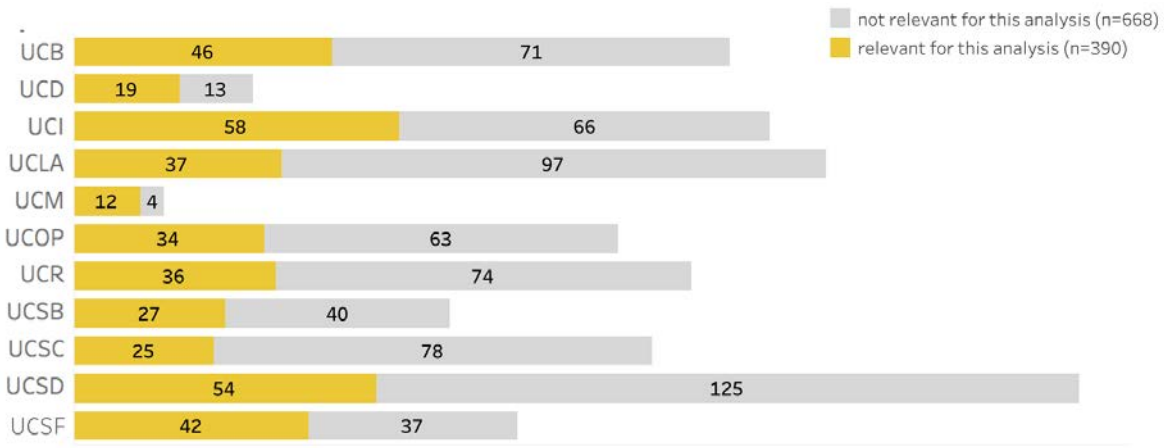

Figure 5. Total number of news stories collected for analysis. Number of news stories (1,058 total) collected through direct browsing and search of campus public communication and sustainability office webpages, January 2016 - March 15, 2017.

3.3.2. Findings

3.3.2.1. Campus Communications Office Coverage vs. Sustainability Office Coverage

A majority of the sustainability-focused news stories from UC campuses appeared on web pages associated with public communication offices on those campuses. Of the stories we found that contained carbon neutrality themes, only 22% (59 stories) mentioned carbon neutrality explicitly. Stories published on sustainability office websites more frequently made explicit mention of carbon neutrality. For the 14.5 month period for which data were collected, we found 265 stories that contained carbon neutrality-relevant themes on UC public communication websites, including all 10 campuses and the Office of the President. Of these, 25 9.4%) explicitly mentioned carbon neutrality. We found 125 such stories on sustainability office websites, of which 34 (27%) explicitly mentioned carbon neutrality.

Sustainability offices at five campuses (UCLA, UCI, UCB, UCSF, and UCSB) produced substantial portions of the sustainability-themed news stories on their campuses. Other campuses' sustainability web pages included links to specific stories on their campuses' public-communication web pages. A few sustainability offices provided little or no news-type content on their web pages. Three of the sustainability offices that host substantial news-type content on their websites (UCI, UCB, and UCSF) included themes relevant to carbon neutrality in a relatively large portion of the articles they produce. The term carbon neutrality was mentioned specifically, however, in just around one-quarter of these articles on relevant themes (Figure 6). On campuses where sustainability offices produce substantial amounts of news content, we found generally much less coverage of sustainability themes in public-communication news stories.

3.3.2.2. Sustainability Story Types

When comparing how often various story types appeared among the carbon neutrality-relevant articles, stories from public-communication websites more frequently featured research discovery/profile or awards, while those from sustainability offices more often focused on events or performances. Explicit mention of carbon neutrality was less frequent in discovery/profile type articles from public-communication offices, but more frequent in award-focused articles. Opinion pieces were very rare, and appeared almost exclusively on sustainability office websites.

- Research discoveries or profiles. Among the coded articles, stories about research discoveries and/or profiles of individuals making those discoveries were common, especially among public communication office stories (Figure 7). However, for those stories that mentioned carbon neutrality specifically, this story type was less prevalent than it was for the overall set of sustainability-themed stories.
- Sustainability awards. Many stories also focused on awards received by campuses or individuals affiliated with the campus. Public communication stories that mention carbon neutrality have an awards focus more often than stories with relevant themes that do not specifically mention carbon neutrality.

- Events or performances. Stories featuring content about events or performances were also common, and a very large percentage of the articles produced by sustainability offices contained information of this sort.
- Opinion or editorial. There were very few opinion-pieces or editorials among the articles we analyzed. Nearly all of the small number that we found in the data set came from the sustainability office websites.

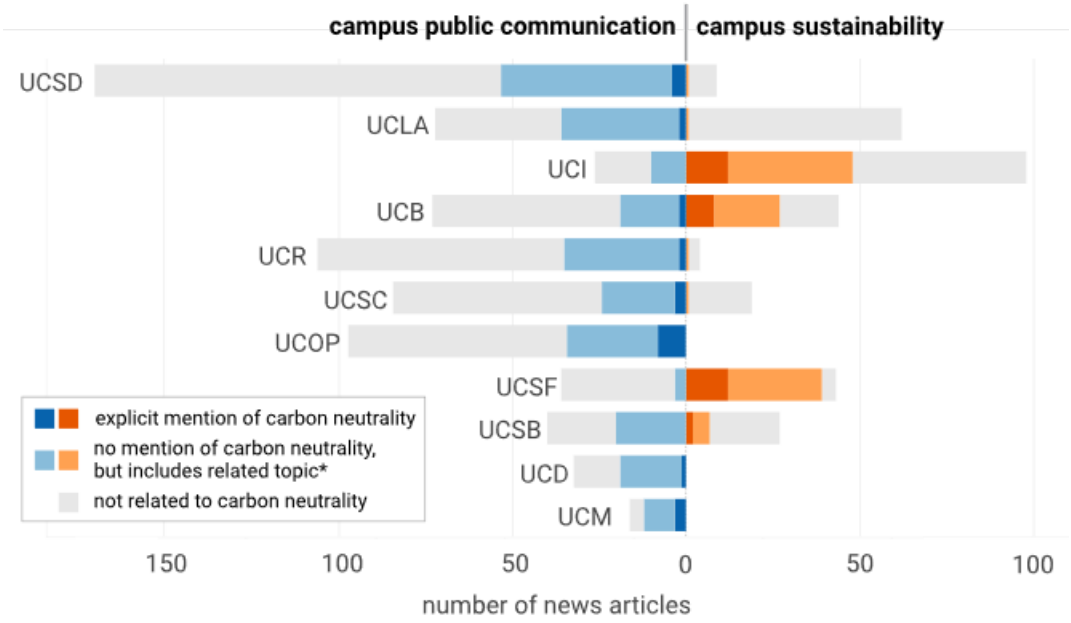

Figure 6. Level of coverage for carbon neutrality or related topics. This figure shows the number of news articles collected from campus public communications offices (blue) and campus sustainability offices (orange) and the how frequently carbon neutrality-related topics or explicit mention of carbon neutrality appeared in the stories.

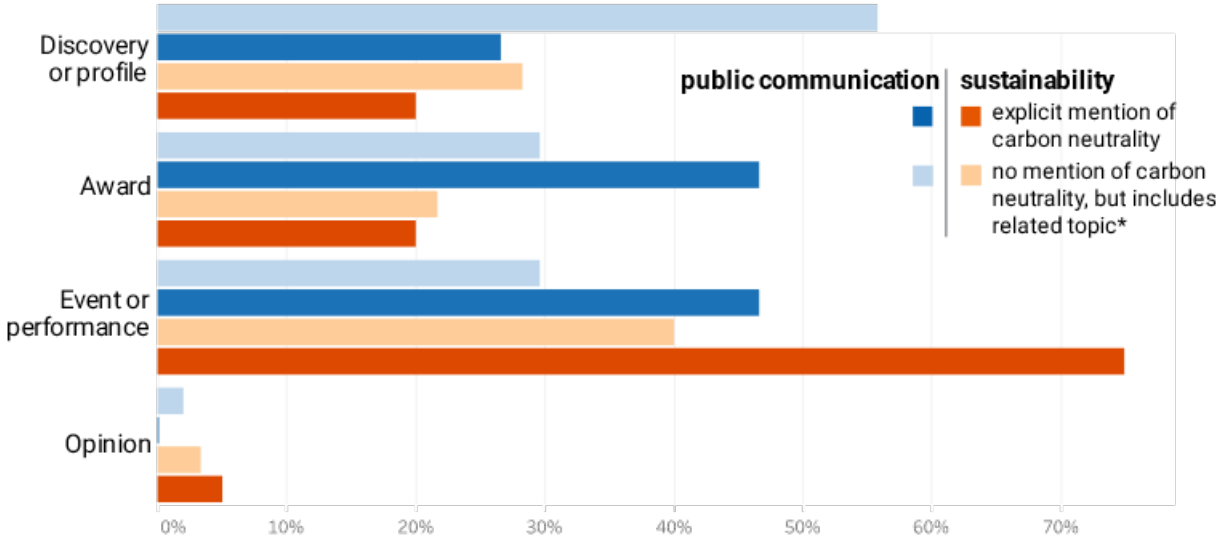

Figure 7. Framing of carbon neutrality and sustainability news in news stories. Percentage of coded articles (n = 240) that feature profile/discovery, award, event/performance, or opinion content. Article is focused on some aspect of the sustainable energy, energy or fuel-efficiency carbon footprint or carbon neutrality, or other activity with focus on Scope 1, 2 or 3 emissions. Also includes articles related to campus greenness or sustainability in general (E. G., Awards) if no specific non-energy aspect of sustainability is the main focus of the article. (See main text for criteria for inclusion in analysis.)

3.3.2.3. Coverage of Carbon Neutrality Strategies and Other Sustainability Themes

Overall, the campus news stories that mention carbon neutrality provide limited and sometimes ambiguous information about steps campuses can take to achieve carbon neutrality.

In sustainability-themed news stories about strategies that campuses can pursue to achieve carbon neutrality, alternative energy and energy efficiency/conservation featured very prominently, while market-based mechanisms such as renewable energy credits, cap and trade, and carbon offset programs very rarely appeared, and were entirely absent in sustainability-themed news at many of the UC campuses (Figure 8). Stories available through public communication offices more often focused on alternative energy, innovation, regulation, and pollution, while stories available through sustainability offices more often focused on education, agriculture and food, waste, and health. Very few of the news stories included social/environmental justice themes or made explicit connections with belief systems (e.g., religion, political affiliation, ethical or moral obligation, environmentalism).

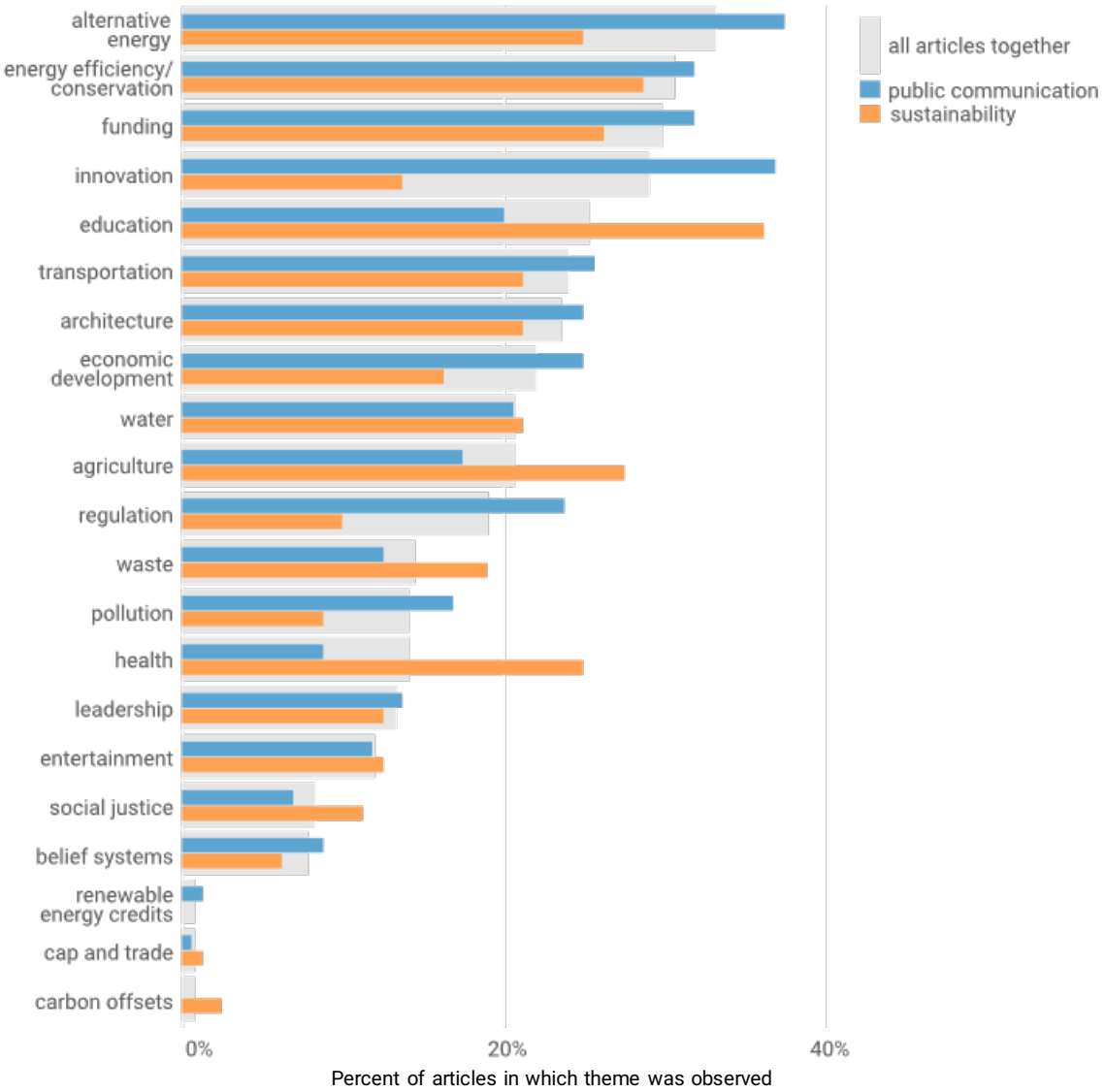

Figure 8. Frequency of theme occurrence in coded articles. Theme occurrence across all coded articles (n = 241) and within article subsets from public communication (n = 160) and sustainability (n = 81) offices.

On deeper reading and analysis, many of the stories that mentioned carbon neutrality provide only minimal information about what carbon neutrality is, or about the UC system goal. Of the 59 stories in our data set that specifically mention carbon neutrality, only 23 (39%) mention both the UC and/or campus goal and the Carbon Neutrality Initiative. An additional 33 stories mention either the goal or the CNI (but not both), leaving 34% of the stories that mention neither the goal nor the CNI. Of the 39 stories that mention carbon neutrality as a goal for an individual campus or for the UC system as a whole, only 11 stories (28% of the 59 total) also provided the additional detail that the carbon neutrality goal is related specifically to emissions associated with campus building energy and campus vehicle fleets.

While 27 of the stories (46%) mentioned specific strategies for reducing campus carbon emissions, one or more strategies were often named but no additional detail was provided. Over one-third of the stories that mentioned specific carbon reduction strategies included strategies that would not directly contribute to the 2025 CNI goal together with strategies that would help to achieve the CNI goal (i.e. they mentioned strategies to reduce Scope 3 emissions but not Scope 1 and 2 emissions). This potentially confounds understanding of which types of actions will actually help campuses to achieve the CNI goal. As we observed for carbon neutrality-relevant sustainability stories overall, most mentions of Scope 1 and 2 strategies involved campus-based energy efficiency or renewable energy activities. Only 5 of the stories mentioned market-based strategies such as carbon offsets. Presentation of information about the pros and cons of these strategies and/or obstacles to achieving them was quite rare in the story set. UC President Janet Napolitano and/or the UC Office of the President features quite prominently in stories that mention carbon neutrality. Twenty-five stories (42% of the 59) mentioned President Napolitano or her office specifically, and that rate was even higher for stories that mentioned the CNI (57%). Seven of the 59 stories (12%) mentioned both carbon neutrality and UC or campus-level investments, which are the focus of the members of the campus communities who support fossil fuel divestment for the UC. Substantially more (32%) mention social justice, environmental justice, or health aspects of carbon neutrality-related activities.

Just over one-quarter of the stories mention curriculum development or strategies involving education and awareness raising, community engagement, or behavior change campaigns. Just over 10% mention or describe the concept of UC or an individual campus as a "living laboratory", and 15% mention carbon neutrality-related research opportunities for UC researchers or students.

Our data revealed notable differences in the frequency with which different themes appeared in sustainability-themed news stories across campuses. Table 1 summarizes instances when a particular theme appeared more frequently or less frequently within the news stories from each of the campuses.

3.4. Campus-level Administrative Decision Making and Implementation

3.4.1 Data and Analytic Approach

We conducted semi-structured interviews with 30 personnel and decision makers across all campuses* to determine how those who manage programs or make decisions central to campus efforts to achieve carbon neutrality perceive of and interact with the CNI. Interviewees included high-level staff and administrators in sustainability, facilities, utilities, energy management, and capital planning. Questions focused on eliciting interviewees' views on 1) competing priorities and other barriers to achieving carbon neutrality as well as key opportunities for progress; 2) existing organizational structure, roles and internal communication relevant to carbon neutrality; 3) promising carbon-neutrality strategies and tradeoffs associated with those strategies; 4) prevailing attitudes toward carbon neutrality among campus stakeholders; 5) current and previous communication and outreach efforts focused on carbon neutrality; and 6) burden of responsibility for action, as well as resources that could support effectiveness of their own actions. The complete Administrative Interview Guide is available in Appendix 6.1.1.

Because we were only able to speak with a small number (3-4) of key staff and administrators on each campus, we caution against overgeneralizing the sentiments of those we spoke with, since other members

* A master's project, completed in 2016, that focused on CNI implementation at UCSB, included interviews in with a key members of UCSB facilities and sustainability staffs. To avoid overburdening these individuals, we did not conduct follow up interviews with them, but rather cite results from the UCSB study that correspond to our own work.

of the sustainability, facilities, and energy management staff would almost certainly broaden the perspectives summarized here. Future research should focus on these wider perspectives.

Table 1. Coverage of sustainability strategies by campus. Types of themes featured in carbon neutrality and sustainability news stories at each campus and the Office of the President. + (-) signs mean that the theme appeared more (less) frequently than average.

UCB	UCD	UCI	UCLA	UCM	UCOP	UCR	UCSB	UCSC	UCSD	UCSF	THEME
			-		+					-	**Alternative energy** Renewable energy sources, such as wind, solar, biofuel, etc. Different modes of fossil fuel use are excluded.
+		-			+			-	-		**Energy efficiency/ conservation** Use of less energy to provide the same service. Involves reducing or going without a service to save energy.
			-			+			+		**Funding** Related to the provision of money to an individual, organization, research project, or other sustainability-oriented endeavor. Does not include research funding grant statements.
	-		+	-	+		-	+	+	-	**Innovation** Refers to use of innovation (technological, organizational, social) to meet goals or find solutions.
		+	-	+			+			+	**Education** Refers to activities or programs (formal or informal) focused on teaching and learning. Includes references to curriculum development and educational opportunities. Includes training, internships and professional development.
	+				+		+				**Transportation** The act of carrying someone from one place to another via vehicles of any kind.
+		-	+	+		-	+				**Architecture** Highlights architecture or building design concepts.
		-	+		+						**Economic development** Contributing to economic prosperity either locally, nationally, or globally, such as in the opening of markets, price reduction of commodities, business opportunities, or job creation.
			+	+	-		+				**Water** Related to status or management of water resources.
		+	-	+		-				+	**Agriculture** Related to production, distribution, and consumption of crops, livestock, foodstuffs, etc.
-			+					-	+		**Regulation** Refers to conditions or changes coming from outside the university through local, state, federal, and international regulations.
			-				+		-	+	**Waste Systems** for managing and/or treating waste. Includes reuse, repurposing or recycling of waste materials.
-	+		+	-					+		**Pollution** Negative feedback caused by the degradation of the environment (all pollution not included in carbon emissions).
	-	-		-	-		-	-		+	**Health** Refers to events or conditions that promote or diminish the health of individuals or groups.
			+	+				-	-		**Leadership** Relates particular actions or goals to taking responsibility or a leadership role from campus organizations.
			-	+	-	+	-	+	+		**Entertainment** Refers to activity that is intended to provide enjoyment, diversion, or leisure.

UCB	UCD	UCI	UCLA	UCM	UCOP	UCR	UCSB	UCSC	UCSD	UCSF	THEME
	-			+	-		-	+	-	+	**Social Justice** Refers to any of the multiple and overlapping categories of justice (race, gender, environment) as well as intersectionality of experience along these categories.
+		-	+		-	-	-	+	-	+	**Belief Systems** Relates to particular actions or goals from belief systems (e.g., religion, ethical or moral obligations). Includes environmentalism and political affiliations.
+									+		**Renewable Energy Credits*** Any mention of credits or policy that incentivizes renewable energy through market mechanisms.
			+				+				**Cap and Trade*** Any mention of a cap and trade system or policy.
		+					+				**Carbon Offsets*** Any mention of a carbon offset or carbon offset program.

3.4.2. Attitudes Toward Potential Carbon Neutrality Strategies

Staff involved with campus-level CNI implementation saw energy efficiency and on-campus renewables as the most important opportunities for making progress toward carbon neutrality. At campuses with natural-gas-fueled central heating and power plants (also called cogeneration plants) there is concern about challenges involved with transitioning away from such systems. All of the interviewees identified ways to help reach carbon neutrality. Across the board, increased efficiency was viewed as a significant opportunity for each of the campuses. Many also expressed opportunities for on-campus renewables, such as solar. While biogas and the use of centralized water heating were also cited by some campuses, these were not mentioned as frequently. One possibility is that biogas requires a long-term commitment:

> *"Let's say you develop a biogas plant and I'm gonna buy biogas for the next 20 or 25 years, and that's gonna get my cost of biogas down...so if one of your researchers on campus comes tomorrow and says, 'I have this great way to sequester your carbon, and it costs four dollars.' Uh-oh, I'm already contracted for the next 20, 25 years. How do you unwind that position, right?"*

Changes to space use, fuel procurement, and transportation were only suggested by a few of those interviewed. While campuses that rely on cogeneration spoke to the importance of reducing this reliance, they also expressed significant barriers in being able to do so. For example, one individual emphasized how inexpensive cogeneration is compared to other options, in this case, solar:

> *"...so even if we're super, super efficient here with all sorts of stuff, we're still fighting the limitations of the co-gen as well as the good aspects of the co-gen."*

Most interviewees did not see market-based offsets as a viable strategy for carbon neutrality because they would divert funds from efficiency or renewables-focused projects. Interviewees did, however, support offsets if they were a funding mechanism for on-campus projects, or if purchased locally. The majority of those we spoke with did talk about offsets as a potential opportunity, but not in the way one might expect. As articulated by one interviewee:

> *"Can we do, either UC, or even campus level developed offsets? Take the money that we would spend on buying market offsets, but use it for either putting it back into energy efficiency or renewable energy project. (On-campus energy efficiency, or renewable energy, or something like that). We are a public institution. This would help the taxpayers.*

* There were very few mentions of these topics overall, so any mention resulted in a "+" category designation. However, it does not signify a high number of mentions of these themes.

> *It would help the students. Rather than just going out and spending money on the market. That's what I would like."*

All those interviewed agreed that while offsets might be an inexpensive "easy fix," they were not the best use of funds for long-term sustainability and development goals on campus. Most would rather spend money investing in campus infrastructure, such as energy-efficiency projects, in order to receive long-term savings, rather than spending money each year on offsets. If offsets are needed, respondents noted that they would need to be chosen with the teaching and research missions of the university in mind. Further, to satisfy students and California taxpayers, the offsets should be purchased locally, or at least from California.

3.4.2.1 Perceived Barriers and Opportunities

We spoke at length with interviewees about their perceptions of barriers to implementing carbon neutrality on their campuses. We also discussed opportunities for implementation that were currently overlooked but could contribute to success of the initiative. Every person we spoke with had at least one idea for how to better implement the CNI, and some respondents had already implemented their solutions on their campuses. Challenges and opportunities fell into four broad areas:

1. informational
2. technical and logistical
3. organizational culture and policy
4. organizational structure and management

Below, we highlight commonly described barriers and opportunities in each of these key areas. Overall, our interviewees considered organizational factors to be the most important to ensure successful implementation of the initiative, so we focus in particular on the communication and stakeholder engagement strategies our interviewees saw as useful, or even critical, to the success of the initiative.

Informational

Most respondents saw potential for improved communication and engagement around the CNI, but many voiced a concern that the goal, its relation to the UC mission and values, and the practical strategies for achieving it all remain poorly defined. Many did not feel as though carbon neutrality, or sustainability goals generally, have been defined within the mission of teaching and research (or health, in the case of the medical schools). They expressed concern that until such connections are made clear and well communicated internally, carbon neutrality will not be a campus priority. Beyond expressing a need for information about the relationships between the CNI and the university's mission, some respondents suggested "humanizing" the message by framing it in terms of public health or social justice would be effective. Others considered clearly articulating the relationships between the CNI and other initiatives, such as the Global Food Initiative or UCs water goals, to be key to demonstrating relevance to issues people already care about.

Some interviewees reported frustration over the gap between the CNI in theory and the CNI in practice. They expressed feeling that few tangible specifics are available regarding how their campus might reach carbon neutrality, and they expressed concern that they might be supporting financially or operationally non-strategic or non-practical goals.

Alignment of the CNI with the primary UC mission (research, education, and patient care) was considered a key opportunity (or barrier if not aligned) that is critical to the success of the initiative. Clear and transparent communication with campus stakeholders about the synergies and tradeoffs between the CNI goals and these priorities is important for broad engagement with and support for the CNI. Overall, interviewees observed that the CNI is often out-prioritized by other aspects of the UC mission because of its comparatively unclear value proposition. While benefits of research and teaching to the campus and its stakeholders are familiar and widely accepted, the relationships between carbon neutrality and UCs mission are much less salient. The university's research mission was identified as a strong competing priority for the CNI because of the intensive energy use in many laboratories. Some respondents expressed concern that those who manage research facilities may be likely to view emission reductions as interference that limits research. Similar concerns were voiced about campuses with medical facilities, with their priority on quality of patient care rather than research impacts. In general, interviewees perceived the teaching mission to be less of a barrier than research or patient care, since programs and

activities implemented to achieve the CNI can also offer opportunities for education and student professional development.

While the majority of interviewees did not speak to the potential costs that carbon neutrality measures might pose for students in particular, a few did express considerable concern.

> *"So the question is, are you gonna jack up tuition on the students just to pay for carbon neutrality? And then my own personal beliefs behind that is most of your students finance their educations, which leaves them with debt that they have to pay for over the next 10, 15, 20 years. And god forbid you're now financing carbon neutrality over the students for next 20 years. Can you imagine what the end cost of the ends up being?...from my personal opinion, we can't put this on the backs of the students and say, 'We're gonna make you guys pay for it, and not only that, most of you are probably gonna finance it.'"*

One individual specifically spoke to the way this dichotomy has been framed by students on his/her campus:

> *"Yes, we support carbon neutrality and we can't pursue carbon neutrality on the backs of the students. We have to be able to address student basic needs, like food security, at the same time as we are pursuing carbon neutrality."*

Most respondents identified transparent sharing of information and data about campus carbon emissions and energy sources and use as a key strategy for engaging campus stakeholders. Most all respondents reported that the best way to engage various campus audiences would be to share information and data about campus energy use and campus emissions, such as data on building heat and electricity. For people to change their behavior, respondents reasoned, they need to know how their current behavior could be improved:

> *"Because there's a lot in the realm of user behavior that certainly affects energy performance. It affects our ability to be carbon neutral. The more that we can get people to keep the lights off or not plug things in or unplug things that are draining energy or keep their thermostat within a bandwidth and so on, that sort of thing can make a huge difference in the overall consumption."*

This was echoed in the case of laboratory energy use:

> *"So the first goal was to have a good understanding of how much energy one lab uses, because it's something we don't really know, so we did that for chemistry lab and for biology lab, and one was an open lab space, one was a closed lab, so we are going to compare the efficiency of the program so we find out that with the open lab…"*

Those we spoke with who have had more interaction with students reported that students had asked for feedback on their actions, which would require better access to energy data. Data, importantly, also serves to clarify campus options for neutrality:

> *"A lot of students and other people talk about solar, for example. I wonder if they understand how much solar a campus of this size would have to do to offset all of our energy with just solar energy, even with energy storage added it. Almost to the point where it would be impractical to do it on a campus level."*

> *"...We had students who would do surveys in departments. And what that was basically them walking around and taking our tip list and customizing it a little bit for each department but I think the people that we did that for really found that kind of useful. So, that being actionable and personalizing it to the extent that you can, and having some numbers and data that go with it was a nice mix."*

Technical and logistical

Campus dependence on cogeneration plants and on outdated and inefficient infrastructure are recognized as significant challenges. Nonetheless, interviewees generally did not consider technical issues to be the primary barriers to achieving carbon neutrality. Challenges included existing natural-gas-burning combined

heat and power (cogeneration) infrastructure; substitution of other technologies to serve needs currently met by these plants was identified as a major challenge for every campus that had a cogeneration plant, and this challenge was also identified as a barrier to system-wide carbon neutrality by those at campuses without such facilities. The issues with the cogeneration plants, beyond their carbon intensity, is that some are relatively new, fully operational, and often in the process of being funded. No obvious solutions were offered to address this beyond resignation to buy offsets to compensate for their use.

> *"The other is just the physical, the age and efficiently at our campus plant. For us to bring our buildings into the performance that would improve our carbon footprint is just inherently problematic because they're old, they're hard to work in, their systems are archaic. You can't make small changes, they require a major investment... And our utility system is also old and archaic. It just limits our opportunities and our options for making improvements."*

> *"Well, I think flexibility for the campuses is important, but at the same time, I do think there's plenty of centralized action that could be taken. Unfortunately, some of the great centralized programs that exist, we haven't been able to access because of the weak structure of our utilities."*

Highly visible on-campus installation of emissions-reducing technologies are seen as providing opportunities for community engagement in addition to their primary benefit of reducing energy consumption and/or carbon emissions. In our interviews and those conducted at UCSB[46], respondents highlighted significant secondary benefits of energy efficiency projects in buildings. According to those we spoke with, because such technology upgrades are very visible, they lend themselves to rallying student engagement and support for the CNI. For example, as expressed by one individual:

> *"... I would have to say that not as many people know about the carbon neutrality initiative the way they do about the zero waste initiative. I think there's a few reasons for that. One is that zero waste has been around longer. Two, recycling is also they say that gateway to sustainability. It's something a lot more people can understand very easily. It also happens to have a lot more visible physical infrastructure for people to interact with, so people walking around the campus will see the recycling bins, see the zero waste bins, and they kind of get reminder. Unless you have big physical reminders like renewable energy or signage everywhere, it's a lot harder for people to interact with carbon neutrality because it might just be stuff that's happening behind the scenes."*

For this reason, strategies that involve visible installation of new technologies on campus were seen as having an advantage over market-based measures such as carbon offsets.

Organizational culture and policy

Higher prioritization of carbon neutrality by campus leadership is viewed as a linchpin to the CNI's success. Interviewees anticipated that increased involvement and support from top-level campus administrators would lead to more efficient decision making, increased access to resources, and higher prioritization by mid-level administrators. Respondents identified increased support from leadership as important, with nearly all respondents adamant that chancellor- and vice-chancellor-level support is critical for reaching carbon neutrality. Some staff perceived a lack of appreciation for the value of their units and work, and they interpreted lack of funding for the initiative as a sign of low prioritization. Public support from chancellors, they believed, would "trickle down" into mid-level management, helping make more resources available to carbon neutrality projects. Furthermore, many expressed that, regardless of the organizational structure, decision making was most effective when the "right" people or leadership were present: meetings or projects felt ineffective without those key players.

Interviewees perceived carbon-neutrality programs to be especially vulnerable to budget issues, with budget shortfalls easily resulting in loss of the staff and know-how critical to implementing CNI projects. Campus or system-level budget crises, lack of funding, and limits to debt capacity were seen as very likely to impact CNI projects. Interviewees reported too few staff for the tasks at hand, a lack of formal support from the university, and a significant lack of funding for their work. For example, the budget crisis was identified as difficult beyond lack of funding because it led to loss of staff and administrators. After such

loss of critical capacity, projects need to "start from scratch" to be compatible with the skills and expertise of the staff that take them on. Progress on the timeline is therefore lost, even if funding is restored in the future.

Some interviewees expressed concern about budget crises or debt capacity.

> *"A big issue right now is that we all are being asked to cut, cut, cut. It's hard when that cutting of budgets, whether it's changing priorities to the bare minimum or it's even you're losing staff who might do the carbon neutrality work or staff are being asked to do more. It's hard to then add carbon neutrality onto that or to get the campus to see carbon neutrality as a priority, unless you can frame it in a way that shows it will actually help with the budget crisis."*

Also, budgetary constraints can affect campus relationships with UCOP at a very high level.

> *"... because of the interactions between the campus and UCOP at a very high level around our [budget constraints], I think I'll just describe that as sometimes tense. In the short run, I see the campus being mostly on its own to do things."*

The high priority placed on campus growth—in particular, expansion of the research and patient-care infrastructure—is seen as a barrier to achieving carbon neutrality. Capital planning was identified as a key locus of activity to ensure that such campus growth does not magnify existing challenges to campus emissions reduction. A majority of respondents across all campuses identified campus growth as a major competing priority, though the challenge of working within this growth was expected to vary based upon the type of growth and its energy intensity (e.g., additional students versus more medical facilities). In this context, a number of those we spoke with considered involvement of capital planning units as critical to achievement of the carbon neutrality goal. Specifically, they saw a need for campus planners to shift from short-term thinking focused primarily on upfront costs to life-cycle assessments that incorporate consideration of longer-term reductions in energy inefficiencies and costs. Some respondents noted that several campuses (e.g., UCSC, UCD) have been creative in ensuring that energy-efficiency measures are implemented in new buildings, and they identified an opportunity for other campuses to adopt a similar approach.

Perspectives on the value of engagement of the broader campus community in achieving carbon neutrality were mixed. While many saw campus-wide communication and engagement as effective strategies, others were skeptical that the types of small behavior changes typically achieved through such campaigns would have any substantial impact if larger energy-procurement issues weren't addressed first. Interviewees who were most supportive of communication and engagement as a key strategy identified several areas of opportunity. Larger campaigns that provided a broad vision and accessible engagement, such as the recent Cool Campus Challenge, were considered by sustainability officers, in particular, as a highly effective approach. Training in sustainability leadership for faculty, staff, and students was also identified as a potentially valuable approach. At the same time, the individuals we spoke with saw a few key challenges to achieving tangible change through communication. Some noted that lab managers are a key audience to engage, as they oversee some of the most energy-intensive facilities. However, this audience is primarily driven by research-based incentives, therefore they may be less willing to prioritize sustainability. As emphasized by one individual we spoke with:

> *"We bought two minus-80 freezers that were the same amount of storage as three of the old ones, but the two run at what five used to run at, as far as energy consumption. All you have to do now is co-locate your sample, they're all gonna look at you and go, 'We're not co-locating our samples.'...I've always struggled with the behavior part because it's so time-consuming and it's so hands on, and it doesn't result in the reduction you're looking for."*

Others noted that students are more likely to become involved in efforts for which they feel that have some level of ownership, and that this sense of student ownership currently does not exist for the CNI. Some suggested linking (or at least clearly communicating the synergies between) the CNI and fossil fuel divestment—a carbon emissions-reduction campaign that students originated and are deeply invested in.

Organizational structure and management

Siloed roles and responsibilities are seen as a critical barrier to the coordinated and collaborative effort considered essential to progress toward carbon neutrality. The result may be needlessly duplicated effort, or disparate (and sometimes conflicting) goals and metrics of success for different units, which can undermine collaboration. Respondents also noted an organizational culture in which departments involved with carbon-neutrality efforts (facilities and energy management staff, planners, and sustainability staff in particular) often remain somewhat isolated from each other. Some sustainability staff reported feeling disconnected from other staff, such as energy managers who make decisions regarding carbon neutrality implementation. In some cases, energy managers and facilities personnel were in regular contact, but their interactions with sustainability officers were limited. Others noted that planning departments are not typically involved with ongoing building maintenance, and therefore are not incentivized to consider long-term cost savings from energy-efficient facility design.

Respondents reported efforts to collaborate across these divides, and support for cross-collaboration was identified as important to progress toward carbon neutrality. Some campuses have clearer divides between sustainability and operations, whereas others have already taken steps to provide greater support for cross-collaboration. One campus has addressed this communication and decision-making gap through a staff position specific to the CNI that crosses divisions. On some campuses, sustainability offices had a "distributed" model, in which sustainability staff were placed in different units throughout campus, while others had a central sustainability office that didn't interface as much with other offices. While it is difficult to compare the effectiveness of these different models based upon our interviews, interviewees participating in the more integrated structures generally reported feeling they were better informed and better able to implement their CNI-related projects.

The importance of organizational structure is emphasized in particular by one party:

> *"And then at Davis they have an incredible team ... I look at our facilities management, we're kind of sticks in the mud, we're very stuffy and conservative. You look at Davis and their energy management team has a war room, and ... even their offices are oriented more like a team, really all focused on reducing energy. And they've got students working on cool apps that help you gauge the building occupants. That's the other piece. We've got these other campuses doing some really good things, but it requires rethinking and reframing the way you operate. You walk into our facilities management, everyone's stuck in cubes. There's no war room. We don't have the space. ... Campus by campus ... we've got to pull the electricians, we've got to pull basically the people that are doing the work on the campus, the project managers, the capital programs, the senior leadership, put them in the room and go, "Okay. If we are not going to burn any more fossil fuels on this campus, what does that look like?" And make that the new norm."*

Lack of norms or venues for inter-departmental communication is perceived as a fundamental obstacle to unifying efforts across a siloed management structure. Interviewees expressed the desire for communication and venues that could support effective collaboration. All units and positions represented in our interviews also noted a lack of internal communication with other relevant campus units and with UCOP regarding the CNI and strategies for reaching carbon neutrality. Interestingly, this lack of effective communication was vocalized from the UCOP office itself: the biggest barrier UCOP officials identified is that they believe their directive is unclear to the campuses, causing confusion and stymieing CNI progress. Most respondents also cited the importance of improved organizational structures and communication to promote better coordination and collaboration, and creation of forums for more-transparent discussions around the CNI and other campus priorities. They noted the importance of time and space for creative problem solving, and for everyone to have a space "at the table," when planning for carbon neutrality.

Some respondents said their campuses had already implemented solutions to their communication challenges, such as creating cross-functional teams and working groups. Further, campuses that had the feel of "war room" (a group of people with a shared goal that they actively pursued) appeared to feel more effective at their work.

3.4.2.2 Perceptions of Responsibility for Leadership on Carbon Neutrality

Because carbon neutrality-focused actions generally require cooperation between multiple actors at the campus and system levels, official responsibilities for achieving carbon neutrality goals are not always clear or well aligned with capacity to achieve the goals. In addition, the potential for recognition or reward for achieving goals is ambiguous.

> *"So basically the responsibility for carbon neutrality is sitting on the shoulders primarily of the energy management team. But … as with any of the sustainability goals … the ability to achieve it sets on many different departments' shoulders."*

> *"The carbon neutrality goal has been a little bit different on that issue of OP versus the campuses. So, in the past, we have set system-wide goals and campuses were very clearly responsible for all the leg work to getting it. And [campuses] would get the credit for doing that. With the carbon neutrality, it's been blurred a little bit. It is a presidential initiative, It's still a system-wide goal. I think the 'on the ground' work has to be done by the campuses because they're on the ground. But you have this energy services unit that was created because there were some things that were going to be easier, or only able to be done in a centralized kind of way. There's actually a lot of tension around that point."*

Interviewees generally identified UCOP as having an important obligation to lead on this issue, and they shared their perspectives on what forms this leadership could take. In general, UCOP is perceived as best positioned to:

1. promote sharing of information about carbon-neutrality strategies
2. help acquire resources (e.g., funding, negotiated agreements, partnership opportunities)
3. help coordinate inter-campus collaboration
4. structure reporting from chancellors and vice-chancellors to make a focus on carbon neutrality a part of the communication and evaluation system

Respondents generally approved of UCOP's existing efforts to share energy-related data and provide information about best practices in this area, but they also specifically suggested that UCOP could do more to increase data and information sharing throughout the system. In particular, sustainability staff expressed a need for more-comprehensive information about the CNI and relevant emission-reduction strategies that could be integrated into communication and engagement efforts. Those we spoke to saw an important role for UCOP in acquiring the financial resources required to achieve the goal, including providing funding or helping campuses to raise it, looking for creative partnerships (e.g., for construction of new buildings or biogas facilities) and assisting with negotiating power purchase agreements:

> *"I think it's incumbent on the campuses to work at the local level, and then help foster the partnership between the local community and OP. Then OP can help a lot at the state level and help find opportunities for the campuses."*

> *"When the UC need the utilities to play fairer with them as far as energy efficiency incentives and rebates and programs and building codes. that's a great role for UCOP…I think they're better at coordinating more than leading."*

Across the campuses, respondents placed the greatest emphasis on how UCOP could provide support to help campuses make the CNI a priority:

> *"I guarantee that there are reports that go through the president from the chancellor. And those reports or monthly or quarterly, I don't know. But they're something, measures of success. And those reports are populated by information from their vice chancellors. So we need to have the president asking the chancellor for success measures that support these, so that person comes down to get that information from that communication tier."*

Interestingly, those campuses potentially most dependent on system-wide opportunities (e.g., UCLA, UCI, UCB, UCD) especially stressed UCOP's role in garnering such opportunities. For example, UCOP has been instrumental in the success of the strategic energy program:

> *"...the energy efficiency program, the strategic energy program, SEP... where [UCOP] put the bond funding in place and they put the ability to borrow money to do energy projects in place, that's invaluable. And that has taken [us] on a completely different path, and you really do get something out of it...For them to expand that program is huge. For them to figure how these campuses that are up against their [debt] capacity limits can go out and access capital to do energy efficiency is huge, because you're not setting that money on fire, you're getting something for it...So making sure that OP is not only working to put the capital in place, but is making sure that whatever program exists, campuses can access it, I think is big. And they probably gonna have to work with legislations, probably gonna have to work with CPUC to try to make sure we can access that."*

3.4.2.3 Perceptions of Model Programs or Approaches

Interviewees saw opportunities to adopt successful strategies from UC and other campuses. Dialogue about these possible models among campus and UCOP staff involved with the CNI as well as engaged campus community members could outline the pros and cons of potential strategies inform campus communities. Without prompting, many respondents offered their perceptions of the work toward carbon neutrality that is being done on other campuses. For instance, several campuses were called out as having better collaboration or more creative solutions for carbon neutrality, such as UCM's meter systems, UCI's investment in its people, and UCD's "war room." Also, campuses that have chancellor support were considered to be better off. Several non-UC campuses were also identified as doing much better than UC, such as Bunker Hill community college (creative space use), Arizona State University (innovative in general), CSU East Bay campus (unique partnerships), CSU system (cap and trade, power purchase agreements), and Stanford (electrification).

3.5. Focus on Faculty

3.5.1 Data and Analytic Approach

3.5.1.1. Faculty Survey

During the spring of 2017, we administered an online survey to faculty members at all 10 UC campuses to learn more about their attitudes towards the Carbon Neutrality Initiative and issues around environmental sustainability more generally. We estimate that the invitation to participate reached over 44,000 email addresses via campus listservs. A total of 3,396 faculty members chose to participate in the study, and 2,427 finished the entire survey*. We estimate that this corresponds to a participation rate of approximately 5%. The survey solicited information across a broad range of topics divided into 10 blocks. To minimize the burden of a very lengthy survey on individual respondents, each participant was randomly assigned to complete 5 of the 10 blocks, plus the demographics information, creating an approximately 10-minute survey for most participants. Our self-selected sample is reasonably reflective of the faculty as a whole with respect to gender and disciplinary focus, but substantially more White/European American than the UC-system as a whole (77% vs. 58% respectively) and faculty of Asian/Pacific Islander backgrounds were particularly underrepresented (5% vs. 31%). Approximately 45% of respondents had 10 or fewer years experience with the UC system. A complete list of survey questions is included in Appendix 6.1.2.

3.5.1.2. Faculty Interviews

In early summer 2017, we conducted narrative-focused interviews with 20 faculty from across all of the UC campuses, representing a diversity of academic fields (e.g., humanities, social sciences, physical sciences, engineering). Invitations to participate were sent to 86 faculty members involved in faculty leadership either as department chairs or as academic senate representatives. The 20 faculty who participated were eager to share their thoughts, even if they had little or no prior knowledge of the CNI. Interview questions focused specifically on eliciting faculty perceptions of campus decision making, including how they would like to be engaged with initiatives like the CNI, their impressions of the CNI generally, and their experiences with campus operations. A complete list of questions is included in Appendix 6.1.3.

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* The survey contained a number of questions that were only shown to a randomly selected portion of the participants. For that reason, some questions have many fewer responses.

3.5.1.3. Representativeness and Limits to Generalizability

We caution that there are limits to the generalizability of these findings. The faculty who participated in our survey and interviews were self-selected, and for that reason it is likely that they are not a representative sample of the UC faculty population. Specifically, it is likely that faculty who already had some interest in the issues of energy, sustainability, or climate change were more inclined to dedicate time to participate in our research. Our survey participants also differ demographically in some ways from the UC faculty population (see Appendix 6.2.1), and we did not collect demographic information from interviewees. Nearly half of our survey participants indicated 10 or fewer years of work at UC, suggesting that our results may not adequately represent the perspectives of more senior faculty. While our results should not be construed as representative of the perspectives of the UC faculty overall, it is possible to say that a notable portion of the UC faculty (approximately 5% completed the survey) do share a number of the views and perspectives reported here.

Faculty invited to participate in our interviews were selected in two ways: 29 invitees were identified by our project PI as individuals who would have valuable perspectives on the issue. An additional 65 invitees were selected to include as broad a sample of disciplines as possible and based on their experience with campus decision making (i.e. service as department chairs or Academic Senate representatives). Twenty faculty members participated in our interviews, 10 who were suggested by our PI, and 10 who were selected arbitrarily from a broader set of potential interviewees who met our disciplinary and decision-making experience criteria.

3.5.2. Faculty Knowledge About the CNI

Most faculty surveyed and interviewed had some understanding of actions that can be taken to reduce campus carbon emissions, and a few had considerable knowledge about this topic. The sources of emissions that the CNI is focused on are less salient to many faculty than are other categories of campus emissions. Most of the faculty who participated in the interviews reported not being very familiar with the CNI. However, the few who were familiar with the initiative were quite knowledgeable about the goal and the possible strategies for achieving the goal. While the survey did not directly ask faculty about their familiarity with the CNI or include questions intended to evaluate their knowledge, we can glean insight into how they think about campus emissions and possible actions to reduce them based on responses to the open-ended question: "What is the most important action for your university to take to reduce its carbon footprint?" Responses suggest that local transportation emissions are somewhat more salient than many CNI-related emissions, and that when faculty do identify CNI-related actions, many think specifically in terms of building infrastructure and onsite renewable-energy generation.

Approximately 8% (~260) of the survey participants were presented with this question, and 166 of those provided responses*. Of the respondents, 33% identified actions to reduce emissions associated with transportation (predominantly the local commute), 30% identified measures to reduce energy demand (including energy efficiency, energy and infrastructure management, and conservation behaviors), and 22% mentioned renewable energy (when specifics were provided, on-campus solar was often identified). Other less-commonly mentioned actions involved recycling/waste reduction, education/awareness raising efforts, building requirements (e.g., LEED), and allocation of funding/resources. Of the 166 respondents to answer this question, two mentioned taxing carbon, one mentioned making more efficient use of space, and one mentioned electrification. Two mentioned cogeneration as a good solution for campuses, and the only one who mentioned carbon offsets referred to them as "not really a solution to the underlying problem".

3.5.3. Faculty Attitudes on Actions to Address Climate Change

The faculty we surveyed and interviewed expressed strong support for senior campus and system-wide administrators to take a leading role in actions to address climate change and environmental issues. They expressed openness to spending more money to achieve such goals. Overall, faculty we interviewed were

* Responses were coded by two independent coders with high reliability (Cohen's Kappa = .93). Cases of disagreement were resolved by consensus.

quite supportive of the university being a leader in climate, energy, environmental, and social issues. Most pointed out that university systems like the UC should have the agility required to respond to large challenges like mitigating climate change. Most believed that it was a responsibility for the UC system to act, and to be a leader intellectually, technologically, and from the research perspective.

Survey respondents voiced substantial concern across a broad spectrum of issues related to carbon neutrality and sustainability, and they expressed strong support for addressing them. Concern about climate issues was revealed through a series of questions about climate change and global warming. One question ("How worried are you about global warming?"), which was also asked of a nationally representative sample of U.S. residents as part of the Yale Climate survey , 92% of UC faculty respondents reported being very or somewhat worried, as compared to 62% for the national sample (see Figure 9).

Correspondingly, faculty respondents support taking steps to improve sustainability and address climate issues. For example, in assessing their "environmental attitudes", responses clustered most heavily towards the most-extreme response options such as "strongly favor" and "extremely important" for issues such as "How much do you favor or oppose paying more for energy to protect the environment from pollution?" or "How important is it for people to conserve natural resources whenever possible?" Other similar items (see Appendix 6.1.2) paralleled these trends.

When told that providing each campus with more-sustainable sources of energy would result in less funding for other priorities, and then asked, "Relative to the current amount being spent, what percentage do you think your campus should spend [on more sustainable sources of energy] in the future?" respondents endorsed spending 33% more than current levels. In addition, we informed a subset of respondents that the UC system currently spends less than 2% of its overall budget on energy. This information about how energy spending figures in campus budgets overall resulted in favor of significant energy spending increases—by 39% above current levels.

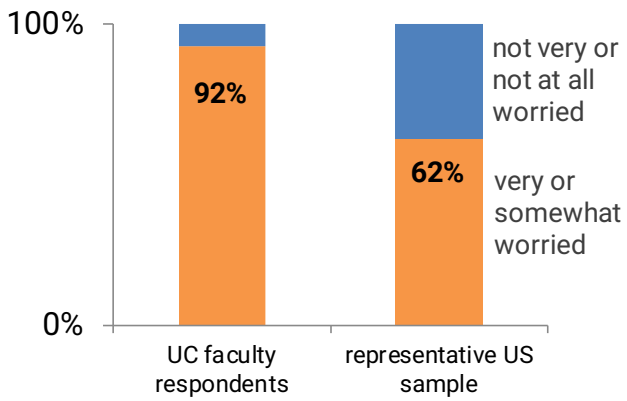

Figure 9. Levels of worry about global warming, UC faculty vs. national survey. Responses to the question, How worried are you about global warming?

Faculty respondents think that it is important for UC campuses to take a leadership role, and are most willing to personally take actions that align with the research and teaching missions of the university. Across a broad spectrum of issues related to carbon neutrality and sustainability, faculty who responded to the survey expressed willingness for the UC-system to take actions to become more sustainable. When asked about how important it is for the UC campuses to play a leading role in moving the state of California towards carbon neutrality (see Figure 10), 48% of respondents reported finding it extremely important, and an additional 40% found it somewhat or quite important. While in the minority, 5% of respondents indicated that taking this kind of leadership role was not at all important.

Many of the faculty we interviewed described this role in addressing climate change as consistent with what they are already doing. First, many thought that addressing climate change should come through research developments in science, engineering, social psychology (and human behavior), communication, economics, and policy. Second, they saw it as an important part of their mission to educate students, leaders, and members of the public on such pressing issues. Only a few respondents indicated that they think it isn't the job of the UC, doesn't align with the mission, and should be something for the state to worry about.

Faculty place high value on the education and research mission of the university, and indicated that they will be less likely to support actions they perceive as diminishing support for that core mission. When survey respondents were asked to rank four values—diversity, affordability of education for students, conducting research that benefits society, and eliminating environmental impact—the environmental-

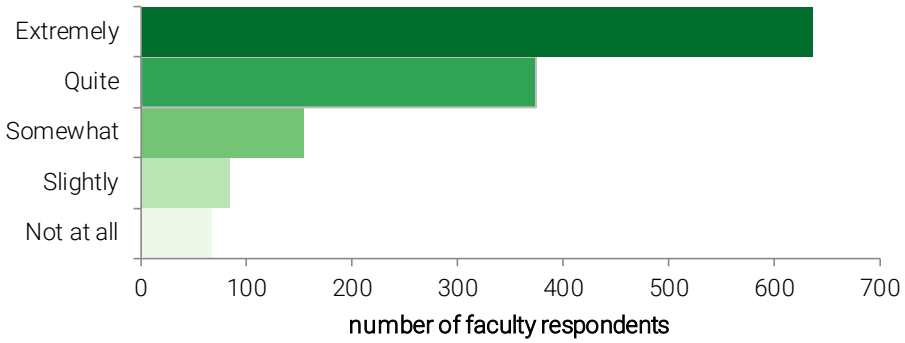

Figure 10. Support for UC leadership moving California towards carbon neutrality. Response to question: How important is it for UC campuses to play a leading role in moving the State of California towards carbon neutrality?

impact item received the lowest (F stat = 338.9; p value < 0.001) mean ranking of 3.12 (where 1 was the most important priority and 4 the least important priority).

This suggests that campus actions to address climate change and reduce carbon emissions will be most likely to gain faculty support if they are seen as supporting the education and research missions rather than detracting from them (Figure 11).

However, faculty who were interviewed saw the university's role going beyond the UC mission of teaching and research. They suggested that UC take a leadership role in climate-change mitigation, including intellectual, technological/research, and educational (curriculum-based solutions) aspects. They suggested leading by action through making campuses "living laboratories" to test strategies for reducing emissions, communicate to the public about issues related to climate change, engage the community, and share best practices for mitigation.* A few faculty mentioned that action should relate to issues that are specifically important to the UC, and that the UC should be apolitical, though these sentiments were not shared widely.

Faculty support for actions to reduce campus carbon emissions wanes when they think about potential tradeoffs related to resources to support the University's mission, or personal inconveniences that could be caused by these actions. Survey results show that faculty support for actions to reduce carbon emissions is more qualified when those initiatives involve personal costs or tradeoffs with strongly held values. While faculty support their campuses spending more to have more-sustainable sources of energy, respondents' support did appear to have limits. They generally seemed to endorse items that entailed personal costs less strongly. For instance, "To what extent do you favor or oppose paying more for products so that they can

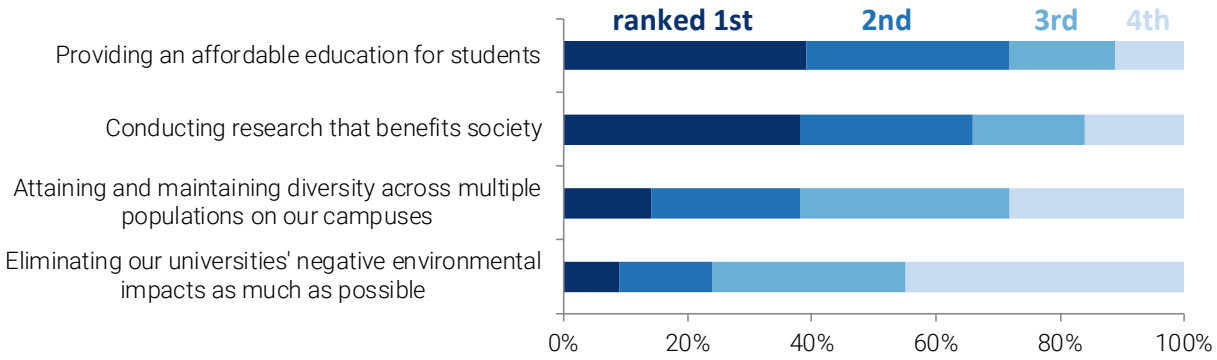

Figure 11. Faculty ranking of values for the UC system. Response to question Please tell us how you prioritize the following set of values for the UC system as a whole by ranking these items such that 1 = the most-important priority and 4 = the least-important.

* This broader role is consistent with the Bending the Curve report, 2016.

be made in more environmentally friendly ways?" was the least endorsed item on the environmental attitude scale (indicating only a very slight "favoring" response). When asked specifically about ideas for generating funds to support campus sustainability through either a 'carbon tax' or a 'sustainability fund' (no significant difference was found based on which term was used), faculty expressed support only for incentive programs (which, as described, don't involve a mechanism for raising funds) and the idea that the greatest users of energy should pay the most for the tax or fund (see Figure 12).* Their responses to ideas involving raising fees for students, evenly sharing responsibility for payment across all members of campus, or determining responsibility to pay based on use of space were strongly negative. The two ideas that elicited the most mixed responses were using indirect costs as a source of revenue and offering a within-campus carbon offsetting program, although in both cases, there were more strong opponents than strong supporters.

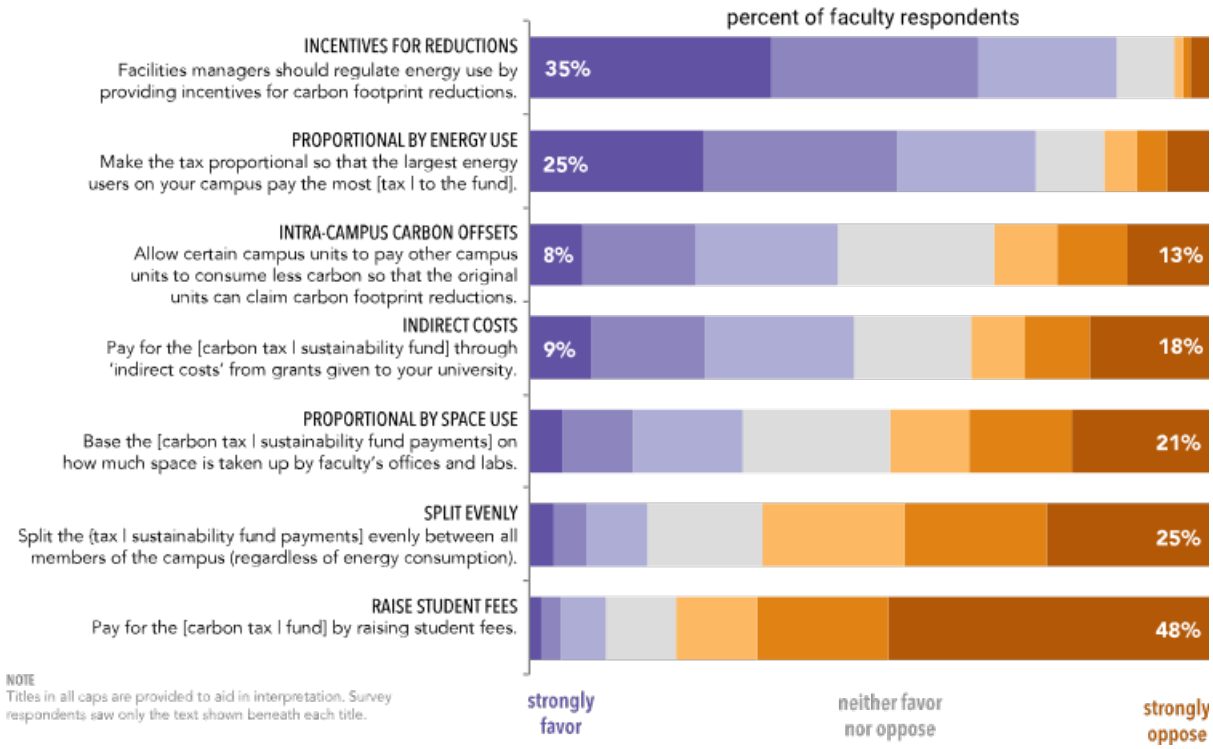

Figure 12. Faculty attitude toward different approaches for funding carbon neutrality at their campus. The above responses are to the following question, with some surveys using the term "tax" and some "fund". "One way to pay for converting from our current energy sources to carbon neutral sources is through a ["carbon tax" | "sustainability fund"]. In this approach, each university within the UC system would pay into an account based on their carbon footprint … There are no current plans for such a [tax | fund] in the UC system, although they do exist at some universities. Please respond to each item to give us a sense of how you would feel about different approaches to [taxing carbon | creating such a fund] at your university."

Although many faculty interviewed feel strongly that reducing campus emissions is the "right thing to do," and want the UC to lead, some expressed concern about projects disrupting teaching and research. They felt that campus operations were inefficient, there was a backlog of projects, when work does happen it hinders their own work, and that there wasn't a clear pathway for changes or reform in the process. However, others expressed general sympathy for improving energy efficiency, saw examples of projects that caused no major impacts to research and teaching, and thought that different stakeholders' interests had been adequately accounted for in new building design.

* The Task Force Report recommended that UC implement a standard shadow price as a first step for internal carbon accounting. The report suggests an internal carbon charge as a best practice for a campus, but does not recommend a systemwide charge.

While a number of faculty believe that everyone on their campus should share responsibility for reducing campus carbon emissions, they consider university administrators to hold primary responsibility in this area. When asked who should bear primary responsibility for reducing the carbon footprint of their campus (see Figure 13), a majority (54%) of the 134 faculty who responded to this item* identified administrators (campus-level, UC-level, or non-specific) as most responsible. Many (28%) stated that everyone on campus shares responsibility, and an additional 9% noted that everyone shares responsibility but also identified a specific group with primary responsibility. A much smaller number (6%) suggested that those on campus who consume the most energy or generate the most carbon emissions should bear primary responsibility, and a few (3%) saw no need to reduce their campus's carbon footprint. Notably, very few of the faculty respondents identified faculty/department chairs (3%) or students (1.5%) as bearing primary responsibility, indicating that they may be inclined to support action to reduce campuses' carbon emissions, but do not see themselves as responsible for taking the lead on the issue.

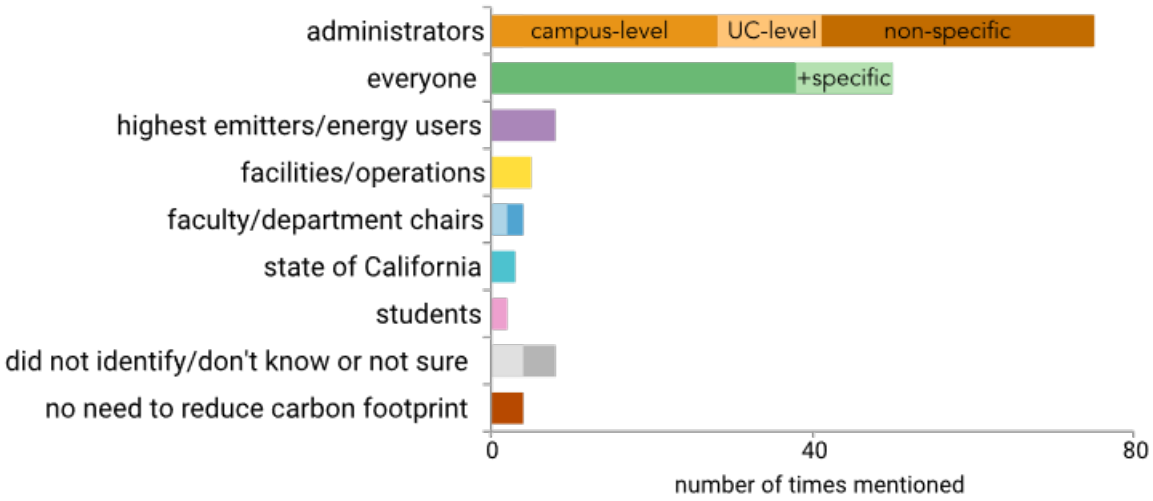

Figure 13. Faculty attitude toward who is primarily responsible for UCs carbon footprint reduction. Response to the question: Who do you think should bear primary responsibility for reducing the carbon footprint on your campus and why?

As a group, faculty respondents were cautiously optimistic about the effectiveness of their own, and the UC system's, actions to achieve carbon neutrality for UC by 2025. However, a substantial number of faculty are quite pessimistic about the possibility of achieving this goal. When asked to make judgments about collective efficacy (i.e., how much influence faculty have in helping the UC achieve carbon neutrality, how confident they are that other campuses or the UC Office of the President will do their part, or how effective the UC will be in addressing environmental problems), they reported feeling tempered levels of collective efficacy with respect to the five items we asked about. Figure 14 shows that while a majority (58%) of the faculty respondents are at least somewhat optimistic that the UC system can become carbon neutral by 2025, a large portion of the respondents are also pessimistic about achieving this outcome.

When asked in interviews about barriers to achieving carbon neutrality, faculty identified lack of funding for the initiative as a much greater barrier than the enormity of the goal, the short deadline, or lack of faculty interest in or willingness to make sacrifices for the initiative.

* Approximately 8% (~260) of the total survey respondents were assigned this question. Responses were coded by two independent coders with acceptable reliability (Cohen's Kappa = .77). Cases of disagreement were resolved by consensus.

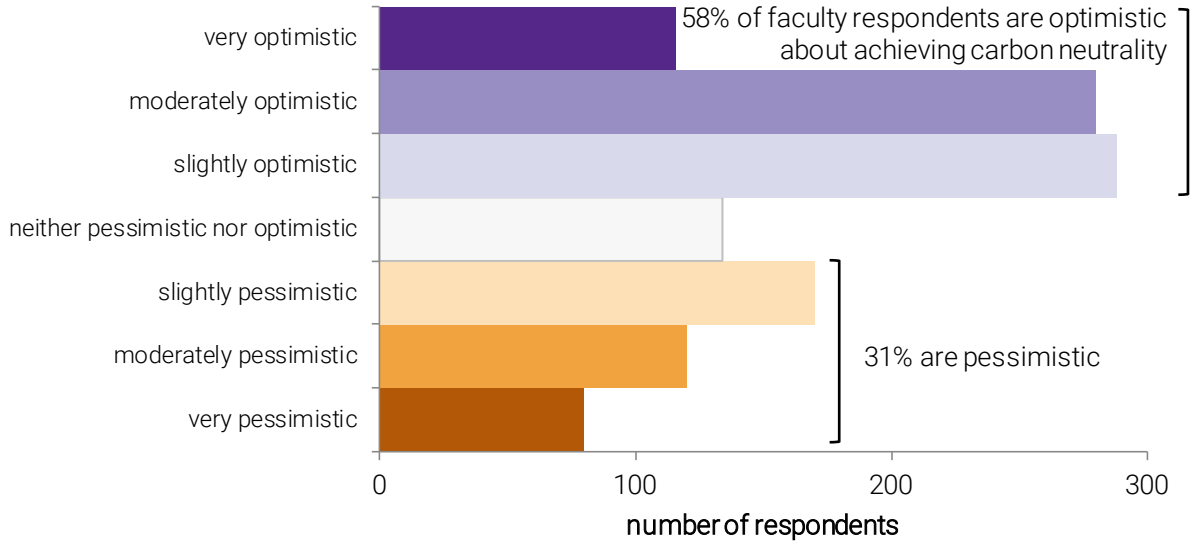

Figure 14. Faculty degree of optimism/pessimism that UC can become carbon-neutral by 2025. Responses to the question: How optimistic or pessimistic are you that the campus operations across the UC-system can become carbon neutral by 2025?

3.5.4. Faculty Attitudes on Campus Decision Making and Facilities Management

Faculty expressed their preference for consultative, collaborative decision making over centralized management and top-down decision making. While not wanting to participate personally in every decision, they feel strongly that faculty views should be represented and responded to when decisions are being made that affect their work or the core University mission. All of the faculty we interviewed had some experience with campus decision making; some were so busy with campus committees that they couldn't recall how many groups they were involved with, while others were much less involved. All faculty spoke of their investment and belief in UCs consensus-based model of decision making; however, many noted frustration when faculty opinions were not accounted for in decisions despite their participation in deliberation. Not all faculty thought it necessary for every member of the faculty to participate in each campus decision, but most stated the importance of having a faculty voice present. In cases where faculty concerns appeared to be ignored, faculty reported several possible reasons, including others "really" being in charge, solicitation of faculty feedback only to make it seem as if others had weighed in, or disorganization in the consensus process. Overall they wished to be involved in initiatives like the CNI, and had a series of suggestions for making it more effective. These suggestions included: improving follow through, reducing the burden on faculty by making their involvement worthwhile (e.g., listening to and acting upon their suggestions), reducing top-down mandates, accounting for inequality in campus policy impacts, reducing a proliferating bureaucracy, and reducing over-reliance on surveys that do not allow room for comment.

Many faculty expressed negative opinions about how campus facilities and operations are currently managed, and they expressed little confidence that changes to campus operations would be done in an efficient and productive manner. They felt that better organization and communication are essential if any changes to campus infrastructure are to be made. Many faculty seemed to have very poor opinions of the way things are done by facilities and operations. For instance, they felt as if there was a lack of consultation with those who were impacted by the work of operations staff, and efforts to manage or update infrastructure were generally perceived to be unorganized, slow, and inefficient. Faculty also felt that decisions about campus facilities were generally quite ad-hoc, with no clear primary contact. They also couldn't tell whether changes to a building (such as changes in heating or cooling) were done deliberately or due to poor building management. For those buildings that did report energy savings, they doubted whether the assessments of actual savings were correct and thought that at times that they must be overstated.

3.5.5. Faculty Perceptions of Strategies to Achieve Carbon Neutrality

Faculty who are already knowledgeable about the CNI or campus emissions reductions often have specific strategies in mind. Those who are currently less knowledgeable are looking for an inclusive, community-driven process for selecting and implementing campus emissions-reduction solutions. Of the faculty we interviewed, the few who were quite knowledgeable about carbon neutrality and/or emissions-reduction strategies had many suggestions, including technology upgrades, power-purchase agreements, and use of renewables. Those who were less familiar, on the other hand, highlighted the importance of creating an active, collective-solution approach. They suggested that those in charge of the CNI make it a priority to inform the campus about the carbon-neutrality goal, and invite students, staff, and faculty into the decision-making process. They wanted much more transparency, more information, joint projects between units, off-campus engagement, and communication about the initiative to a wider public. In short, they felt that if this is truly a priority for UC, the university needs to really engage the campus community and facilitate true collective decision making about the choice of strategies to achieve carbon neutrality.

Across the UC System, the support for energy efficiency, incentives for behavioral changes, and renewable-energy generation was higher than support for purchasing renewable energy and carbon offsets. (Figure 15) Of note is the strong preference for on-campus solutions that change the way energy is generated or used locally. Unfortunately, we neglected to include in the survey one solution option—market-based mechanisms that allow campuses to purchase the environmental attributes of renewable energy that is produced elsewhere (e.g., Renewable Energy Certificates, UCs biogas program) to compensate for emissions produced locally. However, the preference pattern shown here closely resembles the preferences of the students we surveyed (see Section 3.6.5), and favorability for these market-based strategies fell somewhere between favorability for purchasing renewable energy and favorability for purchasing carbon offsets.

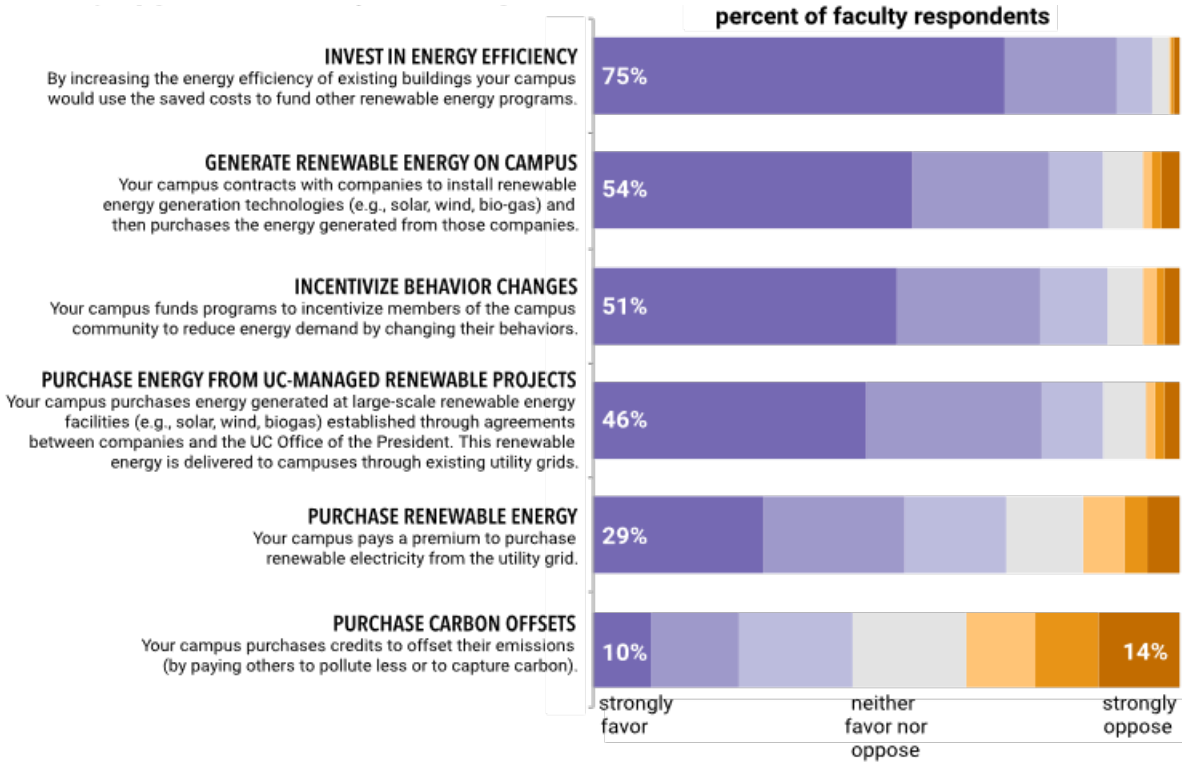

Figure 15. Degree of faculty support for new energy policy approaches. Responses to the question: New energy policies within the UC system might take any number of approaches. To what degree would you support or oppose adoption of the following approaches on your campus?

3.6. Focus on Students

The purpose of the research among students was to gain a depth and breadth of understanding of the student perspective using a combination of research methods, including a cross-campus survey, a series of focus groups, a barriers analysis, and a workshop of CNI fellows. Overall, the findings were consistent and supportive across methods, though they represent a narrow segment of the UC student population. The response rate for the survey was very small, and we received considerably more responses from some campuses than others. However, the students who did participate in the survey are very active on their campuses, highly supportive of the CNI specifically, and supporting of social/environmental issues generally. Thus, their responses reflect those students who are most likely to be involved with on-campus efforts to achieve carbon neutrality, and should be taken as such. Moreover, in the case of the other research methods we employed, which focused on student activists and leaders whose level of involvement in the issues under consideration may be quite different from the average student. Thus, results from these methods cannot be viewed as representative of the typical student across the UC system or within any individual campus. Given the central importance of student voices in driving institutional change, and particularly the role of student leaders, we used multiple approaches to gain an understanding of their knowledge, attitudes, and willingness to engage with the CNI.

3.6.1. Data and Analytic Approach

3.6.1.1. Barrier Analysis Survey of UC Student Government Members (Barrier Analysis*)

An invitation to complete an online survey was sent to 385 undergraduate and graduate members of the University of California Student Association (UCSA) a key student-led leadership organization across the UC system. Invitations to participate were sent to UCSA members at all 10 UC campuses in July 2017. This survey was designed around a "barriers analysis" framework, which requires a focus on a specific behavior within a specific audience[47]. The survey elicited information about perceived barriers and benefits to using a coordinated student government resolution to spur UC campus action on energy sustainability and carbon emissions reduction. Fifty-six of the invited participants completed the survey, corresponding to a participation rate of 15%. Although we do not have demographic information about UC student government members as a standard for comparison, we do know that 62% of our barrier analysis survey identified as female and 52% were graduate students. Participation rates varied by campus, ranging from 29% of participants affiliated with UC Irvine to 3% of participants affiliated with UCLA.

3.6.1.2. Focus Groups with Environmentally Engaged Students at Two UC Campuses (Focus Groups)

Two focus groups (one at UCLA and one at UCSD) and one interview (UCSD) were conducted in May and June of 2017. During these conversations, participants responded to questions and prompts designed to reveal student values and identity as they relate to carbon neutrality, existing knowledge and attitudes about possible energy and CNI funding strategies and tradeoffs, and their reactions to several distinct messaging strategies for the issue. Twenty-six UC students, most of whom were already engaged with environmental or sustainability activities on their campuses, participated in the study.

3.6.1.3. Student Engagement-Focused Workshop with CNI-engaged Students (Workshop)

Six current or former CNI Student Engagement Fellows and 3 of our own project interns (6 undergraduate, 3 graduate students) participated in a two-day workshop and meeting, designed and hosted as part of this project, and focused on student engagement with the CNI. Because these students were engaged in work to support the CNI, it is reasonable to expect them to be among the students who are most informed about the issue. During the meeting, attendees participated in a workshop on prioritizing CNI energy and funding strategies. Near the end of the workshop, attendees began work on recommendations for strengthening the CNI Fellows program to more effectively promote and empower student engagement with this issue.

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* A Barrier Analysis is a rapid assessment tool used to identify behavioral determinants— the reason why someone does or does not do something—associated with a particular behavior to determine key messages and activities for intervention. Through a Barrier Analysis, participants are surveyed to identify "barriers" that can block people from taking action. Survey questions also identify "benefits" or "promoters" - the positive attributes of an action that can be used to motivate that behavior.

We apply qualitative analysis to the outcomes of the workshop, the recommendations drafted by the students, and students' reports on their own experiences with the project.

3.6.1.4. Survey Distributed to UC Students Through Campus Social Media (Survey)

A brief online student survey was distributed via social media (through campus communications personnel and UCOP communications personnel) in the spring and summer of 2017. This survey was designed to gather information about

1. student knowledge and awareness of the CNI and related topics
2. attitudes toward possible actions to achieve carbon neutrality
3. priorities in the face of tradeoffs
4. possible avenues of student engagement

While we designed the survey with a broad sample of UC students in mind, we were unable to use distribution channels that would allow us to recruit broad student participation. Respondents were more likely than the UC student population to be female, liberal, and majoring in a scientific or technical field, and response rates varied from campus to campus. (See Appendix 6.1.4 for additional information about demographics and methods.)

3.6.2. Representativeness of Findings and Limits to Generalizability

Due to the significant constraints on distribution and resulting low participation rate, we do not consider the responses to be representative of the UC student population as a whole. There are important limits to the generalizability of these findings. The students who participated in our surveys, focus groups and workshop were self-selected, and for that reason we emphasize they are not a representative sample of the UC student population. For each of the studies we conducted, students who already had some interest in the issues of energy, sustainability, or climate change were likely more willing to participate in our research. In fact, 41% of survey participants reported being involved with sustainability-focused organizations, as did 38% of barrier analysis participants. As reported above, our survey and barrier analysis participants also differ demographically from the UC student population; demographic data were not collected for the workshop and focus group participants. While it is important that our findings not be construed as representative of the perspectives of UC students overall, it is reasonable to estimate that they are fairly representative of the perspectives of students who are already engaged with sustainability and climate change issues.

3.6.3. Student Knowledge About the CNI

Even though it is likely that many of the students who participated in our research are among those already engaged with sustainability and climate issues, their familiarity with, and understanding of, the CNI was relatively limited. Even students who were already familiar with the CNI or engaged with environmental issues saw a need for more information or anticipated a benefit from deeper understanding of CNI goals and strategies.

Barrier analysis

When asked to describe or define campus energy sustainability, student government representatives were most likely to mention energy efficiency, minimizing consumption, or avoiding resource depletion (29% of respondents), water/food/waste management (16%), or use of renewable energy (13%). A smaller number (9%) made reference to some type of "neutrality" concept, but there appeared to be some confusion about what was meant by "neutral," with one respondent identifying "zero net energy" and another "net zero" without indicating anything more specific. Interestingly, a substantial number (23%) of respondents either did not respond to this question or reported that they didn't know, suggesting a substantial lack of knowledge or a lack of confidence in understanding of this issue.

Student government representatives were also asked about their willingness to commit time to a resolution to the administration that calls for a plan and accountability for campus energy sustainability. Those who were most willing were significantly more likely to indicate that they think they have the knowledge, resources, and skills necessary to support and commit time to a resolution. Interestingly, those more willing to commit time were also significantly more likely to indicate a need for more information and background on the issue than those less willing to commit time. Together, these results suggest that knowledge, skills,

and information are an important aspect of willingness to take action, and that programs focused on providing relevant information could increase both willingness to commit effort to the issue and capacity on the part of student government leaders to take meaningful action.

Survey

While other research efforts completed as part of this project point to low familiarity with the CNI, most students who participated in our survey stated that they were at least somewhat familiar with the CNI (63%, N = 224). This provides further evidence that survey respondents are likely part of a specific subpopulation within the UC student community that is already engaged with environmental and sustainability issues. Among this group of students, familiarity is positively associated with membership in environmental or non-environmental student organizations. This suggests that either these platforms expose students to information about the CNI or these students are more likely to seek it out. Nonetheless, 33% of the respondents stated that they had never heard of the CNI. Also, only 29% (N = 214) of the respondents felt as though they "definitely" know enough about the issue of carbon neutrality to have an informed opinion.

Focus groups

While most of the 22 students who participated had heard of the CNI, when they were asked to explain carbon neutrality, many responses involved topics that are only somewhat related, such as divestment and recycling. They seemed confused as to what campus environmental initiatives were aligned with the CNI and what the campus had done towards achieving carbon neutrality. Further, they didn't believe that most students had heard of the CNI or that students who were not already involved with sustainability-focused activities would want to get involved. So while students that we engaged with may be familiar with the CNI, most recognize that they do not know enough to have an informed opinion.

Workshop

The nine students who participated in the workshop all had formal responsibilities related to the CNI (six were CNI Student Engagement Fellows and three were TomKat Strategic Communication project interns), so they would be expected to have a reasonably comprehensive understanding of CNI goals and strategies. Nonetheless, they found significant value in the energy and funding strategies workshop that we provided to them. In particular, they incorporated a recommendation related to these types of information into their own recommendations for strengthening the CNI Fellows program, recommending specifically an infographic that describes the current state of the CNI, a deeper introduction to CNI energy and funding strategies, and summaries of campus Climate Action Plans and other reports and relevant research. One of these students, who had been a CNI Student Fellow for two years commented:

> *I think there were specific ways in which the TomKat working group impacted my understanding of carbon neutrality…the worksheet that we went through, that process of* ***getting really definite about the strategies that we're actually going to use to reduce carbon emissions****…[and] how much carbon emissions will be reduced from each particular strategy,* ***and then the funding mechanisms as well****. Going through that, and talking through the pros and cons of each scenario with a sizable group of informed students was a really, really valuable thing for me, because with such a macroscopic high-level decision like that…it was really helpful to have people who had different perspectives… [and] provided* ***viewpoints that I would have never thought of on my own****, and definitely rounded out my understanding. [emphasis added]*

3.6.4. Student Attitudes on Actions to Address Climate Change

Students who participated in our research are very supportive of achieving campus energy sustainability. They support using the CNI as a strategy for reducing campus carbon emissions, but their support diminishes somewhat when potential tradeoffs are brought to mind.

Barrier analysis

Eighty-nine percent of respondents indicated support of the UCSA passing a resolution, coordinated across all 10 UC campuses, that calls for a plan and accountability for campus energy sustainability. However, somewhat fewer (68%) expressed willingness to commit time to supporting and developing such a resolution.

Survey

Among respondents who participated in the survey, support for the CNI and efforts to reduce carbon emissions generally is very high. Ninety-two percent (N = 224) of the respondents believe it is "important" or "very important" for their campuses to reduce carbon emissions as much as possible. When informed of the specific goal of the CNI*, again support was very high, with 94% (N = 221) expressing that it is "important" or "very important" for their campuses to achieve the carbon neutrality goal. Even when informed that tradeoffs such as reductions in campus programs or services, amenities and/or departmental budgets, 50% of respondents still responded that carbon neutrality should "definitely" be a priority for their campuses, and an additional 38% thought that it "probably" should be (N = 204).

Key motivations for student support of actions to reduce campus carbon emissions include the need to address climate change and a desire for UC campuses to demonstrate leadership on environmental issues.

Barrier analysis

When asked about the seriousness of possible outcomes if campuses do not take actions on energy sustainability, student government representatives considered failure to take a leadership role in society, spending more money, and contributing to adverse impacts on marginalized communities to be the most serious impacts (see Figure 16). Student leaders were least concerned overall about energy availability and reliability or diminished campus services. Student government members who were less willing to commit time to a resolution nevertheless perceived campus spending, impacts on marginalized communities, and going against campus values as seriously as did those more willing to commit effort to a resolution. At the same time, those more willing to invest effort were more likely to perceive 1) failing to take a leadership role, 2) contributing to climate change, and 3) limitations to truly sustainable lifestyles as having serious impacts. These findings suggesting the possibility that 1) the students currently most willing to dedicate effort to this issue are motivated primarily by environmental concerns, and by the desire to demonstrate leadership on these issues, and 2) students concerned about education costs and social justice may not currently be seeing action to promote campus energy sustainability as a way to promote change on these issues.

When asked about how dedicating effort to a student resolution on this issue would benefit them, student government representatives were most likely to identify opportunities to make more progress through collaboration, the perception that such action is good or moral, and positive environmental or sustainability impacts. Those who indicated more willingness to commit time to a resolution were dramatically more likely to identify collaboration as a benefit, and also more likely to identify opportunities for their campus to take a leadership role and for them to advance a student agenda.

Survey

Students who responded to the survey were very likely to express support for the CNI and for efforts to reduce carbon emissions more generally. A majority of respondents strongly agreed that UC carbon neutrality was important because it helps to address climate change, demonstrates UC leadership on environmental issues, and has local benefits such as clean air. Saving their campus money, fostering a sense of campus pride, or making progress toward other social justice goals were less frequently reported as important reasons for reducing carbon emissions or supporting the CNI to reach neutrality and strongly support other issues related to carbon neutrality (see Figure 17).

So although respondents may not know a lot about the CNI, they expressed willingness to take significant personal action to reach neutrality and strongly support other issues related to carbon neutrality.

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* Survey respondents saw the following description of the CNI: "The University of California (UC) Carbon Neutrality Initiative (CNI) commits all ten UC campuses to eliminate or compensate for all greenhouse gas emissions associated with onsite combustion and purchased electricity by 2025. To achieve this goal, UC campuses will need to pursue a variety of strategies that include cutting energy demand, increasing energy efficiency, and replacing fossil fuel energy sources with renewables. Campuses will also need to make investments or participate in programs that reduce emissions off campus to compensate for remaining campus emissions. Such investments and programs are generally referred to as "carbon offsetting". The 2025 goal is very ambitious; the UC would be the first large university system to accomplish such a feat. It's a challenging goal with a number of important considerations and tradeoffs, however."

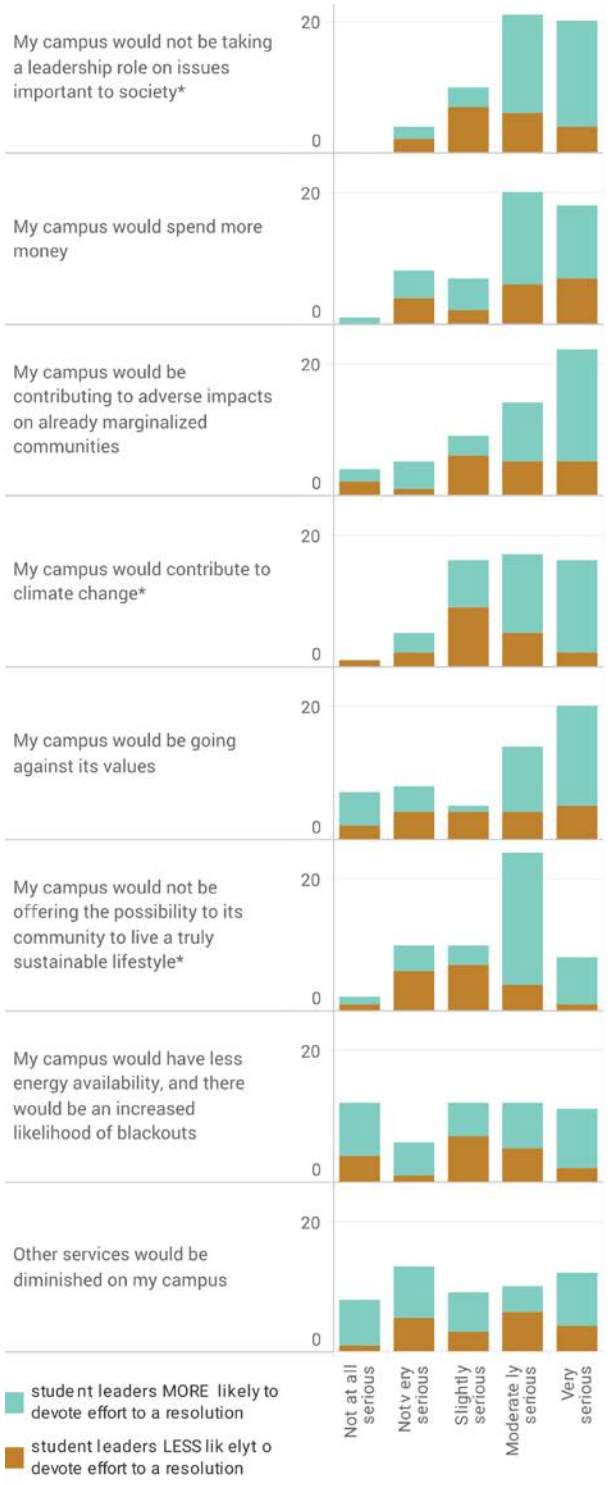


Figure 16. Student leader attitude toward progress on energy sustainability. Student leaders ranked the seriousness of different possible outcomes if their campus does not make progress on energy sustainability. Student leaders who expressed more willingness to commit time to a resolution were more likely to indicate higher seriousness for items marked with an asterisk. Responses to the question "How serious would the following factors be in your campus does not make progress in energy sustainability?"

Student respondents anticipate personal benefits and social approval for actions focused on campus energy sustainability, but report a need for support from student peers in order to make this type of action a priority.

Barrier analysis

When asked questions related to the social acceptability of supporting and committing time to a resolution, responses indicated very high perceived social acceptability for this type of action. Twenty-one percent of respondents* indicated that no one would disapprove. A few respondents mentioned people with competing priorities, faculty, politically motivated individuals, and those not supportive of climate action.

When asked about anticipated personal benefits associated with participating in action through a student resolution, student government representatives were most likely to identify opportunities to make more progress through collaboration, the perception that such action is good or morally just, and positive environmental or sustainability impacts. Those who indicated more willingness to commit time to a resolution were dramatically more likely to identify collaboration as a benefit, and also more likely to identify opportunities for their campus to take a leadership role and for them to advance a student agenda. Both groups indicated that they would need support from other students to support and commit time to such a resolution.

* This is likely a low estimate due to the fact that the number of non-responses was unexpectedly high for this particular question. If one assumes that the true non-response rate should be similar to the non-responses to the subsequent question (about who would approve) and the balance can be interpreted as 'no one', this value jumps to 38%.

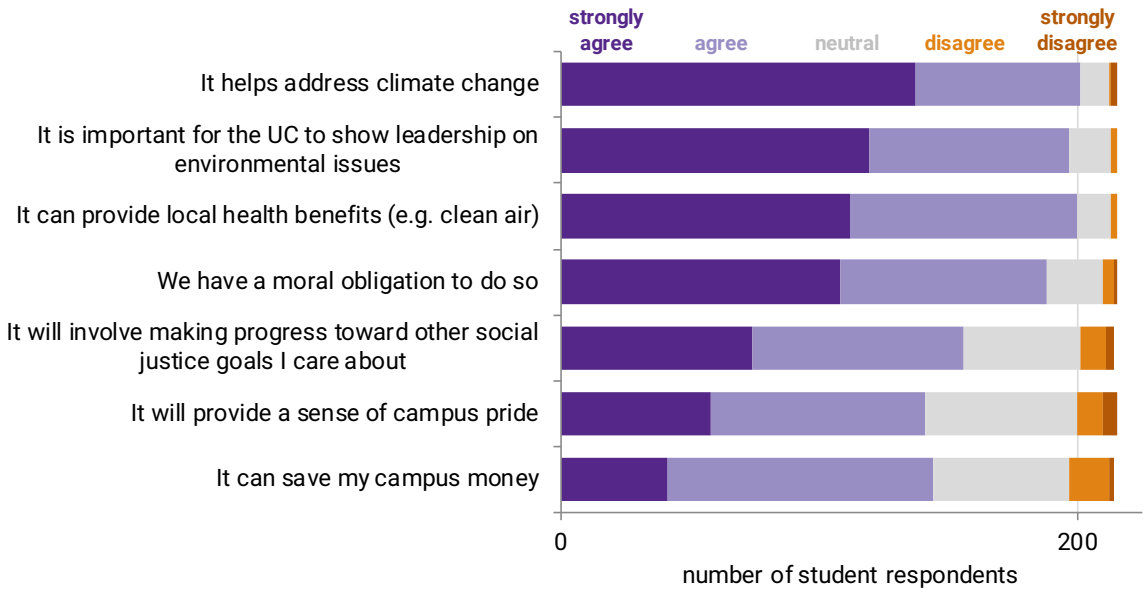


Figure 17. Why student leaders think carbon neutrality is important. Response to the question "We are also interested in why you think carbon neutrality is important. How well do these reasons correspond to your feelings?" (n=215)

Student respondents are willing to participate in a variety of actions to help achieve carbon neutrality, with energy conservation behaviors and "green" transportation choices eliciting highest willingness. Willingness was substantially lower for actions directed at convincing campus leadership to take action on the issue, and students expressed concern about taking on activities that would impact the time they have for other priorities.

Survey

Students who responded to the survey expressed high willingness to engage in a variety of actions to help achieve carbon neutrality. Nearly all of the 215 who responded to an item about willingness to take specific actions (see Figure 18), reported willingness to conserve energy from lights and electronics and to use green transportation methods for travel to campus. On the other hand, only 41% of respondents indicated willingness to join a committee or take on a student government role to represent student perspectives on carbon neutrality. In terms of actions intended specifically to influence others, most respondents expressed willingness to sign a petition or discuss the issue with peers, while fewer were willing to participate in a demonstration/march/protest or discuss the issue with faculty, staff, or administrators. Interestingly, those who are willing to engage in protests and other more difficult actions are generally more likely to support a new student fee to help pay for the costs of carbon neutrality (see Appendix 6.1.4).

Barrier analysis

Students reported being very busy, and one of the biggest barriers mentioned in this survey is a lack of time to devote to new activities. When asked about potential negative consequences of getting involved with a resolution, student government representatives noted that they would have less time both for studying and for devoting to other issues that are important to them. They also indicated that lack of time and/or competing priorities are the factors that would pose the greatest challenges to their committing time to a resolution.

3.6.5. Student Priorities for Carbon Neutrality/Emission Reduction Strategies

Students who participated in our research were split on whether a student fee should help fund energy sustainability initiatives on campus, reflecting the high priority many students place on education affordability and avoiding economic impacts.

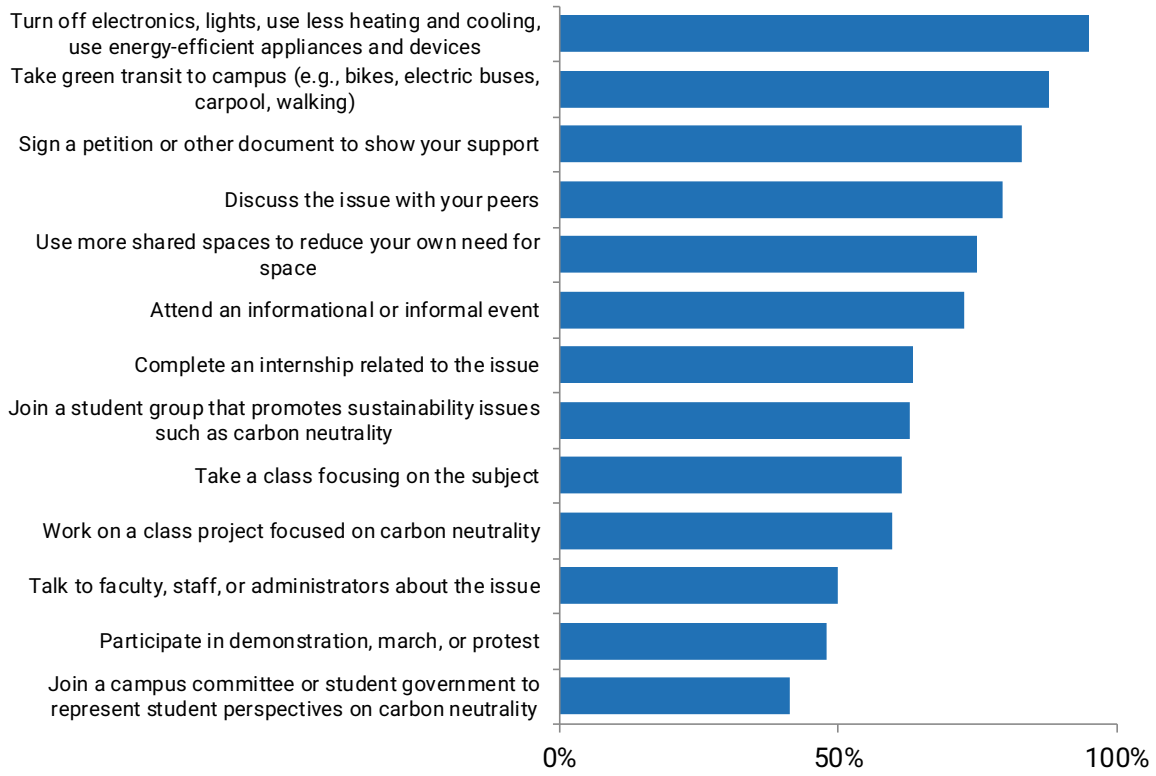


Figure 18. Student willingness to take specific actions to help achieve carbon neutrality. Student responses (percent of respondents) to the question, "Which actions would you be willing to take to help achieve carbon neutrality on your campus?"

Survey

While 44% of respondents were in favor of establishing a new student fee to help pay for energy-related carbon-neutrality programs, 14% strongly disliked the idea of doing so (N = 228). They were, however, somewhat more open to fees being imposed upon the highest polluters on campus (Figure 19).

Barrier analysis

Student-government representatives identified the potential for increased costs or restrictions to unfairly burden students as one of the most important challenges to making progress on energy sustainability through a student-government resolution.

Students who participated in our research viewed development of renewable energy on or near campus very favorably. They also expressed strong support for campus infrastructure improvements (e.g., energy-efficiency,

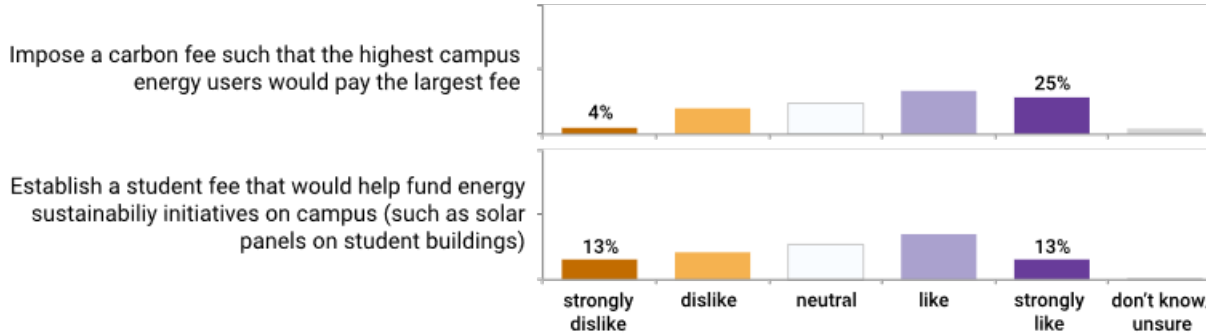


Figure 19. Student support for potential ways to fund carbon emission-reduction projects. Student responses (percent of respondents) to the question, "How do you feel about potential ways to fund carbon emissions reduction projects on campus?"

LEED certification), and purchase of low-carbon goods and supplies. Support for market-based emission-reduction strategies such as renewable energy credits (RECs) and carbon offsets received much less support, with a substantial portion of respondents expressing opposition to such strategies. If campuses intend to reach neutrality through RECs or direct student investment in carbon offsets, they may encounter decreased support for the CNI.

Survey

In general, students strongly support developing on-campus renewable energy, increasing energy efficiency in buildings, requiring new construction to meet low carbon standards, and imposing a carbon tax on campus members (Figure 20). Just 15% of students surveyed strongly support the purchase of renewable energy credits. This is also the option that students feel most neutral to (34%) or unsure of (13%, N = 244). In addition, although a renewable source of energy, support for RECs is not correlated with support for on- of off-campus renewables, suggesting that students do not see these as falling under the same umbrella.

However, when asked if they feel carbon neutrality is important for their campus even if it means buying carbon offsets only 52% are still in favor of the goal, amounting to a 42-point reduction in support (N = 204) (c.f. Figure 21 vs. Figure 20). This is emphasized even further when purchasing offsets comes at the cost of investment in long-term energy efficiency. In this case, only 24% of student respondents expressed support for the purchase of offsets to achieve the goal (N = 204), indicating preference for long-term sustainability achievements over the short-term benefit of reaching the CNI sooner through purchase of offsets. Furthermore, resistance toward offsets is most striking among students who are most interested in actions that increase campus energy efficiency (see Appendix 6.1.4). That is, many students who initially express for carbon offsetting strategies waver in their support if such strategies are associated with establishing a new student fee.

Focus groups

After being shown a graphic depicting a potential mix of strategies to meet carbon neutrality, students expressed the most negative reactions to offsets. It became apparent that many participants didn't understand what offsets were, and offsets needed to be explained. Most participants were opposed to using them, and one student called them a "cop-out." Instead, participants preferred that money be spent for on-campus strategies that directly benefit the campus. However, after being shown screenshots of a rainforest protection and reforestation project that provides offsets, some students modified their response and were willing to accept verified offsets, as long as the offset projects were transparent. Overall, however, students still said that even if offsets were used, they should not be a heavily used strategy. So although students appear willing to accept potential tradeoffs associated with reaching carbon neutrality, their support for the CNI is reduced in light of offsets. These findings point to two conclusions: 1) in general students will temper their support for carbon neutrality as long as offsets are on the table; 2) this reaction is likely to depend on how offsets are described and presented.

Workshop

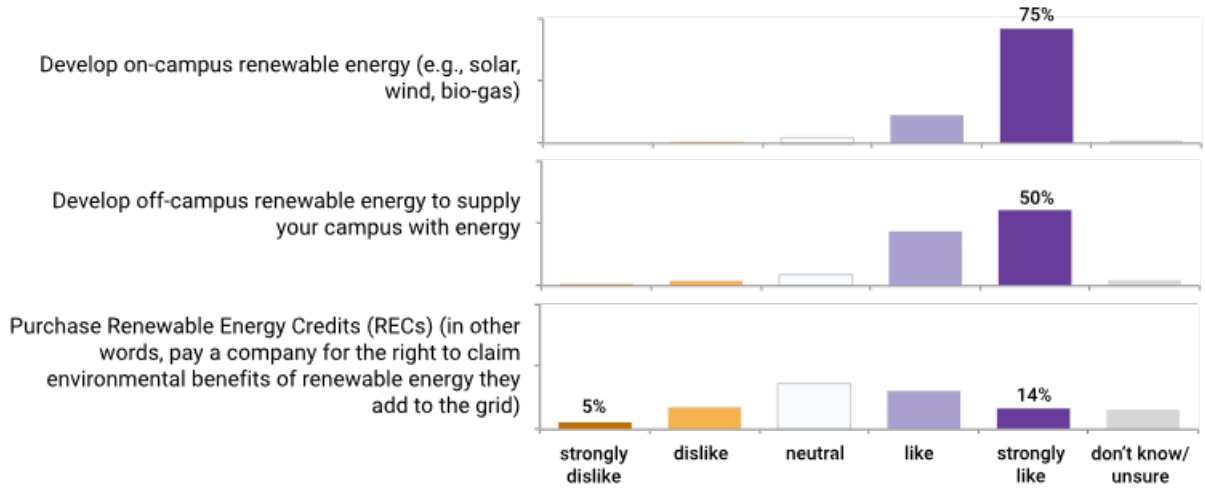
Students who participated in the workshop expressed notable preferences for on-campus and local renewable energy solutions and campus energy efficiency measures. They envisioned behavior change playing an important role in campus strategies for carbon neutrality. While the purchase of carbon offsets was not considered ideal, some level of investment in offsets was seen by these students as a practical way to achieve the carbon neutrality goal.

Students who expressed support for campus emissions reduction were also very likely to indicate that it is important for UC to divest from fossil fuel companies.

Survey

A majority of student respondents endorsed the importance of UC divestment, with 84% reporting they consider the issue important or very important (Figure 22). Additionally, willingness to participate in a wider variety of campus actions to achieve carbon neutrality is associated with increased support for divestment (see Appendix 6.1.4, Figure 72). Because students who express support for the types of action necessary to achieve carbon neutrality are also very likely to think divestment is important, support for carbon neutrality is likely to be highest if carbon neutrality is approached in concert with fossil fuel divestment

a. Ways to acquire low-carbon energy



b. Campus construction and purchasing strategies

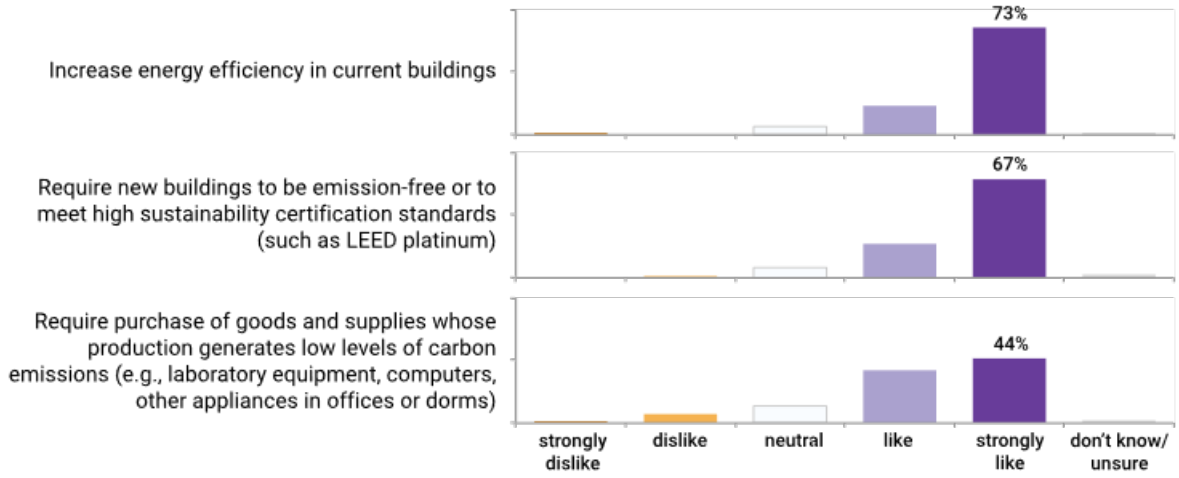


Figure 20. Student feelings about different ways to acquire low-carbon energy. Student responses (percent of respondents) to the question: a) "How do you feel about different ways to acquire low carbon energy? And b) " How do you feel about the following campus construction and purchasing strategies?"

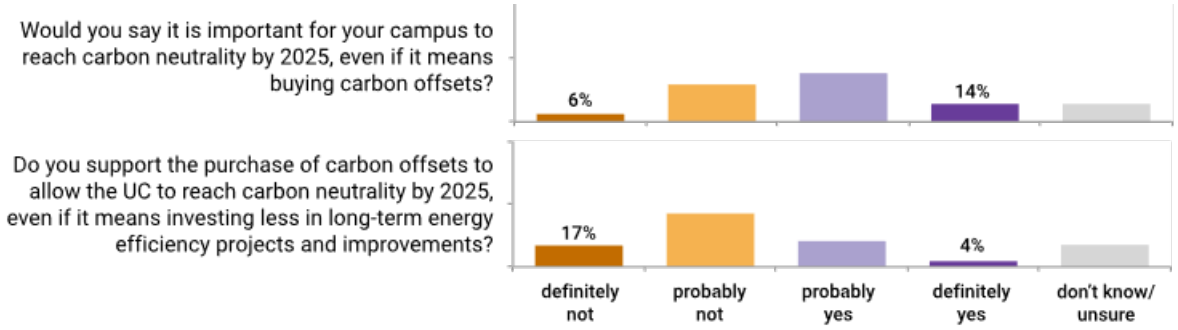


Figure 21. Student attitudes toward carbon offsets (percent of respondents).

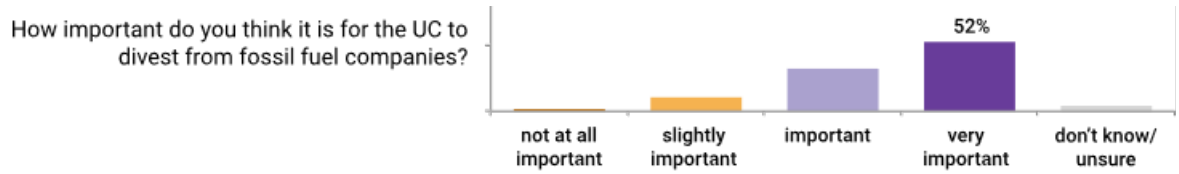


Figure 22. Student attitudes toward divestment. Student responses (percent of respondents) to the question, How important do you think it is for the UC to divest from fossil fuel companies?

Students who participated perceived behavior change and awareness-raising activities as important strategies for achieving UC carbon neutrality, and questioned why they were not represented as key elements of the overall UC strategy.

Barrier analysis

When asked about what measures (beyond a student government resolution) would help to achieve energy sustainability for their campuses, the student government representatives who responded to the survey were most likely to identify awareness-raising activities (e.g., events, how-to guidance, the need for knowledge, teaching, learning, or marketing), involvement of campus administrators, funding for the effort, and campus/UC accountability. While mentioned less frequently overall, the need for government involvement (either through legislation or by providing funding) was more frequently identified by those less likely to commit time to a resolution. Those more likely to commit time to a resolution were significantly more likely to identify awareness-raising as a key strategy.

Focus groups

There was concern among participants as to why behavior change was not included as a strategy for meeting carbon neutrality. This reflects earlier sentiments regarding motivation and engagement: students want actionable ways to reduce carbon emissions, and behavior change represents a clear way for them to participate in the CNI.

3.6.6. Student Perceptions of Responsibility for Action and Leadership

Students ascribe primary responsibility for carbon neutrality actions to campus administrators and staff, but also desire to have a voice in decision making regarding which particular strategies to pursue. Students expressed a desire for greater data and transparency, both about expenditures and the effectiveness of those expenditures.

Barrier analysis

Respondents did not feel that they were primarily responsible for taking the lead on actions to achieve carbon neutrality. Rather, they saw such actions as the responsibility of campus leadership and UCOP (Figure 23). However, all students surveyed were still willing to take action to help out through such actions as making personal behavioral changes, signing a petition, or attending a protest.

Overall, respondents felt that the university groups that take students' desires into consideration were 1) student leaders, 2) other students on campus, 3) the Office of the President, and 4) the chancellor's office. The groups that they felt were the least responsive were 1) faculty, 2) department chairs, 3) deans, and 4) development staff. Students who indicated more willingness to commit time to resolution were more likely to respond that student leaders and other students on campus take students' desires into account.

Focus groups

Students expressed mistrust of UCOP and upper-level UC administration, particularly around how UC handles funds. For instance, UCLA students brought up a recent scandal involving the potential concealment of funds by UCOP (~$175 million in a private reserve), which generated broad skepticism among students as to whether UCOP funds were being spent wisely. Similarly, UCSD students cited a recently installed commemorative engraving, seal, and bench that used $30,000 in UCSD student fees as an example of misappropriated funds. Other students highlighted the top-down nature of the CNI and commented that if this entire project was UCOP's idea, then they should figure out how to fund it without asking students. However, the majority of participants felt that the general student body would be willing to

accept an increase in student fees, as long as there was considerably more transparency in how their money was being spent. Student trust can be improved by increasing transparency, especially regarding potential fee increases or fund allocation for CNI projects.

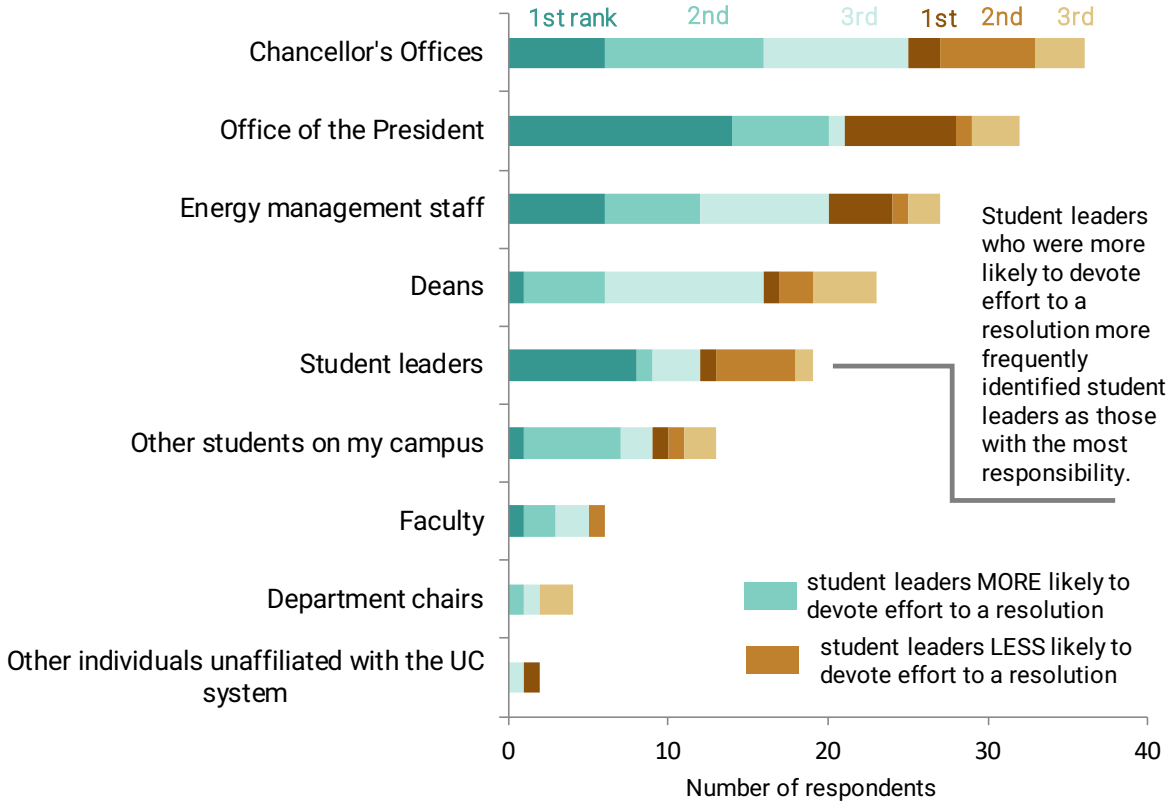


Figure 23. Student opinion of who should be accountable for carbon neutrality Student response to the question, Please rank the following in order of who you think is most to least responsible for supporting and committing time to a resolution (or other similar initiatives) to the administration that calls for a plan and accountability for campus energy sustainability?

3.6.7. Possible Avenues to Greater Student Engagement

Students who participated in our research, and especially those who indicated higher willingness to take actions to achieve carbon neutrality, expressed a need for more information about carbon neutrality. In particular, they saw a need for clear, actionable information about the various strategies UC and campuses are pursuing or considering.

Across all of our student-focused studies, respondents indicated a desire for more information on the full spectrum of strategies that the UC is pursuing or considering to achieve carbon neutrality. In fact, our results suggest that lack of information about the opportunities and constraints associated with each potential strategy limit students' preferred options for energy sustainability and avenues for student engagement. Types of information desired include campus emissions data that demonstrate the magnitude of the challenge, quantitative and contextualized information about the progress that has already been made in reducing those emissions, and transparency about how funds to support progress toward carbon neutrality are being acquired and invested.

Barrier analysis

Regarding the framing of the CNI, students felt that there was a distinct lack of information about solutions available. They felt that they were unable to act and wanted more information on how they could help achieve carbon neutrality on their campuses. The barriers analysis revealed that students want actual, clear

plans for engagement, everything from zero-waste events to workshops or seminars explaining carbon neutrality and how they can help. Student-government representatives who were most willing to commit time to a resolution were significantly more likely to indicate a need for more information and background on the issue than those less willing to commit time. When asked participants to identify things that would make it easier for them to support and commit time to a student government resolution, student-government leaders identified an explicit vision for energy sustainability, including plans for communication and implementation of specific goals, actions, timelines, systems for accountability, and time commitments required. These student leaders also pointed to a lack of access to and information about campus decision making as a barrier to their involvement with the issue.

Student participants identified "ownership," participation in decision making, and confidence that their actions will have an impact as important motivators for the actions and activities they choose to pursue. Students expressed a need for the freedom to create and direct their own activities, and saw systems for supporting long-term communication and collaboration as key to student engagement and effectiveness.

Barrier analysis

Student-government representatives identified having a voice on important issues and/or having access to decision makers and having opportunities to advance a student agenda as important benefits of passing student government resolutions. This could be an important issue, and we anticipate involvement of student government in energy sustainability/carbon neutrality to be a more likely avenue of action if these benefits are salient characteristics of the process. This could involve student government representation on decision-making teams and committees and hearing from fellow students that this is a priority for them.

Student-government representatives identified difficulty coordinating (including both logistics and differences in needs/vision/goals) as one of the most important challenges to making progress on energy sustainability through a student-government resolution. When asked to identify factors that would make it easier for them to commit time to a resolution, respondents identified processes for inter-campus coordination, systems for task delegation and specialized roles, and key contacts or means to network (e.g., communication platforms and events) with potential collaborators.

Student leaders who responded to our survey expressed concerns that their actions would not influence decision makers or make significant contributions toward energy efficiency. In particular, those who were less supportive of action to achieve carbon neutrality also indicated stronger confidence in external support (e.g., government support or regulation) than their own ability to bring about change. However, students who were more supportive of acting on carbon neutrality had stronger confidence in their own influence.

Focus groups

UCLA and UCSD students overwhelmingly responded that their motivation to engage with campus initiatives and groups was to seek out opportunities that allowed them to take ownership of the task at hand, and to influence the direction of a project. For example, The Green Initiative Fund (TGIF), which was created through a student-supported increase in student fees, represents an actionable way for students to reduce UCs environmental impact. Participants explained that the key reason for accepting this fee increase was that they were able to witness the kinds of projects it helped finance, and also because the initiative was student-driven. Students who participated in our focus groups also felt that it was important to implement platforms for coordinated effort moving forward, such as a more robust plan for the CNI fellows or clearer avenues into student government or campus committees.

Students who participated in our research expressed the most interest in engaging with carbon-neutrality-related activities that also provide hands-on opportunities for career development, such as authentic research opportunities, group work with a diversity of participants, paid internships, and class credit.

Survey

Students were asked what would inspire them to get involved with energy sustainability or carbon neutrality on their campuses. Students expressed the most interest in opportunities to learn new skills or build their resume, including paid opportunities. They also reported interest with involvement in with faculty research, access to data that measures clearly illustrates campus progress, and fun events. Interestingly, competitions, recognition for the university, and class projects associated with carbon neutrality do not appear to motivate engagement for many students.

Focus groups

Students expressed more support for initiatives that allow them to actively participate, and identified access to credible, salient CNI data and information as key to enabling this type of active participation.

These students reported preferences for the types of hands-on activities that are available elsewhere on their campuses. For instance, UCLA students mentioned an annual dance marathon that raised money for pediatric AIDs, as well as a sustainable music festival put on each year. Students explained how these fun, social initiatives were successful in bringing student groups together across the entire campus to the point where they have now become embedded in campus traditions.

Workshop

Students who participated in the workshop and research activities carried out by the working group reported a variety of benefits associated with their participation in the project. When discussing their experiences with the project, they highlighted benefits associated with 1) a deeper understanding of carbon neutrality strategies and the complexities of university decision making, 2) increased familiarity with theory and research to inform communication and engagement, 3) experiences that helped to shape their own educational and career plans, 4) exposure to multiple perspectives (at the individual and campus levels), 5) the satisfaction of feeling part of a team working toward a shared goal, and 6) opportunities to share their own insights with other students who were embarking on similar work. These students' experiences demonstrate the range of benefits that students can experience through participation in carbon-neutrality focused projects, and offer ideas for aspects of opportunities that students are likely to find engaging.

Campus-specific issue framing and messaging provide opportunities to resonate with existing student interests and values.

Focus groups

We found that students in the focus groups identify with their specific campus and not the entire UC system. This suggests that campus-specific initiatives are likely to be more successful, and that a campus rather than UCOP identity for CNI goals and projects could be helpful in engaging students. They knew little about the other campuses and mentioned that student organizations and initiatives were focused on their campuses. UCLA students also felt a strong Californian identity; they expressed pride in California's role as an environmental leader, especially given the current presidential administration's stance on the environment.

Students at UCLA and UCSD responded differently to the same messages. UCLA students overwhelmingly agreed that a social-justice frame would be best received, as their campus places a large emphasis on social justice, and that that approach would engage many students who are actively involved with the issue. However, UCSD participants didn't seem to think that environmental justice and social justice were clearly linked. Instead, these students preferred a message frame, that emphasized a sense of urgency ("We Can't Wait") to engage students. But, the UCLA students suggested that the "We Can't Wait" frame could agitate the general student body—especially without actionable methods, such as examples of behavior change to accompany the urgent message. These differences can be traced to differences in campus cultures, highlighting the need for campus-specific messaging.

3.7. Stakeholder Feedback for Energy Information Design

Through The Green Initiative Fund at UC Santa Barbara, funding was obtained to create a Theory of Change* for engaging students, staff, and faculty in the effort to achieve energy sustainability (especially as related to Scope 1 and 2 emissions) at UCSB. In coordination with UCSB Facilities Management staff, we conducted 10 semi-structured interviews with 11 respondents, including faculty, building managers, staff within housing and dining services, upper-level administration, and students. Findings of this study were intended to inform development of an energy data dashboard for the UCSB campus that would include 1)

* Theory of Change is a rigorous formal process in which project stakeholders map out the actions and conditions they believe are necessary in order to achieve an ultimate desired outcome. This approach identifies the desired long-term goal and then works backward to fill in the "missing middle" of the process. The outcomes are depicted graphically in a format also referred to as a Theory of Change. (Source: Center for the Theory of Change, www.theoryofchange.org)

real-time data and visualization for energy use and sources of energy for individual campus buildings or the campus as a whole, and 2) longer-term data and visualizations focused on total campus energy demand and sources.

Studies have found that concern for the environment has the potential to motivate building occupants to conserve resources such as energy or water, but often the average person has a hard time connecting individual actions to their environmental impact[42,43] (A study at Oberlin College in Ohio found evidence that when college students are provided with high-resolution, real-time data as well as education and incentives, they are motivated and empowered to reduce resource use in dormitories. Researchers found that students were engaged by the accessibility of the data and were inspired to think about their own personal resource use in ways that extended beyond the confines of the study[44].

3.7.1. Approach and Methods

The goals of this study were 1) to develop a deeper understanding of the types of campus energy information that are perceived as desirable or useful by a broad cross-section of campus constituents, 2) to evaluate the potential value of data presentation and representation designs that focus on providing context and standards for comparison that are accessible and engaging for key campus stakeholders, and 3) to explore stakeholder interest in interactive dashboard features that would allow them to estimate their own personal campus energy footprint.

In interviews, respondents were asked to talk about their own experiences thinking about energy use on campus as well as their views on how energy data might facilitate problem solving or decision making for themselves or for other campus groups. Interviewees were also shown four visuals (Figure 26). The first used illustrations to depict per-person campus energy use in terms of an equivalent number of constantly running refrigerators. The second provided a visual comparison between per-person carbon emissions associated with campus building energy and per-person carbon emissions associated with home energy use for the average Californian. The third used bar graphs to compare the proportions of UCSB campus building energy derived from different fuels and energy generation technologies and similar proportions for the average California energy grid. The fourth used an area chart to present the same information about proportions of campus energy derived from various sources, but put current sources into the context of changes in source proportions and total campus building energy use over a 7-year period (2010-2016). Interviewees were also shown the UC Davis Campus Energy Education Dashboard[48] (Figure 27), which offers map-based visualization of real-time and historical energy consumption for each building on the UC Davis campus. The UC Davis dashboard was considered a prototype dashboard for the purposes of this study and was discussed as such with those who participated in our interviews.

Researchers recorded interviewee responses and reactions to the information presented. After presenting and discussing the visuals and prototype energy dashboard, researchers asked participants whether they or others on campus would be willing to input information (e.g., which campus buildings they use; how many hours they spend in offices, classrooms, and labs; time spent using a computer on campus) into a campus energy dashboard to get a more accurate representation of their own personal campus energy use.

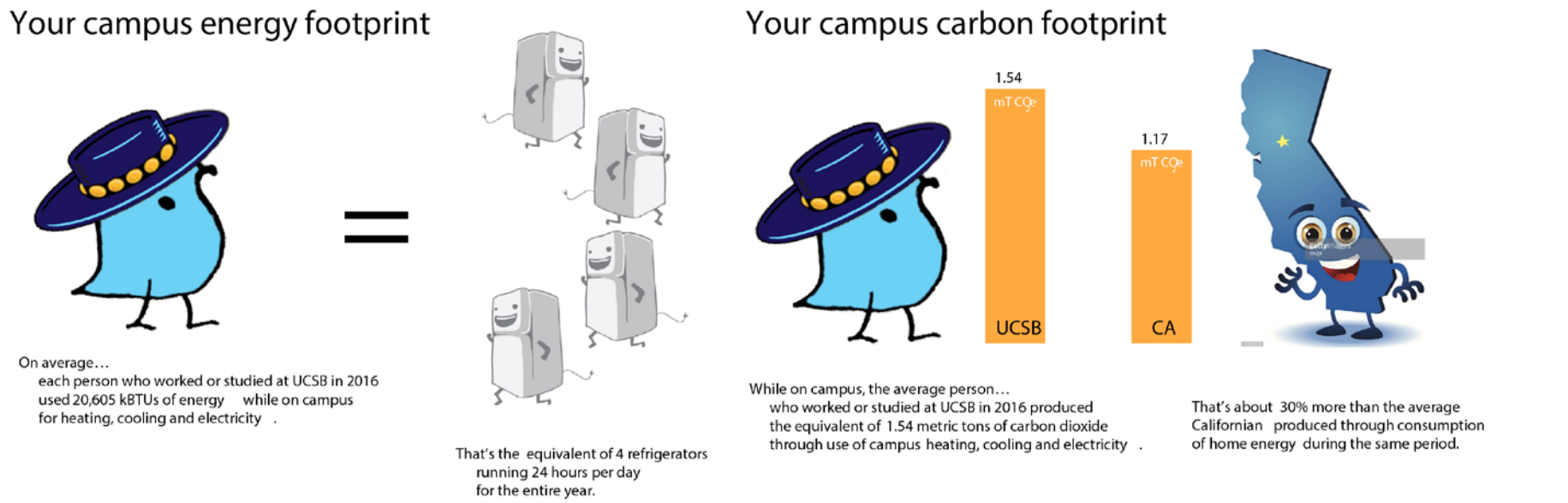
3.7.2. Results

All respondents expressed an interest in knowing about campus energy use, and discussed varying ways they would like such information to be prepared and presented to them. Students predominantly expressed an interest in data regarding personal energy consumption, while staff and faculty expressed more interest in data that could inform them about operational energy use or facilitate educational or informational campaigns directed to colleagues or students.

Staff who work closely with students, and students themselves, expressed interest in the comparative visuals focused on individual campus energy or carbon footprint. They also wanted access to the data behind the visuals, which they said would help them inform fellow students through environmental initiatives or campaigns. Students, as well as staff, noted that they would want to see the data linked with actionable items that could help facilitate energy sustainability on campus, whether through personal behavior change or by enabling participation in decision making. Building energy managers preferred

straightforward building energy visualization without the comparative context and emphasized the value of being able to download the data.

We observed that the administrators we spoke with appeared to feel responsible for maintaining the campus's outward-facing reputation as a leader in sustainability. Although the data and information provided for the sake of comparison were chosen specifically to relate campus energy use to other types of energy use that would be familiar to most campus constituents, administrators interpreted these visuals differently. They were concerned that visuals such as these would present the campus in an unfair and poor light, and expressed the need for all comparison visuals to be "apples to apples" (e.g., not just presenting comparisons with home energy use but also with commercial energy use).



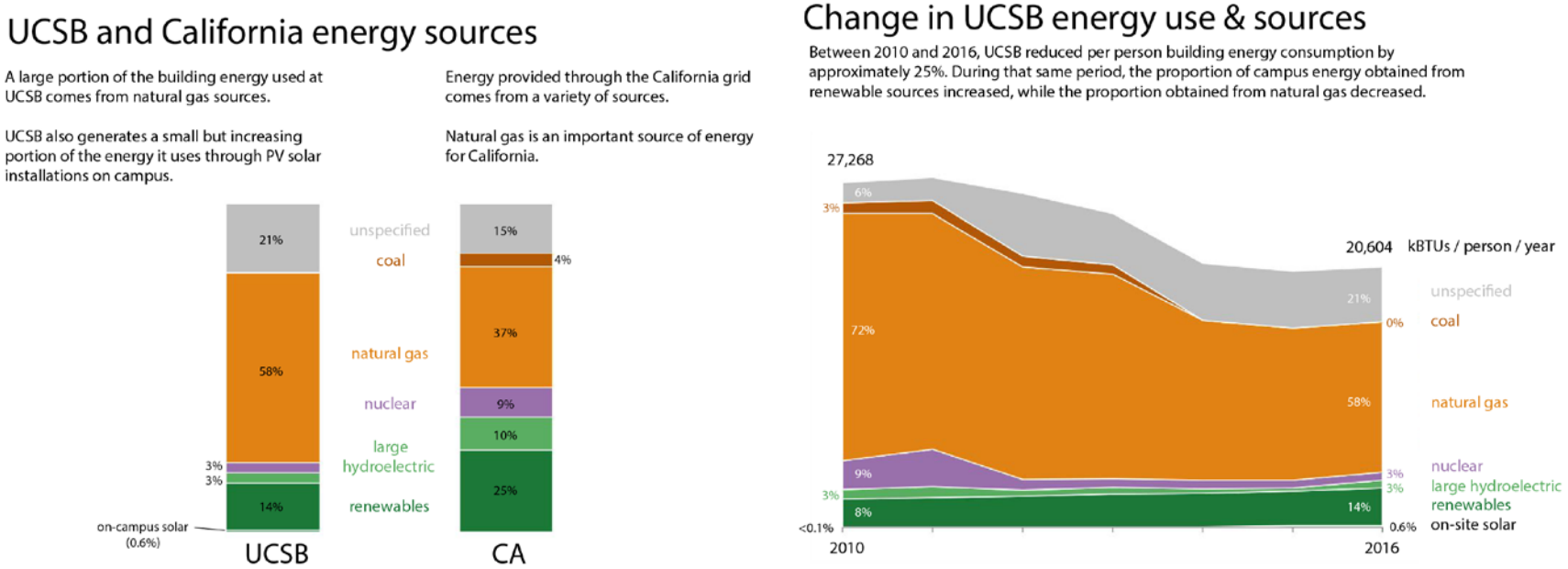


Figure 24. Energy dashboard visuals.

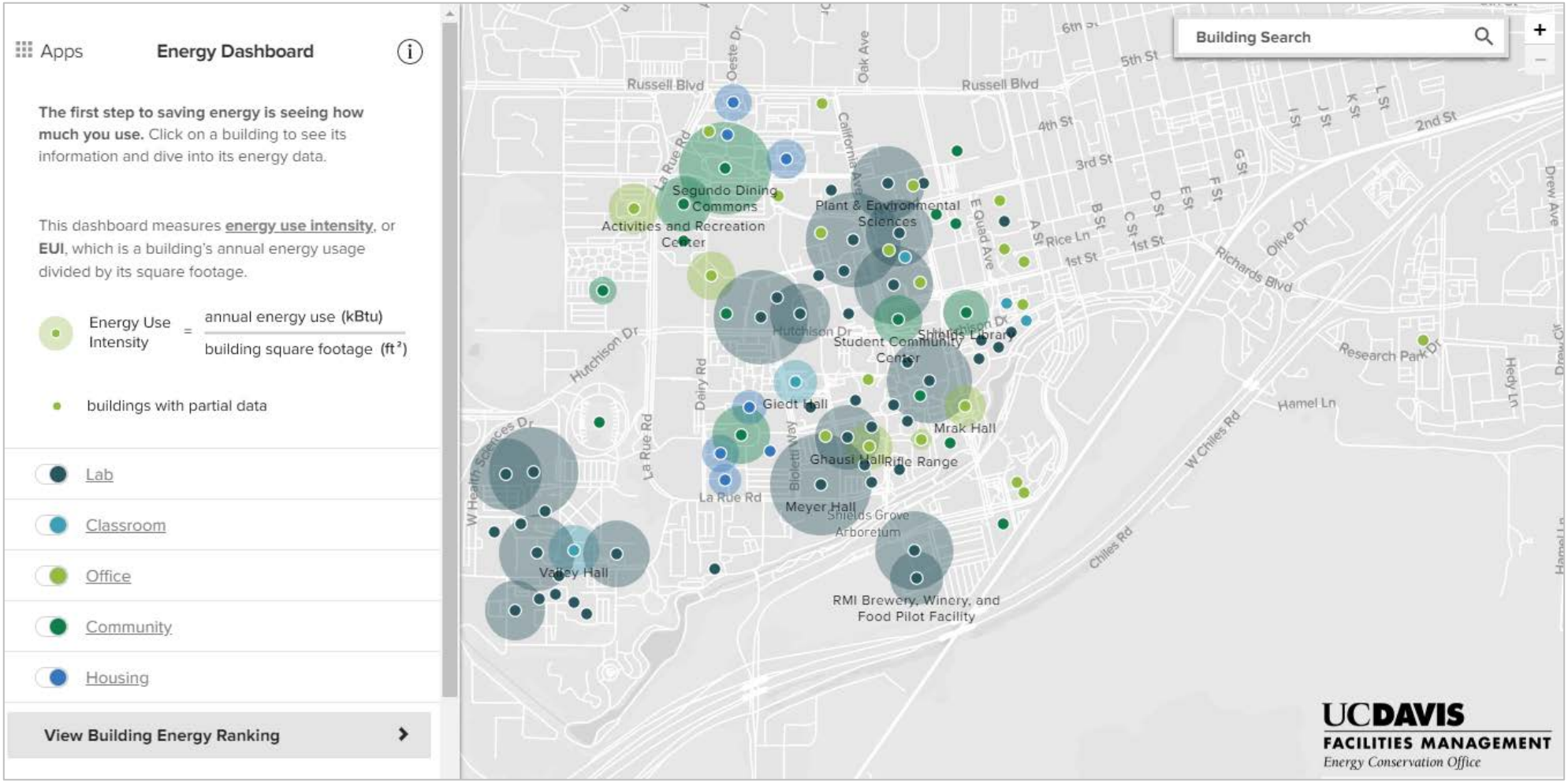


Figure 25. UC Davis campus energy education dashboard

4. Recommendations

4.1. Overview

The overarching goal of this working group has been twofold: 1) to get as close to an accurate picture of UC campus community knowledge and perceptions of the CNI as possible, and 2), to use that knowledge to suggest some approaches for communicating about the CNI to various audiences to increase their awareness and engagement with the CNI. Central to our approach has been to actively listen to the challenges, ambivalences, or issues that our research participants have with the initiative, so as to identify past messaging or engagement approaches that might not have resonated with or motivated interest within the UC community. In doing so, our research has turned up a spectrum of findings, including ways to improve the CNI itself, new mitigation strategies, or alternate management approaches—in addition to suggestions for CNI framing, messaging, or communication tactics.

We, therefore, therefore present a diverse set of recommendations that focus on themes of communication and engagement, but which also echo some of the research findings that address the overall CNI strategy, implementation, or management. We offer some of these results as well because we feel that addressing them may also help any new communication strategies to be more successful. With this in mind, we describe in Chapter 5 a living-laboratory, or collaboratory, structure, to reframe, embody and enact many of the specific recommendations.

Finally, we wish to highlight the importance of a dialogue-based communication strategy, which uses tactics that directly and actively engage the campus community in CNI-related topics and projects. From what we heard, faculty, staff, and students are looking for ways to be more directly involved in decision making and planning around the CNI, rather than being treated as passive recipients of one-way, awareness-raising campaigns. The recommendations presented here should, therefore, be considered within a larger communication recommendation of looking for tangible ways to involve the community in decision making or the design and implementation of solutions.

4.1.1. Main Challenges

Several research results emerged as being the most consistent and relevant to potential communication efforts surrounding the CNI:

- low knowledge of the CNI and lack of information about it
- lack of transparency about tradeoffs and funding challenges that the CNI presents leading to ambivalence about becoming involved
- lack of support for offsets
- lack of trust in an approach that does not integrate multiple campus constituencies, and
- a desire for better internal communication and integration among campus units working on the issue

These conditions present a large communication challenge for the CNI. It may be impossible to achieve the 2025 goal of systemwide carbon neutrality without engaging the UC community Engagement in carbon-neutrality solutions must come from across the UC community, at all levels, from students, staff, administrative leaders, and faculty, as well as key alumni, the state and the local communities in which the campuses operate. Achieving the desired outcomes will likely require a system-wide cultural shift, reorienting behaviors and operational practices, large and small, by inspiring and promoting a broad solution set of meaningful actions. The communication challenges or research identified are similar to the ones confronted by other large organizations and communities, especially pluralistic, democratic communities, in seeking to achieve carbon neutrality. While the recommendations here are specific to the UC system, the lessons potentially are applicable much more widely.

4.1.2. Main Opportunities

Despite these challenges, our research also uncovered several key findings that can support the goal of carbon neutrality.

- Faculty and staff were generally supportive of sustainability initiatives, and while they thought they did not know enough about the initiative or what next steps to take, they were more than willing to be part of discussions and think about how they could make changes or help.
- Many of those we spoke with or who responded to our surveys, particularly students and staff, thought UC should take a leadership role They expressed interest in supporting the initiative.
- Many staff were already invested in making the CNI happen and were just seeking additional support, engagement from the community, or resources to help make it happen.
- We identified frames for presenting information about carbon neutrality that tap into what matters most to audiences on some campuses, such as social justice, health, responsibility, or leadership.
- We found that most everyone also wanted more data about energy use and valued transparency of information and progress toward goals, which could be a relatively straightforward communication adjustment on the part of UCOP and campuses.

To address these challenges and opportunities, we have identified six categories of communication-related recommendations to help achieve the goal of carbon neutrality across the UC: 1) leadership narratives, 2) internal communication, 3) communication and messaging strategies, 4) mission alignment and alternate framing, 5) individual action, and 6) continuing research.

4.2. Leadership Narratives

Develop and communicate consistent CNI priorities and narratives with campus leadership.

Through all of our interviews, surveys and focus groups, particularly interviews with staff positioned to help implement the CNI directly, it became clear that everyone looks to campus administrative leadership for priority setting and support. Without a supportive campus leadership, most of the CNI-aligned activities (particularly large-scale programs and projects) planned by sustainability officers, energy managers, or facilities or planning departments will gain little to no traction and likely remain unimplemented. As suggested by much of our research, if the CNI is truly a priority that needs the engagement of the campus community, it must be aligned with the UC missions of research and teaching, communicated clearly to and adopted by administrative leadership, particularly at the chancellor and vice chancellor levels. In addition, the following would be helpful for leadership to exhibit consistency on, based upon our research:

- **Clear strategies for mitigation**. A clear, economical, and pragmatic path forward should be articulated by each campus, including financing changes necessary to achieve carbon neutrality that work synergistically with other core missions, such as student needs, teaching, and research. It would be particularly helpful to present a credible menu of options on the path to 2025; this would help provide information on steps each campus will take to meet the goal in its own way while still pursuing a longer path to carbon neutrality and energy sustainability.
- **Offset transparency**. Articulate a clear strategy for carbon credits and offsets, including communicating what they are, why they may be essential despite potential tradeoffs, and plans to ensure they are of high quality, UC mission-aligned and (potentially) local. Defining such showcase projects and enacting such a strategy would help demonstrate to audiences that not all credits and offsets projects are created equal, in order to overcome the stigma that is often associated with such offset efforts.
- **Dealing with tradeoffs**. Provide leadership with information and tools on how to address the tradeoffs resulting from costs, particularly if they could affect students, teaching, and research.

We believe it is critical to the success of the initiative to change the "CNI narrative" among key campus leaders from the more common story framing that emphasizes success stories to one that more frankly addresses tradeoffs and challenges, particularly the extremely ambitious 2025 deadline which almost guarantees the need for offsets and other market-based measures that stakeholders find highly problematic. Providing campuses with a menu of options for reaching the carbon neutrality goal economically and sustainably, on a timeline that is realistic given the conditions and resources of each campus may be a more prudent approach that campus leaders can enthusiastically embrace. We offer this observation because it became clear in our research campus leaders will need to support the implementation of the CNI for it to succeed.

4.3. Internal Communication

Develop strategies for effective internal communication that focus on consultation, deliberation, and engagement with the wider campus community.

For the faculty, staff, and students that we spoke with, nearly all asked for a way to be better integrated into the process of decision making and finding solutions for reaching carbon neutrality. This desire for involvement may stem in part from the fact that many respondents were not aware of the CNI and would have wanted to be part of planning early on. Regardless, all members of the community expressed a desire for a more open and transparent process. For energy managers and sustainability officers, this meant more formal and informal connections to other units or departments on campus that are also engaged in aspects of carbon neutrality. This group, particularly sustainability officers, expressed a sense of isolation from the heart of the action. For faculty, it meant being a part of committees where their contributions to carbon neutrality planning would be consistently weighed more equally with those of administrative decision-makers. As for students, it was an expressed interest in supporting campus projects that have multiple co-benefits and through which they can gain professional skills and career experience.

It is quite interesting is that the call for greater transparency in decision making around carbon neutrality occurs within an established UC culture of deliberation and shared governance. Given what our research has revealed, it is likely that these existing structures and processes may not be sufficient to address the unique and pervasive nature of the CNI. Rather, additional means for facilitating dialogue and shared decision making are needed. For this reason, we also recommend that the following be considered to enhance internal communication for the CNI:

a. **Develop additional consultative and deliberative campus decision-making forums.** We found that campus community members across the board desire a voice in decision making about carbon neutrality, beyond what is already available to them. Sustainability officers and energy managers, in particular, desired more formal ties to other units, and faculty were supportive of efforts that involve consistent consultation and feedback. We recommend using existing campus deliberation and decision-making structures—academic senates and student government bodies, for example—as regular venues for discussion and feedback on CNI goals and strategies between now and 2025. It is important that the feedback gained through these processes be genuinely taken into account and have a real influence on decision-making processes. We also recommend that faculty, staff, and student representatives be engaged as participants in the CNI budgeting process.

b. **Data transparency to assess baselines and monitor progress.** It is critical to provide students, staff, and faculty with current, distributed, disaggregated information on campus energy use and potential paths to carbon neutrality. With no baseline or means of assessing progress, the efficacy of any solution may be questioned. We found that students, in particular, are hungry for transparent data on current and historic energy use at their own campus and across other UC campuses. This data could be provided through energy dashboards containing information about campus energy use and sources of energy. (See details below.)

c. **Better leverage student government and organizations.** We suggest looking for more ways to actively engage students, including leveraging existing processes and bodies, such as student government, student groups, special events, and courses or internships. Such individuals should be encouraged to communicate their confidence and experiences with others to empower others to engage in action. Creating broad-based programs involving student leadership, administration and faculty working side-by-side and bringing attention to student efforts (as well as providing feedback to student leaders on the impact their contributions) may help to address this concern.

d. **Build student capacity through education and engagement.** We also found that while students want to be involved with efforts to reduce campus energy use, they are often unsure about how to insert themselves into the decision-making process. Each campus should therefore frequently articulate and advertise a variety of ways for students to take action. Importantly, when students do engage, it is important that their opinions are heard and taken into account by administrators. This will help to build trust and a long-term student commitment to carbon neutrality. Creating an inter-campus platform for sharing best practices will help students become more effective change agents.

Specifically, students expressed the need for tools to facilitate communication and collaboration. To overcome perceived lack of access, it may be feasible to enlist those knowledgeable and supportive of sustainability to collaborate with other student leaders on new projects. Sharing success stories may motivate and convince leaders who are skeptical of sustainability actions that such actions are feasible and effective.

e. **More effectively manage internal CNI coordination and communication to bridge divides**. Given the scale of the communication and coordination work required for the CNI, we suggest that priority be given to information sharing, coordinating communication, developing and updating a data dashboard. Ideally, one person per campus should have this as a top priority. Depending on the campus, this may be achieved through better aligning priorities, more-effective operation, or augmenting staff. Further, organizational structures that do not integrate sustainability staff and operations staff may be less successful in delivering the communication needed to implement carbon-neutrality measures. We found that some campuses demonstrate clear cultural differences between campus units, which can hinder CNI process through "siloed" decision making or lack of collaboration. It is therefore important to ensure that someone at each campus facilitates joint goal setting, communication, and information sharing between sustainability and operations staff. Further, it is crucial that this individual is viewed as credible by campus subunits.

Provide robust interactive tools for understanding campus energy data.

The following recommendations stem from feedback for energy information design discussed in section 3.6.

a. **Provide data on personal and institutional energy use that is manipulatable and downloadable such that varying stakeholders (students, faculty, and staff) can adapt the data to their needs.** Based on all participants expressing a desire for more information on personal and organizational energy use. we recommend creating an interactive website that includes both personal energy consumption and building-level energy consumption data. Provide visuals as well as stories about how individuals can make a change regarding energy use, and about how changes to infrastructure, energy management practices, and purchasing decisions lead to tangible reductions in energy use.

b. **Present engaging visuals and stories on campus energy use and sources and provide actionable tips on how an individual on campus can make a change and avenues for increasing campus energy sustainability.** Because different types of visualizations resonated with different stakeholders, we recommend providing both visual information and raw data so that interested stakeholders can learn more about campus energy use. Students expressed a particular interest in using this type of data for educational or informational campaigns. We recommend providing information on how to interpret the data, how individuals can change their behavior to reduce energy use on campus, and how they can get involved in campus decision-making processes to advocate for energy sustainability.

c. **Promote transparency and create an active, community-driven learning environment by including data and information about what can be improved as well as what is being done.** Administrators and other stakeholders tend to want to ensure a positive reputation regarding sustainability at their individual campuses. This desire to maintain a "green" reputation can lead to a hesitancy about displaying all of the data regarding energy use and sources, for fear that some data may show the campus and/or their department in a bad light. In order to overcome reputational concerns, actual data should be shared along with possible campus energy solutions to create an atmosphere that encourages frank and open discussion on how both individuals and the campus can do better. This will provide administrators and people tasked with sustainability initiatives with an alternative to simply touting green achievements for reputation-building, to highlighting a community that collects and shares data in order to solve challenging problems like carbon neutrality.

4.4. Communication and Messaging Strategies

Develop a strategic communication program that emphasizes pragmatic paths to carbon neutrality and provides concrete ways for campus community members to engage or take action.

Few members of campus communities have even a basic understanding of carbon neutrality, sources, and types of emissions (e.g., Scopes 1, 2, 3), UCs carbon neutrality goals, or the strategies that their campus is pursuing to achieve carbon neutrality. Further, many are skeptical about how much it will cost and how it will be financed. We therefore recommend that the UC Office of the President, in collaboration with campus leaders and the sustainability and communication offices of each of the campuses, initiative a long-term strategic communication program by providing information about:

1. the sources of carbon emissions system wide and on each campus and candidly describing the magnitude of the challenge,
2. the pros and cons of potential emissions-reduction strategies and tradeoffs,
3. frank acknowledgement of costs and financing options, including potential impacts on student costs, and
4. clear descriptions and discussion of offsets, RECs, and other market-based methods to compensate for emissions.

To the extent possible, the opportunity should be taken to reframe the CNI from a UCOP mandate to a menu of options for all of the campuses individually and collectively to reach a shared goal. An example of the type of information to share with campus community members is the CNI Fact Sheet developed by our working group (see Appendix 6.3.2). Specifically, we suggest that the outreach program include the following:

a. **Communicate solutions.** The top finding, across all audiences, was that people wanted to know what could be done to achieve carbon neutrality—specifically what they could do individually. Awareness raising is not being enough; stakeholders need tangible ways to help move the initiative forward and help reduce emissions.

b. **Address concerns about tradeoffs between the CNI and other UC priorities openly and honestly.** In our survey of faculty and interviews with administrators, staff, and students, we found broad support for taking action to reduce campus climate impacts. Yet this support was more tentative or guarded when it meant potentially competing or conflicting with other important UC values—especially providing an affordable education for diverse students and pursuing research to benefit society. As part of a strategic communication and engagement campaign, we recommend that UCOP and campus leaders identify trusted messengers who can provide campus communities with the information necessary—early on and throughout the process—to engage in deliberation about any potential actual tradeoffs, including realistic cost estimates and concrete ideas for how to integrate the costs of the CNI into budgets with minimal impact on other aspects of the university's mission.

c. **Articulate a transparent strategy for the use of credits and offsets:** We found a strong preference across all audiences for local solutions (on campus or in the local or regional community) to reduce emissions. We found significant skepticism for investing university resources in distant offset programs that divert funds from directly reducing carbon emissions or increasing the sustainability of the campuses' own infrastructures. Our respondents reported experiencing a lack of clear communication about the use of credits and offsets, a lack of understanding the distinctions between them, and a seeming reluctance on the part of the university to communicate about them for fear of creating confusion and or inviting criticism. Because credits and offsets will be an important element in the set of solutions UC will need to achieve carbon neutrality, we recommend that UCOP and campus leaders determine how likely it is they will be used and then transparently articulate that to the community.

   We believe this will be crucial to foster understanding and acceptance of these strategies on UC campuses, and could contribute to more productive conversations about these strategies beyond the UC system. This will entail providing information, including pros and cons for local and distant offsetting options, and for offset programs led by the UC vs. others. We also recommend that the university encourage and facilitate campus-level deliberations about the potential degree of reliance on carbon offsets, Renewable Energy Certificates, and other market-based strategies as appropriate for each campus (given their existing infrastructure, the energy market, or unique

budgetary constraints). Timeframes for implementing offsets and other market-based strategies should be included in these communications.

Utilize campus media more effectively to create awareness and involvement in the CNI.

Our evaluation of how carbon neutrality and sustainability have been covered in campus media, including communication-office and sustainability-office websites, led to the following recommendations to improve the use of these media in support of carbon neutrality.

a. **Support the involvement of sustainability officers in the production of carbon-neutrality news content.** Our research showed that on most campuses the majority of sustainability-themed news items were found on the public communication websites while more mentions of the UC carbon neutrality goal or the Carbon Neutrality Initiative were on sustainability office websites. Therefore, we recommend that campuses support the involvement of sustainability officers in the production of news content either independently, on sustainability websites, or in collaboration with public communication staff. In addition, because public-communication offices are producing a large proportion of the sustainability-themed news, we recommend providing these offices with information that will help them identify when stories contain content relevant to carbon neutrality and also providing them with information about the actions already being taken and still necessary to achieve carbon neutrality.

b. **Generate discovery/profile type stories about carbon neutrality.** Because public-communication offices are likely to feature content that fits within the discovery/profile type, those interested in raising the profile of carbon neutrality in campus news could bring more stories of this type to the attention of staff in the public communication offices.

c. **Develop venues for editorial coverage about challenges that need to be overcome to achieve carbon neutrality.** The desire to promote an image of campuses as leaders in sustainability, as illustrated by the strong focus on sustainability awards in the stories we evaluated, could make it difficult to communicate about the challenges campuses face in pursuing carbon neutrality. If understanding the nature and magnitude of the challenges is an important factor in motivating the broader campus populations to take action to support the endeavor, the notion that campuses are already sustainable because they win awards could undermine efforts to build broad-based support for further action. On one hand, if campuses are concerned that information about the challenges they must overcome to achieve carbon neutrality will not promote the leadership image they want to project, it will be difficult to present the kinds of information that campus community members might need to know, such as which actions are most important to helping to achieve the carbon neutrality goal.

   Editorial or opinion-type stories could provide a venue for authentic perspectives on carbon neutrality strategies or actions, but this type of communication approach very rarely appears in sustainability or public communication office news. Therefore, we recommend exploring communication venues (either within the public communication/sustainability news websites or elsewhere) where diverse perspectives on specific strategies campuses will need to pursue to achieve carbon neutrality can be disseminated. We also recommend building capacity among campus community members to generate this type of content.

d. **Provide information on market-based strategies, and other less-frequently covered carbon neutrality topics, to those who write sustainability-themed stories for campuses.** We recommend providing information about carbon neutrality topics that appear infrequently in the news to those preparing stories about the types of information that appear relatively infrequently. For example, to overcome the absence of information about market-based strategies for achieving carbon neutrality, we recommend providing information about these strategies to those writing sustainability-themed stories for each campus. This will help make news writers more aware of possible thematic gaps in the news stories they're producing.

e. **Provide carbon neutrality angles for non-carbon neutrality stories.** One possible strategy for boosting awareness of the Carbon Neutrality Initiative would be to provide those who write news stories for the campus with information about how carbon neutrality relates to other topics already frequently

covered in the campus media. This type of information could enable writers to include connections to carbon neutrality in more of the types of articles.

4.5. Mission Alignment and Alternate Framing

Find alternate ways to talk about carbon neutrality by working with related initiatives and reframing solutions and impacts.

To date, the CNI has been articulated as a distinct initiative focused solely on the task of achieving system-wide carbon neutrality. While this has its benefits in terms of educating or informing about carbon neutrality, this framing may turn people away or confuse them, as many students, in particular, were unaware of what carbon neutrality actually means. To address this, we suggest aligning the CNI with the UC mission and initiatives to frame it in such a way as that it engage a broader constituency.

Note that these recommendations derive from research among a self-selected segment of UC students and faculty who reported being generally ready to engage and were open to discussing carbon neutrality or sustainability options,. We suggest continuing research to assess the resonance of these approaches on broader segments, as described in the section below, "Continuing Research."

a. **Connect CNI efforts to other UC initiatives and a broad commitment to a sustainable future.** We found that engaged students want to see the CNI as part of a complete commitment to reducing climate and environmental impacts. For example, one fundamental challenge in garnering student support for the CNI is the fact that students do not feel ownership of the issue. Students perceive that it comes from UCOP, unlike the divestment campaign, which was student-originated and is currently student-led. Therefore, any attempt to work with related environment or climate initiatives that are student-run, such as divestment, may help to bring in the most engaged students. (For instance, UCOP could highlight UC holdings in companies related to renewable energy; or they could consider divestment.) Finally, campuses should demonstrate how CNI projects intersect with and benefit other sustainability goals or UC initiatives. This is particularly relevant for linkages to teaching, research, and students. One way to help with this would also be to present data on how CNI projects overlap with other initiatives.

b. **Broaden appeal beyond climate solutions.** While discussing climate and environment may resonate with certain environmentally engaged students, putting a strictly "green" or environmental frame on this initiative may dissuade individuals who value other campus priorities over carbon neutrality. While there was broad support for sustainability among faculty, framing the CNI as relevant to, and supportive of, other potential UC initiatives would have the added benefit of "opening the tent" to more campus community members. To this end, we suggest that effort be made to link the initiative to other initiatives, such as water, transportation, or other sustainability goals, new initiatives like the Healthy Campus Network program, or even social-justice initiatives. Achieving this may simply mean linking the goals of the campaign with those of other related initiatives, or creating a larger "umbrella concept," and including carbon neutrality within it.

c. **Social justice, health, and divestment linkages.** We suggest communicating the interrelation of environmental and social-justice issues that affecting on- and off-campus communities. Students understand and are passionate about climate issues. Moreover, they strongly support efforts to improve the health of their local community. Connect the CNI with environmental or social justice issues present in their local communities. For example, highlight the benefit of decreasing natural-gas use on local air pollution. Highlighting other issues important to students, such as health and divestment may help. However, it's important that the specific linkages be explained or otherwise they may not understand how the initiatives relate.

d. **Emphasize experimentation, dialogue, and campus-focused solutions, such as a "living lab."** Most critically, we suggest that campus and UCOP communications shift from reputation-building and touting sustainability achievements or awards to characterizing campuses as "living labs", or collaboratories, that emphasize pragmatism and transparency. We found that campus stakeholders are acutely sensitive to hype and somewhat skeptical about the ways that sustainability achievements are currently communicated. They expressed a strong desire for transparent reporting on actual progress toward carbon neutrality, how much remains to be done,

and which solutions will be implemented on their campus. We also heard that reputation building on campus achievements in sustainability currently tends to focus on good news and incentivizes guarding of potentially unflattering information that can be critical to the transparency that our research shows will be essential to building support for the CNI.

At the same time, we found widespread support for an alternate narrative of the UC as leaders in research and solutions for society. We, therefore, recommend a concerted, conscious effort to change the frame and narrative of communication about sustainability efforts to campuses as evolving "living labs," solving their own problems, and those of the wider society. The goal would be to provide useful and scalable research solutions and pragmatic examples for communities and organizations to achieve energy sustainability or carbon neutrality. This would also potentially reduce the feeling of "do or die" with regard to the 2025 deadline and allow the campuses to determine what solutions work for them, on timelines that work best with existing infrastructure and budgetary constraints.

4.6. Individual Action

Put potential individual actions into a realistic, honest context in order to motivate engage individuals in the CNI.

We found that students and sustainability staff are often disillusioned by the fact that individual behaviors do not contribute significantly to the 2025 carbon neutrality goal. Faculty in our survey were also skeptical about their individual and our collective role in achieving carbon neutrality. We, therefore, recommend that any outreach provide information, examples, and stories about specific actions individuals can take to contribute to carbon neutrality goals within the context of the community's larger efforts. These communication efforts need to be continuing, sustained processes rather than one-time events. They could take place in a variety of contexts, through sustainability offices and student groups, as well as in the classroom. An app could even be developed to show the impact of individual actions. Motivated individuals should also see a path to participate in deliberation and decision making related to collective CNI efforts on their campuses, particularly if individuals' Scope 3 emissions are not counted toward the carbon neutrality initiative 2025 goal.

Motivate individual-level behavior change through data transparency and on-campus challenges.

We found that students are most interested in learning about and making changes to their habits and lifestyle that support the goals of the CNI. Unfortunately, because most of these actions are not included in Scope 1 or 2 emissions, particularly transportation, it is hard for campuses to leverage this enthusiasm for the 2025 goal. Nonetheless, there are still many opportunities to inform students about their on-campus energy use in residence halls, classrooms, and laboratories. Campuses should draw attention to student (as well as staff and faculty) behaviors and opportunities for conservation. At the same time, because students do not seem to view themselves as "in competition" with other UCs or having a "UC" identity, we encourage campuses to pursue on-campus competitions, perhaps between residence halls, departments, labs, etc. This would be in contrast to the 2015 Cool Campus Challenge, which pitted campus against campus in a system-wide sustainability and energy-conservation competition. We believe that such activities will increase student buy-in and support for other operational conservation efforts. Also note the importance of collecting and presenting campus energy use data to facilitate this type of individual engagement and potential enthusiasm (see energy-dashboard design recommendations, above.

4.7. Continuing Research

Conduct periodic research on how the campus community feels about the CNI and develop a way to reliably assess progress toward campus carbon neutrality goals through data collection.

For the CNI to be a success, it's important to continue to monitor campus community attitudes toward the initiative and to have ongoing data to assess progress toward the goal. Therefore, we suggest that significant attention be paid to developing an ongoing monitoring system or protocol, with the assistance of the proposed CNI officers, as outlined above. Specifically, we suggest:

a. **Campus community assessment.** Continue to conduct periodic research on campus attitudes, and behavioral changes, and levels of involvement as they relate to the CNI. Utilize this type of research to establish a baseline and measure the effectiveness of communication and engagement strategies. Further, because we suggest implementing ways for people to become involved more formally or substantially, we recommend conducting impact and evaluation studies to ensure that the targeted community members are, in fact, being integrated into the decision making or solution-design process and that their voices are being heard and represented.

   It's important to note the limitations of our research, simply because our self-selecting segment of the campus population consisted of faculty and students who were predisposed and willing to respond to surveys or be interviewed about the carbon neutrality initiative and sustainability. We captured some attitudes of individuals not as pro-environmental, though they are not the majority. it will be critical to assess attitudes and involvement among a broader segment of the campus and/or university that is more generalizable to students, faculty, and staff. While learning from the most-active environmental values-driven subgroup is helpful in determining how to engage the most-likely-to-engage individuals, once any new outreach or communication strategies are underway, it will be important to learn about other audience segments. We have provided our methodologies, survey instruments, and interview questionnaires in the Appendices to help inform future research efforts.

b. **More measurements, information, and data.** We suggest developing an ongoing program of measurements to support using UC as a laboratory for scalable CNI solutions. This means sharing baseline data around energy use and other sustainability metrics relevant to the initiative and developing a way to collect and make it available consistently, such as through the use of energy dashboards, as discussed in this report. Further, these data should be provided in the context of information about the initiative, its goals, and strategies and with an accompanying evaluation that assesses where each campus, and the system as a whole, stands in terms of progress.

5. The Campus as a Scalable Laboratory for Society, Energy, and Environment

A campus-based, system-wide Collaboratory (CoLab) provides applied-research and education opportunities through alignment of CNI with the University's primary education and research mission, and provides a foundation from which to leverage additional funds for engagement of the campus community in the CNI. It reframes carbon neutrality as an opportunity rather than a mandate, using an approach that: 1) more actively engages the campus communities in pursuing solutions, 2) links carbon neutrality to other initiatives on campus, to draw in a wider swath of potentially interested individuals, and 3) meets the spirit of the initiative while potentially allowing for more flexibility. This approach complements and builds on existing awareness-raising efforts in that it goes beyond framing, branding, and one-way communication and offers an explicitly inclusive, dialogue-based, engagement-centered effort.

The UC Collaboratory approach highlights the concept that each individual campus is already a laboratory that involves multiple ongoing "experiments" or "case studies" that can be observed and documented to provide replicable and scalable solutions–both within and beyond the UC system. In this model, potentially scalable changes to campus infrastructure or management are viewed as "experiments" to reduce carbon emissions; and the process can engage members of the campus community in designing, implementing, observing, and documenting the process. This emphasis on community-driven monitoring, goal-setting, and program development to reduce impact is foundational to the Collaboratory approach.

5.1. The Collaboratory Concept

5.1.1. Opportunity for Engagement

Building on the premise that engagement of the campus community is essential for a transformative initiative such as achieving carbon neutrality, we recommend reframing carbon neutrality as an opportunity rather than a mandate, using an approach with the following characteristics:

1. It actively engages the campus community in pursuing solutions for their campus, given known constraints.
2. It links carbon neutrality to other campus initiatives to draw in a wider swath of potentially interested individuals.
3. It embraces the spirit of the initiative while potentially allowing for a more-flexible timeline for some carbon neutrality strategies, such as campus-energy solutions.

This approach would complement and build upon existing awareness-raising efforts in that it would go beyond typical branding techniques and one-way communication channels and would provide an explicitly inclusive, dialogue-based, engagement-centered platform for meaningful communication.

Because we recognize the value of concrete descriptions and examples when discussing this type of communication strategy, we have outlined an example communication and engagement program that provides details about the type of approach we recommend.

5.1.2. The Current Approach to CNI Communications

Since the Carbon Neutrality Initiative was launched by President Napolitano in 2013, communication efforts have involved campaigns about carbon emissions whose key messages emphasize reaching the extremely challenging, yet potentially motivating, goal of reducing all of its Scope 1 and Scope 2 emissions to zero by 2025. Outreach has focused on the concept of carbon neutrality, largely in the context of climate change, sustainability, environmental themes, energy, renewables, and other "green" topics. Communications about the CNI have also focused on the importance of overcoming what might have once appeared an impossible goal, and on positioning UC as a world leader in developing and implementing climate solutions by being the first university to become carbon neutral. The CNI communication program has involved broadly targeted, infrequent messaging and stories; and as our research shows, has not engaged the campus community. Some communications have been aimed primarily at external audiences who track the progress and projects of the university, with internal communications to those involved in implementing the

initiative being secondary. Many students, staff, and faculty remain unaware of the initiative; and most are unsure how campuses will meet the CNI's ambitious goal. Even the operations and sustainability staff interviewed for this research project are unsure of how and when available resources and approaches will be combined to build the momentum required to reach carbon neutrality within a relatively short time frame. Most are well aware of the barriers to achieving carbon neutrality, many of which are perceived as beyond the realm of possibility given many campuses' reliance on co-generation plants, the financial constraints, and the limited philosophical and material support from campus administrative leaders. While many students, faculty, and staff are broadly supportive of sustainability, they are concerned about the tradeoffs that may be required to reach carbon neutrality. They are concerned with those tradeoffs affecting the university's core mission of teaching and research, and favor an approach that prioritizes local measures over external investments.

Although the communication techniques used to educate the public about the CNI thus far are sound, an alternative framing that is more inclusive and community-driven is needed to generate a culture for achieving carbon neutrality. Below, we propose an alternative framing to support the concept of "living labs"[9] and address our key findings regarding the goals, attitudes, and priorities of the UC community. It aligns with current research on how information, values, and motivation can intersect to produce transformational change. We believe that this approach can overcome many of the barriers to carbon neutrality by offering tangible opportunities for engagement by UC staff, faculty, and students within a different kind of communication environment than has been used so far. Such an approach is not intended to replace the use of informational or action-oriented campaigns, but would provide an additional platform for motivated individuals to participate in and help drive the implementation of CNI-related goals they would like to realize on their campuses.

5.1.3. Reframing the Communication Challenge

The approach that best satisfies the many criteria for the success of UCs Carbon Neutrality Initiative is the collaboratory, a space where people explore collaborative innovations.

The term "collaboratory" was first coined in the 1980s to describe a center without walls[49]. As networking technology evolved[50], so did the possibilities for open-space creative collaboration. The use of collaboratories has gained traction in the scientific community [51] and in a variety of other disciplines, including social sciences[52], informatics[53], medical care[54,55], etc. It has recently been defined as "an open-space, creative method for hosting meaningful conversations where various stakeholders tap into the collective intelligence to generate solutions to complex problems[56]." We envision a UC collaboratory to horizontally integrate discussions and action related to the many similar needs, goals, objectives, and projects across campuses, while also vertically integrating the conversation among diverse academic and administrative disciplines across the many phases of project planning and implementation. Shared data rather than shared tools would define the proposed collaboratory.

Most published examples of the collaboratory approach are shorter projects, whereas our recommendation is to use it as a longer-term initiative. Muff writes about the 50+20 collaboratory approach that was used at the Rio+20 conference on sustainable development. This approach involves a guided, collective process of understanding a problem, visioning solutions, proposing concrete steps, evaluating, and developing action plans, and which involves experts who could implement the plans It is suggested that this approach is transferable to many other applications within a university, business or community situation[56]. It has been applied to drive change in a pharmaceutical company, to help unite people in a global business around common aims, and to engage members of a national industry group in socially responsible leadership. It has also been used in university classrooms, including a semester-long course on "Strategies for Sustainable Development." Finally, it is being used by the Globally Responsible Leadership Initiative (GLRI) as an evolving meta-collaboratory of corporations, educational institutions, and global organizations working together to enable development of individual and collective leadership and practice that is globally responsible.

5.2. A New Collaboratory for UC

For UC, the collaboratory approach highlights the fact that each individual campus is already a laboratory where multiple ongoing "experiments" or "case studies" can be observed and documented to provide replicable and scalable solutions for UC that also offer solutions for external organizations. Within a CNI collaboratory framework, potentially scalable changes to campus infrastructure or administrative processes are viewed as "experiments" to reduce carbon emissions, and members of the campus community are engaged in designing, implementing, observing, and documenting the process. This emphasis on community-driven monitoring, goal setting, and program development to reduce impact is foundational to the collaboratory approach. As one UC administrator expressed it:

> *"I think it's about shifting that mindset toward applied research, using the campus to conduct research that actually helps us to meet our target, [and] implement pilot level projects that could be scaled on our campus to help meet our targets. Really supporting students in preparing them to go out and find jobs that no matter which field or which industry, they're climate-literate, and they have a sense of urgency around addressing that issue no matter which industry they're in.*

In addition, based on our findings, we suggest that the UC collaboratory should embrace carbon neutrality as its main theme within a broader sustainability context (Figure 26). Within that framework, and given

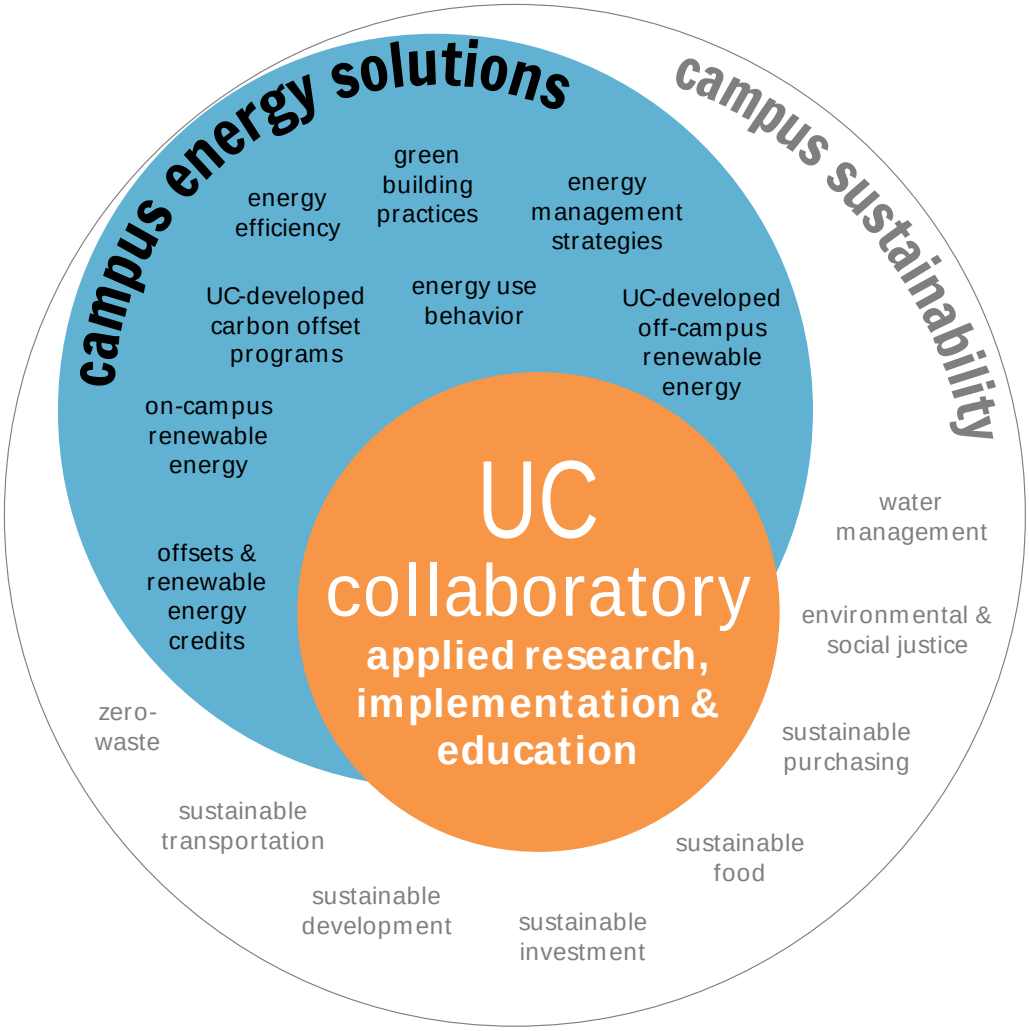


Figure 26. Relationship of the proposed collaboratory to energy solutions and broader sustainability themes on campuses and across the university.

what we have discovered about the values and priorities of the UC community, the collaboratory could be impactful if it has campus energy solutions as its core focus. For the CNI goal, a programmatic component on campus energy solutions may prevent confusion associated with the term 'carbon neutrality,' which has broader connotations that have impacted communication efforts to date. Focusing on campus energy solutions will highlight how achieving carbon neutrality is linked to other sustainability goals and emphasize the immediate challenges of transforming energy sources and usage on campus. Because the phrase "campus energy solutions" doesn't have a specifically environmental connotation, it has the potential to engage those in the UC community who are less inclined to invest in strictly environmental goals. For others, engagement in the broader sustainability goal is a path to engagement with carbon neutrality and campus energy solutions. Using the collaboratory to develop scalable solutions for organizations outside UC is also an important feature that can promote engagement and longer-term support on the part of external stakeholders.

5.2.1. Collaboratory Format

Although we propose the UC Collaboratory as a communication and awareness strategy, it is also aimed at bringing about greater engagement in achieving carbon neutrality. Growth in externally or internally funded cross-departmental, cross-unit research and implementation projects with the goal of improving energy use and other sustainability attributes of a campus can help stimulate higher levels of community engagement in, and outcomes from, the UC Collaboratory. Applied-research projects would focus on design, implementation, and evaluation of infrastructure or programs on one or more campuses. They would also need to answer a specific question related to campus energy sustainability. Guiding questions for the energy-solutions collaboratory could include:

- What actions can your campus take to promote wise and efficient energy use?
- How can your campus improve its management and operational strategies, goals, and capacity to help reach energy sustainability?
- How can your campus ensure that its energy sources are the best value for the price paid, e.g., the most reliable with the lowest negative impact on society and the environment?

5.2.2. Collaboratory Project Goals

We consider the following to be essential criteria for collaboratory research, design, and implementation projects*. These examples focus mainly on energy-management projects, but can be applied more generally:

- **Cross-disciplinary, cross-operating-unit teams.** Staff and faculty from a range of divisions and disciplines would collaborate on projects. This would specifically bridge the gaps between energy-management, facilities-management, and sustainability that were reported in our research.
- **Human-centric design solutions**. Projects must contain applied social- or behavioral-science components in the research, design and observation phases. This will help ensure that technical, market-based, or behavior-change solutions could be adopted by the relevant communities, and that project impacts on human behavior and well being are documented.
- **Work within one of several strategic areas relevant to carbon emissions.** To ensure that projects focus on ideas that have the promise of significant emissions reductions, the funder and/or program administrator would determine annual priorities, e.g., monitoring, on-campus or off-site renewable-energy generation, efficiency retrofits, revolving-energy funds, offsets or other market-based programs.
- **Scalability.** Projects should be potentially scalable to other campuses, regions, the state or even more broadly.
- **Applied rationale.** Each project must articulate a clear rationale for why its particular solution is important for each campus to quantify the degree to which it will contribute to a campus goal (e.g., reducing carbon emissions), estimate what its budgetary impacts will be, explain how it will benefit

* There are examples of the collaboratory approach already within UC and other universities that can serve as potential starting points.

campus operations (infrastructure, practices, and people), and describe how project outcomes will inform campus planning.

- **Dissemination.** Project results must have some form of application beyond the campus borders (e.g., being applicable to K-12 education), and should be communicated beyond the traditional academic paper (e.g., press release, interview, open data, etc.). UCOP and campus communication offices would be expected to help highlight these projects.
- **Data transparency and availability.** All data must be made available to all campus units and delivered in a way that subsequent projects can use and build on those data. Ideally, data will also be made a part of an ongoing data-transparency project for campus energy, available to colleagues outside UC and the public.
- **Student involvement.** Research fellowships must be made available to undergraduate and/or graduate students, with some of their time allocated to working with campus staff (e.g., sustainability, energy management, communication, etc.).
- **Potential for faculty advancement credit.** Faculty governing bodies (i.e. Academic Senate) may wish to consider how participation in collaboratory projects might contribute to tenure and promotion for faculty (e.g., as integrating research, service, and teaching).
- **Facilitation support for projects**. Because projects will involve collaboration between staff, administrators, faculty, and students from a variety of disciplines, proactive support in facilitating collaboratory groups' formation and progress will be essential to maintain adequate communication and collaboration.

5.2.3. Benefits of the Collaboratory Approach

Applied-research projects developed in the collaboratory would benefit the work on energy solutions that are already occurring on UC campuses in the following ways:

1. They would focus on the campuses' own energy infrastructure, procurement, management, and energy-use behaviors
2. They would partner university staff and researchers in designing, implementing, and studying changes to the university's own infrastructure or practices.
3. They would be explicitly inter-departmental and interdisciplinary at all stages of design, implementation, and evaluation.
4. They would be undertaken with the dual goals of improving campus energy procurement and use and of taking a leadership role in society by providing tested and well-documented examples for other organizations and institutions to follow.

We also find this approach would likely be effective at engaging campus community members and reaching a practical energy goal because they are crowd-sourced, applied-research programs that encourage the community to monitor itself and make changes applicable to specific campuses. UC has considerable intellectual capital at, and the idea of using our collective intelligence to solve our own campus problems aligns well with how the campus members who participated in our research envisioned their own role in actions related to carbon neutrality.

Such an approach is also highly scalable. A few initial pilot or seed projects could provide the basis for refining the collaboratory before making larger investments in the strategy. Scalability beyond the boundaries of the UC system is also promising, because, the heart and soul of the strategy is its organization-tailored, crowd-sourced methodology that can be straightforwardly transferred to other universities or organizations.

Finally, given the current pressing need for scalable, effective energy solutions, this approach could provide others seeking to make changes in their own institutions with insight on best practices and processes for developing their own tailored solutions. We also anticipate the following additional benefits:

- **Interdisciplinary collaboration**. Applied research will promote better integration across campus departments, and between faculty, students, and staff. Applied outcomes also provide a common goal that makes it easier for individuals from different backgrounds to collaborate.

- **Cross-sectoral collaboration**. It allows for enhanced collaboration with staff in sustainability, energy management, and facilities. It also provides needed resources (data, student help, faculty collaboration) and helps build trust.
- **Transferable skills for graduates**. Applied skills that student researchers learn are much more transferable outside the university, enhancing prospects for non-academic jobs post-graduation.
- **Support for diversity**. The potential for this type of applied research to attract a diverse group of researchers and students should be assessed.
- **Opportunities for additional funding**. Moving changes in campus infrastructure and practices from a purely operations to an applied-research framework opens up new possibilities for funding. It will require funds for the research and operational components together, with the potential for longer-term benefits that exceed the investments. There will be no single funding source for these, and business plans that build on the Carbon Neutrality Initiative Finance and Management Task Force Report[3] and ongoing campus programs is an immediate priority. Research funders could be open to the possibility of supporting changes as part of the research costs, and faculty are likely to be more supportive of infrastructure or energy system investments that also further the important missions of education and research. Businesses that have relevant products or services might also be interested in investing in the projects that support their own product development or service delivery.

5.2.4. Evidence-based Rationale

This collaboratory concept is presented as an alternative to the current CNI messaging based upon the following results of our study and priorities of UC:

- **Metering, metrics, and monitoring**. Students and staff have identified a need to better understand building energy use, and this would require it.
- **Research mission**. The research focus is in line with the mission of the university, and also promotes open data access, allowing others to better collaborate and engage with the university (promotes an "open science" culture)
- **Education mission**. Research projects provide good case-study materials for classwork and also gives students practical, hands-on experience for course credit or internships
- **Isolated sustainability offices**. The collaboratory would provide more connections across campus, and, potentially, more resources to sustainability offices, thus overcoming some of the limitations identified in our research.
- **UCOP role**. This speaks to the desire expressed by faculty, staff, and student participants in our research for UCOP to help provide internal and external funding or resources for achieving carbon neutrality. It also shows that UCOP recognizes the unique situation of each campus as it pursues carbon neutrality.

5.3. Engagement Strategy

5.3.1. Research and Engagement Initiative

We recommend establishing the collaboratory as a clear initiative with an applied-research agenda and opportunities for engagement. We further recommend that any project proposal opportunities be distributed widely, well beyond those already involved in similar research. We envision using this program and associated projects as the focus of a larger communication program whose aim is to develop a foundational ethos for the UC as an active, community-driven learning space. We suggest a communication strategy and messaging system that supports the collaboratory by focusing on these values and providing tangible opportunities for participation.

Guiding themes:

- We ask tough/important questions.
- Transparency: open data and shared decision making
- We take responsibility.
- We work together.
- We solve challenging problems.
- We lead by example and share openly so that others can follow.

- We determine what works for us. (self-determination)

In addition to these themes, we suggest additional potential messages and value propositions for different campus audiences:

- Students: practical experience that can lead to career, research, and leadership opportunities, learn more about the issue, research projects help with engagement, internships
- Faculty: research and funding opportunities, opportunities to participate in decision making regarding campus goals and pathways to those goals, opportunities to contribute to scalable solutions for energy management and carbon neutrality.
- Staff: sharing and accessing data, opportunities for collaboration among administrators; another way to build reputation – we are doing experiments on ourselves, creating a better society; an opportunity to escape from zero-sum calculations regarding operational budgets, since spending on infrastructure changes would also be contributing to the research mission; opportunities to partner with vendors in the application, testing and documentation of energy-efficient systems and technologies

5.3.2. Tactics

Implementing a collaboratory can be done in steps and built up through a structure similar to that used for Multi-Campus Research Units within UC. We envision a stakeholder-driven process for fully launching the collaboratory over a one-year period (described below as four quarters of activity). The process would be led by an organizing committee comprised of staff (e.g., sustainability officers, facilities/energy staff), faculty and students from each UC campus, plus a program manager to help set up the collaboratory structure and develop a plan for advancing the collaboratory on individual campuses and across UC. Initial priorities of this committee would include assembling information necessary to inform collaboratory design, building relationships across campuses, and identifying ongoing projects that can form a foundation for the collaboratory. Throughout the process, effort should be dedicated to maintaining an ongoing dialogue with campus stakeholders about the work of the committee. Campus outreach and internal communications should include presentations and discussions at meetings involving campus sustainability officers and facilities/energy managers, student groups, faculty senate, academic departments, and other forums.

An early (first quarter) milestone should be a clear strategy for developing the collaboratory, which can then be broadly distributed for comment and feedback. This strategy should start with ongoing activities and build upon them in a way that both leverages existing capacity and fills in gaps in resources, knowledge, and capabilities. As a first step in strategy development, the initial team should document completed, ongoing, planned and envisioned emissions-reduction activities at each UC campus and at the Office of the President that may embody the collaboratory concept. This information-collection, compilation and distillation effort that could best be led by sustainability officers and implemented with the help of student interns. The collaboratory program manager would help design a process for assembling and synthesizing this information and maintain communication and collaboration for the process. This would be followed by convening virtual or in-person meetings with these key staff on each campus to inform distillation and preparation of a document that summarizes the campus activities and plans in a way that will be useful to inform deliberation of the broader group focused on refining and articulating the collaboratory program. A second early activity would be for the organizing committee to work with sustainability officers, faculty, administrative leaders and other key contacts on campuses to develop list of potential faculty and administration members for a broader steering committee.

Once the inventory of existing projects has been developed, a (second quarter) activity would be to engage faculty, students, and staff for the steering committee, and begin building relationships with and between steering-committee members. It is envisioned that members would: 1) have research and/or teaching expertise relevant to the types of projects envisioned for the collaboratory, 2) indicate sufficient availability to complete planned steering-committee activities, and 3) express willingness to invest the effort required for interdisciplinary and cross-sectoral collaboration. Based on the deeper understanding of faculty perspectives and interests from the initial dialogue, this group would refine the collaboratory concept and highlight barriers and opportunities to implementation, plus factors that can motivate involvement of faculty from multiple disciplines.

Within six to nine months of initiating the collaboratory, the steering committee should convene an in-person or virtual meeting (depending on budget) focused on building relationships and collective understanding of constraints and opportunities. At this meeting, committee members begin to refine shared goals develop and document an explicit plan for implementation of the collaboratory as a full-fledged multi-year program. The meeting should also involve developing plans for refining and documenting work over the coming months. Following the initial meeting, the committee would hold regular virtual meetings to further enable information gathering, synthesizing of initial collaboratory projects and document preparation. This will involve identifying and scoping new collaboratory projects, including resources and people who could be involved.

By the end of the initial year, the steering committee and program manager would prepare of a brief report that provides a rich and grounded description of the collaboratory concept and how it can be fully implemented on campuses, taking into account existing activities and capacities of each campus. The report should include:

- Concrete ideas for promising campus emissions-reduction projects amenable to implementation and study through the collaboratory.
- Estimates of the level of support (including both internal and external resources and sources for external resources) needed to make each project idea feasible.
- Information about the types of research data and analyses that would be produced through each project and descriptions of educational opportunities that could be interwoven into the project implementation and applied research.
- Assessment of the types of people (campus roles, areas of expertise, etc.) that would need to be involved in each project to ensure success.
- A plan for ongoing dialogue with the broader campus communities about plans and progress for each collaboratory project implemented, as well as opportunities to participate in collaboratory research and education programs.
- A strategy for sustaining and growing the collaboratory.

After this year-long process of strategy development and program building, UC will be prepared to formally launch the collaboratory as a transformative information, engagement and identity vehicle for carbon neutrality at UC campuses, for the system as a whole, and more broadly. Program launch would include an information and engagement campaign (see next section). It is envisioned that on-campus outreach would also include activities such as: 1) engagement with student groups (visit and present at their meetings), 2) seminars on collaboratory research topics hosted by various departments with different perspectives, 3) materials for use in selected undergraduate and graduate classrooms (current research themes, larger message of the collaboratory), 4) a distributed, online seminar/course, and 5) a variety of presentations and discussions at other forums on campus. Outreach should both leverage ongoing activities, and initiate new engagement opportunities for students, faculty, staff and administrative leaders.

5.3.3. Information and Engagement Message Testing

Four potential themes and headlines were developed for testing with audiences, before launching an information and engagement campaign. These were drawn from a longer report prepared by working-group member Robin Raj, and other working-group members. Consideration was also given to broadly defining the contours of a public-facing strategic communications program to engage campus audiences. The approach outlined is predicated on the belief that a cultural shift is required system-wide, on each of the ten campuses, if UC is to achieve its 2025 CNI goals (see Appendix 6.3.1).

References

1. Brylinsky, S., Muzzy, S., Peacock, C., Petee, L., Pumilio, J., Pyles, J., Williams, M., Williams, T. *American College & University Presidents' Climate Commitment Implementation Guide*. (2012).
2. University of California Office of the President. President proposes tuition freeze, new systemwide initiatives. (2013). News item available at: https://www.universityofcalifornia.edu/press-room/president-napolitano-proposes-tuition-freeze-new-systemwide-initiatives.
3. University of California. *Overcoming Barriers to Carbon Neutrality: Report of the Carbon Neutrality Finance and Management Task Force*. (2017).
4. Kezar, A. J. *Understanding and facilitating organizational change in the 21st century*. *ASHE-ERIC Higher Education Report Volume* **28,** (2001).
5. Callewaert, J., Marans, R. W. & Shriberg, M. Advancing a Culture of Sustainability at the University of Michigan. in *Implementing Campus Greening Initiatives: Approaches, Methods and Perspectives* (eds. Leal Filho, W., Muthu, N., Edwin, G. & Sima, M.) 165–181 (Springer International Publishing, 2015). doi:10.1007/978-3-319-11961-8_14
6. Adams, R., Martin, S. & Boom, K. University culture and sustainability: Designing and implementing an enabling framework. *J. Clean. Prod.* **171,** 434–445 (2018).
7. Zimmermann, S., Bäumer, T. & Müller, P. Achieving a Climate-Neutral Campus: A Psychological Analysis of the Participation Process with the Stage Model of Participation. in *Handbook of Sustainability and Social Science Research* (eds. Leal Filho, W., Marans, R. W. & Callewaert, J.) 227–243 (Springer International Publishing, 2018). doi:10.1007/978-3-319-67122-2_13
8. State of California Governor's Office. Governor Brown Issues Statement on Trump Decision to Roll Back Clean Power Plan. (2017). Available at: https://www.gov.ca.gov/news.php?id=19996. (Accessed: 12th May 2017)
9. St. Clair, M & Chiang, L. Chapter 2. The University as a Living Laboratory for Climate Solution. *Collabra* **2,** 1–19 (2016).
10. Newig, J. & Fritsch, O. Environmental governance: Participatory, multi-level - And effective? *Environ. Policy Gov.* **19,** 197–214 (2009).
11. Betsill, M. M. & Bulkeley, H. Cities and the multilevel governance of global climate change. *Glob. Gov.* **12,** 141–159 (2006).
12. Unruh, G. & Ettenson, R. Growing Green: Three smart paths to developing sustainable products. *Harvard Business Review* 88 (2010).
13. Rappaport, A. Campus greening: behind the headlines. *Environ. Sci. Policy Sustain. Dev.* **50,** 6–17 (2008).
14. Adomssent, M. Exploring universities' transformative potential for sustainability-bound learning in changing landscapes of knowledge communication. *J. Clean. Prod.* **49,** 11–24 (2013).
15. Moser, S. C. Reflections on climate change communication research and practice in the second decade of the 21st century: what more is there to say? *WILEY Interdiscip. Rev. Chang.* **7,** 345–369 (2016).
16. Leiserowitz, A., Maibach, E., Roser-Renouf, C., Rosenthal, S., Cutler, M. *Politics & Global Warming, May 2017.* (2017).
17. Corner, A., Markowitz, E. & Pidgeon, N. Public engagement with climate change: The role of human values. *Wiley Interdiscip. Rev. Clim. Chang.* **5,** 411–422 (2014).
18. Nisbet, M. C. Communicating Climate Change: Why Frames Matter for Public Engagement. *Environ. Sci. Policy Sustain. Dev.* **51,** 12–23 (2009).
19. Collins, W. D. *et al*. Chapter 3. Science and Pathways for Bending the Curve. in *Collabra* **2,** (2016).
20. Maibach, E. W., Nisbet, M., Baldwin, P., Akerlof, K. & Diao, G. Reframing climate change as a public health issue: An exploratory study of public reactions. *BMC Public Health* **10,** 299 (2010).
21. Masini, A. & Menichetti, E. The impact of behavioural factors in the renewable energy investment decision making process: Conceptual framework and empirical findings. *Energy Policy* **40,** 28–38 (2012).
22. Lertzman, R. Tackling apathy and denial. *Climate 2020, UNA-UK* (2017). Available at: http://www.climate2020.org.uk/tackling-apathy-denial/. (Accessed: 12th May 2017)
23. Carpenter, S., Takahashi, B., Lertpratchya, A. P. & Cunningham, C. Greening the campus: a theoretical extension of the dialogic communication approach. *Int. J. Sustain. High. Educ.* **17,** 520–539 (2016).

24. Bauer, M. W., Allum, N. & Miller, S. What can we learn from 25 years of PUS survey research? Liberating and expanding the agenda. *Public Underst. Sci.* **16,** 79–95 (2007).
25. Ajzen, I., Joyce, N., Sheikh, S. & Cote, N. G. Knowledge and the prediction of behavior: The role of information accuracy in the theory of planned behavior. *Basic Appl. Soc. Psych.* **33,** 101–117 (2011).
26. Franklin, C. G. & Alebiosu, A. Re-shuffling the Deck on Environmental Sustainability: Using a Card Sort to Uncover Perceived Behavioral Categories, Effort, and Impact in a College Environment. in *Handbook of Sustainability and Social Science Research* (eds. Leal Filho, W., Marans, R. W. & Callewaert, J.) 197–214 (Springer International Publishing, 2018). doi:10.1007/978-3-319-67122-2_11
27. Disterheft, A., Caeiro, S., Azeiteiro, U. M. & Filho, W. L. Sustainable universities - A study of critical success factors for participatory approaches. *J. Clean. Prod.* **106,** 11–21 (2014).
28. McKenzie-Mohr, D. *Fostering sustainable behavior: An introduction to community-based social marketing.* (New Society Publishers, 2011).
29. Mildenberger, M., Stokes, L., Savan, B., Kolenda, B. & Dolderman, D. Beyond the information campaign: Community-based energy behavioral change at the University of Toronto. in *Environmental Practice* 47–57 (2013). doi:10.10170S1466046613000057
30. Birnbaum, R. *How colleges work: The cybernetics of academic organization and leadership*. (Jossey-Bass, 1991).
31. Velazquez, L., Munguia, N. & Sanchez, M. Deterring sustainability in higher education institutions: An appraisal of the factors which influence sustainability in higher education institutions. *Int. J. Sustain. High. Educ.* **6,** 383–391 (2005).
32. University of California Board of Regents. Standing Order 105. Academic Senate, 105.2: Duties, Powers, and Privileges of the Academic Senate. Available at: http://regents.universityofcalifornia.edu/governance/standing-orders/so1052.html. (Accessed: 5th December 2017)
33. Verhulst, E. & Lambrechts, W. Fostering the incorporation of sustainable development in higher education. Lessons learned from a change management perspective. in *Journal of Cleaner Production* **106,** 189–204 (2015).
34. Stokes, L. C., Mildenberger, M., Savan, B. & Kolenda, B. Analyzing Barriers to Energy Conservation in Residences and Offices: The Rewire Program at the University of Toronto. *Appl. Environ. Educ. Commun.* **11,** 88–98 (2012).
35. Tierney, W. G. Organizational Culture in Higher Education: Defining the Essentials Organizational Culture in Higher Education. *J. Higher Educ.* **59,** 2–21 (2017).
36. Bergquist, W., & Pawlak, K. Sustainability Through Leadership in the Six Cultures of Contemporary Collegiate Institutions. (2007).
37. Phillips, D. TomKat Communications Working Group presentation. (2016).
38. University of California. UC Office of the President Energy & Facilities Management Services. (2018). Available at: http://www.ucop.edu/facilities-management-services/programs-initiatives/energy-procurement.html.
39. State of California Air Resources Board. Cap-and-Trade Program. (2018). Available at: https://www.arb.ca.gov/cc/capandtrade/capandtrade.htm.
40. Meier, A., S.J. Davis, D.G. Victor, K. Brown, L. McNeilly, M. Modera, R.Z. Pass, J. Sager, D. Weil, D. A., A. Abdulla, F. Bockmiller, W. Brase, J. Brouwer, C. Diamond, E. Dowey, J. Elliott, R. Eng, S. Kaffka, C. & Kappel, M. Kloss, I Mezić, J. Morejohn, D. Phillips, E. Ritzinger, S. Weissman, J. W. *University of California Strategies for Decarbonization: Replacing Natural Gas. UC TomKat Carbon Neutrality Project*. (2017). doi:10.17605/OSF.IO/HNPUJ
41. McCombs, M. E. & Shaw, D. L. The Agenda-Setting Function of Mass Media. *Public Opin. Q.* **36,** 176 (1972).
42. Darby, S. Making it Obvious: Designing Feedback into Energy Consumption. in *Energy Efficiency in Household Appliances and Lighting* 685–696 (2001). doi:10.1007/978-3-642-56531-1_73
43. Roberts, S. and Baker, W. *Towards effective energy information: improving consumer feedback on energy consumption*. (2003).
44. Petersen, J. E., Shunturov, V., Janda, K., Platt, G. & Weinberger, K. Dormitory residents reduce electricity consumption when exposed to real-time visual feedback and incentives. *Int. J. Sustain. High. Educ.* **8,** 16–33 (2007).
45. Rubin, H. & Rubin, I. The First Phase of Analysis: Preparing Transcripts and Coding Data. in *Qualitative*

Interviewing: The Art of Hearing Data 201–223 (2005). doi:10.4135/9781452226651.n10
46. Bart, H., Kaysen, B. Maggass, M., Park, H., Watson, O. Achieving Carbon Neutrality at UCSB by 2025: A Critical Analysis of Technological and Financial Strategies. (2016).
47. Kittle, B. *A Practical Guide to Conducting a Barrier Analysis*. (2013).
48. UC Davis Facilities Management Energy Conservation Office. UC Davis Campus Energy Dashboard. (2018). Available at: https://ceed.ucdavis.edu/#!/.
49. Wulf, W. A. *The National Collaboratory--A White Paper*. *Towards a National Collaboratory, Report of workshop at Rockefeller University, NY* (1989).
50. Edelson, D. C., Pea, R. D. & Gomez, L. M. The Collaboratory Notebook. *Commun. ACM* **39,** 32–33 (1996).
51. Sonnenwald, D. H. Expectations for a Scientific Collaboratory : A Case Study. *Proc. 2003 Int. ACM Siggr. Conf. Support. Gr. Work - Gr. '03* 68–74 (2003). doi:10.1145/958160.958171
52. Arias, E., Eden, H. & Fischer, G. The Envisionment and Discovery Collaboratory (EDC). *Lifelong Learn.* 1–15 (2015). doi:10.2200/S00670ED1V01Y201509HCI032
53. Lassi, M. & Sonnenwald, D. H. The socio-technical design of a library and information science collaboratory. *Inf. Res.* **18,** (2013).
54. Dreher, M., Everett, L. & Hartwig, S. M. The University of Iowa Nursing Collaboratory: A partnership for creative education and practice. *J. Prof. Nurs.* **17,** 114–120 (2001).
55. Price, M., Weber, J. H. & McCallum, G. SCOOP - The social collaboratory for outcome oriented primary care. in *Proceedings - 2014 IEEE International Conference on Healthcare Informatics, ICHI 2014* 210–215 (2014). doi:10.1109/ICHI.2014.36
56. Muff, K. *The Collaboratory: A Co-creative Stakeholder Engagement Process for Solving Complex Problems*. (Routledge, 2014).