From Rhetoric to Realization: Bridges to Sustainability at Dartmouth College

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Table of Contents

Table of Contents	i
 CHAPTER ONE: From Rhetoric to Realization: Bridges to Sustainability at Dartmouth College. 1.1 Introduction. 1.2 Defining Sustainability. 1.3 Barriers and Bridges to Sustainability in Higher Education. 1.4 Barriers and Bridges to Sustainability at Dartmouth College. 1.5 Research Questions. 1.6 Organization of the Report. 	1 2 3 4 6 9 9
 CHAPTER TWO: The Importance of Understanding Norms and Values around Issues of Sustainability at Dartmouth. 2.1 Introduction. 2.2 Methodology. 2.3 Results and Analysis. 2.4 Conclusion. 	12 13 16 18 36
 CHAPTER THREE: The Sustainability Education Campaign: Institutionalizing Sustainability at Dartmouth College. 3.1 Introduction. 3.2 Research Questions. 3.3 Conceptual Overview. 3.4 Methodology. 3.5 Results. 3.6 Discussion. 3.7 Conclusion. 	39 40 42 50 50 55 58
 CHAPTER FOUR: College Administration and Sustainability Foreword: Research Questions	61 62 67 70 76 79 82

4.7 Discussion of Results.....

CHAPTER FIVE: The Dartmouth Revolving Green Fund	93			
5.1 Introduction	. 94			
5.2 Methods and Methodology	100			
5.3 Dartmouth Revolving Green Fund	106			
5.4 Implementation of Revolving Green Fund at Dartmouth	118			
5.5 Conclusions	126			
CHAPTER SIX: Conclusions	128			
	120			
ACKNOWLEDGEMENIS	130			
REFERENCES	131			
	151			
APPENDICES	138			
Appendix 2: Interview Transcript	138			
Appendix 3.1: Survey Questions Utilized to Direct Focus Group	143			
Appendix 3.2: Mini-Fridge Ad in <i>The Dartmouth</i> for Incoming Students	144			
Appendix 3.3: UGA Pamphlet	145			
Appendix 3.4: Eco Mug Design	146			
Appendix 3.5: Educational Video DVD (URL)	146			
	1 477			
Appendix 5.1: Proposed Charter and Covenant, Dartmouth Revolving Green Fund	14/			
Appendix 5.2: Project Application Forms (Dartmouth Revolving Green Fund) 15				
Appendix 5.3: Maximizing Revenue from a Voluntary Student "Green Fee" 15				
Appendix 5.4: Green Fund Performance Calculator	160			

Chapter One: From Rhetoric to Realization: Bridges to Sustainability at Dartmouth College

1.1 Introduction

When asked in the spring of 2010 where sustainability should rank among Dartmouth College's various priorities, one student responded,

I...see [sustainability] as part of student efforts to learn about the world and make the world better, which is part of the college's role in educating...In my opinion it has a higher moral purpose so it would go above chess club and social clubs and go along with social justice efforts...So I would say it should be a pretty high priority in terms of how much recognition and funding it should have.¹

This same student did not label herself as an "environmental" person. However, she related, "it's [sustainability] important to me." Sustainability is important to many at Dartmouth. In one recent case, students spent months advocating for sustainable housing, and finally succeeded in founding the Sustainable Living Center (SLC) in 2008 (Williams, 2010), which has subsequently been met with great enthusiasm. As part of Dartmouth's Sustainability Initiative (DSI), students, faculty and staff were encouraged to sign on to an Energy Pledge, where they agreed "to take 8 to 12 simple actions that, collectively over time, will reduce energy consumption and greenhouse gas emissions at Dartmouth" (DSI, 2010). Over 2,000 people committed to the pledge (Ibid.). The creation of and response to projects like the SLC and the Energy pledge demonstrate not only a significant amount of interest in sustainability on this campus, but also considerable passion for affecting changes to benefit the environment.

This passion is reflected at the administrative level as well. Dartmouth's President Jim Yong Kim stated in his inaugural address that the "Dartmouth community must lead in the area of sustainability and respect for each other and for our earth. Let us continue the Dartmouth tradition of helping to understand and appreciate the value of our society and our resources" (Kim, 2009). Despite these obvious commitments, Dartmouth is not currently a leader in sustainability among peer institutions, ranking fifth in the Ivy League in terms of various indicators of sustainability, and not appearing on the list for "Best Overall Grades" among university and college campuses (Sustainable Endowments Institute, 2010). As students and authors of this report, we believe that Dartmouth has the potential to be on the cutting edge of the sustainability movement, but that further action and new approaches are needed to bridge the gap between what the Dartmouth community intends and espouses when it comes to sustainability, and the reality of the college's daily functioning.

¹ This quote was a repsonse to an open-ended question included as part of a campus-wide survey carried out as part of this report (see Chapter Two and Appendix 2B).

When a group of students entered President Kim's office on 22 October 2009 strongly requesting further efforts to make Dartmouth carbon neutral, the President agreed that "there is no excuse for Dartmouth not to be the greenest college in the world" (Williams, 2010). We agree—there is no excuse for "the Big Green" to fall behind in this critical time.² Through our examination of the barriers to sustainability at Dartmouth, and the existing and potential bridges that can be used to overcome these obstacles, we hope to help move the college forward to a point that accurately reflects the strong ideals and impressive capacity for innovation that characterize this great institution.

1.2 Definining Sustianability

Prior to embarking on this journey towards greener pastures, we must first answer a simple yet highly relevant question: what exactly is sustainability? Responding to this question has proven exceedingly difficult. One of the most commonly cited renditions was put forth by the Brundtland Commission (World Commission on Environment and Development, 1987), who argued that sustainability is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." Yet, what exactly is development, and whose needs are going to be met? What about current generations, and where do environmental concerns fit into this understanding of sustainability?

Over the past several decades, sustainability has been applied to countless disciplines, and depending on the topic, the definition inherently changes (Sneddon et al., 2006). This uncertainty was represented in how individuals in our class responded to the question, "What does sustainability mean to you?" Every individual gave a distinct answer, each one of them correct in its own context. Some said that sustainability was preserving our lifestyle and ecological systems for future generations, albeit a lifestyle in need of modification. Others commented on the necessity of sustainability to aid those who have less and are in need of more. More than a few commented more specifically on the belief that environmental problems and sustainability work hand in hand via different avenues such as cultural norms and respect. For our purposes, we chose to focus on the common understanding of sustainability as an interdisciplinary effort to integrate three vital facets of existence: the integrity and resilience of the planet's biophysical systems (from local to global

² As will become clearer in later chapters, the research contained in this report was carried out during the spring 2010 term (March-June) at Dartmouth College under the augsices of Environemntal Studies 50 (Environmental Problem Analysis and Policy Formation) with the facilitation of Professor Chris Sneddon.

scales); human and economic well-being; and equity within and across generations of human society (Admas and Jeanrenaud, 2008). For our purposes, defining sustainability—while certainly important—takes a back seat to examining the *actions* required to bring about a more sustainable relaitonship between human beings and the environment.

The place we chose to examine these actions is Dartmouth College. In the context of institutions of higher education, sustainability means a critical examination of how these organizations consume resources via the daily operations and the activities of students, faculty and staff; how sustainability is taught (curriculum); and research into the science and social aspects if sustainability (Sterling, 2004). While we perceive the obvious importance of teaching and research about sustainability, our focus in this report concerns the operations of the campus and the role that different actors, particularly students and administrative staff, might play in moving the college towards sustainability. We thus recognize the vital role played by institutions of higher learning in exploring the full ramifications of 'sustainability thinking'. Colleges and universities have a near unique capacity to promote "awareness and stewardship of the natural world, as well as increasing the chances of clean and pleasant local and global environments for the future" (Dahle and Neumayer, 2001). By integrating sustainability into educational constructs, we can seek standards for sustainability, not set them blindly, which allows us room to be creative and develop a diversity of approaches and models in the process (Wals and Jickling, 2002).

1.3 Barriers and Bridges to Sustainability in Higher Education

We believe that examining sustainability within the context of college and university campuses is particularly important. As Dahle and Neumayer note, "higher education institutions can be seen as 'microcosms' of environmental problems facing larger society" (2001, p.141). While institutions of higher education have a significant potential to create change and set positive examples for society at large, there are common challenges that colleges and universities face in institutionalizing sustainability. Conversely, there are numerous advantages unique to colleges and universities that make it easier to promote and practice sustainability. Implementing sustainability anywhere can be exceedingly difficult, and at institutions of higher education, there are a number of general barriers and bridges to sustainability.

Several of the most prevalent barriers to sustainability at higher education institutions can be categorized as financial, awareness, cultural, and administrative barriers. Many institutions lack the financial resources to fund sustainability projects and recognize it as an institutional priority.

Colleges and universities much prefer to make investments with short term paybacks because of a limited mount of capital available (Dahle and Neumeyer, 2001; Cleaves et al., 2008) Energy efficiency projects unfortunately require time to accrue profit. Furthermore, the lack of environmental awareness among students, faculty, staff, and administrators at institutions of higher education has also been identified as a leading obstacle in implementing sustainability throughout an institution (Dahle and Neumayer, 2001; Marans and Scott, 2010). Without professionals who are well-versed in sustainability, the less likely for this knowledge to spread throughout campus. In addition, "investing in waste and energy reducing devices has no meaning unless people know how and *why* it should be carried out" (Dahle and Neumeyer, 2001, p. 151). A lack of environmental education is therefore a barrier to implementing sustainability because without reason or motivation, change is unlikely to occur. A limited cultural awareness surrounding sustainability results from this lack of environmental education. Numerous institutions, including Tufts University, the University of Netherlands, and the University of Michigan note that general attitudes that are ambivalent about or ignorant of sustainability issues prevail on campuses as a leading obstacle to achieving sustainability (Dahle and Neumayer, 2001; Marans and Edelstein, 2010). Without collective action and commitment, progress towards change becomes extremely difficult. (Dahle and Neumayer, 2001, p. 153).

Finally, administrative reticence and active resistance is identified as a fundamental barrier to implementing sustainability throughout a college or university (Uhl, 2004; M'Gonigle and Starke, 2006; Weber et al., 2009). According to Sterling, "what an institution does (provision) is ultimately informed by its dominant view of reality and its epistemology (paradigm)" (2004, p. 64). The administration of any institution of higher education is integral in creating and defining the institution's *epistemology*, or how knowledge is created and transmitted. Furthermore, If sustainability is not centralized under the administration, many institutions suffer from a delocalization of sustainability leadership (Cleaves et al., 2008, pp. 260- 262) and therefore have trouble effectively implementing any form of sustainability policy. In some cases, administrative reclacitrance towards the desires of students and faculty members to move a campus towards sustainability can take the form of active opposition to sustainability initiatives (Uhl, 2004; M'Gonigle and Starke, 2006).

While we have identified four general barriers to implementing sustainability at a college or university, these barriers are very much influenced by one another. For example, an increase in environmental education would lead to an increase in cultural awareness of sustainability. If an

entire campus collectively acts towards sustainability, the administration might feel more inclined to implement environmentally conscious policies and people would be more compelled to invest in sustainable technologies. Conversely, if the administration embraced and implemented sustainability policies and investments, then an improved cultural awareness would likely follow. Thus, institutional barriers are not confined to a single category but rather are interconnected and part of a single over-arching system.

Fortunately, there are various bridges at any college or university that can mitigate and ultimately overcome the institutional barriers. According to Uhl, "universities are powerhouses of knowledge and expertise" (2004, p. 30). There is huge potential for successfully achieving any goal an institution of higher education if people can collaborate and commit to a specific task. Students, for example, can be trained to become experts in climate policy analyses and address sustainability issues on their college campus (Cleaves et al., 2008, 260- 262). An additional bridge, demonstrated by a pilot study at the University of Michigan, is that a majority of people are often willing to alter their behaviors in an effort to conserve more energy (Marans and Edelstein, 2010, 6). A final bridge to implementing sustainability throughout colleges and universities is that sustainability is becoming a more of a central issue at these institutions. More and more institutions are competing for related fundraising, faculty and staff recruits, and under more scrutiny to demonstrate climate and energy leadership (Cleaves et al., 2008). Consequently, sustainability is becoming more of a priority among institutions of higher education. Once sustainability becomes an integral component of an institution's framework, the financial, awareness, cultural, and administrative barriers will eventually dissolve.

1.4 Barriers and bridges to Sustainability at Dartmouth College

Dartmouth has a specific set of barriers and bridges to sustainability that coincide with the general barriers and bridges to sustainability throughout all institutions of higher education. The recent *Dartmouth Sustainability Assessment* (Hart, 2009) provides an important foundation for understanding the specific barriers and bridges to sustainability at Dartmouth. Other resources include the College Sustainability Report Card 2010 (Sustainable Endowments Institute, 2010), an important metric for sustainability in higher education, and student-produced documents that have shed light not only on where Dartmouth is struggling, but on the proactive and creative ways that the College can integrate sustainability into its institutional mission and operations.

The College Sustainability Report Card 2010 indicates areas of strength at the College: climate change and energy, food and recycling, student involvement, and shareholder engagement. Dartmouth has a plan to reduce emissions by 30% from 2005 levels by 2030, which motivates the College to implement energy-saving upgrades like energy monitoring. Dartmouth encourages local agriculture through its Farm-to-Dartmouth project, educates students during orientation about sustainability initiatives and provides a sale of second-hand items from older students (Sustainable Endowments Institute, 2010). These successes have facilitated further examinations of ways to strengthen sustainability at Dartmouth. The Dartmouth Sustainability Assessment also shows that Dartmouth has made some critical strides in addressing sustainability concerns. For example, the Resource Working Group (RWG), established in 1996, is a diverse group of faculty, staff, and students who meet regularly to identify necessary changes to operating policies and practices in order to make the College more sustainable, and continues to be an important impetus for change (Hart, 2009). The RWG, Facilities, Operations, & Management (FO&M), and student groups have engaged in some sustainability-related initiatives, but these programs are not cohesive or crossdepartmental, and therefore have not substantially impacted the greater Dartmouth community (Ibid.).

Strong support from the administration is essential for successful change within an institution. At Dartmouth, senior management is supportive, but generally allocates responsibility to mid-level managers within departments such as FO&M. While FO&M has the ability to facilitate reduction of energy, water, and waste with technological innovations, they do not have the authority to implement specific policies that will change behaviors and actions across the College community. Thus, there is a disconnect between those responsible for creating change and those with the authority to require change. Additionally, there is a lack of a strong, unified, and transparent plan or vision statement. Dartmouth would benefit from having a sustainability management system to provide better metrics and reporting, and to better integrate the economic, environmental, and social domains of the College (Hart, 2009).

In terms of finances, the disconnect between FO&M and upper management also creates problems when it comes to a more integrated and effective sustainability approach. Those who use energy and water (students, departments) are not the ones paying for them (FO&M is responsible), so there is little incentive to act sustainably. This is seen throughout campus as purchasing is decentralized, so even though the purchasing department is providing more sustainable options, there are few incentives for community members to follow them. As for technology, money is

actually available to be spent by FO&M on efficiency upgrades on buildings throughout campus: the Trustees allocated \$12.5 million to FO&M in 2008. However the shortage of manpower is causing upgrades to proceed slowly and this money is only good for building efficiency projects (Bruce Dunn, personal communication, May 5, 2010).

Additionally, the Sustainability Assessment determined that sustainability thinking is not particularly pervasive throughout campus culture. However, continued student engagement (and reports like this one) indicates that there is a cohesive network dedicated to increasing administrative support of sustainability measures. The Dartmouth Sustainability Initiative, launched in 2005, has been effective in raising the level of awareness among students and communicating the different aspects of sustainability being promoted across the campus. Still, many student organizations have requested more support in the form of more staff, meeting space, and cocurricular education. Specific staffing needs include a sustainability student educator/advisor in the Dean of the College area, a recycling, compost and waste manager, a sustainability planning and design manager, and a communications and outreach coordinator. Students have suggested that a central "hub" of sustainability might take shape in the form of a Sustainability Resource Center where collaboration between administrators, staff, and student interns and organizations would be facilitated (Marissa Knodel, personal communication, April 14, 2010).

Dartmouth's educational nature presents both pros and cons for campus-wide sustainability. The College places high value on "free thinking," which allows students to learn and faculty to perform research quite freely (essential for a liberal arts education and even for promoting sustainability thinking). However, it also makes it difficult to achieve successful formal sustainability training and outreach efforts that reach every Dartmouth community member (Hart, 2009). Integrating a sustainable mindset into "free thinking" may be very difficult, but may be possible with educational initiatives and incentive programs, and other ideas discussed in this report. The Sustainability Assessment, College Sustainability Report Card, and student initiatives address realms of the College that could be improved in order to integrate and implement sustainability at Dartmouth. These realms represent both "barriers" and "bridges" to a more sustainable Dartmouth, and encompass the attitudes of senior management, the availability of finances, the educational nature of the College, and campus culture. This report seeks to address each realm by clearly identifying sustainability challenges and concrete ways to overcome them.

1.5 Research Questions

At the broadest level, our collective question is what are the most significant barriers administrative, financial, cultural—to bringing about a more sustainable Dartmouth College, and what bridges—student initiatives, existing programs, key individuals—exist within the College to overcome these barriers? As we contemplated our project in the spring of 2010, we met several times to begin the task of breaking into teams and tackling the various barriers and bridges to sustainability at Dartmouth College. While realizing that we could not possibly address the full range of institutional obstacles to sustainability at Dartmouth over a ten-week period, we agreed that four areas were critical to address: the norms and values of students with regard to sustainability; the need for more refined and innovative educational campaigns focused on sustainability; the capacities of the college administration to be a change agent; and the need for a long-term, comprehensive funding source for green projects. The following questions guided our research into each area:

- What are the perceptions, norms and values of current students with regard to sustainability, and how might a better understanding of these perceptions be used to promote campus-wide sustainability initiatives?
- How is sustainability education important in the context of institutions of higher learning, and how can education be used to greatest effect in promoting more sustainable student behaviors?
- What is the role of the college administration in promoting and bringing about sustainability, and in what ways can a college administration act as a bridge to sustainability?
- What possibilities exist to create and maintain a campus-based revolving fund focused on sustainability initiatives (a 'green fund'), and how can this mechanism be used to overcome financial barriers to sustainability?

These questions provided the means for organizing our research.

1.6 Organization of the Report

Our report begins with a snapshot of current sustainability perspectives at Dartmouth. It then investigates three different methods to institutionalize sustainability at the College. Education of students and alumni, a comparison of administrative structures, and a proposal for a financing mechanism are creative tools we have developed to realize sustainability and continue to reinforce ecologically sound norms and values at Dartmouth (see Figure 1.1).



Figure 1.1 Organization of ENVS 50 (Spring 2010) report.

Chapter Two investigates the current perception of sustainability among Dartmouth College students as revealed via a campus-wide survey. This survey also asked essential questions regarding energy-saving behaviors, student perceptions of administrative support for sustainability, and whether or not students would support creation of a Green Fund for various sustainability projects. It thus serves an important role in providing tangible links to the other chapters. Chapter Three describes the development of an educational campaign designed to increase awareness of sustainability among students—in particular incoming students and first-years—and alumni. Chapter Four addresses the crucial administrative dimensions of promoting sustainability by investigating how other colleges and universities overcame general organizational barriers to move forward on innovative initiatives. These case studies demonstrate the critical role played by administrative staff and structures in moving campuses towards a culture and practice of sustainability. Chapter Five presents the argument for Dartmouth College to create and maintain a revolving green fund that would finance energy efficiency and other projects on campus. The case

for a Dartmouth Revolving Green Fund is a compelling one for both economic rationales and the signal such a fund would send to current and future students and staff that Dartmouth is committed to being a leader in sustainability. As diagrammed in Figure 1.1, our hope is that integration of these important facets of sustainability at Dartmouth College—norms and values, education, administrative structures, and funding mechanisms—and making them stronger will lead to a greater level of institutionalization of sustainability at Dartmouth. This in turn will reinforce the norms and values of students, staff, faculty and other stakeholders and help realize a culture of sustainability at Dartmouth.

There are of course numerous aspects of sustainability in higher education, both generally and specific to Dartmouth, that we recognize as important but could not cover given space constraints. In terms of substantive topics, most of our examples involve campus energy use, although we recognize that Dartmouth has challenges remaining in the areas of food systems, solid waste, water usage, and general campus environmental conditions. We focus a great deal of attention on students as key stakeholders in promoting sustainability, but are equally aware of the critical role of staff persons and faculty in contributing to sustainability. And, finally, we are aware that there are crucial questions regarding how curriculum and research at Dartmouth address sustainability, even though our focus remains on operational aspects. We hope that this report reaches a broad audience of students, administrative staff, faculty and other interested parties, both at Dartmouth College and at other institutions of higher learning.

Chapter Two: The Importance of Understanding Norms and Values around Issues of Sustainability at Dartmouth

Elizabeth Brown, Aurora Coon, Joshua Prosper, Joanne Schneider

2.1 Introduction

Dartmouth College brings together students from all over the world, representing different backgrounds and viewpoints. This produces a unique blend of perspectives that ultimately becomes our unique "culture." In this chapter, we are going to be looking at the culture, values, and norms surrounding sustainability at Dartmouth. Beddoe et al. (2009) outline the importance of understanding how our worldviews, institutions, and technologies affect any given culture – in our case, a culture of sustainability. "Our worldview is unstated, deeply felt, and unquestioned. These unconscious assumptions about how the world works provide the boundary conditions within which institutions and technologies are designed to function" (Beddoe et al., 2009, p. 2484). Therefore, we must understand and begin to define what these unconscious assumptions are before we can begin to overcome them. Our objective in researching norms and values around sustainability at Dartmouth is to inform the design of the college's future and the evolution of campus culture in order to make all aspects of the college more sustainable.

We believe that it is first necessary to get a snapshot of what people think about sustainability at Dartmouth in order to make lasting change. Furthermore, we believe it may very well be impossible to try to make changes that do not match the culture and values of the college. This section serves as the foundation to our larger project, and it is our hope that the other groups (those looking at administrative issues, education, and the creation of a Green Fund) will be able to take the information that we have collected to see how their ideas compare with those of the campus at large. We also hope to collect and present data that will give us an idea of areas of sustainability at Dartmouth that have been overlooked. The underlying purpose of our section is therefore to understand and begin to define the barriers, and bridges, to sustainability at Dartmouth and to determine what kind of norms or values would have to exist to help get around them. Though, when looking at these barriers, it is important to realize that these are not set in stone and differ across our diverse population.

We have circulated a survey throughout all members of the undergraduate population by email, with questions to gauge where sustainability now stands at Dartmouth. We also conducted interviews with some of our peers who were selected as perhaps being more apathetic in regards to issues of sustainability, in order to get some candid initial responses and test-run some of our survey questions. Our questionnaire survey seeks to identify underlying

assumptions about sustainability at Dartmouth. Surveys are frequently employed in sociology, human geography and related fields, and are described by Parfitt (2005) as an "indispensable tool when primary data are required about people, their behaviour, attitudes and opinions and their awareness of specific issues" (Parfitt, 2005, p. 78). Through our survey data and analysis, we hope to present a representative, reliable and relevant snapshot of current knowledge, ideas and practice around sustainability among Dartmouth's diverse student body. Beddoe et al. (2009) conclude, "we can design the future that we want by creating new cultural variants for evolution to act upon and by modifying the goals that drive cultural selection" (Beddoe et al., 2009, p. 2488).

We also believe that our methodology will help us understand the social networks that students often form in institutions of higher education, and that ultimately are the basis for the norms created around any given issue. Evangelinos and Jones (2009) point to social capital as a resource higher education institutions can apply to achieve a culture of sustainability. They define four categories of social capital, "first, social networks (both formal and informal), second, social (or interpersonal) trust, third, social norms (referring mainly to the tendency of complying with social norms) and finally, institutional trust" (Evangelinos and Jones, 2009, p. 336), and discuss how each of these components exist and affect environmental initiatives at universities. For each component of social capital they explore, Evangelinos and Jones (2009) point out how it can be used to overcome common obstacles to campus greening. Their argument for using the concept of social capital to understand and implement sustainability policies within higher education institutions provides convincing support for our research on the norms and values around sustainability at Dartmouth. We seek to fill the need that they identify for "investigating components of social capital prior to environmental management applications in [higher education institutions]" - our quantitative and qualitative research into current relationships between social norms and networks and social and institutional trust provides the information needed to create successful initiatives that will use social capital to create the cultural evolution required to achieve sustainability that Beddoe et al. (2009) describe.

When looking at how to transform Dartmouth into a more sustainable campus we must first see where the campus fits in with regards to any proposed organizational changes. Tukker et al. (2007) define three possible scenarios. First, there are measures that fit within mainstream beliefs and values. Next, there are issues where a rough agreement on goals and values exist,

but because the change is radical, or the means of achieving the goals are uncertain, planning on how to achieve the desired outcome becomes difficult. Finally, there are issues that outright clash with mainstream beliefs and paradigms (Tukker et al., 2007, p. 1218). In assessing how to integrate sustainability at Dartmouth we must find where our ideas fit in this framework in order to make lasting change. For measures that fit within the beliefs and values of Dartmouth it is simply a matter of implementation (p. 1221). Creating change becomes more difficult with issues that people find important but see no clear path towards the solution. For these issues, Tukker et al. (2007) call for the fostering of vision, experimentation, and support (p. 1222). Lastly, for measures that clash with the mainstream values and beliefs there is a need for informed deliberation on the fundamental issues. At Dartmouth it is very important that we adhere to this framework. In the past, many initiatives that were aimed at increasing campus sustainability have failed because their implementation has not been aligned with the values and beliefs of the campus¹. A way to build a bridge toward overcoming the problem of failed initiatives can be seen by looking at the suggestions of Tukker et al. (2007): "Radical change usually takes a long period and 'command and control' approaches usually will not work. Indicative planning and developing strategic intent with a process of learning by doing along the way are likely to be much more successful" (p. 1221). By assessing where we stand today on sustainability we are able to see how our ideas fit with the rest of campus, if the campus is ready for change, and if not, how to move Dartmouth towards readiness for sustainable change. However this change will likely require a combination of both top-down and bottom-up approaches – both the students and the administration need to be involved.

An example of how Dartmouth might make these changes in the future is the University of New Hampshire's (UNH) sustainability and general environmental initiatives. UNH has launched a series of different green projects such as the Campus Carbon Calculator, the Energy Task Force, and WildCAP, which bring to light a variety of important differences and similarities between Dartmouth and other schools (Cleaves et al., 2008, p. 259-260). This will also be covered more extensively in Chapter 4. An immediate difference is that the cultural norms and values depicted in the Cleaves et al. (2008) article suggest a student body and administration that is on the same page about environmental programs. Not only is the

¹ One example is the bike program that was implemented at the college. It was a program created to provide shared bikes on campus. The program eventually failed with the bikes being vandalized and stolen.

sustainability initiative at UNH organized and supported by an enthusiastic community, but it also has been a part of the school's mission, so to speak, for approximately 35 years (p. 250). Dartmouth College student culture and norms have a significant amount of progress to make before we achieve the same level of enthusiasm as that displayed at UNH. Aside from the difference discussed previously, a critical similarity between Dartmouth College and UNH, in terms of cultural norms and values, is the barriers the colleges face to sustainability and enacting green ideas. At UNH, two barriers hold particular relevance to our project on cultural values – "limited time and resources" and "competing priorities" (p. 260-261). While UNH prioritizes sustainability, it still encounters priority issues nonetheless, especially at a time when we are experiencing new forms of financial and economic stress. UNH sets the stage for an educational setting with well-organized sustainability practices that Dartmouth may someday also achieve. Until then, however, research in the form of a survey on cultural norms and values at the college will lay the foundation upon which future projects, like those at UNH, might be built.

Students are uniquely positioned to change an institution's cultural norms, and have a critical role to play in fostering change with regards to sustainability (Larsen, et al., 2009). Larsen et al. (2009) argue that a university provides a unique setting for the promotion of sustainability on a larger scale: "Based on the assumption that sustainability should start with oneself and that Universities are a microcosm of society, higher education institutes can model sustainability that society can then emulate and become transformative" (p. 29). These findings suggest that students are effective at identifying the barriers and bridges to achieving sustainability. In this chapter, we will begin to answer the following questions:

- 1. What is the student body's perception of sustainability?
- 2. What are the primary barriers that this perception presents to addressing sustainability?
- 3. What should the role of administrators and students be in tackling sustainability?

2.2 Methodology

We conducted a survey as the primary research method utilized to determine the general thoughts of students on barriers and bridges to sustainability at Dartmouth College. In order to obtain results from the desired ten percent of the population, approximately 400 students, we

opted for the advanced version of SurveyMonkey, a reliable online survey website used by many groups for similar purposes. After two weeks dedicated to designing the survey and making sure the questions were appropriate for the information we needed, we used our classmates and professor to proof read it, we sent out the survey to campus on May 9, 2010. Prior to sending the survey, we considered alternative methods to get students to fill out the survey such as tabling, because we did not think we would get as high a rate of participation as we ultimately achieved. By the afternoon of Wednesday May 12, 2010, we had more than our goal of 400 responses and shut down the survey with 531 completed student responses.

The survey consisted of six pages and took an average of fifteen minutes to complete if all the free response boxes were filled in (Appendix 2A). The first section of the survey collected information on the students' backgrounds – major, year, various campus affiliations, and race. Participants in the survey could easily read through the questions and quickly select an answer by clicking on a button. Following basic information, we had a section devoted to the Environmental Studies department so that we could compare students who were familiar with the department versus students who had never taken a course and then compare those results with later questions in the survey such as "How familiar are you with the Sustainable Living Center?" The incentive behind this approach was to see if we could draw connections between the Environmental Studies Department courses and how much students know about sustainability at Dartmouth. Results related to this topic will be discussed further on in the chapter.

Later sections of the survey touched on the sustainability initiatives at Dartmouth as well as possible future directions for creating a greener Dartmouth – the Green Fund. Questions from these sections varied in style and format. Some questions required open-ended responses, as well as questions using a rating scale. Towards the end of the survey, we polled students on some of their habits on campus related to actions that promote sustainability like conserving energy, purchasing water bottles, or recycling. These questions also varied in format, but were well suited to the question asked. For example, the question, "do the green 'Dartmouth Conserves' stickers next to light switches encourage or remind you to turn lights off when you leave a room?" had answer options of "yes," "somewhat," "no," and "I've never noticed them" (Appendix 2A). The section devoted to the Green Fund is the one section designed to gain insight into how students perceive future directions and goals of sustainability at Dartmouth

College. Questions were designed to encourage participants to answer honestly. In the E-mail we sent out to campus asking students to fill-out the survey, we made it clear that we wanted open and straightforward answers. We encouraged survey takers to be candid in their answers because otherwise we would not fully benefit from the survey. Based on the results, which will be discussed later in the chapter, we believe survey participants were sincere in their responses.

Overall, the design and delivery of the survey was well executed. This is supported by the fact that we received high participation in a short amount of time and did not need to use alternative methods to reach more students. Inclusion of basic demographic data allowed our group to make connections between year, major, and race and perceptions of sustainable efforts on campus. Further analysis of the survey will help us determine what the student body perceives as the greatest barriers and bridges to sustainability at Dartmouth College. In addition to the survey, members of our group conducted a small sample of interviews to aide in the discussion of sustainability at Dartmouth. We targeted individuals who were not environmental studies majors, who were not involved in any significant 'green' groups on campus, and who generally did not fit into the category of environmentalist at Dartmouth. The interview took approximately twenty minutes to conduct and consisted of questions asking the interviewee about his or her opinions on topics related to barriers or bridges to sustainability at the college (Appendix 2B). Responses ranged in depth and specificity, but for the most part revealed useful and important information.

2.3 Results & Analysis

Our survey was taken by a diverse group of Dartmouth students. With over five hundred responses in total we have students from nearly every background represented in the survey results. We collected responses from all current class years and one member of the class of 2008 who is graduating in the spring of 2010. From each class there were more than one hundred responses with seniors (class of 2010) responding in greatest numbers. Overall, '10s represented 30% of respondents, '11s represented 25%, 12's represented 21% and '13s represented 24% (Figure 2.1). Given the fact that Dartmouth operates on a unique quarter system and seniors are required to be on for their senior year we are happy with the breakdown of class years.



Figure 2.1. Class Year of Respondents.

The percentage of respondents receiving financial aid in our survey was approximately 48% (Figure 2.2). This figure is very close to the figure from the admissions office of 49% of students receiving financial aid (Dartmouth Admissions, 2010). This helps indicate that our sample is representative of the diverse socioeconomic backgrounds from which Dartmouth students come from.



Figure 2.2: Percentage of Respondents Receiving Financial Aid.

The academic studies that the survey respondents were taking was extremely diverse. With 44 majors represented in total we believe that our survey captures the perspectives of most diciplines at the college. 39 of the respondents who took the survey reported that they were undeclared or undecided on their major at the time of the survey. The top 10 majors were economics with 63 respondents, government with 54 respondents, environmental studies with 49 respondents, engineering with 47 respondents, history with 47 respondents, biology with 38 respondents, english with 27 respondents, mathematics with 24 respondents, pyscology with 22 respondents, and geography with 22 respondents (Figure 2.3).





The activities and interests of the survey respondents varied remarkably. Figure 2.4 shows the results of when respondents were presented with a list of options and told to check all that they affiliated with. These responses allow us to get a snapshot of the culture and activities at Dartmouth College. The political orientation of our survey were composed of 47.9% of respondents who identified as liberal, 30.7% who identified as moderate, and 12.4% who identified as conservative (Figure 2.4). Dartmouth is usually described as having an extremly active Greek scene and our survey helps validate this with 58.4% of respondents members of Greek organizations. Respondents in soroities compromised 30.2% of our total responses followed by fraternities with 19.9% and co-ed houses with 8.3% (Figure 2.4). This number is increasingly high when the fact that freshman are not allowed to join a house are factored in.

Finally, the importance of athletics in our survey and campus can be seen by the fact that 23% of respondents identified as varsity athletes which is correlated with the figure of 20% from the admissions office.



Figure 2.4. Affiliations of Respondents

One of the areas in our survey that was not representative of campus was the racial breakdown of respondents. 72% of students who took our survey self-identified as White (Figure 2.5). When looking at the official number from Dartmouth we see that only 53% of the student body identifies as White. This touches on a theme that we did not explore too far in the class. Environmentalism has been critiqued as something that mostly wealthy white people take part in. In the future it may be beneficial to look at why people of color chose not to respond to our survey and how we can best outreach to groups on campus on discussions regarding sustainability.

The responses to our survey indicate that Dartmouth is able to bring an extremely diverse set of students together in one location. With people from all different walks of life there will be no easy answer to questions regarding sustainability on campus. When looking at how to increase sustainability at Dartmouth we must understand that each student is a stakeholder in the discussion surrounding sustainability. Furthermore, this diversity should be seen as an asset that should be utilized. In order to avoid failures due to initiatives that were

poorly designed for the diversity of our campus we must work to include more people in any talks of sustainability at Dartmouth.





A way to bridge the problem of failed past initiatives can be seen by looking at the suggestions of Tukker et al. (2007): "Radical change usually takes a long period and 'command and control' approaches usually will not work. Indicative planning and developing strategic intent with a process of learning by doing along the way are likely to be much more successful" (p. 1221). Using this logic at Dartmouth we see that both administration and students are needed to make lasting change. In addressing bridges towards sustainability at Dartmouth we must look at where Dartmouth students currently stands in regards to sustainability and then have an administration that is willing to try innovative approaches to removing barriers towards sustainability.

The results of our survey provide a good example of where sustainability currently stands at Dartmouth. One of the striking trends was the positive views towards sustainability at Dartmouth from students. Over fifty percent (54.6%) of Dartmouth students see themselves as "environmentalists" compared with just above twenty percent (21.2%) who disagree (Figure

2.6). Nearly seventy-five percent (74.8%) of Dartmouth students believe that Dartmouth should be seen as a "green campus" with almost forty percent (37.7%) of respondents agreeing strongly with the statement (Figure 2.6). 80.3% of Dartmouth students believe that learning about the environment and sustainability is important with the majority (42.3%) agreeing strongly (Figure 2.6). Even during difficult economic conditions in which budget cuts are required 62.2% of Dartmouth students believe that funding for sustainability is "necessary" (Figure 2.6). This data suggests that the student body at Dartmouth agrees that sustainability is an important principle and it is up to the administration of Dartmouth to "foster visioning, experimentation, and support" (Tukker et al., 2007, p 1222) towards the goal of a more sustainable Dartmouth.



On a scale of 1-5, how do you feel about the following statements?

Figure 2.6. Dartmouth Students' Opinions on Being Green. This figure demonstrates that Dartmouth students support a green campus and sustainable initiatives.

The section of the survey devoted to students' knowledge of sustainability at Dartmouth reveals that more can be done to increase awareness of the resources available on this campus.

The first question on this topic, "Who makes decisions about sustainability?" shows that approximately half of students do not know, while half do know, or have a guess as to who might be involved in decisions of sustainability (Figure 2.7).



Who makes decisions about sustainability?

Figure 2.7. Making Decisions about Sustainability at Dartmouth. This pie chart displays almost an even split in knowledge of survey participants about who makes decisions on sustainability at Dartmouth.

Before continuing analysis of this question, we should draw attention to the fact that the question may have misled survey participants, as we did not specify decisions being made on sustainability at Dartmouth.² Despite the ambiguity of the question, many students answered with ideas focused on sustainability at the college. After coding and tallying the answers, the majority of the survey participants thought it was up to the individual or the student to make decisions about sustainability. Following the students, decisions about sustainability were believed to be made by the administration, then individual groups (ex: Student Assembly, FO&M, ORL, SLC, etc.), then individual people (ex: Jim Kim, Carol Folt, Marissa Knodel, Linda Snyder, etc.). A full list of responses can be seen in Appendix 2A.

² Therefore, a selection of the free responses were eliminated because the answers were not specific to Dartmouth

In addition to the data on who makes decisions about sustainability at Dartmouth, we asked students their level of familiarity with certain green projects such as the Sustainable Living Center (SLC) and the sustainability initiative. More students were familiar with the SLC than the sustainability initiative, although the majority of survey participants expressed the highest level of familiarity with these projects as "know something." In other words, the majority of students, it seems, have heard of the SLC or the sustainability initiative, but do not know enough about these programs to explain them to other people or to understand the programs themselves. How, then, do we go about educating the student body more so that they find an interest in these initiatives (See Chapter 3)? It is possible, that students are desensitized to terms like "sustainability" and "environment," so that when they receive blitzes about these topics, the emails are immediately deleted. This idea is supported by the free responses given to the question, "what are the first words that come to mind when you think about sustainability?" (Appendix 2A). Common responses to this question ranged from "green" and "environment" to "annoying" and "pushy." Response like "a word that is becoming overly used and vague," "annoying, good overall but WAY in your face at Dartmouth," or "good, but fake at Dartmouth," suggest that the desire to be green and sustainable on campus is present, yet its execution lacks tact. Said another way, sustainability is buzzword at Dartmouth as opposed to a positively viewed term. Based on the responses to this question, students seem to be open to sustainability, but resent the constant nagging that is now heavily associated with green proposals. Suggestions on how to counteract this negative trend will be discussed in the conclusion.

A question from the survey asking participants to rate how strongly they feel about certain statements related to sustainability at Dartmouth further supports that students generally feel positive about Dartmouth and being green. The majority of survey takers 'strongly agree' that "Dartmouth should be seen as a 'green' campus," "learning about the environment and sustainability is important," and "funding for sustainability is necessary even in a time of budget cuts" (Figure 2.6). It is important to note that while participants may not think of themselves as environmentalists, they nonetheless agree that sustainability and environmental causes are important.

A second question, asking students to rate the importance of certain parts of their Dartmouth experience, illustrates that 'sustainable living' is ranked low in comparison to other

factors such as academics, career services, off-campus opportunities, and social life. When sustainability is put against other options the college has to offer, it falls to lesser importance despite the results from the previous questions displaying that sustainability is of high value. More specifically, sustainability at Dartmouth is viewed as important, but students, at this point in time, are considering sustainability of lesser importance to their Dartmouth experience compared to academics, career services, or social life (Figure 2.8).



Rate the importance of the following to your Dartmouth experience:

Figure 2.8. Important Components of a Dartmouth Experience. This graph demonstrates that academics, social life, and career opportunities hold precedence of sustainable living.

Based on the responses from these two questions, we need to figure out how to balance important factors of a Dartmouth education, like academics and career opportunities, with the desire to be environmentally focused. Further research is necessary in this area. Based on the innovative responses we received on our survey, in our interviews and our focus group (see Chapter 3), we recommend that dialogue among stakeholders, including students, be included in the decision-making processes involved in achieving this balance. A final question on sustainability at Dartmouth: "which do you think will make greater strides towards sustainability at Dartmouth?" displays an even split in answers. Fifty percent of participants believe it to be 'individual behavior' while fifty percent believe it to be 'administrative action' (Figure 2.9).



Figure 2.9. Making Strides Towards Sustainability at Dartmouth. This pie chart indicates that it will be the combination of the administration and students' individual behavior that will build the bridges to a more sustainable Dartmouth.

We did not include an answer option of 'both' so that we could force participants to choose an answer. The results of this question indicate that both the administration and individual action play a critical role in building bridges to sustainability at Dartmouth.

Looking further at the student's responses we can see interesting trends. The majority of students agreed with the following four statements.

- 1. I am an environmentalist
- 2. Dartmouth should be seen as a "green" campus.
- 3. Learning about the environment and sustainability is important.

4. Funding for sustainability is necessary even in a time of budget cuts. (Figure 2.6).

Even though the majority of campus agrees with the following statements we see that when these questions are cross-tabbed with the number of ENVS courses taken there are clear trends (Figure 2.10).



Relationship between ENVS courses taken and Sustainability Values

Figure 2.10 Relationship between sustainable values and the number of ENVS courses taken.

As the number of ENVS courses increases the percentages of students who "agree" or "agree strongly" with the above questions also increases (Figure 2.10). This suggests that the administration can indeed change the beliefs and norms of the college through education. As Tukker et al. (2007) suggest, for measures that clash with the mainstream values and beliefs there is a need for informed deliberation on the fundamental issues. This advice can also be seen by a quote in the survey in which we asked what is the biggest thing that can be done to increase sustainability:"I think the [ENVS] department could be more open and have more accessible

courses to non-majors but that are still amazingly interesting (kind of like ED[UC] 20 for education department)" (Appendix 2A).

Students' responses about their daily behaviors showed that most students are open to making environmentally conscious choices, but are unwilling to go too far out of their way to do the 'green' thing, and do not always have enough information about sustainable choices to easily, quickly take the 'green' option. Recycling was one behavior we asked about in our survey that illustrates this trend. Although recycling is not necessarily the environmental action that will reduce Dartmouth's environmental impact the most, it is a simple step in that direction that is very accessible to students, well known by our generation, and definitively associated with ecological thinking – when interviewees were asked, "When you hear the word 'environment' or 'sustainability,' what comes to mind" recycling was consistently one of the first things that came up (Appendix 2B).

According to our survey, the vast majority of the student body recycles most of the time – 76.8% of respondents reported that they mostly or always recycle (Figure 2.11).



Do you recycle?

Figure 2.11. Frequency with which Students Recycle.

This indicates prevalent openness to taking simple, daily actions towards reducing environmental impacts. Even if respondents overestimated how often they recycle, the fact that more than three-quarters chose the "mostly" or "always" options indicates that they value recycling. When asked what deterred them from recycling, 49% of respondents said they had trouble finding bins – either they didn't know where recycling bins were, couldn't find the appropriate bin, or found a trashcan first (Figure 2.12, Table 2.1).

One characteristic respondent included in this 49% wrote, "THERE AREN'T ENOUGH BINS! (sic) It's really annoying to go roaming and looking for a place to recycle. If I can't find one near me, I'm going to throw out my trash wherever" (Appendix 2A). This shows that the value students place on recycling is somewhat tenuous. The majority of students have good intentions when it comes to taking simple daily actions towards reducing environmental impacts, but these intentions are frustrated when they are presented with obstacles like not being able to find recycling bins. This indicates that students' good intentions need structural support. If recycling bins were as available as trashcans, it seems that Dartmouth students would certainly use them.



What deters you from recycling?

Figure 2.12. Deterrents to Student Recycling.

Reason	Number of	Percent of total responses
	respondents who	to this question this
	specified	number represents
Access (proximity and/or	81	15.1 %
lack of bins		
Confusion about what to	18	3.3 %
recycle where/how		
Nothing	16	3.0%
Not convinced of benefits	16	3.0%
of recycling		
Don't care	12	2.2%
Laziness	8	1.5%
Don't think it will make a	7	1.3%
difference		
Forget	3	.6%
Bins full	3	.6%

Table 2.1. Breakdown of "Other" Responses about Deterrents to Recycling.

One-third of the 418 respondents responded they were deterred from recycling because of time constraints (Figure 2.12). This result also indicates a need for making recycling infrastructure more available, and supports the theory that Dartmouth students are open to behaving environmentally but need help to follow through. Eighteen respondents expressed confusion about what materials were recyclable and where/how to recycle certain materials. In addition to improving the physical accessibility of recycling bins, the college could also make labeling clearer and more consistent across campus. Recycling is a representative example of a daily environmental behavior – as discussed above, people know about recycling, and strongly associate it with reducing their environmental impact (Appendix 2A; 2B). Our results indicate that the majority of students are willing to take simple environmental actions like recycling, but only if they are easy to take. In order to take advantage of students' willingness to make sustainable choices, the college needs to provide students with the physical means and basic information they require to make those choices.

Our survey showed that the best thing the college could do to change student behavior would be to directly reward sustainable actions, and/or to make students directly responsible for some of the costs of wasteful behaviors. One survey respondent put it particularly well: In order for large-scale change, you absolutely *have* (sic) to change the incentives on a fundamental level. Things that are unsustainable have to cost more, and things that are sustainable have to cost less. That's the only way this is going to get fixed. It would be unpopular at first, perhaps, but that's the battle you've got to fight. Further, you have to show that doing things sustainably can make economic sense. Proselytizing can only go so far. (Survey p. 6, question 6, response 71).

This respondent was far from alone. When asked whether they'd "participate in a rewards program that cuts...Room & Board costs in exchange for energy reduction," a notable 89.8% of respondents said yes (Figure 2.13), the biggest percentage to respond positively to any question on the 6-page survey.



Would you participate in a rewards system that cut **R&B** fees in exchange for energy reduction?

Figure 2.13. Students' willingness to participate in a rewards program.

In addition to that impressive result, the free responses to the question "What's the single biggest thing Dartmouth could do to be more sustainable or encourage sustainable behaviors" (Appendix 2A) also supported using economic incentives to encourage 'green' choices - the number one recommendation was to implement a system where students would directly receive benefits or costs of environmental actions (Table 2.2).
Sustainability suggestion	Number of respondents	Percent of total
	who specified	responses
Incentives, fines and rewards	45	15.4%
Energy efficiency in buildings	40	13.7%
More information and awareness	40	13.7%
Dining waste, bottled water	37	12.6%
Greek waste	26	8.9%
Make recycling easier	24	8.2%
Renewable energy	18	6.1%
Change individuals' behavior	17	5.8%
Greater administrative	14	4.8%
commitment, action		
Food sourcing	8	2.7%
Better, less condescending	7	2.4%
communications		
Use less paper	7	2.4%
Research and invest in broader	6	2%
community (Upper Valley and		
beyond)		
Green maintenance practices	6	2%
Compost across campus	3	1%

Table 2.2. Students opinions on the biggest thing Dartmouth could do to be more sustainable.

The fact that 293 people responded to this final question, which required the most effort to answer, as it was open ended and invited critical thinking, impressed us. There was a diversity of ideas as to what Dartmouth could do to be more sustainable. Many of these ideas targeted structural issues that students perceive as limiting their ability to be 'green.' For example, the second most popular recommendation was to make buildings more energy efficient (Table 2.2), an idea explored in depth in Chapter 5, in which a mechanism for achieving efficiency upgrades to campus buildings is presented and potential projects to be implemented through this mechanism are described, as well as the financial and environmental effects their implementation would have. Our survey indicates that this is an avenue of environmental action that many Dartmouth students would support, as many expressed frustration about lighting and heating inefficiencies in classroom buildings or dorms that they couldn't fix.

Students were also concerned about inefficiencies in the use of current technologies. For example, one student wrote, "custodians...frequently LEAVE A BAJILLION (sic) lights on!" (Appendix 2A). A solution that was proposed by another student was to "put sensor lights in dorm hallways. There is no reason they need to be on 24/7" (Appendix 2A). Another common instance where students felt limited by existing institutional structure was when it came to Greek waste – many of the 26 respondents brought up recycling or reducing Greek waste as the biggest thing Dartmouth could do to be more sustainable (Table 2.2), and many of these mentioned changing the keg policy as a way to eliminate thousands of cans entering Dartmouth's waste stream.

The need for greater administrative commitment that some respondents brought up (Table 2.2) is explored in more depth in Chapter 4: Administrative Comparisons. The respondents who noted this had compelling arguments that got at a larger issue behind other students' frustrations with availability of recycling bins, lack of incentives for environmental actions, institutional energy inefficiencies and unnecessary Greek waste. One student wrote, "I think real change has to come from a change in administrative policy and idealogy. Any sustainability effort from the college really just looks like lip-service at this point and that's a shame. I think this student body would be more receptive to a more aggressive approach" (Appendix 2A). Another commented, "We [students] need the resources to actually make something happen. students (sic) can definitely make a difference, but unless there is a top-down, institutionally backed system, nothing will ever *truly* (sic) change or have a lasting impact" (Appendix 2A). These responses articulate the underlying theme demonstrated by the results of our survey: students are willing and ready to take at least some environmental actions, but do not currently feel that they have the necessary institutional support.

One way that Dartmouth could fund projects that would change the way our institution functions to better reflect student values and reduce the college's environmental impact would be through a "green fund," money that could be taken from student tuition and alumni donations and invested in energy efficiency projects and other sustainable initiatives that would actually generate returns for the college. Any interest or returns above the fund's start-up amount could be invested in structural or educational changes that might not have calculable returns but that could reduce the college's environmental impact by making sustainable choices more accessible

to students. Instituting a green fund at Dartmouth is the focus of Chapter 5, but we will touch briefly on our survey results in this regard.

When presented with the idea of a green fund, most respondents said they would voluntarily donate each term (Figure 2.14). There was also significant support for a mandatory fee of \$5 included in tuition (Figure 2.15).



How much would you voluntarily donate to support the fund?

Figure 2.14. Students' Willingness-to-pay for a Green Fund on a Voluntary, per Term Basis.

These results demonstrate yet again that the majority of students are open to participating in environmental initiatives at least at a minimal level, and often more than that (the average willingness-to-pay was \$9.55, and the highest response was \$500). Dartmouth's constituents unambiguously support making straightforward structural changes to make the college more sustainable, and are willing to pay to make this happen. The time is ripe for administrative action on energy efficiency and other environmental issues to take advantage of these encouraging norms and values around sustainability.





2.4 Conclusion

Our survey enabled us to take a snapshot of student perception surrounding sustainability in the year 2010. Based on our findings, we have found that the lessons to be gleaned fall under two general categories: First, the college administration needs to play an active role in making sustainability a desirable and easier goal to achieve. Second, we must be both wary of information overload, and conscious of how this information might affect student perception.

The survey indicates that Dartmouth students do value sustainability and feel that our campus ought to be a "green" one. However, students generally seem to value academics, career opportunities, off-campus opportunities, and social life either equally or more, and they would not want to sacrifice the quality or resources for any of these areas for the sake of sustainability. Most students are open to living more sustainably, but they are often unwilling to sacrifice their time to make the more sustainable choice, or to find out about alternatives. It is therefore imperative that the administration and the students are on the same page in order to tackle issues of sustainability, and to make sustainable behaviors available and convenient.

Though students may believe in sustainability goals, most students do not see a clear path towards achieving them. Even for students interested in sustainability, the four-year turnover is often not nearly enough time for anyone to fully understand what needs to be done or is possible. The administration needs to take a particularly active role in ensuring we continue to progress in this area, and that sustainability initiatives are not difficult to participate in. We believe this should come in the form of both a sustainability incentive or rewards programs, as well as financial or structural backing. We have refined our results into the following four recommendations:

1. Offer an Environmental Studies course specifically for non-majors.

Our results indicate that as more ENVS courses were taken, respondents increasingly agreed with sustainability values such as "funding for sustainability is necessary even in a time of budget cuts." Although we believe that Dartmouth should eventually consider offering a distributive requirement specifically geared toward environmental education, we suggest that an ENVs course is offered that is accessible and desirable to non-majors, perhaps fulfilling a different distributive requirement in order to incentivize enrollment, could help shift the campus perception even more favorably toward environmental initiatives.

2. Make it easy to be sustainable.

The results show that students are generally very willing to engage in environmental behaviors, as long as they are no inconvenient or take up too much time. One suggestion is to have more recycling bins dispersed in all areas of the campus. As the Educational Group covers more extensively in Chapter 3, it seems that by focusing educational efforts on incoming students and first-years, students at Dartmouth would be armed with better information at an earlier time and could consequently form sustainability behaviors more naturally, before college habits become engrained and harder to change.

3. Incentivize students to engage in sustainable behaviors.

Students report that receiving direct rewards for behaving sustainably, or costs for behaving wastefully would be particularly effective in facilitating sustainable choices. Ideas include deductions in Room & Board fees if certain measures are taken such as decreasing their energy use. Alternatively, there could be a fee to use mini-fridges in dorms, or other appliances that are known to consume large amounts of energy.

4. Establish a green fund.

Our results showed that many students are receptive to the idea of contributing to a "green fund." This is the centerpiece of this project's proposal and will be covered more extensively in Chapter 5.

As a final cautionary note, we strongly recommend that both the administration and environmental groups are wary of the messages they send to campus about sustainability initiatives, and that they pay particular attention to the marketing of those initiatives. Students complained that they are bombarded with emails so frequently that they no longer even open them and many say that they find sustainability initiatives "annoying." In order for any progress towards sustainability to be made, it is imperative that the students understand why this progress is necessary, but that they also feel inclined to participate in it. We recommend that a survey is repeated every five years, to ensure that the administration can constantly evaluate the campus climate, and to track changes in student values so that they can continue to implement measures that will be well received.

Chapter Three: The Sustainability Education Campaign: Institutionalizing Sustainability at Dartmouth College

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3.1 Introduction

As an institution of higher education, Dartmouth College seeks to train the future leaders of the world. Through their academic coursework and extracurricular experiences, Dartmouth students hone their critical thinking skills, rectify and evaluate their personal moral codes, and develop behavioral habits that become incorporated into their everyday lifestyle. Dartmouth has an obligation to society therefore, to promote morally and socially conscious values to its students. The hope is that after completing their education, Dartmouth students will continue to identify with these core values and ultimately endorse them throughout their individual future endeavors. In light of climate change and current events, sustainability is one of these core values that Dartmouth must incorporate into its central framework of moral and social principles.

The current lack of basic sustainability knowledge amongst universities highlights the need for an environmental awareness campaign at Dartmouth. A study of the University of Michigan's "energy conservation-related attitudes and beliefs among faculty, staff, and students" (Marans and Edelstein, 2010, p. 6) found that few of the staff and faculty reviewed were aware that their department had an energy policy for lighting and computer use. At Tufts University, a similar pattern existed within the student population, whereby students had misconceptions about sustainable practices (Marcell et al., 2004, p. 177) and about campus-wide commitments to climate change (Ibid., p. 180). These findings supplement the information we have personally observed regarding the general lack of knowledge about sustainability in practice and energy usage policies here at Dartmouth. The lack of awareness that was so prevalent at the University of Michigan and Tufts University will most likely present an important barrier to Dartmouth's sustainability efforts that our educational program is primed to address. An educational program thus becomes vital for increasing campus knowledge about energy use in general, as well as for facilitating other sustainability programs at Dartmouth.

In light of these institutional gaps in sustainability awareness, the Education Group has proposed an educational campaign that aims to plant sustainability at Dartmouth's core. The campaign seeks to inform community members about their energy choices in an effort to promote individual behavior change and facilitate administrative and financial changes for Dartmouth at large. This campaign would also aim to change behaviors in an effort to complement the norm-changing efforts of the Office of Sustainability and its Energy Pledge Drive, in which "over 2,000 student, staff, and faculty pledged to conserve energy and use it

more efficiently" (Trustees of Dartmouth College, 2010), and target those students whose beliefs don't necessarily align with normative programs like the Pledge. We believe that this approach is far from limited to energy issues and could, in the future, be applied to most any sustainability issue, be it one of food sources, waste, or water.

As an educational research group, we conducted research in order to determine the best target audiences, the most effective educational tools for conveying our message, and the most influential behaviors to target that would result in the greatest energy use reduction at Dartmouth. The Education Group divided the campaign strategy into three primary sections:

- 1. Education before Dartmouth: Educating incoming first-years before they arrive at Dartmouth via newsletters, websites, and first-year trip media.
- 2. Education at Dartmouth: Educating first-years at Dartmouth via UGA training and visual aids on-campus.
- 3. Education beyond Dartmouth: Informing alumni about current sustainability initiatives taking place at Dartmouth and providing opportunities for donation to various Green Funds.

The Education Group supports efforts to reduce campus energy consumption by encouraging Dartmouth students (particularly Dartmouth first-years) to reduce their personal energy usage based on personal choices before arriving at Dartmouth and individual behaviors while living at Dartmouth. A focal point of the campaign, for example, is to discourage incoming first-years from purchasing mini-fridges before arriving to campus. While there is not significant literature research on campaigning towards alumni in order to promote sustainability at an institution of higher education, we see alumni as playing a critical role in achieving sustainability at Dartmouth. Alumni represent a powerful financial force and therefore play a leading role in decision making at the college. Thus, the alumni aspect of our campaign indirectly supports efforts for reduction of energy consumption by communicating with alumni about sustainability measures at Dartmouth and creating more opportunities for alumni donation to the Green Fund, another potential bridge to sustainability at Dartmouth (see Chapter Five).

Dartmouth is a single, integrated system. Change can only be realized with the support of the administration, faculty, staff, students, and alumni. Thus, an educational campaign focused on raising student and alumni awareness is an integral bridge to sustainability at Dartmouth that both compliments and enhances other potential bridges. The creation of a Green Fund, for example, is rendered futile if the Dartmouth student body is unaware of the importance of

sustainability (see also Chapter Four on sustainability norms at Dartmouth). The proposed educational campaign is therefore an essential step that Dartmouth must implement if it hopes to recognize sustainably as an institutional priority.

3.2 Research Questions

In conducting our research, our group focused on five main questions that ultimately dictated not only our research methods, but the educational products we created, as well.

- 1. Why is sustainability education important at an institute of higher learning?
- 2. Who is our audience for our education campaign?
- 3. What student behavioral changes would lead to the greatest reduction in energy consumption on campus?
- 4. What methodology do we want to use in order to conduct our research?
- 5. What are the best delivery tactics for our educational campaign?

3.3 Conceptual Overview

To develop our sustainability education program, we examined literature concerning the importance of focusing on college-age students as agents of change. As our understanding grew, we decided to focus in particular on incoming students at Dartmouth, and students who are in their first year. Our framework also encompasses the need to focus on everyday habits and make use of innovative delivery tactics to promote behavioral change. We feel this is an appropriate conceptual framework for the type of campaign being proposed, and provides some necessary theoretical foundations for the campaign.

An educational campaign focused on energy use at Dartmouth would inform its community members about their energy choices in an effort to ultimately change individual behavior and facilitate administrative and financial changes for Dartmouth at large. One corollary benefit to educating the Dartmouth community is to increase awareness of the contribution of individual energy choices to society's impact on the environment. Kagan and Skolnick (1993) provide evidence for the broader efficacy of such educational programs in considering how and why civility norms changed with respect to smoking, which has become an unacceptable public space activity in the last twenty years with very little opposition. They argue that laws will not work unless "double institutionalism occurs where the law reinforces an already existing normative order" (Ibid., p. 85). This research also found that "legislators and corporate officials who wish to change everyday social norms must wait for signs of a rising wave of cultural support, catching it at just the right time" (Ibid.).

By applying this framework to sustainability education, it becomes clear that students will not change their behaviors just because of rule changes. Rules will lack enforcement authority if they do not reflect the normative habits or values of the student population. Smoking laws were successful because of the coinciding change in the normative values of society once the health risks of second-hand smoke became widely known; thus, moral authority supported enforcement authority (Kagan and Skolnick, 1993, pp. 86-87). For a sustainability campaign to have any enduring impact at Dartmouth, it must alter regulations as well as the corresponding habits of society. By influencing habits and increasing student knowledge, our educational program hopes to transform campus norms at Dartmouth in order to increase the chances of success for other sustainability programs, such as the potential Green Fund and resulting green investment projects (see Chapter Five).

In order to achieve sustainability education that is both effective and transformative, Dartmouth will need to redesign its system to incorporate "deep, conscious reordering of assumptions leading to paradigm change" (Sterling, 2004, p. 58) rather than mere provisionary change that "lacks deep learning on the part of policy makers, administrators, curriculum developers, and all actors in higher education" fostering "a partial and accommodatory response to sustainability" (Ibid. p. 51). True paradigm change would require considerable alterations to the Dartmouth community's perception of its impact on the natural environment. What better way to do this than to focus on educating students in particular, who are arguably the foundation of higher education institutions? Sterling (2004) discusses the lack of progress in sustainability in higher education and the severe need for proactive programs instead of "adaptive responses" (Ibid., p. 50). That is, we cannot simply react to the current state of sustainability at Dartmouth; we must also invest in preemptive actions to mitigate future excess. A proactive, studentcentered focus would help to alter the normative views of Dartmouth's unsustainable societal microcosm from its very base. Normative educational change could bring issues of sustainability to the forefront of Dartmouth's (not to mention society's) many concerns and achieve "a change in the fundamental epistemology in our culture" (Ibid.). Sterling (2004) deems such fundamental change necessary in order for higher education institutions to truly recognize society's

incorporation into the ecosphere and correct the root system failures created by mere provisionary change.

Pollock et al. (2009) also addresses this dichotomy between top-down and bottom-up efforts in sustainability education, noting that most university priorities are developed in a "top-down manner," but that true change within an institution depends on shared goals with the community (p. 344). This statement lends further support to an educational campaign for students in particular, rather than faculty and staff at Dartmouth. A "bottom-up" program like the one we propose would promote sustainable living practices and awareness of energy issues among students such that the top-down changes proposed by the administrative and financial groups will be further complemented and strengthened by a supportive student body.

There is evidence, furthermore, that at Dartmouth in particular, focusing on student habits rather than large-scale overhauls of campus infrastructure can be particularly effective in terms of lessening overall energy use. In her honors college thesis entitled *Input Metering and Analysis for North Hall*, Hannah Dreissigacker (2009) evaluated the energy usage of Dartmouth's North Hall as it transitioned from a typical upperclassman dormitory to the Sustainable Living Center (SLC), an affinity house in which the residents live in an intentionally sustainable community. From her results, Dreissigacker formulated suggestions for both behavioral and infrastructural adjustments at Dartmouth that would reduce the college's dormitory energy usage. Out of heating, electricity, and hot water use, heating is the most significant source of CO₂ emissions at Dartmouth. Dreissigacker noted that without any physical adjustments to buildings, student behavioral changes would have the greatest impact on reducing electrical and hot water use (Ibid., p. 33). According to Dreissigacker, the SLC residents were able to reduce North Hall's electricity use by 58% after its first academic year (Ibid., p. 30). Furthermore, by the end of May, the SLC hot water usage ranked 55% below the regional average (Ibid., p. 20).

College students are also absolutely crucial not only to the success of a sustainability program at Dartmouth, but also to the sustainability of our society at large. Several factors complicate sustainability efforts, including its complexity as a concept, the unlikelihood of simple technological solutions, the unacceptability of command-and-control regulation, the danger of assigning responsibility to uncaring and/or uninvolved citizens, the difficulty of negotiating universal with individual rights, the lack of generally-accessible information, and the unfeasibility of economic incentives (Sibbel, 2009, pp. 69-74). To that end, it is important to

"trai[n]...professionals who manage the resources, educate the public or design the options from which choices are made" (Ibid., p. 74) so that the problem of sustainability can be simplified for the general public. It is within the university that this training takes place (Ibid.). Our educational program will allow future leaders of society to acquire knowledge and habits that will guide our larger society to a sustainable future.

In her study at Tufts University, Marcell et al. (2004) suggest that first-years, above all other groups of college students, may be the ideal target audience of an educational campaign because of their eagerness to meet new people, their initiation into new lifestyles, and the opportunity they present to incorporate energy reduction into the mainstream campus culture (p. 185). In addition, first-years are a group that, if ultimately affected by our program, could have the greatest effect on Dartmouth's sustainability in general because they will have another three years at Dartmouth in which they can influence the habits of those around them, both within their class and without it. In particular, the elimination or reduction of mini-fridge use on campus—which, as we will discuss, is one of the most effective means of increasing sustainability—is a habit that pertains particularly to incoming first-years, who have not yet purchased mini-fridges (often a one-time purchase for college students). Our rationale for targeting this and other habits that would reduce energy use on campus is discussed below.

Dartmouth's SLC residents in Dreissigacker's (2009) study were able to make the most dramatic reduction in energy use by abolishing their use of mini-fridges and reducing dryer use (p. 30). Dreissigacker estimated that disallowing or strongly discouraging the use of personal mini-fridges on campus could reduce dorm energy use by up to 35%. Additionally, encouraging hang-drying clothes could save up to an additional 15% (Ibid., pp. 35-36). Therefore, without any physical modifications to Dartmouth's campus, student behavioral adjustments alone could potentially reduce the campus dorms' electrical usage by up to 50%.

As an educational research group, we are seeking to develop a sustainability campaign that will result in the largest reduction of energy usage on Dartmouth's campus. While Dreissigacker's results are based on a self-selected group of students, they are still indicative of therefore critical in determining which specific behavioral changes to target within our campaign in order to that would affect the most change most efficiently. As a group, we decided that discouraging mini-fridge use should be a focal point of our campaign because of its noteworthy implications in energy reduction. Furthermore, we see the reduction of mini-fridge use as a

plausible behavioral adjustment (especially as compared to eliminating dryer use). In fact, the potential for similar behavioral change has already been recognized within a university population. A 2007 study at the University of Michigan demonstrated that both students and staff *were* willing to reduce energy use via less lighting and heat (Marans and Edelstein, 2007, pp. 13-14). Our assumption is that the reduction of mini fridge use could be embraced with the same willingness by the student body at Dartmouth, and we are currently investigating the most effective means to contact and convince incoming first-years to that end before they come to Dartmouth. Much of this investigation entails eliciting student input both through focus group discussion and survey methods.

Secor (2009) states that a focus group is designed to provide researchers with a pseudosocial environment in which they can observe "the range of statements and positions taken up and the ways in which they are deployed in relation to one another" (p. 200). Essential to this method are group dynamics, for the research that lends itself to a focus group is concerned with issues that take place within a social context (Ibid.). Our educational campaign seeks to address behaviors in energy use among Dartmouth students; a focus group would allow us to not only witness the diversity of perspectives within a sampling of the larger student body, but also to see how those views develop within a social environment that parallels that of Dartmouth at large. Moreover, discussing energy use and attitudes toward sustainability with a group not extensively acquainted with these issues can allow "new framings of the central questions to emerge" (Ibid.). Because the members of this group are not necessarily as invested in sustainability as we, the investigators, are, the focus group is a means to uncover the views we may not have considered from our somewhat myopic perspective.

By taking into account the perspective of the focus group participants, these research strategies will help us design an educational campaign that is suited for students—one that addresses the most important issues *to them* in a manner that is tailored to both the interests of and feasibility within the student body. Based on the "envisioning" research that took place at the University of Vermont, Pollock et al. (2009) notes the importance of promoting shared values and long-term goals in order to avoid polarization within the student body that can impede progress (p. 350). Thus, it becomes not only helpful, but crucial that we learn where the students' true interests and shared values lie.

Furthermore, since "learning communities start from small acts," it is our belief that conducting a focus group with Dartmouth students would be a stepping stone toward creating a learning community in the very process of conducting our research (Hattan et al., 2009, p. 39). Small focus groups allow for the initial contact to be made between students regarding issues of sustainability. Our hope is that a focus group will not only provide high-quality information to the facilitators, but also catalyze discussion between the students that may not have otherwise occurred.

Surveys are also important in our research, for many of the same reasons focus groups are. The Pollock et al. (2009) study used an online survey method in order to expand the research at UVM to a large number of participants—a number, in other words, that is simply not possible for an effective focus group. A similar survey technique will be useful for our study in order to better understand student behavior, awareness, and willingness to change on a larger scale outside of our small focus group (Ibid., p. 344). Additionally, survey results will be used to focus the information conveyed in an educational program for first-years. Our next step then becomes determining exactly *how* to educate students and implement the campaign resulting from these research methods.

Hattan's (2009) research argues for the importance of "connecting head, heart and hand" in achieving change within a university, stating, "Profound change cannot not be merely intellectual; it must be rooted in a place that is personally relevant and connected with an ability to take action" (p. 5). We cannot take these findings for granted. It is not enough for us to simply *tell* students that they need to care about sustainability, nor can we assume that presenting students with abstract images and facts will change their minds. Thus, our program will focus on how students can *personally* affect Dartmouth's sustainability efforts using specific tactics that will connect their "head, heart, and hand" and on making energy use changes relevant for the student body. Our goal is to find tactics that will better connect students *consciously* to the sustainability efforts at Dartmouth and provide them with tangible habit-changing methods.

At Tufts University, a pilot sustainability program was established that incorporated social marketing, which "shift[ed] the focus...to how to create a situation where the public chooses to alter their lifestyle and behavior" so that "people...feel that what is required of them or exacted of them is useful, desirable, and meaningful" (Marcell et al., 2004, p. 171, p. 186). The University "br[oke] down complex information, personalize[ed]...the issue, foster[ed] trust,

us[ed] humor, encourag[ed] dialogue, and distinguish[ed] facts and their sources from opinions" to promote energy conservation within two upper-class dorms (Ibid., p. 172). Social marketing was also used in one of those dorms in the form of mail and e-mail reminders and simple incentive programs (Ibid.). Although the sample size at Tufts University was too small to suggest any strong patterns in the effect of social marketing (Ibid., p. 175), the qualitative description of the program on the whole does present some compelling strategies for effective educational programs. Moreover, an article by Doug McKenzie-Mohr (2000) argues that community-based social marketing efforts are, in fact, particularly "effective at fostering sustainable behavior...due to [their] pragmatic approach" to habit changes (p. 532). Our UGA training, video, and outreach to incoming first-years will be tools to help students markedly improve their sustainability efforts conveniently and consciously at Dartmouth; we will make an effort to include some of Tuft's tactics into these strategies as well.

We would like to focus on UGA training in particular because research shows that schools like University of New Hampshire, University of Pennsylvania, St. Olaf College, and Prescott College have found success with integrating sustainability into their orientation traditions (Hattan et al., 2009, p. 11). Marcell et al. (2005) also stresses the importance of interpersonal channels (p. 184), thus further supporting our pursuit of UGAs as intermediaries that are uniquely qualified and positioned to interact with first-years on a personal level. Meanwhile, Pollock et al.'s (2009) study emphasizes the importance of "identifying specific outcomes," (p. 351), and Arbuthnott (2009) argues that specific intentions are more likely to influence behavior change (p. 154). At the University of Michigan, students interviewed felt that the "historical figures" featured in the school's "Use Your Power Wisely" poster series were "irrelevant" (Maran et al., 2007, p. 12). They preferred "shorter, more direct" do-or-do-not reminders of how to curb their energy usage with temperature and lighting (Ibid.). These strategies are particularly suited to simple, direct educational tactics like the video and newsletter projects we are pursuing as part of our outreach to the incoming first-year class.

In addition to simply aiding in the success of our educational program, all of the tactics we will implement in our program will provide connections between our study and those on cultures and values within this report. Connecting the "head, heart, and hand" creates a more personal educational program, and, we hope, leads to an adjustment in students' perspectives and habits about sustainability (Sipos et al., 2008, p. 8).

Although it ultimately proved to be outside the scope of our group, we also recommend that stickers be placed in student dorms that would serve as fun, immediate reminders to take shorter showers. Part of McKenzie-Mohr's (2000) recommendations for the community-based social marketing approach to sustainability that he advocates also involves simple behaviorchange tools such as prompts (p. 534). Therefore, a significant focus of our campaign overall will be on concrete behavior changes and benefits, rather than widespread attitude and belief changes among Dartmouth students.

Katherine Arbuthnott (2009) also speaks to this aspect of our group's work. Her research examines the factors that influence behavior and goes on to discuss the implications of those factors for university institutions. Her thesis argues that there is a "weak correlation" between people's attitudes and their behaviors (Ibid., p. 161). Arbuthnott suggests that "the more personal and specific our intentions are, the more likely they are to influence our behavior" (Ibid., p. 154). She also states that "repeated behaviors require constant monitoring to enable action consistent with our intentions" (Ibid., p. 157). We propose that stickers and prompts could be effective stand-ins for actual monitoring, and would be much more feasible in terms of labor. Furthermore, the University of Michigan study emphasized the importance of presenting short, simplified information rather than historical figures, perhaps suggesting that students want to be told what to do, not what to think about it (Marans and Scott, 2010, p. 15). Each individual is affected uniquely by different educational tactics. We believe our time spent focusing on students would be most efficiently used in implementing direct reminders; ideally, campus morals will either shift in response to widespread change in habits or in response to future, more long-term educational campaigns. The importance of prompts in other studies has been a driving force in our planning for these potential stickers. Oftentimes, all that is needed is a reminder to prompt people to act sustainably; these stickers seek to unobtrusively do just that.

As the Education Group, we are tasked with designing tools that will effect change in the behavior of students at Dartmouth College. In doing so, we hope to change behavioral norms on campus, facilitate top-down sustainability efforts, and influence our society's future leaders. To that effect, we will focus our campaign on the specific audience and habits that will most influence Dartmouth's overall sustainability, using delivery methods that have proven most successful in other sustainability education efforts.

3.4 Methodology

First, the Education Group reviewed articles that addressed the research questions mentioned in the conceptual overview. The articles provided research support and served as a roadmap for our methodology, targeting audience, and implementation pursuit.Next, on April 29th, 2010, the Education Group conducted a focus group comprised of nine Dartmouth students. We selected the nine students according to their perceived lack of involvement in sustainability issues as well as their general apathy towards environmentalism. Upon arrival, the focus group participants filled out a brief survey that requested personal information and their background on sustainability issues at Dartmouth (see Appendix I for survey). With the students' permission, our team filmed the one hour-long focus group session. Alexi Pappas moderated the focus group. Pappas asked a wide array of questions regarding the participants' opinions on environmentalism, sustainability at Dartmouth, and their personal motivations and behaviors pertaining to sustainability.

The purpose of forming the focus group was to create a welcoming and relaxed atmosphere in which students would be willing to share their honest opinions. From this focus group, we hoped to gain insight of a typical Dartmouth student's impression of sustainability and how he or she behaves in the context of his or her personal opinions. We then used this information in order to create an educational campaign that is best tailored to opinions and behaviors of typical Dartmouth students. The Education Group also submitted three questions to the Norms and Cultural Values Group's ten-minute long survey to the entire campus. Over 10% of the student body anonymously completed the survey. Our questions pertained to mini-fridge use, the effectiveness of visual devices in influencing behavior, and the enticement of a rewards system regarding energy consumption. The survey provided a broader, less detailed snapshot of Dartmouth students' current perceptions and behavior towards sustainability.

3.5 Results

3.5.1 "What's in it for me?": Student Reactions to Sustainability at Dartmouth College

The focus group aided the Education Group in finding out more about how to best educate Dartmouth students about sustainability. Although most of the student participants rated themselves low in terms of how sustainable they currently are, many expressed interest in becoming more sustainable in the future. We started our discussion with introductions, and then

warmed up with a conversation about what sustainability means. Most students agreed that with regards to student involvement at Dartmouth, sustainability means developing habits that ensure the ongoing availability and integrity of current resources. However, one '10 specifically mentioned that this lifestyle should be able to be maintained "without compromising life goals" (Focus Group, April 29, 2010).

Our next questions were directed at daily and immediate forms of sustainability education. We began by asking students about the very Boloco burritos we provided at the group meeting—Did they think about the environmental impacts of the foil on the environment? It became clear that students generally do not care about environmental impacts based on decisions that are somewhat out of their reach. This also applies to fraternities and the idea that, according to a '12, students "don't think about recycling on a Friday night" (Ibid.). However, another '10 mentioned that students tend to recycle in those fraternities where green recycle bins are scattered throughout the basement. "What helps is providing ways to make being sustainable easy" (Ibid.) (See also Chapter Four). This same '10 noted that although the members of his fraternity were initially reluctant towards having recycling bins in the basement, they now view basement recycling bins as the norm. This idea supports the notion that educational tactics and physical campus changes can result in more sustainable student habits.

We later asked the focus group members about their opinions regarding the green "Dartmouth Conserves" stickers covering light switches in bathrooms, dorm rooms, laundry rooms, among other places. The general consensus was that the stickers are extremely effective because students need constant reminders on how to be sustainable. They encouraged more use of the sticker tactic, because it is a way of being sustainable without being intrusive. One student said, "You can't tell people to be sustainable, but you can give them easy ways to be sustainable" (Ibid.). From this comment, we learned that although students are not *against* being sustainable, they are not willing to go out of their way to be more sustainable.

We asked if it would be realistic to focus on sustainability education with the goal of changing the norms and sustainability culture at Dartmouth. We told students that we would target students' habitual tendencies before arriving at Dartmouth. For example, we asked them about potentially adding sustainability education into Dartmouth Outing Club Trips. The focus group participants responded positively to this idea. The participants noted that not only do students respect the DOC Trips program and leaders, but also, impressionable first-years are

more easily persuaded to change their habits than older Dartmouth students. One '13 admitted, "When [first-years] come into Dartmouth, we are very gullible... If we were given information about sustainability early on, we would take it seriously" (Ibid.). This confirmed our predictions and literature review findings that aiming education efforts at first-years is the best tactic, because it is, as one student put it, "leading by example" (Ibid). However, when asked about how they responded to first-year Undergraduate Advisors (UGA) meetings, students had mixed responses. While first-year students look up to and respect their UGAs, they resent being told what to do, thus illustrating the importance of *how* the message is sent to students. Additionally, one student expressed to us that not only do her UGA's meetings lack a sustainability agenda, but her UGA was unaware of any general sustainability issues at Dartmouth. Since many UGAs do not seem to know or care about sustainability, and since students do not care to attend meetings, we considered what could be changed. We mentioned our initial idea to create a fun video for UGA meetings supporting sustainability at Dartmouth. The video, we thought, might share quick and easy ways to help our campus become more sustainable while also setting the example for more permanent changes in social norms among first-years and beyond. The reaction was positive from the focus group participants, who also mentioned, "people like to know what's in it for them" (Ibid.). The focus group students encouraged us to make sustainability more fun through our video, and include it incentives for why students should want to be sustainable for *themselves*.

In addition, we learned that the whole idea of sustainability is rather intimidating, and perhaps we should not even use the word "sustainability" in our visual presentations. Students are not interested in hearing abstract numbers and facts about sustainability, but prefer that we "make [sustainability] easy and practical" (Ibid.). This means, again, that if sustainability is both easy and attractive for them, they'll participate. An '11 put it well when he told us, "It's all about having the ability to reach an audience and hold their attention" (Ibid.). Next, we asked about mini-fridges at Dartmouth, because abolishing student mini-fridge use would be most advantageous for Dartmouth's overall energy use. Most of the students at the focus group agreed that they only put one or two unessential items in their mini-fridge, and might be willing to give theirs up. Students admitted that they, "just assumed they should purchase one before coming to college," and people are unaware that first-year dorm floors have a community refrigerator

already (Ibid.). Although students felt that we cannot make a *rule* against mini-fridges, the Education Group should encourage incoming first-years not to bring one at all.

We briefly touched on the subject of the Green Fund, and whether or not students supported this idea. In general, students seemed to think it is a good idea, but did not agree to unanimously support tuition raises for a sustainability cause. They argued that while sustainability is important, we cannot just assume that it is more important than raising tuition for other causes that are also unsupported. A '10 admitted, "Based on principle, donating to a Green Fund should be optional" (Ibid.) (see Chapter Five). All of the students, however, were proponents of promoting alumni education and offering additional venues for alumni to donate to sustainability initiatives. (Ibid.).

From conducting the focus group, we learned that Dartmouth students are most willing to behave sustainably when it is most convenient. Additionally, we learned that students are most responsive to sustainability campaigns that are presented in an attractive and personalized manner. We also learned that an education campaign would be most effective when targeted specifically at first-years before arriving to campus and throughout their first-year. Our focus group participants highlighted that DOC First-Year Trips and UGA advising are two important areas of focus for our campaign; the participants reminded us that it is far more effective to prevent unsustainable habits in first-years than it is to alter upperclassman's already established habits. Finally, we learned that while students support the idea of allocating funds to a Green Fund, they were more in favor of relying on alumni to supply the funds rather than on a student fee.

The focus group, therefore, has helped the Education Group designate first-years and alumni as our target audience for the education campaign. In terms of educating first-years, we are now aware that DOC First-Year Trips and first-year residential life should be two critical areas of focus within our campaign. We discovered that the most effective delivery tactics for sustainability education within these areas of focus should be visual aids that are attractive, nonintrusive, and convenient to the student. In fact, this discovery is reminiscent of Marcell et al. (2004)'s discussion of social marketing, with its simplification of complicated issues, personalization, trust-building, and use of humor and dialogue (p. 172). The focus group was a huge success, not only for the information that we acquired, but it also provided an open forum for discussion among students who may never have discussed sustainability at Dartmouth

otherwise. The students responded positively to our questions, and seemed enthusiastic about our goals.

3.5.2 Energy Consumption patterns: A Survey of Broader Student Behavior at Dartmouth

The results of the survey helped the Education Group to formulate tools and ideas for how to best reach our audience. Our questions on the survey were focused on mini-fridge use, the effectiveness of visual devices in influencing behavior, and the appeal of a rewards system regarding energy consumption in dormitories. Roughly 77% of the responders indicated that they own mini-fridges in their dorm rooms.¹ However, most students with a mini-fridge indicated that they would not be interested in using their dormitory's community refrigerator instead of their personal refrigerator. In the interest of time, we were not able to ask why students preferred to have a mini fridge. However, it is common knowledge that there is currently not a defined system in which students can safely store their food in the community fridge without the risk of it being stolen. Thus, it is important to note that had we suggested an alternative system that would ensure the protection of their food, we might have gotten different results. Therefore, in order to reduce mini-fridge use, we know that we need to target a campaign towards incoming first-years to prevent them from purchasing a mini-fridge in the first place rather than attempting to change upperclassman's already established preferences. Additionally, we know that in order for a community refrigerator system to be successful, the residential community must create a trusting and functional system that ensures the protection of an individual's personal food supplies by avoiding the "tragedy of the commons refrigerator".

Roughly 44% of respondents admitted that the green "Dartmouth Conserves" stickers around light switches are effective in reminding students to turn off lights when not in use. An additional 29.5% of the students confirmed that the stickers are somewhat helpful in reminding them to turn off the lights. From these responses, we learned that students are fairly receptive to visual reminders regarding sustainability. Finally, in a dramatic 89% majority, students admitted that they would like to participate in a rewards program that cuts room and board costs in exchange for energy use reduction. From this response, we learned that students are willing to change their behavior if they directly benefit from their behavioral changes. These results have

¹ Cultural Norms Research Group, ENVS 50. "ENVS 50 Sustainability". Retrieved from http://www.surveymonkey.com/MySurvey_Responses.aspx?sm=xwW3qSO9KLjBA%2frtAvy%2b0%2bpFF9xRtH ANoiFkjN1iejY%3d.

helped the Education Group form an opinion on how to best achieve our goal of educating the Dartmouth community.

3.5.3 Rationalizing Research Methods and Behavioral Targets: An Overview of the Literature

The results of the Education Group's conceptual overview demonstrated the need for a focus group and use of survey questions in order to better curtail our educational strategies to the average student while maximizing the educational benefits. The overview also led our group to conclude that an educational campaign focusing on first-year's sustainability education would have the greatest long-term impact on Dartmouth's sustainability future. A specific focus on students' use of mini-fridges would entail the largest decreases in student energy use. The survey and focus group would later further the notions that a concentration on first-years and mini-fridges would establish the most fundamental and long-lasting changes in both Dartmouth's culture and students' later lives. The conceptual overview additionally illustrated that the use of more visual and interpersonal presentations of sustainability would enhance the changes that our group seeks in Dartmouth's student population.

3.6 Discussion

After looking at the results for the focus group, the survey, and the literature research, the Education Group was able to better assess how to approach the issue of sustainability with students. Based on the information from the focus group, we concluded that the first step is to target students before they arrive at Dartmouth, because this is when students set the stage for future habits at college. Approaching students before they arrive is the best way to stop unsustainable trends before they start such as purchasing a mini-fridge. As indicated in the conceptual overview, mini-fridges are a significant source of energy consumption on Dartmouth's campus (Dreissigacker, 2009, p. 30).

The focus group indicated to us that most students think they are supposed to purchase a mini-fridge before coming to college. Additionally, the survey shows that the majority of current students are unwilling to give up their mini-fridge. However, according to the focus group, students said that if they were told before coming to Dartmouth that they don't need a mini-fridge, they probably would have taken this advice. The Education Group thought about the modes of communication that Dartmouth has with incoming first-years, and how we could most

effectively influence them. Based on the research supporting visual aids and campaigns, we decided to create an ad in the first-year issue of the college newspaper *The Dartmouth* to inform incoming first-years that they do not need to purchase their own mini-fridge. This is a feasible option, as we have already approached *The Dartmouth* about creating an ad in the incoming first-years' issue (see Appendix 2 for ad). Creating an ad would be the first step in abolishing mini-fridge use on campus, and thus provide a significant student-influenced improvement in Dartmouth's energy use. (Dreissigacker, 2009, p. 30).

Additionally, the Education Group hopes to utilize the DOC Trips program as a way to educate incoming first-years about sustainability. The focus group participants confirmed that incoming first-years look up to trip leaders. Therefore, trips provide an energetic and fun environment for learning. After looking over the results from our conceptual overview, it became clear to us that using visuals would be the best technique to educate. Keeping in mind that we didn't want to create *more* products to give to students that take energy to make, we came up with the idea of creating a design for the yearly eco-mug that includes facts and tips about how to be sustainable at Dartmouth. We learned from the focus group that people use these mugs often, and would definitely pay some attention to the image that is printed on it.

The Education Group has taken the results retrieved from our original methodology and applied it to several educational scenarios at Dartmouth College. We have illustrated the need to educate first-years about sustainable energy and general life practices early via pre-matriculation newsletters and Dartmouth Outing Club Trips. Once first-years arrive on campus they can continue to be educated by their Undergraduate Advisors (UGAs).

During students' first year they must live in on-campus dormitories with hallway UGAs that conduct weekly meetings with a moderately guided format and plan. These lessons include hallway meetings focused on Dartmouth's alcohol policy, seeking academic guidance, and advice for the sexually active student. Part of a UGA's \$1000 per term payment from the college is compensation for their weekly work in these meetings that are mandatory. During our focus group we learned that most students generally respected their UGAs; however, not all halls had mandatory weekly meetings and no sustainability information was dispersed by Dartmouth College through UGA lesson plans. We believe that creating a sustainability lesson plan (see Appendix 3 for lesson plan) for UGAs to teach during one mandatory hall meeting per term would be a further investment in UGAs. Sustainable facts about shorter showers, turning off

lights, etc can be dispersed to UGAs through their UGA training that occurs the week before classes officially start. By educating UGAs about sustainable initiatives at Dartmouth, they will be able to educate first-years and possibly even implement cluster wide competitions that reward energy conservation. As indicated by the survey results, students would positively respond to a reward system for reducing energy consumption in their dormitories (see Chapter Three,). In general, UGAs put a friendly face and an educational reason on why those green stickers are always reminding students to turn off lights and conserve energy. By instilling first-years with this knowledge upon their immediate arrival at Dartmouth, it can reinforce their pre-Dartmouth sustainable knowledge, and hopefully continue with them as they become alumni.

The Education Group hopes to further student knowledge of sustainability by creating a video that depicts sustainability as a 'cool thing' that students should want to do for themselves. The focus group demonstrated to us that most Dartmouth students are so busy that they begin to look at their possible array of scheduled activities and must often conclude, "What's in it for me?" Our video hopes to illustrate that sustainably using energy at Dartmouth is in students' best interest, and that gaining general sustainability knowledge will soon be in the world's interest. We plan for our video to be incorporated in UGAs' lessons plans, posted on YouTube, and a URL sent to various campus and alumni organizations (See the video at http://www.youtube.com/watch?v=jUl6kp2MwTg).

By showing our video to students and making sustainable practices a 'cool thing' we hope to begin to fundamentally change the culture of sustainability at Dartmouth College. Due to our conceptual overview, focus group information, and survey responses, we believe that the best way to get students attention is through visuals that are active, amusing, and succinct. By making our video widely available to the Dartmouth student population we hope that we can truly alter students' perception of sustainability both at Dartmouth and in the world at large. Targeting alumni will also be helpful since the video can update them on Dartmouth's current sustainability initiatives and hopefully inspire them to become more active in sustainability campaigns.

The third aspect of the Education Group's campaign is to educate alumni about sustainability initiatives at Dartmouth College and offer venues for donation to a potential Green Fund. It is important that we educate Dartmouth alumni about campus sustainability efforts because we believe that education of these efforts will make an impression on the lives of the alumni and hopefully those around them. In addition to the sustainability efforts being made, the

Education Group plans to inform alumni on how they can help promote sustainability projects by donating to the Green Fund. The capital donated to this fund will go towards projects aimed at making Dartmouth a more sustainable campus (See Chapter 5).

It is imperative that alumni are educated both on sustainability in general and on the efforts being made at Dartmouth so that they will be motivated to donate into the Green Fund. We plan on reaching out to alumni by requesting publication space on the Dartmouth electronic newsletter, Speaking of Dartmouth. This newsletter is updated roughly every three weeks and reaches Dartmouth alumni and parents of undergraduates. These are two demographics that are key in the building and sustaining of the Green Fund. Within the allotted space on the newsletter, we would like to see written news pertaining to the fund and projects that are being developed. In addition to this, we have designed a pamphlet that is to be mailed to the homes of alumni (See Appendix 4 for pamphlet). This pamphlet will also keep Dartmouth alumni educated and updated on projects at Dartmouth and how they can donate to the Green Fund. Ideally, a sustainability office will keep both of these forms of communication up to date. The alumni aspect of the education campaign is an integral component in connecting the Education Group to the rest of the research groups in Environmental Studies 50. There is also evidence from a recent collegewide survey that alumni greatly trust student perspectives on current Dartmouth issues; student updates about sustainability initiatives on campus—via a pamphlet and newsletter postings—will thus hopefully make such projects receive recognition and support from alumni (Roberta Moore, personal communication, May 11, 2010). The Education Group essentially serves as a media tool that would promote the Green Fund and therefore connect various affiliates of Dartmouth College to the notion of sustainability.

3.7 Conclusion

The Education Group has designed a campaign that seeks to institutionalize sustainability at Dartmouth. As an institution of higher education, Dartmouth is obligated to instill values of sustainability amongst its constituents – who will ultimately become active members of society and its norms– to ensure that sustainability will be perpetuated in institutional frameworks beyond Dartmouth. Our campaign therefore, has implications for change both within and beyond Dartmouth.

Our group targets first-years and alumni as audiences for our educational campaign. We focus on first-years because research denotes first-years as the most impressionable and malleable demographic at college (Marcell et al., 2004, p. 185). Our campaign seeks to educate first-years before arriving to campus and while living on campus their first year. We are not, however, advocating ignoring the older classes; eventually, it would, of course, be ideal for sustainable habits to become universal across all classes. In fact, creating a "base" of one class of students who have been introduced to a sustainable lifestyle would facilitate shifting behaviors for other classes. We plan to communicate with incoming first-years via a newsletter printed by the Dartmouth that gets sent to incoming students' homes over the summer. In this newsletter, we will inform first-years that it is unnecessary (and unsustainable) to purchase a mini-fridge for their dorm room. We also hope to educate first-years orientation trips. For example, every first-year receives an eco-mug on their orientation trip. Our group has created a design for future eco-mugs that delineates personal energy use at Dartmouth in order to reinforce the message (see Appendix 5 for design).

Our campaign also targets first-years while at Dartmouth. We have designed educational pamphlets and material to be incorporated into UGA training that will hopefully be conveyed to first-years during their weekly hall meetings. Our video, "Sustainability: What's in it for me?" serves as an educational tool that specifically appeals to college first-years because of its light-heartedness and catchy nature. This video can be incorporated in the UGA sustainability curriculum and also featured on the sustainability website along with other sustainability media tools at Dartmouth.

Finally, our educational campaign educates alumni about current sustainability initiatives taking place at Dartmouth in addition to informing them about various ways to donate to sustainability at Dartmouth (ie Green Fund). The alumni component of our campaign helps connect our work with the work of the other campaigns because our campaign serves as a potential media tool for the Green Fund.

Education is an essential component of achieving sustainability at Dartmouth. Administration, faculty, staff, students, and alumni must be well informed about sustainable practices and initiatives in order for Dartmouth to move forward as a "green" institution. In the interest of time, our team has only designed a campaign for students and alumni.

We however, acknowledge the importance of educating the administration, faculty, and staff and do not think that these groups should be overlooked. Similar research methods to those we undertook with students—i.e., literature reviews, focus groups, and surveys—could prove equally instructive when designing educational programs for these demographics. For instance, research can be done to support the importance of administration, faculty, and staff leading by example, and thus furthering sustainability at an institution of higher education. It would be necessary, however, to create a strategic campaign that most effectively communicates with these particular demographics of college or university. Furthermore, each demographic would require a unique campaign that targets the specific behaviors that we would intend to change, keeping in mind that different behaviors may be most effective for different demographic groups.

As a team, we recommend that the administration create a working force, perhaps a subdivision of the current Office of Sustainability that is responsible for educating all members of the college and creating effective campaign catered to specific demographics at Dartmouth. Indeed, this is one of the primary functions of the newly proposed Sustainability Director position (Dartmouth College, 2010). In order to create an effective sustainability campaign, Dartmouth must keep people equally aware of sustainable practices and sustainability efforts at the college. While our group has only planted the seeds for sustainability education at Dartmouth, we hope that the college can use our work as a foundation for implementing future educational frameworks.

Chapter Four: College Administration and Sustainability

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Foreword: Research Questions

How is Dartmouth going to become sustainable? While "sustainability" can be a complex term with many meanings in different contexts, we can at least settle on the fact that Dartmouth ought to regain its status as a leader among American universities in reducing its environmental impact, improving its operational efficiency, and working a long-term ecological focus into its curriculum. Achieving these goals will better prepare its students to lead society's transition to a greater level of sustainability in the future. What is the best way to go about accomplishing these measures? What role do members of the Dartmouth community have to play? More specifically, what is the role of the college administration in promoting and bringing about sustainability? How do administrations contribute to or detract from sustainability initiatives, and how can Dartmouth administrators specifically learn from past successes and failures at other schools? In what ways can an administration act as a bridge to sustainability, and in what ways might it be a barrier to the implementation of sustainability advances? These questions form the basis of our research in this section, which presents case studies of sustainability at peer institutions to draw conclusions about the role of the college administration in general and the challenges and opportunities presented to the Dartmouth administration by the Dartmouth Revolving Green Fund proposal outlined later in this report.

4.1 Sustainability as a Goal for Dartmouth

Sustainability is a worthwhile and achievable goal that plays an increasingly important role at higher education institutions. Dartmouth College has made many strong initiatives towards sustainability, such as the targeted 30% carbon reduction by 2040 and the creation of a Sustainable Living Center, but there are number of areas where Dartmouth can continue to move towards sustainability. Recently Dartmouth received a B+ from the 2010 College Sustainability Report Card, down from their previous grade of an A- in past years (College Sustainability Report Card, 2010). One area where Dartmouth consistently scores lowest in this report is the Administrative category, which includes administrative structure, transparency, and leadership. College administration is critically important to achieving sustainability because without the support of top-level administrators meaningful change rarely occurs. The late Dartmouth Environmental Studies professor Noel Perrin observes: "no college or university can move far towards sustainability without active support of at least two senior administrators" (Perrin, 2001, p. 4). Writing almost a decade ago, he continues, "The current senior administrators at Dartmouth are not in the least hostile to sustainability; they just give a very low priority to the college's practicing what it preaches (Perrin, 2001, p. 4). More recently, the administration was also identified as a potential area for improvement in the 2009 Dartmouth Sustainability Assessment. Writes consultant Maureen Hart, "Dartmouth needs a stronger commitment on the part of senior management and the faculty to create a culture of sustainability and systems thinking. The new administration of President Jim Kim has the opportunity to make this an area of excellence for Dartmouth" (Hart, p. 2).

Clearly, if Dartmouth wants to continue at the forefront of sustainability in higher education, addressing many of the issues with administrative structure and planning are necessary. The appointment of President Jim Kim and the recent administrative restructuring in response to budget deficits present opportunities to prioritize sustainability within the Dartmouth Administration. It is not that the administration is against sustainability in any way, but rather given time and budget constraints, sustainability at the College is likely to take a back seat to other pressing issues. The purpose of this section of the ENVS 50 report is to look at successful sustainability initiatives at peer institutions to identify common themes and facilitators to sustainability—in our language "bridges"--and then apply them to Dartmouth. The goal with these case studies is to provide suggestions and guidelines that the Dartmouth Administration can adopt without having to spend valuable time researching and debating. As Weber et al. (2009) highlight, "the formalization of a sustainability management structure... is necessary to critique, strengthen, and formally sign-off on the recommendations emerging from the various committees to expedite the process of approval by the president and administration" (Weber et al. 2009, p. 176). A better understanding of administrative bridges and barriers will make the implementation of sustainability measures like the Dartmouth Revolving Green Fund more achievable and straightforward.

4.1.1 Conceptual Background

Our research, conducted through case studies of exemplary peer institutions, draws on systems thinking, organizational theory, cross-institutional comparisons, and modern approaches to management to analyze the strengths and weaknesses of a university administration in promoting college-level sustainability. University-level sustainability is tantamount to broader

societal change, and the administration is a central component of this push for sustainability. The importance of the role of administrative support is clearly documented in the literature on institutional change. In the words of Dahle and Neumayer, "no college or university can move far toward sustainability without the active support of at least two senior administrators" (2001, p. 139). Administrators shape a school's policies, philosophy, and long-term plans, and have direct control over sources of funding and the means to transformative change.

Applying systems thinking is an important tool in understanding how sustainability can succeed in higher education. Universities and colleges are uniquely positioned to act as leverage points towards a more sustainable society. Administration clearly plays an important role in facilitating these changes; without cooperation from the administration, significant top-down changes rarely occur. But as systems thinking stresses, we cannot rely on "command and control management" where change only occurs on an individual level (Beddoe et al., 2009). Instead we should view the whole system when attempting change. This means that although administration may play a key role towards sustainability, both student and faculty willingness and involvement are also necessary for systemic change. Still, no actor can be considered an island in the systems approach to institutional sustainability. Every element of a system impacts every other element, and college-level sustainability initiatives must recognize this interconnectedness. As Beddoe et al. emphasize, "Worldviews, institutions and technologies are mutually interdependent and mutually reinforcing" (2009, p. 2482).

In order to enact sustainability, an institution and its administration must sometimes undergo a transformation. Shriberg (2002) describes a number of challenges that institutions of higher education face in bringing about these transformations: diffuse power distribution, lack of absolute authority among decision-makers, lack of accountability, high risk aversion, and bureaucratic resistance to anything more than incremental change all hinder campus sustainability efforts. Despite these challenges, universities and colleges have a number of factors to take advantage of in promoting systemic transformation. Inclusive decision-making, for example, and a tradition of collaboration drawn from academia are important keys to sustainability initiative success. Committed support from high-level organizational leaders and the support of a core group of committed individuals with broad reach and influence are also necessary for successful comprehensive and coordinated sustainability initiatives (Shriberg, 2002a). To analyze the Dartmouth administration's successes and failures in sustainability, it is important to compare our school to peer institutions rather than maintaining an inward focus on year-over-year improvements or setbacks (Shriberg, 2002b). Universities compete in almost every field imaginable (see US News & World Report); in our view, framing sustainability in a way compatible with this mindset will motivate administrative initiative. In light of this, our project will examine flagship sustainability measures achieved by a range of institutions across the country. Shriberg stresses the importance of quantitative metrics in comparing campus sustainability (2002b), and in our selection process we looked to the College Sustainability Report Card to find schools ranked highly in the relevant categories. It is important to note, however, that administrative integration of sustainability to its mission is difficult to quantify, and so the case study method will provide a valuable means of comparison for our purposes.

4.1.2 Where Dartmouth Stands

Dartmouth College is at a crossroads whereby sustainability is discussed and supported by students, faculty and staff, but Dartmouth has yet to commit to a flagship sustainability project that can highlight its initiative. The college's carbon reduction target is a step in the right direction, but it is a non-binding agreement, and it appears the college has done little to move towards the stated 30% reduction in emissions. The Sustainable Living Center had been an idea in the works for many years before the project gained the momentum with the administration necessary for its formal approval. On the other hand, the Organic Farm is a fine example of Dartmouth's past leadership in campus sustainability.

4.1.3 Methodology: Case Studies

We have identified five case studies that will demonstrate how administrative efforts can contribute to or detract from campus sustainability. The five case studies chosen were selected because the schools in question represented various factors relevant to Dartmouth as an institution such as geographic proximity, student body size, educational mission, and student body composition. Oberlin and Carleton, for example, demonstrate the abilities of small liberal arts colleges, while UNH and Duke illustrate the capacity of large universities to affect substantive change. Finally, Yale shows what one of Dartmouth's strongest rivals in the Ivy League can achieve with collective administrative support and a dedicated sustainability office.

In each case study, we examined a particular noteworthy project at the school and investigated the history of how that project came to be by interviewing students, faculty, and staff. Interviews were conducted by phone whenever possible and followed a common script as closely as was practical. When phone interviews were impossible, some questions were answered over email, with the list of questions based off of the script for the interview. Additional data were gathered from school sustainability websites, books, and sustainability reports available online. We also examined the administrative structure of each school and tried to uncover how that structure helped or hindered the case study project and sustainability projects at that school in general.

From these case studies, we hope to isolate and discover what factors at these schools allowed them to effectively complete their ambitious sustainability projects. The successes and failures of the schools presented in the remainder of this chapter will comparatively illustrate what is holding Dartmouth back from being the best in the country. Many other peer institutions with similar financial and human resources and constraints have successfully adopted highly acclaimed and effective sustainability projects. How can Dartmouth most ably follow suit and become a leader in campus sustainability? It is the goal of this chapter to answer these questions in support of the undertaking of a flagship project such as a revolving green fund here at Dartmouth. The analysis of these case studies, selected from successful projects at a variety of schools around the country, draw upon the work of Peter Senge, Mary Boyce, Steven Sterling, and Michael Shriberg to understand organizational theory, systems thinking, and challenges to sustainability inherent in institutions of higher education. Framing sustainability efforts in terms of institutional learning and first- and second-order change informs our analysis and ties it to relevant academic work on campus sustainability.

4.2 Carleton College

Carleton College is a small liberal arts college located in the town of Northfield, Minnesota (population 17,000). It currently has a student body of 1,986 undergraduates, coming from 49 different states. There are 37 different majors at Carleton, and the academic school year is split up into three 10-week trimesters (Carleton College, "About Carleton"). Carleton has been noted as a leader in college sustainability in places such as Audubon Magazine and The College Sustainability Report Card for its many impressive sustainability efforts including: a one-stream recycling stream, LEED Gold certified new dormitories, an 800 acre arboretum, a \$40,000 sustainability revolving fund, and a 1.65mW wind turbine (Carleton College, "Initiatives"). In this section, the wind turbine is discussed, with the goal of explaining what factors at Carleton and in its administration allowed a large capital project such as the wind turbine to be approved and funded by the college.

4.2.1 Project: Wind Turbine

In September, 2004, Carleton College finished construction on a 360 foot tall wind turbine 1.5 miles east of its campus in Northfield, MN. The wind turbine produces an average of 4,457,203 kWh, all of which is sold directly into the grid through the utility company Xcel. The 1.65 mW turbine cost \$1.83 million to construct, but was partially funded by a \$150,000 grant from the Minnesota Department of Commerce (EAC, 2005). The expected payback period for this turbine is 10-12 years, and the overall life expectancy is 20 years (Carleton College, "Frequently asked questions"). Although the location of the turbine right outside of Northfield is not ideal for wind power, it uses new technology to harness the lower wind speeds more efficiently, and is seen as a prime example of the strategy of putting wind turbines near areas where they can connect directly into the grid rather than in isolated areas where they might experience the higher wind speeds (Carleton College, "The History of").

Carleton Student Assembly had approached the college administration about purchasing more of their electricity from renewable sources (Lamppa, personal communication, May 22, 2010). The assembly offered to pay part of the cost of buying 10% of Carleton's electricity from renewable sources, which would have increased the electricity bill for the college by \$30,000 annually. When faced with this cost, some in administration thought that this type of money might be better spent investing in actual infrastructure to make Carleton's electricity more

sustainable, rather than just purchasing electricity at a premium to support renewable energy elsewhere. The idea for the wind turbine originated in a Carleton College service learning class called Global Change Biology in the Environmental and Technological Studies department (EAC, 2005). Planning for the project started in 2002 when a coalition of Carleton College, the Northfield school district, nearby St. Olaf College, and a community wind energy advocacy organization called RENEW surveyed the surrounding Northfield area and came up with two ridges suitable for wind development. After this initial survey, Carleton and the Northfield school district jointly hired a wind developer to help in the advancement of the project. RENEW conducted a town meeting to assess the public opinion on the potential wind turbine, and despite widespread acceptance, the school district dropped out of the process to build the turbine, leaving Carleton as the only paying partner remaining (Carleton College, "The History of"). The decision to initiate the project was made because it was consistent with Carleton's Environmental Statement of Principles and RENEW as well as students from the ENTS program showed that such a turbine operating in the relatively low winds near town could produce favorable rates of returns with the new turbine technology available(Carleton College, "Frequently asked questions"). Additionally, the project fits in well with Carleton's Carbon Neutrality Statement, which states the goal of becoming carbon neutral, although no deadline for neutrality is set (Carleton College, "Statement of Values"). When the turbine was being planned, Carleton worked out a contract with the energy company Xcel to sell the electricity back to the grid as a way of recouping the cost. However, currently that decision is being regretted as Carleton is locked into selling the electricity from the turbine to Xcel at below market prices. Carleton is currently planning the construction of a second turbine, although this one will provide electricity directly to the college and is funded entirely by an alumni donation. (Kanazawa, personal communication, May 19, 2010)

The organization of Carleton College for sustainability decision-making is illustrated below in figure X. Although it has no dedicated, full-time sustainability staff, the college does have an entity called the Environmental Working Committee (EAC), which is somewhat analogous to the Resources Working Group at Dartmouth College. The committee is "dedicated to upholding the Environmental Statement of Principles and the Carbon Neutrality Value Statements at Carleton College, ensuring that these visions and ideals are incorporated into all aspects of College function" and generally acts in reporting, information gathering, and advising
roles (EAC, 2005; Nachman, personal communication, May 19, 2010). The EAC does have some direct power in the form of its own small budget from which they pay a stipend to the undergraduate Sustainability Assistants (STA's) and finance small projects. Also, the EAC manages the Revolving Sustainability Fund, and is in charge of deciding which projects get funds through that mechanism (EAC, 2008). The committee, however, does not have a large role in funding or approving large projects such as the wind turbine. This type of large capital project, as in many other schools, is decided by upper level administrators who handle the long term planning for Carleton College as a whole (Nachman, personal communication, May 19, 2010).

4.2.2 Conclusions

Carleton's strong commitment to being a sustainability leader is one aspect of the school which enables sustainability projects to be completed there effectively. This commitment is evidenced in their Environmental Statement of Principles and their Carbon Neutrality Value Statement. Although these are only ideological pledges with no binding targets, they illustrate that sustainability is a core issue to Carleton College, and that any and all efforts should be made to increase sustainability there. Furthermore, Carleton's newly retired President, Robert Oden, was one of the first fifty college presidents to sign onto the Presidents Climate Commitment, indicating that support for sustainability at Carleton reaches to its highest levels (EAC, 2008). One aspect of the EAC that helps support sustainability efforts is that three of its nine voting members are undergraduate students of the college (Carleton College, "Charter of the",) This helps lend transparency to the decision making process of the committee, and makes it easier for other students to approach the committee with ideas. Carleton College also realizes that it is part of "interconnected communities" and that sustainability is not an issue that can be handled only within the confines of the campus (Carleton College, "Statement of Values",). Carleton partnered with numerous community organizations in planning and constructing its wind turbine, which may have helped make the process easier to envision and execute.

While Carleton has strong bridges to sustainability, it also faces many of the barriers that probably face higher education institutions across the country. Like many institutions across the country, Carleton is "feeling the crunch" from the current economic situation and is cutting back funding in many areas (Kanazawa, personal communication, May 19, 2010). Because of this, they are may be unable to fund some projects that that may be economically viable and

consistent with their long term vision and would probably be pursued by the college in normal economic circumstances. (Kanazawa, personal communication, May 19, 2010). Additionally, as in many places, Carleton faces the issue that it is very difficult to achieve communication between students and administrators (Nachman, personal communication, May 19, 2010). Often, students have the ideas and creativity and energy to accomplish great sustainability projects but lack the institutional know-how to actually start the process of turning those ideas into realities. There are no administrators focusing only on sustainability issues, and thus they are very busy executing their other roles and have little time to focus soley on the sustainability issues presented by students.

4.3 Oberlin College

Oberlin College is a small liberal arts institution located in rural Ohio. Known for its conservatory of music and its history of social activism, Oberlin is also becoming increasingly recognized for its achievements in campus sustainability (Sustainable Endowments Institute, 2010). While the school received high marks in almost every category of the College Sustainability Report Card, it stands out among institutions of higher education for its remarkable Adam Joseph Lewis Center for Environmental Studies, which has received numerous accolades for its innovative design and commendable energy efficiency (Oberlin College, 2007d). At the time of its construction, the Lewis Center was one of the first buildings of its kind in the country, and it demonstrates sustainable design features that are cutting-edge even today. The conceptualization, approval, and construction of the Lewis Center, which may be Oberlin's greatest triumph in advancing towards sustainability, will be the subject of this case study. The roles of primary actors, including the college administration, in the process will illustrate some of the challenges that Dartmouth can expect to encounter in its future proposals and campaigns and for sustainability.

4.3.1 Project: The Lewis Center

Named one of the Top 10 Green Projects of 2002 by the American Institute of Architects, the Lewis Center has received national acclaim for its ground-breaking application of ecological principles to sustainable design (American Institute of Architects, 2002). The building itself was created to be the new home of the college's Environmental Studies Department, which was at the

time a small but growing group of faculty and students. Contracted out to the architectural firm William McDonough + Partners (Rosenblatt & San, 1999), and designed with a broad coalition of support outside the college itself, the Lewis center was designed from the ground up to showcase the strengths and abilities of sustainable design and to lead the nation's academic buildings in energy efficiency.

Perhaps the most celebrated feature of the AJLC is its "Living Machine," created by renowned biologist John Todd, which treats waste water using a cycle based on the natural operation of wetlands (Hallowell, 1999). The Living Machine yields fresh water and converts nutrients from solid waste into biomass, bypassing the environmentally destructive college sewer system that dumps waste into the nearby Black River (Orr, 2002).

Energy use is minimized through a number of measures that work together to reduce heating, cooling, and electrical needs. Geothermal heat pumps connected to deep wells import or dump heat, and a large solar photovoltaic array on the roof provides much of the building's electricity needs. The orientation of the building on an east-west axis with plenty of southfacing windows maximizes solar radiation, making the AJLC a passive solar building as well. Classrooms and offices are equipped with compact fluorescent lights and motion sensors to turn lights off when no one is there. Triple-pane insulated windows, airlock doors, and radiant floor heating all help minimize the energy footprint of the building as well. And a network of sensors spread around the building tracks real time production and consumption, enabling students and faculty to analyze their energy use and find areas for improvement (Oberlin College, 2007a).

Finally, the Lewis Center is valued not just for its physical innovations, but for its place in the Environmental Studies Program as well. It is meant to be a living laboratory where concepts crucial to the discipline can be studied and understood at a localized scale. Ecosystem services, thermodynamics, renewable energy, and energy efficiency all are integral components of how the Lewis Center works. The planning and design processes employed full-cost accounting, an exercise in life-cycle analysis that considers the entire environmental, economic, and social costs of construction and operation. And the Lewis Center, according to Professor John Petersen, was envisioned as "an *integrated building-landscape system* that would continue to change and to improve in performance over time" (Oberlin College, 2007c). In Orr's words, "the building and its landscape would be made active parts of the curriculum, not just anonymous places where education happened disconnected from place" (Orr, 2006, p. 72). The original idea for an Environmental Studies Center emerged from a seminar-style class taught by Professor David Orr with the goal of locating a space for a center that would "provide offices, classrooms, and working areas for students and faculty in the program" (Orr, 2006, p. 65). The class brought leaders in sustainable design to campus to engage with the students and sketch out a rough list of requirements and goals. Administrators suggested renovating an existing college-owned structure, but after a survey of the options, the class decided that the construction of an entirely new building would be needed for a potential new center.

Initially, expectations for the class were low. Many thought it was going nowhere, merely an exercise in proposal design (Orr, 2002). According to a student in the class, it was "a pipedream kind of idea at the time" (Deirdre Holmes, personal communication, May 26 2010). In June of 1995, however, the project took a big step forward with the arrival of the new president of the college, Nancy Dye. "She saw the opportunities the way he [Orr] did and really backed him on it" (ibid). With this support, trustees authorized the construction of a new Environmental Studies building to be developed by Orr, with the caveat that all funding for the project had to come from outside the college's main channels of revenue. With this step, the project suddenly became very real, and Orr and his students sought out the cooperation of a wide range of supporters. Architects Bill McDonough and John Lyle joined the design team, as did biologists John Todd and David Benzing and energy and sustainability expert Amory Lovins. Two graduates of the class of '93, Brad Masi and Deirdre Holmes, returned to Oberlin to work full-time on the project. The Lewis Center benefitted from this wide coalition, bringing in many additional engineering firms and research institutes (Oberlin College, 2007b). Indeed, as progress continued through the architectural planning phases, Orr and Lyle hosted a number of design charrettes, a method of teaching sustainable design through community involvement (Walker, 2008), to expand the process to all interested parties (Orr, 2002).

The linchpin of any proposal is its financing, and the Lewis Center was no exception. Unlike most college construction projects, however, the Lewis Center was built without financial or fundraising support from Oberlin (Orr, 2006, p. 156). Orr was explicitly instructed to draw funding from sources without previous ties of loyalty to the college, ruling out the college's primary fundraising source, the alumni. Nonetheless, the project went ahead as planned in 1995, 1996, and 1997, with Orr traveling around the country to speak with potential donors. The

Lewis Center secured big donations from a few wealthy foundations, eventually amassing independently the \$7.2 million necessary to begin construction. In fact, according to David Benzing, a biology professor involved "at all stages of the planning and construction of the AJLC" who helped coordinate the charrettes, "the success of the project is entirely due to his [Orr's] tenacity and success as a fundraiser" (Benzing, 2010).

Oberlin demonstrates a case in which the administration approved a transformative proposal but stayed quite disengaged from the process of seeing it through. Fundraising was achieved by appealing to donors' sensibilities beyond loyalty to Oberlin; the attraction of the AJLC as a cutting-edge project in ecological design with the potential to become a gold standard for sustainable architecture in higher education was a stronger pull than an association with the school itself. That the project was a success without the assistance of college fundraising and financial support hints at the advantages of structuring a proposal outside a college's typical scope of activity: "had we worked through the usual process by which the college makes decisions about capital projects, we would have been in direct competition with other and more powerful interests, and thus would have been rejected outright" (Orr, 2006, p. 156). This competition is familiar to any proponents of sustainability measures at Dartmouth; securing funds in the face of more urgent priorities is a perennial difficulty of sustainability proposals (Hart, 2009).

Despite the success of the project leads in securing funding, the design and construction of the AJLC still had to overcome what Professor David Benzing called "major obstacles." Depending on one's source for information about the project in those early stages, the administration's involvement ranged from passive and noncommittal to thoroughly adversarial. In none of our sources or interviews did we find evidence of strong support from the administration. According to Orr, "the concept of a high-performance building did not have visible 'buy-in' or enthusiasm from the senior staff" (Orr, 2006, p. 156). Others were even harsher in their analysis: in the words of one member of the design team, "participation was wide (students, faculty, townspeople, imported experts) but did not include any top administration ... definitely did not demonstrate behavior conducive to the adoption of measures that promote campus sustainability." Indeed, according to a faculty member close to the project, one

prominent administrator in a powerful role with regards to the project "saw David [Orr] as a competitor and did his best to undermine the project."

The design of the Lewis Center may have also been hindered by the narrow hierarchical organization of the Oberlin administration. The design team had one and only one administrator to report to, the Vice President of Development, and the compartmentalized nature of the administration made effective communication and collaboration even more difficult than it already was (Orr, 2002). Students, however, were interested in the project, which received plenty of coverage in the Oberlin Review in the years leading up to its construction, and the community was invested to some degree via the design charrettes, but sources suggest that the administration was largely dragging its feet. Why was this the case? It may have to do with the reluctance to change that is a common feature of academic administrations. Anyone who has made some kind of a proposal to Dartmouth administrators will be quite familiar with the polite nods from administrators in meetings: "the unstated rules of engagement required that they show little or no enthusiasm, make only innocuous and thereby safe remarks, express no gratitude for fear of I'm not sure what, and take cues from superiors" (Orr, 2006, p. 150).

British philosopher Mary Midgely suggests that administrators are ruled by a doctrine of "make no mistake" (Midgley, 1989). That is, nobody has ever been fired for turning down a proposal, and administrators are motivated by fear of repercussion and comfort in stability to focus on keeping things more or less the same. While a bit incendiary, this does seem to ring true with the case of the Lewis Center: Orr and his students were proposing a radical departure from contemporary college architectural design, with unknown costs and unseen benefits. Why take the risk of throwing one's support behind a project without an express command to do so from a superior? This may be one of the key problems with administrations in promoting sustainability: the aversion to risk and the "think big" visionary attitude precludes many initiatives from getting off the ground.

Today, it seems, Oberlin is doing better with campus sustainability. It earns top ranks in college sustainability, and has a dedicated Office of Environmental Sustainability that operates under the Vice President for Finance. A revolving loan program funds efficiency upgrades and other green projects on campus, providing \$125,000 a year from student tuition-bill donations, and Oberlin is working towards a number of other green initiatives. According to Nathan Engstrom, the director of the sustainability office, current projects are "largely all lumped

together under one broad banner: carbon neutrality... much if not most of what we're doing is connected to that one specific topic" (Nathan Engstrom, personal communication, May 24 2010). The biggest challenge moving forward is "reaching consensus on just what our priorities are" (ibid), but Engstrom was confident that Oberlin is on the right track. The Sustainability Report Card confirms his position, giving Oberlin straight A's in every category except "Endowment Transparency" and naming the school an "Overall Campus Sustainability Leader" (College Sustainability Report Card, 2010.

4.3.2 Conclusions

Oberlin presents a quite thorough case for an administration of what not to do. Its footdragging, risk-averse attitude, and general disengagement from the design process hindered the efforts of students and faculty to bring about a positive change for the college. Ironically, Oberlin's sustainability project succeeded without assistance or support from the administration beyond the cautious approval of the president, and now it brings national acclaim and recognition to the college as a whole. Due in large part to the extraordinary efforts of a small group of professors, architects, and engineers, this case still demonstrates the importance of a college administration in sustainability measures, but in slightly veiled ways. Without the support of President Dye, however mild, the project certainly could not have succeeded. And if the administration had taken a more active stance in weighing the project competitively against other options, it may have failed as well due to the non-progressive attitudes of senior administrators and the "make no mistake" mentality described by Orr and Benzing. But the Oberlin administration "really dropped the ball on the environmental issue" at a time when it could have come out strongly in favor of a revolutionary design. If one thing is clear in terms for sustainability at universities, it is that environmental consciousness and sustainability activism are only going to become more important. The Princeton Review is coming out with a Guide to Green Colleges, and two thirds of students take greenness into account when making enrolment decisions (The Princeton Review, 2010). The big lessons for sustainability at Dartmouth relate to the Lewis Center's successes: the ability to independently fundraise, the support of at least one high-level administrator, and the tireless efforts of a small core of activists can lead a project to success in the face of considerable administrative adversity. Sustainability efforts would be more fruitful for all, however, including the college itself, with proactive administrative support.

4.4 University Of New Hampshire

The University of New Hampshire is a medium size University located in rural Durham, NH. As of 2009 it had an enrollment of about 12,000 undergraduate students, 2,000 graduate students, and nearly 1,000 faculty. The annual operating budget for the school in 2009 was \$487.9 million dollars and their endowment was \$180 million dollars (http://unh.edu/unhedutop/about-unh). The university offers 100+ majors and has numerous different graduate programs. One area where the University has focused attention has been achieving sustainability on campus. The school has realized a number of impressive awards and accomplishments, including the first endowed sustainability office in higher education, campus leadership awards from the Association for the Advancement of Sustainability in Higher Education (AASHE), and top grades from the College Sustainability Report Card for several years running.

4.4.1 Project: Landfill Gas Pipeline and Cogeneration Plant

With the May 2009 completion of the ECOLine Landfill Gas Pipeline, the University of New Hampshire achieved another first; becoming the first College in the US to use landfill gas capture to provide heat and electricity for their campus. Already a leader in higher education energy efficiency, this project sent a strong message to other institutions that UNH is committed to sustainability and addressing climate change (http://www.energy.unh.edu/). In conjunction with the 2006 construction of their \$28 million Co-Gen natural gas power plant, the 12.8 mile pipeline project provides 85% of the campuses power needs. The project uses 300 extraction wells at Waste Management's Turnkey Landfill in Rochester NH to capture and refine methane from the breakdown of organic matter in the landfill and then pipes the methane to the school campus in Durham NH.

These projects were undertaken by the University because they made both sound financial and environmental sense. To quote University President Mark W. Huddleston, "By reducing the university's dependence on fossil fuels and reducing our greenhouse gas emissions, ECOLine is an environmentally and fiscally responsible initiative. UNH is proud to lead the nation and our peer institutions in this landmark step toward sustainability" (sustainableunh.edu) The 2006 construction of the Co-Gen power plant and the \$49 million Eco-Line project were

both internally funded by the college with 20 and 10 year payback periods respectively. Switching the power plant from petroleum to natural gas saved the college significant yearly fuel costs and resulted in a 21% reduction in greenhouse gas production from 2005 to 2006 levels (http://www.energy.unh.edu/). ECOLine is projected to cut more than 36,000 t CO2e (metric tonnes of carbon dioxide equivalent) annually by 2020 (unh.edu/wildcap) and the cost saving by switching to a byproduct fuel source that Waste Management would otherwise have to flare off will help pay for the project. UNH is selling REC (renewable energy certificates) through 2015 to help finance the project to invest in other energy efficiency projects on campus. After the project is paid off after 10 years UNH will claim full environmental benefits, a key part of GG reduction plan at UNH (unh.edu/wildcap).

Clearly for a project of this magnitude to come to fruition, high level administrative support was required. UNH President Mark Huddleston, Chief Sustainability Officer Tom Kelly, and Alan Davis manager of the Turnkey Landfill were all key backers of the Co-Gen power plant and ECOLine project and because of the "win-win" situation both UNH and Waste Management were able to collaborate closely for a successful outcome. Additionally, because the program is integral to achieving UNH's climate action plan (WildCAP), getting the project passed by the administration and finding financial backing was facilitated (sustainableunh.org). These projects were the culmination of multiple years of planning on the part of the staff of the Sustainability Office starting with their formation in 1997 and the creation of an energy task force in 2005 (sustainableunh.org). One of the results of this task force was the adoption of the WildCAP climate change plan. To achieve this aggressive greenhouse gas reduction target, the task force identified power production at the University as the primary emitter of greenhouse gases and began brainstorming ways to reduce emissions. The construction of the Co-Gen power plant in 2006 and the ECOLine pipeline project in 2009 were direct results of the Energy Task force established by the sustainability office. Below is a flowchart of the thought process and implementation of the different sustainability phases at UNH starting with the creation of the sustainability office in 1997.

Figure 4.1 Sustainability Roadmap at UNH (1997-2009).



(Source: Cleaves, 2009)

The primary barrier encountered in the construction of the ECOLine landfill gas pipeline project was perceived initial cost; like the Co-Gen power plant, implementation of the landfill gas pipeline would cost UNH tens of millions of dollars upfront (http://www.energy.unh.edu/). A large effort was made to keep costs and environmental impact as low as possible by routing the project through existing infrastructure right of ways from the Turnkey Landfill to the Durham campus (sustainableunh.edu). After extensive cost benefit analysis, project coordinators realized that the pipeline made sound financial and environmental sense. The project was able to be internally funded by UNH with a ten year payback from selling REC credits and will achieve UNH's targeted emissions reduction in their WildCAP climate action plan (unh.edu/wildcap).

4.4.2 Conclusions

Because of the extensive time and financial commitment required by these projects, UNH effectively committed itself towards a path of sustainability. In academic circles this is referred to as "second order change" as opposed to "first order change". First order change is focused on doing 'things better' as opposed to 'doing better things' (Sterling, 2004). Second order change instead results in change so fundamental (in this case the University's stance on sustainability) that the system itself has changed. This change requires many years of commitment and as Boyce writes, "The sustained work calls for collective action leading to new practices and beliefs, steps that are entrepreneurial in character, with much risk taking and flexible adjustment on the way" (Boyce, 2003, p. 127). He continues, "Sustaining organizational change depends on a college or university's continuing ability to engage in rigorous second order change (Boyce, 2003, p. 128).

While UNH's construction of a Co-Gen power plant and Landfill Gas Capture Pipeline may seems like prohibitively large projects for many other peer institutions, it is important to note that these projects were merely the result of many years of planning towards sustainability. One needs to learn how to walk before they can run. Fostering a culture of sustainability at an institution is a necessary first step. This may be accomplished by the creation of a sustainability office or the creation of a sustainability task force to identify potential areas for improvement. Then once this first order change is accomplished, second order lasting change can be adopted.

4.5 Yale University

Yale University is a private college located in New Haven, Connecticut and is home to 11,250 students, roughly 5,247 undergraduate students and 6,169 graduate students attend this institution. The University is comprised of three major components, Yale College (Undergraduate program), The Graduate School of Arts and Sciences, and the 13 professional schools. The endowment for this institution is \$22.6 billion and the operating budget for the 2008-2009 year was \$2.31 billion. (Yale University 2010a) This institution was rated as an Overall College Sustainability leader in the Green Report Card for 2009-2010, as well as a Campus Sustainability leader. (Sustainable Endowments Institute, 2010) Yale has proven itself as one of the premier sustainability institutions in the country. A large part of their success is due

to the fact that this institution has an Office of Sustainability that is a part of the administrative framework.

4.4.1 Project: Yale Office of Sustainability

Yale University has been a school in the Ivy-league that has taken the initiative to take a lead in incorporating into the framework of the institution. Although this school was not founded for sustainability, this institution has taken charge in finding ways to have sustainability present in everyday life for the students, staff, and faculty at Yale. Projects for sustainability have been started at Yale to promote a more sustainable campus for the future. There are three key programs that are in place for sustainability. One is a community carbon fund: this program aims to reduce the campus's carbon emissions by purchasing carbon offsets to meet a goal of reducing emissions by 43% from 2005-2020. Another is the Becton Micro-Wind Turbines. There are ten micro-wind turbines located on the roof of the engineering building at Yale's campus, and this reduces the school's dependence on fossil fuels, slightly, by creating their own power from the turbines. The third program is a recycling program, "Pen Pail." This program takes already recycled objects or traditionally not recycled objects, such as candy wrappers and yogurt containers, and writing instruments. These objects are then turned into back packs and trash cans. The Office of Sustainability was not initially thought of until 2000, when a student advisory committee expressed concern to the administration. As a result of this the Office of the Provost established the Advisory Committee on Environmental Management (ACEM) and put faculty and students as members of this committee in 2001. This committee in 2002 proposed eight sustainability goals for Yale University. Seven of these goals were passed and put into place, one of which was reduction of carbon emissions by 43% by 2020 (Yale University 2010b). The Yale Office of Sustainability was created to meet these goals in 2005 and placed Julie Newman as the Director of Sustainability. The Office of Sustainability is now a part of the Yale administration.

A big mover with these programs was the fact that the students and faculty actively promoted sustainability initiatives within the Yale campus. To implement these projects, excess funding was used. After the necessary funds were allocated for the fiscal year, Yale set aside some of the extra money for the administration to allow temporary sustainable administrative positions. These positions were later secured into the framework of the administration after much support from the other staff and faculty. Their expressed concern and passion for keeping the

sustainability position allowed the program to form and become a part of the Yale administration framework. Today the Yale Office of Sustainability has four full time staff, eight students, and more than 50 students are funded through grants and other outside sources of funding (Yale University 2010b). With this new branch of the administration introduced to Yale, it became easier for the school to get initiatives rolling and access funding for projects like wind turbines, community carbon fund, as well as Yale's "Pen Pail" recycling program. These projects were put into place because of the support of the administration and enthusiasm of the students who wanted a more sustainable campus (Yale University 2010b).

In terms of financing, initially there was no funding for a program like this at Yale. Until 2000, there were no sustainability programs present at Yale; until the student advisory committee was formed, which eventually led to the formation of the Office of Sustainability in 2005 through a surplus of funding. Then in 2005 the position of the Office of Sustainability, Julie Newman, was secured as a full time position. (Yale University 2010c)

Yale University's sustainability program has been one of success. Julie Newman, director of the Office of Sustainability, explained that there were no major barriers in the way of Yale becoming a sustainable campus. The biggest barrier to overcome, in her mind, was the fact that Yale was not founded as a school of sustainability, because of this it is difficult to prioritize sustainability when it was never laid out in the institution's mission. This made it difficult for Yale to allocate funding for sustainability because it was not a "mission goal" at Yale University. Julie Newman stated,

A great barrier was economic downturn. But, behavior change is the biggest obstacle. Not only does behavior change matter, it all depends on the director that is in charge of funding and resources. They (students and faculty) want convenience. It's a culture change that must be first to shift! Building bridges is essential in figuring it out. We live in a culture of consumption and disposal. It's all about approach; the way to go about it building support and partnerships all the time. (Newman, personal communication, May 19, 2010).

Another barrier that she encountered was a lack of funding, primarily due to the economic situation of the years from 2005 to present. However she did mention that was not the end of the battle. Although Yale was not founded on ideals formed around sustainability, and the mission of the school will never be changed, in her mind (Newman, personal communication, May 19, 2010). Julie Newman's vision for sustainability at Yale was and is not to change the framework

of the college to a sustainability centered institution, but rather have a sustainability be present in the minds of the administration, students, and faculty.

The Yale administration was very supportive in the formation of the Office of Sustainability. By hearing the history of Yale's Office of Sustainability it is clear that administrative support and partnership is essential for progress in this endeavor. The support of the administration and the risk--taking that Yale exemplified by investing money into a pilot program is a commendable quality that other institutions could learn from. Yale took the chance and provided money for sustainability when there was a desire to meet sustainability goals and set aside money to see if the Office of Sustainability would keep these goals on track. This allowed the Office of Sustainability at Yale to prove its worth and show Yale that sustainability is not only important but it is essential to have present in the administrative framework. Although the administration was essential to getting the Office of Sustainability program off the ground, student initiative was what started the efforts and because of a supportive administration the students' actions were made into reality. Yale University's administration is a positive example of what support and partnerships can establish. Yale is already a leader in sustainability, according to the Green Report Card, and other institutions can learn by example and adopt a program like Yale's Office of Sustainability to make approval and implementation of sustainability projects possible.

4.6 Duke University

Duke University is a major private research university located in the city of Durham, North Carolina (population 223,284). As of June 30, 2009, Duke had a student body of 6,400 undergraduates and 7,262 graduate and professional students and a total endowment of 4.4 million dollars. The university is made up of the undergraduate Trinity College of Arts and Sciences, as well as schools of business, divinity, engineering, environmental studies, graduate studies, law, medicine, and nursing. Duke is known for its cutting edge research programs and Division I national champion varsity basketball team

(http://www.dukenews.duke.edu/resources/quickfacts.html). Duke provides a unique example of how sustainability can be integrated broadly across an academic institution. The degree to which sustainability has become integrated into Duke across operations, administrative policy, academics, community impact, and other areas is especially impressive given that the

university's sustainability office was created only 5 years ago in 2005, and previous to that, sustainability initiatives at Duke were widely considered uncoordinated and lacking in any sort of cohesive strategy or implementation plan (Woo, 2000).

4.6.1 Project: Green Grant Fund

One especially relevant sustainability project that has helped to institutionalize sustainability at Duke is the university's Green Grant Fund, which provides \$50,000 in grant money each year to fund initiatives which will reduce the university's environmental impact. A student especially active in sustainability issues came up with the idea for the fund in 2005, and the fund was actually implemented by Duke's executive vice president Dr. Tallman Trask, III (Smith, personal communication, May 3, 2010) Trask has committed \$50,000 total grant money to be available each year (http://www.duke.edu/web/ESC/campus_initiatives/greengrant/ index.html), and Duke University student activity fees are used to finance the fund. Grants from the fund have supported a wide variety of projects each year: sending students to national sustainability conferences, hosting a carbon offset symposium, putting on an exhibit related to sustainable food, creating a rainwater cistern, creating a composting program, and creating two community gardens. Grant funding money was also used to research and create plans for a sustainable dining program—Duke dining services now spend over one third of their annual budget on local food (Sustainable Endowments Institute, 2010)-as well as to support a conference entitled "The Power of Environmental Purchasing: Greening the University Supply Chain" that resulted in the adoption of the environmental purchasing guidelines mentioned above.

Duke's success in sustainability initiatives is due in large part to strong administrative support. According to a sustainability office staff person, the Executive Vice President, who also is head of the university's Campus Sustainability Committee, is especially "excited about sustainability" and there are several "champions" on the board of trustees, so sustainability initiatives "don't get too much push back" (Smith, personal communication, May 3, 2010). According to the interviewee, the main barriers to sustainability are, perhaps surprisingly, resistance to sustainability on the part of individual academic departments, and lack of student interest and investment in the issue.

The administration is widely supportive of student sustainability initiatives. As mentioned above, The College Sustainability Report Card gave Duke an A in the administration category (Sustainable Endowments Institute, 2009) and Duke was called "a model for successful top-down administrative commitment to sustainability" by the Association for the Advancement of Sustainability in Higher Education (http://www.aashe.org/resources/profiles/cat4_120.php). According to one Duke PhD student, what makes Duke a unique place is "the real willingness of the administration and staff to listen, to be receptive of new ideas and to work with students, allowing them great freedom to shape the institution" (Bloomhardt, 2010).

Today, Duke has a Sustainability Office housed under the authority of the office of the executive vice president with 7 full time staff, 20-45 part-time paid student interns, and a sustainability director who reports directly to executive vice president Tallman Trask, III (Sustainable Endowments Institute, 2010). The Sustainability Office's position in the office of the executive vice president puts the sustainability office fairly high up in the administrative power structure and provides direct access to the executive vice president who oversees the university's financial resources.

Sustainability is also integrated into Duke's guiding vision. Sustainability at Duke is integrated into Duke's Campus Master Plan

(http://www.architect.duke.edu/planning/master_plan.html), and Duke's strategic plan (Making a Difference, 2006). Additionally, Duke's Climate Action Plan provides guidelines for Duke's commitment to achieving climate neutrality by 2024 (Growing Green, 2009). Duke also has a formal Sustainable Purchasing Policy

(http://www.procurement.duke.edu/procurement/buygreen), a green building policy, and provides the university community with a wide variety of sustainable transportation alternatives, including a carpooling system, buses, zipcars, and a bike-loan program, as well as a wide variety of other sustainability-related programming and academic initiatives.

The Duke administration has been shown to be a key driver in sustainability-related initiatives at the university. Duke sustainability projects, like the Green Grant Fund, have benefitted both from the direct active support of high level administrators as well as from passive administrative support apparent in the university's inclusion of sustainability goals in various administrative guiding vision and university planning documents.

4.7 Discussion of Results

While these case studies represent in-depth investigations into specific sustainability projects at a range of very different schools, it is also important to be able to make general conclusions that can be applied across a wide variety of higher education institutions (See Tables 4.1 and 4.2 for summaries). From the five case studies, we have isolated seven bridges and seven barriers to sustainability in higher education. These general principles can be applied to any school, particularly Dartmouth, and are useful in thinking about the effectiveness of a college in terms of sustainability. The implementation of specific proposals like a Revolving Green Fund ought to take these findings into account during planning, design, approval, and follow-through.

School	Project	Project Idea	Funding Source	Administration Role	Cost	Payback
		Origin				Period
Carleton College	1.65 mW Wind Turbine	Environmenta l Studies Class	College funds, \$150,000 grant from Minnesota Department of Commerce	Funding for project, working with local organizations to evaluate feasibility	\$1.83 million	10-12 years
Oberlin College	Adam Joseph Lewis Center for Environmen tal Studies	Environmenta 1 Studies Class	Private donations secured outside the college's fundraising pathways and development office	Passive approval, Environmental Studies faculty and students mainly drove the project	\$7.2 million	N/A
University of New Hampshire	ECOLine Landfill Gas Pipeline	Collaboration between Waste Management and UNH	Internally funded by college using REC credits (50,000/YR) for 5 years to help offset costs	Partnership with Waste Management and Presidential approval of project	\$49 million	10 years
Duke University	\$50,000 per year Green Grant Fund	Student, Sustainability Office	Internally funded by college/college funding through student activity fees	Supportive, executive vice president responsible for establishing Green Grant Fund	\$50,000 per year plus administrati ve support	N/A
Yale University	Office of Sustainabilit y	Student advisory committee	Funded by college; research grants; outside grants	Apart of the Yale administrative infrastructure	N/A	N/A
Dartmouth College	Proposed Revolving Green Fund	ENVS 50	Multiple Potential Sources	Approval of Green Fund, Authorization of initial funds, approval of projects	\$1 million	4 years

 Table 4.1.
 Sustainability Project Case Studies Comparison

School	Project	Sustainabilit	Position in	Sustainability Staff	Sustainabilit y Pudget	Student
		y Once:	Hierarchy		y Budget	mvorvement
Carleton College	Wind Turbine	No	N/A	Four undergraduate Sustainability Assistants (STA's), in process of hiring new energy/sustainability director	Small budget for Environmenta I Advisory Committee (EAC)	Three student voting members of EAC, Four student STA's
Oberlin College	Adam Joseph Lewis Center	Not at the time, now yes	Office located under Vice President for Finance	One full time and four project interns	Salary for coordinator, \$125,000 annual budget for revolving fund	Lots of student groups, internships for students, and 2 student members on the Committee on Environmental Sustainability
University of New Hampshir e	ECOLine Landfill Gas Pipeline	Yes (oldest endowed in US)	Director reports to Provost and Executive Vice President	Eight full time staff, two graduate researchers and interns	Fully endowed Sustainability Office	No direct undergraduate involvement in the office, opportunities on projects and internship for graduate students
Duke University	\$50,000 per year Green Grant Fund	Yes	Director reports to Executive Vice President	7 full time, one part time, multiple paid part time student interns	Salaries for employed staff and additional funds	Seven student voting members on Duke's Campus Sustainability Committee, various student groups, internships for students
Yale University	Yale Office of Sustainabilit y	Yes	Reports to the Vice President/Secret ary	4 full time, 1 part time, 8 paid interns, multiple part time students interns	Salaries for employed staff and additional funds	Over 50 Students are employed through grants and other outside funding.
Dartmout h College	Proposed Revolving Green Fund	Yes	Proposed restructuring to report to Vice President	l program specialist, multiple student interns; Currently in process of hiring new sustainability director	Limited budget for projects, currently no full time staff	Student intern positions for organizing campaigns such as Sustainable move Out/In and the SLC

 Table 4.2. Sustainability Project Case Studies Administrative Comparison

4.7.1 Barriers

A lack of funding is often the ultimate barrier to implementing sustainability projects. All other factors aside, if an institution does not have the financial means to do a project, it is very unlikely that it will get done. This results from a number of factors, but the most immediate cause is the short time-span on which administrative decisions are often made. Every potential investment, whether a solar array or an alumni event, must be compared to its opportunity cost, equal to the highest rate of return that the money could earn elsewhere. Many sustainability projects have a payback period of five years or more, which can be too long for consideration by a Board of Trustees or a President. Despite this, efficiency upgrades and other initiatives often have the potential to save lots of money that could then be reinvested for profit in the securities and hedge funds that populate the College's portfolio.

One barrier which sustainability projects must overcome is that projects often have a very obvious and tangible cost while not providing a benefit that can be easily measured or quantified. Administrators must reevaluate how they calculate costs and benefits of a project, and try to consider the financially intangible benefits of something such as the Lewis Center, which earns Oberlin lots of positive publicity and greatly strengthened the allure of its Environmental Studies program. A more thorough understanding of the benefits of sustainability initiatives will lessen the need for students and faculty to raise funds outside normal channels, and will provide the college with a more integrated standpoint from which to evaluate its sustainability decisions.

A roadblock in the face of any progressive change is the aversion to risk inherent in college administrations. A "can't-do" attitude is often pervasive, and precludes genuine wholehearted engagement with the pros and cons of any particular proposal (Orr, 2006). This was a major challenge that the Lewis Center design team had to overcome in getting their project approved and finally built. Perhaps this is a symptom of years of steady incremental measures as opposed to transformational change, but to really grapple with issues of sustainability, administrators, faculty, and students must open the door to substantive change even if it bears some risk of criticism. Sustainability is only going to become more important on campuses across the nation, and being a leader in this emerging field will require an energetic and proactive stance.

On campuses where the student body feels no sense of urgency or responsibility in becoming

more sustainable, it can be hard to gather enough momentum to even get sustainability projects noticed. Without student support, there is little to no reason for the administration to embark on costly sustainability projects. With a project like Duke's Green Grant Fund, even if a green fund is successfully implemented, if students are too apathetic to use grant money for sustainability-related initiatives, such a fund would lay dormant and not result in any sustainability-related gains to the institution. Many similar sustainability projects require student support to be successful.

If the different departments and organizational entities within a college do not coordinate effectively, it can be difficult to make decisions and move forward projects that fall under the jurisdiction of multiple entities. In the early 1990s at Oberlin, for example, the Environmental Studies Department was on the fringes of the academic organization, and the separation between fine arts, liberal arts, and social and hard sciences meant that even a project as far-reaching as the Lewis Center "did not change who had lunch with whom" (Orr, 2006). A greater emphasis on interdisciplinary studies that integrate the teachings of disparate academic fields will help make sustainability an issue springing from more varied sources than just the Environmental Studies program or department of each school. The way administrative decisions are made is also extremely important. An approach that is "transparent, democratic, and inclusive" can stimulate sustainability efforts, while if the decisions happen behind closed doors, "organizational and behavioral types of issues within administrations become obstacles" (Nathan Engstrom, personal communication, May 24 2010).

A rigid hierarchy can often be the cause of death for a project originating from its bottom. According to Oberlin's sustainability coordinator, "the short answer is the higher up, the better. A vice president or a dean level position, rather than buried underneath one of those other columns [in the administrative organization chart]" (Nathan Engstrom, personal communication, May 24 2010). Aligning priorities is always a challenge as well, so if an idea or proposal can only travel through certain, set pathways, it may encounter enough obstacles and apathy to drain it of all of the momentum it initially had. More links in the chain of communication make the clear transfer of ideas harder, and if a sustainability office is organizationally located too far from positions of power, getting proposals heard and truly considered is quite difficult (see Table 2).

If an institution does not prioritize and internalize sustainability, there is often little that can be done to effectively implement projects. In the case of Yale University, sustainability is

not high on the priority list even though there is an Office of Sustainability located within the administrative framework. A barrier for increasing funding and support in the high-ranking administration and trustees is because sustainability is not written into the mission of the institution. Sustainability is not high on the priority list because the mission does not lay out any guidelines for having sustainability as an essential aspect to the Yale's structure. The lack of institutional support will cause projects to collapse because of a lack of interest, funding, and support. These aspects are essential to having a successful sustainability project implemented into an institution. In the case of Yale, the institution's priorities do not include sustainability, despite the fact that they do have an Office of Sustainability, because of the fact that it is not written into the mission of the university and thus places a barrier on progress for sustainability.

4.7.2 Bridges

An administration whose members hold environmental principles close to their hearts can be invaluable in forwarding sustainability at an institution. At Carleton College, for example, the President and other high ranking administrators felt strongly that sustainability was a core part of the future of the college and thus were enthusiastic about pursuing the opportunity for a wind turbine. Similarly, UNH President Mark Huddleston was one of the chief drivers of the multimillion dollar Co-Gen power plant Landfill gas pipeline. Oberlin's project would not have succeeded without the approval of the then brand new president. The success of Duke's Green Grant Fund was due in large part to the executive vice president's support of the initiative. And as we've seen at Dartmouth, the support of a president for a specific cause, whether it's James Wright's staunch advocacy of health-care for veterans or President Kim's connections to global health in developing countries, can really move the college along in its endeavors in that particular field. Having the top authority at an institution personally supporting the project serves to smooth out all the bureaucratic processes that can hinder change and form a compelling vision, which can spell success for a sustainability project.

Having staff whose only job is to further the sustainability of the institution is another tool that can effectively enable sustainability projects. In the case of Yale's Office of Sustainability the director of Sustainability ensures that that the goals of the students, faculty, and college are monitored and met throughout the school year and for the future of Yale University. Yale provides The Director and three other full-time salaried staff members with the

funding and resources they need to address the needs of students. The support of faculty members ensures that administrative action will be taken in a manner that will encourage future sustainability projects to push for implementation. Duke's seven full time staff and 20+ student interns in the sustainability office have allowed the institution to support a wide variety of sustainability initiatives that are currently being pursued at the university, initiatives that would have been impossible to pursue before the sustainability office was created in 2005. Currently, Dartmouth has one full-time employee dedicated to sustainability. Additionally having the sustainability staff report directly to senior administrators (President, VP, or Dean) allows for the bypassing of the traditional hierarchical administrative structure and prevents the slowdown of information traveling up through this structure.

Obviously, any project that is a "win-win" scenario will more likely to be adopted by higher education institutions because it doesn't involve weighing the environmental benefits with financial costs. The Eco Line landfill gas pipeline at UNH made both environmental and fiscal sense because will help UNH achieve its WildCAP climate plan while simultaneously saving the college from annually purchasing heating oil. Additionally the project will be funded through the sale of renewable energy credits (REC's) and is expected to be paid off within 10 years. Furthermore UNH was able to collaborate closely with Waste Management on the project for a win-win outcome for both parties; UNH acquires a cheap reliable fuel source and Waste Management avoids the costs of dealing with the excess methane and both parties receive positive PR.

Though many sustainability projects are limited by funding from the college, this barrier can sometime be circumvented by pursuing funding from outside sources independent of the main college funding stream. Working within the college's official channels for finance and funding can grant certain advantages, to be sure, but in the case of the Lewis Center, David Orr's personal fund-raising efforts underwrote the entire project and secured its financial viability in the face of often-increasing costs. Carleton would have been unable to fund their second turbine, currently in progress, if it had not been for an alumni donation which completely funded the project. Administrators sensitive to issues of cost and priority will be much more likely to endorse a project if it can provide its own funding without draining the alumni donor base or the operating budget.

The perceived risk of investing in a sustainability project can be lessened for an institution if there are other partners to share the risks, costs, and preparation. This most clearly applies to contracted work such as construction and engineering, but partner research institutions can strengthen the foundation of a project as well. Carleton College, for example, partnered with the local school district to share costs for the planning phase of the wind turbine, and also worked with a local non-profit to evaluate the economic feasibility of a wind turbine. Such partnerships enabled Carleton to lower costs and receive free outside expertise in the area of their project. Oberlin's design team drew together a collection of architects, engineers, energy analysts, and sustainable design experts from across the country to plan and construct the Lewis Center, including the National Renewable Energy Lab and NASA's Glenn Research Center. The variety and prestige of its members gave the Lewis Center design team a number of advantages: "among staff and administration, it confirmed that the project was in the right place.... Funders who had no connection to the college, admirers of [chief architect] Bill McDonough got interested" (Deirdre Holmes, personal communication, May 26 2010). In this way partnerships with extra-institutional parties can hedge against perceived riskiness, draw nation-wide interest, and spread the costs of a project.

Students may not always have the information or experience to navigate the administrative bureaucracy, but they often possess unbounded enthusiasm and energy which can be mobilized to support sustainability efforts. In the case of Yale, the students' enthusiasm for sustainability led to the college creating the Advisory Committee on Environmental Management (ACEM). This committee was created to address the concerns of the students regarding sustainability at Yale, it was comprised of students and faculty. Also at Carleton, students are 1/3 of voting members of the Environmental Advisory Committee that advises the administration on environmental issues. Having students involved in genuine administrative decision-making increases its transparency and gives the committee some members who are easily approachable by the student body as a whole.

A clear institutional vision which holds sustainability as a core issue for a college can provide justification for projects and make it easier to navigate the hurdles to implementation. For example, Duke's institutional commitment to climate neutrality, as evidenced in their Climate Action Plan, has resulted in the successful implementation of a variety of climate-related initiatives at Duke, including the pursuance of significant on-site renewable energy projects,

creation of incentives for alternative transit, and an expansion of energy conservation and green building efforts. At Carleton, the Environmental Statement of Principles provides the institutional roadmap to follow when implementing policy. Any project at Carleton considers the principle in its conceptualization, and in that way sustainability is institutionalized in everyone's thinking. Additionally, signing on to cross-institutional pledges such as the Presidents Climate Commitment further reinforces in peoples' minds that their institution actually cares about sustainability and they should include it in their thinking processes.

4.8 Conclusions

The case studies above present a broad and comprehensive portfolio of projects that, while tailored to the unique characteristics of each institution, bear out a few general conclusions as well about the role of college administrations in promoting and supporting campus sustainability initiatives. As we have seen, projects are not always easy or straightforward, but with the right combination of student enthusiasm, faculty backing, and administrative leadership, great strides forward are possible for any college. Dartmouth used to be at the forefront of college-level sustainability (Perrin, 2001), but today, without strong and consistent support from all corners of campus, we have faltered. This is not to say that Dartmouth faces inherent challenges that make its road any harder than that of Oberlin, Duke, Yale, Carleton, or UNH. Indeed, we believe Dartmouth is well positioned to reclaim its place as a premier example of how colleges can develop and grow sustainably, particularly in its administration due to the recent reorganization and the hiring of a new Sustainability Director. As the above bridges and barriers demonstrate, the role of a dedicated higher-up in the college structure is as important as any. With a strong and specific guiding vision, a well-placed office of sustainability integrated thoroughly into the mechanisms and operations of the greater administration, and a rethinking of the true long-term costs and benefits of sustainability initiatives, college officials can become sustainability leaders and inspire and institutionalize sustainability throughout their entire institution.



Chapter Five: The Dartmouth Revolving Green Fund

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5.1 Introduction

5.1.1 Research Outline

States David Orr, "Students learn that it is sufficient only to learn about injustice and ecological deterioration without having to do much about them, which is to say, the lesson of hypocrisy" (Orr, 1992, p.104). Universities around the country are seeking innovative ways to address environmental and social concerns. Specifically, many universities have implemented revolving green funds as means of financing energy efficiency upgrades in a profitable and sustainable manner. We compiled a list of research questions and conducted a literature review to set the academic context for our project.

Research Questions:

- What are the barriers to sustainability at institutions of higher education?
- Are capital constraints an issue?
- What are peer institutions doing to address these barriers?
- Is a revolving loan fund a viable method of addressing capital constraints at Dartmouth?
- How is a revolving green fund structured?
- What would the path to implementation look like at Dartmouth?
- What are possible projects and outcomes?
- How would a revolving green fund relate to Dartmouth's environmental goals?

Our literature review consisted of a thorough survey of academic articles pertaining to sustainability in higher education. We drew from articles found on the class syllabus and elsewhere in order to move forward in an informed manner. Selected articles addressed capital constraints, lack of awareness, and a lack of incentives. These general themes were prevalent throughout the literature, indicating their importance in achieving sustainability in higher education.

The implementation of a revolving green loan fund could provide a valuable example of the power of student action and the importance of engaging global problems within the microcosm of the Dartmouth campus. The revolving green loan fund could provide students and the college as a whole with a means of empowerment – connecting students with remediation techniques of a global issue.

Wals and Jickling describe sustainability as a continuum from law and order ecototalitarianism to transparent society with action competent citizens able to problem-solve collaboratively. They emphasize that integration of sustainability into higher education should not standardize realities. It should result in a "commonly accepted strategy" on multiple levels (macro, meso and micro). In essence, sustainability presents an opportunity to empower learners with work toward resolution of real issues yet to be embedded across all functioning of the university (2002).

M'Gonigle and Starke use the University of Victoria as an example of reactive planning with little internal and external feedback. Campuses in general have little educational value beyond their function as a space in which to learn. They argue that a disconnect exists between what professors teach and how the university functions (2006).

Dartmouth as an institution of higher education aims to produce action competent citizens, and could benefit from direct engagement between students and sustainability projects. This could be accomplished by encouraging students to apply for funding from the revolving green loan fund, or partnering on projects implemented by FO&M. A loan fund would both empower learners as well as improve the educational value of the campus itself.

Several reports have analyzed faculty, and facilities operations barriers to campus sustainability measures. Levy and Dilwali investigate Harvard's revolving green loan fund, and its impact on facilities operators. Larsen et al. examine awareness at Liverpool Hope University, and Cosmann et al. examine perceptions of sustainability at Columbia University.

Levy and Dilwali investigated the impact of Harvard's initial \$1.5 million revolving green loan fund, implemented in 1993. They conducted a survey of facilities operators to determine the impact of the loan fund on efficiency upgrades. They determined that while the initial number of proposed projects was high, fewer projects were proposed in later years as efficiency upgrades become more involved with lower returns. Interestingly, Levy and Dilwali determines that "for the eight [FO&M] participants, the primary incentive for participating was the financial structure of the RCIP, including the 0 percent interest and the provision of funding that would not interfere with the capital budget" (2000, p. 252).

They further concluded a lack of further initiated projects to be a result of "lack of knowledge about green products and effective conservation efforts, insufficient information about the benefits of taking action, and confusion about who should be taking the lead in advocating for sustainable practices" (2000, p. 252). These findings are an important factor in the development of a revolving green loan fund.

A group of 3rd year sustainability students at Liverpool Hope University (liberal arts college with 8,000 students) conducted interviews with students and staff in order to identify the level of environmental awareness and performance on campus. The most common barriers that students felt were blocking staff from taking sustainability action were finance, other priorities, time, and lack of knowledge/awareness. The author argues that students in general make effective change agents because they are in a unique position to expose and question inadequacies. Furthermore, this article is useful because it backs the idea that overcoming capital restraints is critical for sustainability – a chasm that a revolving green loan fund could begin to bridge (Larsen et al., 2009).

The Cosmann et al. article presents a survey of key stakeholders across Columbia University, and examines perceptions of sustainability, its importance in the context of Columbia University, and how sustainability measures could be implemented. An environmentally sustainable campus integrates research, curricula, and environmental leadership. At Columbia, like at Dartmouth, the current academic infrastructure, and faculty priorities are not consistent with potential opportunities for campus sustainability. This survey aims to understand why that is, and how it can be improved. Key issues (barriers) that the interviewees discussed, that are also of concern for Dartmouth:

- Most people view sustainability as long term. It's easier to be involved definitions and practices involve our generation.
- Difficulty/disinterest in interdisciplinary research/work among faculty
- Initiatives would be costly, but would be supported by both students and staff i.e. "costs would be worthwhile" (Cosmann et al., 2006).

In summary, these three studies conclude that the major barriers to sustainability, from individual incentives to facilities management, distill down to financial constraints and poorly

disseminated information. Interestingly, faculty and facilities management staff may share similar barriers to implementation of sustainability initiatives. This research is pertinent to a revolving green loan fund proposal. The establishment of a loan fund could provide the financial incentive for efficiency upgrades, potentially saving FO&M as well as academic departments money. This research is also relevant to our decision regarding the payouts of the revolving loan fund. These three studies point to the idea that in order to incentivize change through faculty and facilities, financial payouts may be necessary.

Administrative support of a revolving green loan fund is critical to its implementation and success. Jahiel and Harper examine institutional frameworks necessary to implementation of broad sustainability measures, and Hoffman and Henn discusses decreasing capital costs for sustainability related projects. Dahle argues that cost barriers to energy retrofits are often outweighed by their paybacks.

Jahiel and Harper propose a similar framework through which to implement sustainability measures by combining the methods of Yale, Johns Hopkins, and Princeton University. Their ten-step framework highlights gaps in Dartmouth's institutional approach to sustainability. There are insufficient sustainability metrics through which to measure our progress, and there exists no framework through which to institutionalize recommendations pertaining to the college's sustainability efforts (2004).

Hoffman and Henn cite psychological and social norms as barriers to "green" building design on college campuses. The authors outline 7 specific strategies to overcome these barriers - issue framing, targeting the right demographic, education, structural and incentive change, indemnifying risk, green building standard improvements, and tax reform. They argue that costs for green buildings are already competitive, and that their economic benefits go beyond financial savings, providing healthier living environments more conducive to learning (2008).

Dahle and Neumeyer surveyed higher educational institutions in London to determine their progress, and barriers to sustainability. They determined the most significant barrier to improved campus sustainability was cost. However, most of the interviewees agreed that cost is considered a barrier because of a reluctance to change and a lack of understanding of cost savings. The interviewees also cited high upfront costs and a lack of capital for such measures as further barriers. Dahle and Neumeyer show that energy upgrades can have fast positive returns, such as SUNY (State University of New York), which saves \$9 million annually due to energy

efficient retrofits and promotion of energy conserving awareness. While the upfront cost was \$17 million, it was paid back in less than 4 years. Georgetown University saves \$45,000 each year with a photovoltaic system. Rarely are these energy savings used to finance energy saving measures with longer payback periods (2001).

These three articles outline clearly to the administration where they are falling short, and how a revolving green loan fund could bridge these administrative gaps. A revolving fund could institutionalize recommendations pertaining to campus sustainability, providing a framework for proposing and funding recommended projects. Hoffman and Henn's analysis of green buildings, and conclusion that they are now competitively priced, provides even more incentive to establish a green fund. Finally, Dahle and Neumeyer's analysis of SUNY and Georgetown show that other energy upgrades can have fast returns, while also stressing the importance of administrative education. It is critical to fill the information gap that exists between administrative knowledge, available technologies, and their returns.

5.1.2 The Opportunity

The 2009 Dartmouth Sustainability Assessment revealed that Dartmouth lags behind peer institutions in sustainability implementation. The assessment draws attention to the College's lack of "a sustainability vision and framework that clearly defines the business case for sustainability; a clearly articulated plan and process for promoting sustainability and embedding sustainability thinking into strategic planning and the finance and budgeting systems" (Hart, 2009, p. 11). These shortcomings constitute a missed leadership opportunity, prevent Dartmouth from addressing its environmental impact, and fail to address ways to reduce the institution's operating budget. This need not be the case.

Opportunities to invest in profitable energy efficiency upgrades abound at Dartmouth College. Many of these projects nonetheless go unfunded. When this happens, the College misses out on the prospect of improving its bottom line, improving its reputation among peer institutions and society at large, and reducing its environmental impact.

In 2008 Dartmouth College's Facilities Operations & Management released the Strategic Energy Conservation Plan (SECP). The report concludes that energy efficiency and conservation should be the primary method for meeting the College's growing energy demand. The numbers put forth in the report add weight to this conclusion. Many building on campus

could undergo comprehensive efficiency retrofits that would pay themselves back in fewer than five years. If all of the projects in the SECP report were implemented, the College would save nearly \$2 million per year and pay off the capital cost of the projects in 6.1 years (Dartmouth College Facilities, Operation, & Management, 2008). In times of pressing financial challenges, these are substantial savings.

The 2009 Environmental Studies (ENVS) 80 class compiled an assessment of the cost, payback, and feasibility of various projects geared toward reducing Dartmouth's Carbon emissions. The report recommends efficiency upgrades, geothermal heating and cooling, an offsite wind farm, solar water heating, and replacing number 6 fuel oil with biomass. Payback periods and cost savings for efficiency upgrades, a wind farm, and a biomass plant are encouraging (ENVS 80, 2008).

In 2010 members of Engineering (ENGS) 44 conducted a similar analysis of the potential impact of green technologies at Dartmouth. The report examines Dartmouth Hall and Russell Sage dormitory and is broken down into sections on energy efficiency, geothermal heating and cooling, photovoltaic solar, and solar thermal. The estimated combined cost of efficiency upgrades for both dorms is \$1.6 million, with a 9-13 year simple payback (Kawiaka et al., 2010).

5.1.3 The Idea

One of the most persistent barriers to the sustainability upgrades proposed in the SECP, ENVS 80, and ENGS 44 reports is the large capital cost of many of the projects. The up front costs of efficiency upgrades in the SECP range from \$65 thousand to upwards of \$1 million. Although all of the upgrades will pay for themselves, securing large sums of money can present budgetary issues.

Revolving loan funds are an innovative method for addressing the financial barriers to sustainability. Revolving loan funds serve to provide up-front capital for sustainability measures with quantifiable paybacks. Cost savings from these investments are returned to the fund and then reinvested in other projects. In the case of an efficiency retrofit, the savings would come in the form of reduced electricity bills. Whoever pays the electricity bill for a given building returns the savings to the fund until the entirety of the loan is paid off, after which the savings accrue to them. Most funds require that slightly more than the amount of the loan be paid off in order to allow the fund to grow over time (Campus Inpower, 2010).

Implementing a revolving green fund would benefit Dartmouth through numerous avenues.

- *Financial:* As demonstrated by the plethora of NPV positive projects on campus (FO&M, 2008) investing in sustainability would benefit the College's bottom line by reducing its operating budget. Because the structure of the fund allows it to grow over time, the savings can fund future retrofits.
- *Reputation:* The fund would distinguish the school as a leader among its peers and within society at large. The publicity generated by the fund would emphasize Dartmouth's commitment to social responsibility, promote awareness and education among the student body, and encourage donations from supportive alumni.
- *Environmental Performance:* From an environmental standpoint, a revolving loan fund would reduce Dartmouth's carbon footprint as well as lessen the school's ecological impact by reducing its electricity consumption.

Numerous factors indicate that now is the time for Dartmouth to take advantage of this proven and innovative tool. The idea has been successfully piloted at numerous peer institutions and will save the College money while improving both its reputation and environmental performance. Dartmouth should treat itself to a rare free lunch.

5.2 Methods & Methodology

Before attempting to create a Revolving Green Loan Fund at Dartmouth College, we looked to comparable institutions for information on the successes and failures of revolving loan funds nationwide. We started by identifying other institutions of higher education that have Revolving Loan Funds (RLFs). As outlined below, we then selected a smaller pool of schools to interview in depth. We identified several critical elements in creating a Green Fund specifically designed for Dartmouth so that we could examine and compare these elements across institutions. The criteria we looked for are listed and briefly elaborated below:

- Seed funding: We explored how RLFs at other schools gained their initial funding.
- Fund management: We looked at the loan application process, where funds are housed and how RLFs are governed at different schools.

• Terms of loan: We examined the varying payback periods and interest rates of different institutions' RLFs.

To begin our research, we read through scholarly articles and browsed the Internet to search for leaders in sustainability initiatives at the higher education level. We searched through College sustainability websites for relevant information, selected schools with preexisting green funds, and conducted phone interviews after contacting Sustainability Programs at the Colleges via email. While compiling a list of colleges, we found that some Universities have well-established RLFs while others were still in the planning and proposal stages of doing so. We utilized the College Sustainability Report Card web site (http://www.greenreportcard.org) to locate Universities with Revolving Loan Funds and narrowed the list down to fifty-five Colleges in Canada and the United States that were listed as having RLFs. These RLFs serve as models for the Dartmouth RLF.

In order to apply the information offered by sustainability staff at other schools, it was very important to understand how Dartmouth is operating now. Therefore, we surveyed students at Dartmouth and interviewed a wide variety of Dartmouth faculty and administrators, with the goal of finding out how a Green RLF might apply to Dartmouth today.

Our interviews at Dartmouth included Andy Friedland, Chair of the Environmental Studies Department and member of the Energy Task Force of 2008; Bruce Dunn, an energy engineer for Dartmouth's Facilities Operation and Management (FO&M); Mark Orlowski, Founder and Executive Director of the Sustainable Endowments Institute; Megan Hammond, the Managing Director of the Dartmouth Investment Office; Chris Wohlforth, Associate Director of the Dickey Center; Professor Richard Howarth, environmental and ecological economist in the Environmental Studies Department; Tuck Students from the "Tuck Sustains" program in the Tuck School of Business at Dartmouth; and Katie Kobylenski, class manager from the Alumni College Fund. These interviews allowed us to better understand how the college operates now and the improvements that could be made in the realms of creating a sustainable future for Dartmouth.

5.2.1 Institutional Comparison

We have included three tables comparing colleges in their efforts to fund sustainability projects. The first table compares the Ivy League Institutions, the second compares small institutions with reputable RLFs in place, and the third table lists 55 institutions with existing RLFs.

Ivy	Enrollment	Size of fund	Year RLF founded	Grade
League				
Dartmouth	4196	N/A	N/A	B+
Harvard	7,181	\$12 million	1993	A-
U Penn	10,337	\$1million	2010	A-
Brown	6,013	\$1 million	2008	A-
Princeton	5,113	N/A	N/A	В
Yale	5,275	N/A	N/A	A-
Columbia	7,169	N/A	N/A	В
Cornell	13,931	N/A	N/A	В

Table 5.1 Ivy League Schools

According to the College Sustainability Report Card of 2010, out of the Ivy League institutions, only Brown University, Harvard University, and the University of Pennsylvania have preexisting green revolving loan funds (RLF). Among those, Harvard's RLF is the largest, has the longest history, and is also quoted as a typical case study by Mark Orlowski, Founder and Executive Director of the Sustainable Endowments Institute, which runs the College Sustainability Report Card. Brown University has a campus wide sustainability program along with a \$1 Million loan to fund sustainability initiatives that are not related to energy. The University of Pennsylvania, despite its large enrollment population and complexity in administrative structure, is launching its Green Fund this year with an endowment of \$1 Million. Projects will be capped at \$50,000 each and all members of the UPenn community are welcome to apply for the fund to improve environmental performance and reduce campus emissions. It is also worth noting that, of the four Ivy League institutions that received an overall A- grade on the green report card, three have implemented a RLF. Sustainability is a key marketing point in our environmentally and economically troublesome days. With a RLF in place, Dartmouth will not only catalyze its progress towards a sustainable and energy-efficient campus, but will also raise its reputation and become more attractive to prospective students as the "Big Green".

Reputable small schools with RLF	Enrollment	Year RLF founded / will be founded	Size of fund	Grade
Swarthmana	1 525	2000	\$42 E00+	D
Swarthinore	1,525	2009	\$43,500+	D+
Smith	2,600	2011	Pending	A-
Carleton	1,958	2007	\$41,190	A-
Oberlin	2,744	2006	\$152,000	A-
Seattle University	5,415	N/A	\$13,000	B+
Macalester	1,865	2006	\$27,000	A-
College				

Table 5.2 Reputable Small Schools with RLF

Table 5.2 shows a list of six reputable small schools with RLFs, rated a B+ or higher in the College Sustainability Report Card of 2010. We chose reputable small schools because, albeit their small student body, they are rated overall leaders in sustainability and have funded projects to improve their campus in this area. A majority of these schools have a significantly smaller student population than Dartmouth, and yet, they are still capable of gathering enough support to finance a RLF. What many of these colleges share is student involvement. With the amount of student support at Dartmouth College, a green revolving loan fund is a feasible way to not only improve our standing in sustainability, but also to promote student education and involvement in sustainability-related projects.

Schools Listed by Report	Location
Laru (W/ RLFS)	Edmonton AD
University of Alberta	Canada
Alloghony Collogo	Mondvillo DA
Anegneny conege	Meauville, PA
Arizona State University-	Tempe, AZ
Tempe	
Ball State University	Muncie, IN
Boston University	Boston, MA
Bowdoin College	Brunswick, ME
University of British	Vancouver, BC,
Columbia	Canada
Brown University	Providence, RI
California Institute of	Pasadena, CA
Technology	
California State University-	Seaside, CA
Monterey Bay	
University of California–Los	Los Angeles, CA
Angeles	
Carleton College	Northfield, MN
University of Lincinnati	(Cincinnati, OH)
College of William & Mary	Williamsburg, VA
University of Colorado	Boulder, CO
University of Denver	Denver, CO
Duke University	Durham, NC
Franklin and Marshall College	Lancaster, PA
Furman University	Greenville, SC
George Washington University	Washington, DC
Harvard University	Cambridge. MA
University of Illinois	Champaign, IL
Iowa State University	Ames, IA
Johns Hopkins University	Baltimore, MD
Kalamazoo College	Kalamazoo, MI
Lehigh University	Bethlehem, PA
Loyola University of New	New Orleans, LA
Orleans	
Macalester College	St Paul, MN

Schools Listed by Report Card (w/ RLFs)	Location
University of Maine	Orono, ME
Massachusetts Institute of Technology	Cambridge, MA
McMaster University	Hamilton, ON, Canada
Miami University	Oxford, OH
University of Montana– Missoula	Missoula, MT
University of New Hampshire	Durham, NH
University of Notre Dame	Notre Dame, IN
Oberlin College	Oberlin, OH
Oregon State University– Corvallis	Corvallis, OR
University of Pennsylvania	Philadelphia, PA
Pomona College	Claremont, CA
Queen's University	Kingston, ON
Rider University	Lawrenceville, NJ
Seattle University	Seattle, WA
Smith College	Northampton, MA
Southwestern University	Georgetown, TX
Stanford University	Stanford, CA
Swarthmore College	Swarthmore, PA
University of Toronto	Toronto, ON, Canada
Tufts University	Medford, MA
University of Utah	Salt Lake City, UT
Western Michigan	Kalamazoo, MI
University	
Whitman College	Walla Walla, WA
Willamette University	Salem, OR
Williams College	Williamstown, MA
University of Wisconsin– Madison	Madison, WI
Dickinson College	Carlisle, PA

Table 5.3	Schools with Revolving Loan Funds ((RLFs)	
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Of the 55 Schools with RLFs, we initially contacted seven to find out more about their green funds: Harvard University, Auburn University, Swarthmore College, Miami University, Brandeis College, Rensselaer Polytechnic, and Emory University. We then gathered information
on the criteria mentioned in the previous sections from four of these schools. These institutions represent the various stages of development of a Green Revolving Loan fund and offer wisdom from their obstacles and successes. The RLFs in the selected institutions are as follows:

- **Harvard**: The Green Campus Loan Fund (GCLF) has been around since 1993, and since then their fund has grown significantly. For 17 years the fund has provided financial incentives to invest in energy and water conservation measures, aligning with the former Harvard President's mission of providing cutting-edge facilities for study and research (Presidents and Fellows of Harvard College, 2009).
- Miami University: The Miami University Revolving Green Fund (MURGF) was proposed and put together largely through student initiatives. The fund was established in November 2009, and huge effort was put in to encourage students to submit proposals and support student-sponsored projects related to sustainability (Prytherch, personal communication, May 6, 2010).
- Auburn: Auburn's fund is being proposed this summer. Auburn University (AU) permanently established their Office of Sustainability in the fall of 2008, and it currently operates on soft funding resulting from the AU Sustainability Initiative from 2005-2008. Auburn has yet to establish a formal RLF to support sustainability project proposals, but their office is in the preliminary stages of proposing one. Because Auburn's RLF is in its preliminary planning stages, the AU sustainability office has offered useful suggestions for improving the start-up process (Williams, personal communication, May 5, 2010).
- **Brandeis**: Brandeis's proposed fund is strictly financed by a student fee. Thus, students are stewards for sustainability improvement projects. In Brandeis's student fee proposal, they noted University of California in Los Angeles' \$4 green fee (per semester), while a smaller school such as Colorado College has a \$20 green fee (per semester) (Brandeis Sustainability Fund, 2010).

5.3. Dartmouth Revolving Green Fund

Using documents and information from other institutions, we created a charter and covenant that detail how the fund will be managed (see Appendix 5.1). Many of the administrators we interviewed at Dartmouth and other institutions stressed the importance of establishing a fund managing process. We have included explanations and parts of the covenant and charter templates below to detail how the fund could be managed, and why we chose these governing methods. Complete versions of the covenant and charter templates can be found in Appendix 5.1.

5.3.1 Mission and Goals

The mission of the Dartmouth Revolving Green Fund (DRGF) is to encourage environmentally sound technologies and practices on Dartmouth's campus. It will finance innovative projects that reduce the College's environmental impact, improve the educational environment, and generate net positive financial returns. The DRGF will engage students, staff, faculty, and administrators in the decision-making and implementation process. The fund will further the broader academic mission of the College while helping it to meet greenhouse gas reduction targets and become a green leader among campuses worldwide. Once start-up capital is received, the DRGF will function as an independent fiscal entity managed by a committee of Dartmouth community members. It will grow over time by collecting cost-savings from the projects it funds and reinvesting them in similar projects. This structure will provide substantial cost-savings over time, while providing opportunities for engagement and hands-on learning for the entire Dartmouth community.

Our goals are straightforward:

- To foster sustainable design and environmentally sound technologies and practices on Dartmouth's campus.
- To facilitate cost-saving green projects and ensure that a portion of the returns are used to finance similar projects in the future.
- To empower students, staff, faculty, and administrators with opportunities to move the College toward sustainability and carbon neutrality.
- To provide an educational opportunity for Dartmouth students interested in sustainable and energy-saving projects.
- To ensure that the most beneficial and profitable green projects do not go unfunded due to capital constraints.

- To buffer Dartmouth's budget against rising energy prices.
- To transform Dartmouth into a national leader in sustainable practices and demonstrate that sustainability and financial viability are not mutually exclusive.

5.3.3 Appropriate Projects

DRGF money shall be used only for projects that are in complete alignment with the intended goals of the fund. Funding a project consists of all proposed aspects of the implementation process that have been approved by the DRGF Board (management committee), and could include (but is not limited to) construction and material costs, education, advertising, metering, and maintenance. The Board shall have the discretion to ensure that funds support only projects that are cost-saving and have a positive impact on sustainability at Dartmouth. The Board should consider both smaller, short-payback projects and larger, longer-term ones, especially those that are educational or research-based.

The following is a list of viable sustainability improvements for the DRGF to

finance. The list is by no means exclusive, but it should give a good idea of the type of projects that the Fund is meant to support.

- *Efficiency Improvements:* Installation of high efficiency pumps, lighting, boilers; weatherization and insulation; energy recovery ventilators.
- *Water Conservation:* Installation of low-flow appliances; systems which recover or reuse wastewater.
- *Renewable Energy:* Installation of on-campus and community renewable energy systems such as geothermal, solar thermal, solar photovoltaic, wind turbines, biomass.
- *Renewable Fuels:* Production of renewable fuels, such as biodiesel from agricultural waste or dining hall waste oils.
- *Green Building:* Investment in green building designs, such as green roofing, passive solar heating, and elimination of conflicting practices.
- *Sustainable Agriculture:* Investment in processes that recycle and reuse agricultural materials.

Conversely, the following list represents projects that should not be considered for Fund support.

- *Fossil Fuels:* Projects that use fossil fuels should not be invested in, unless the project quickly and significantly leads to a net decrease in fossil fuel consumption and greenhouse gas emissions.
- *Non-Renewables:* Funds should never be invested in projects using unsustainable practices, such as large hydroelectric dams, or nuclear power.
- *Credits or Offsets:* Funds should never be used to purchase carbon offsets, renewable energy certificates, green tags, or any other credits. Rather, the DRGF should focus on projects that provide cost-savings while improving the sustainability, leadership, and image of Dartmouth College.

- *Budget shortfalls:* Funds should not be used to cover budget shortfalls for the College, except by investing in appropriate projects that reduce College costs.
- *Salaries:* The Fund is not intended to cover faculty or staff salaries, except as direct wages for projects when the Board deems appropriate.

5.3.4 Structure of the DRGF

In order to assess how the fund could be governed and managed, we researched fund management at other colleges. Most funds were managed either by an Office of Sustainability or by a committee. Due to the small number of sustainability administrators at Dartmouth, a committee that incorporates other members of the Dartmouth community would be more able to manage this task. We propose the following set-up for the "Big Green Board," based upon the committees at other colleges:

The fund will be managed by the Big Green Board ("Board"), a committee including:¹

- The Director of Sustainability Initiatives, who will serve as the non-voting chair of the Board.²
- Two undergraduate students, (1 appointed by Student Assembly, 1 by the Office of Sustainability).
- One staff member with technical expertise, appointed by Facilities, Operations, and Management
- One faculty member, appointed by the Environmental Studies Department
- One administrator, appointed by the President of the College
- One trustee or alumnus, appointed by the Board of Trustees
- The Chief Financial Officer

Non-student Board members will serve for two-year terms, while student members will serve for one-year terms. Terms shall begin on the first day of the fall quarter. Due to the continuous nature of the fund, it is imperative that student members of the Board be "on" for at least two consecutive terms, and available via email to maintain responsibilities during "off" terms. Board members may be reappointed if agreed upon by the appointing party. In the case of resignation, the appointing party in conjunction with the Board must choose a replacement as soon as possible.

¹ This proposed committee is large and has members who are most likely very busy, and thus might have trouble meeting as a group. Since the currently proposed committee has an even number of members, we suggest that each position be reanalyzed, and that either the Director be non-voting, and/or one to three members could potentially be eliminated.

² As of June 2010, there is an active search for this open position. The new Director will be expected to assume operations in the fall of 2010.

5.3.5 Fund Management and Procedural Process

We examined the procedural processes of Green Loan funds at other schools, including the proposal process, housing, administration, and review of funds. Of the schools that we contacted, the one with the most well-planned fund administration is Harvard. Harvard's fund is housed in one of the Office for Sustainability accounts, and administered by their office. The finance department helps with the transfer of money. A Green Loan Fund Committee reviews the sustainability project proposals to see if they are innovative and legitimate. Although anyone can propose a project to the Green Loan Fund Committee, almost all requests come from building managers, since they have an operating budget and can identify the detailed account information required to complete the application (Gauthier, personal communication, May 12, 2010).

Evaluation committees are often composed of members from different groups on campus, such as staff, faculty, administrators, alumni, and students. At Miami University, the RLF committee (the MURGF Board) meets to review proposals on a rolling basis, and is composed of students, staff, and faculty (Saltman, March 9, 2010). The main goals of the fund include facilitating and empowering students in energy efficiency investment on campus (Prytherch, personal communication, May 6, 2010).

At Brandeis, the RLF is also managed by a committee, made up of 4 students (treasurer of the Student Union or a representative, chair of the Student Union Social Justice Committee, and two students elected by the undergraduate student body), staff members (one representative from the Department of Facilities and the Dean of Arts and Sciences or a representative), and one Environmental Studies Department Professor. The entire committee is chaired by the nonvoting Sustainability Coordinator. Proposals are submitted by students and reviewed by this chairperson, who then provides comments and concerns to be addressed in a revised proposal. The chair then flags his/her potential concerns about the proposal before giving it to the administrative board to review. Other parts of the Brandeis community, including MBA candidates from Heller or IBS acting as roving advisors, can aid in the application process by advising any and all students on their proposals. Brandeis is still deciding on where the fund will be housed, but the chairperson of the committee will be the Sustainability Coordinator. Auburn's RLF will likely be housed in an official campus committee that reports to the president and is overseen by a relatively small board for the sake of efficiency (Buildings Working Group, 2010, p. 3).³ The reason for having a small board is to bring the key players together and boost the sustainability of the university while avoiding inefficiencies that would come with a large board (Williams, personal communication, May 5, 2010).

Using the above comparisons, we created a management process for a Fund at Dartmouth. The Big Green Board will manage and maintain the fund, assess and vote on project proposals, disperse loans, manage the repayment process, and help with implementation of projects when required. Anyone can propose a project, but the maximum cost, payback, and application process differ among types of applicants (See Loan Application Process below). It is expected that Facilities, Operation, and Management (FO&M) will serve as the primary user of the funds in the early years, as they already have developed efficiency project proposals. However, community members with ideas are encouraged to work with FO&M and the Big Green Board to develop proposals with a clear target, financial plan, implementation plan, and time line. Only proposals with these criteria will be voted on. All applicants must follow the application process outlined below.

The Board will communicate remotely to discuss day-to-day fund management. Small proposals⁴ (those requesting 10% of the current DRGF balance or less) may be voted on remotely. The Chair must submit such proposals to the Board via email. Board members then vote on the project via email to the Chair within two weeks. Unanimous consent is required for proposals voted on remotely. If any Board member does not approve, the proposal must be presented in person at the next formal meeting.

The Board will formally meet at least once per term while classes are in session, excluding Summer Term, to discuss larger proposals, policy, investments, and management

³ The proposed board is comprised of: two student representatives (one to be chosen by Auburn Sustainability Action Program and another to be chosen by Student Government), the Director of the Sustainability Office, the university's Chief Financial Officer, the Energy Management Engineer for Facilities, a faculty member (approved by the University Senate), and an alumnus (chosen by the rest of the board). ⁴ Examples of small projects can be seen at Swarthmore College: Organic Lawn Care (\$5,500 with 8 years payback), replacement of 1,000 of the 2,000 light bulbs on campus (\$10,000 matched by other funds with a 5.5 year payback), another lighting replacement project (\$10,000 with a 2 year payback), installation of twelve light-sensing switches in halls (\$3,000 with several years payback), installation of occupancy sensors and switches in bathrooms (\$5,000 with a 3 year payback), print-release software and hardware for public printers (\$6,000 with a 3 years payback), and the building of drying lockers in several laundry rooms (\$4,000 with a 5 payback).

strategies. The date and time of this session must be publicly announced via the DRGF website at least two weeks in advance. Potential project recipients requesting a loan of more than 10% of the DRGFF balance must present their proposal to the Board in person during one of these meetings. If multiple projects are presented at the same meeting, all proposals must be heard before a vote is taken. The Board can then vote to deny, approve, or delay voting until a later date to facilitate Board deliberation or refinement of the proposal(s).

Any proposal may be modified by the Board before approval. In this case, the original applicant will be notified within 72 hours and will be given the opportunity for an appeal hearing. Upon passing a proposal, the Board and non-board participants must proceed with the implementation plan as quickly as possible. Students and staff who are not on the board should be integrated into the implementation process as much as possible, especially advertising and publication. Members on the Board are responsible for maintaining ongoing reports on the activities of the DRGF to summarize projects contributing to the College and keep track of the financial status of the Fund. The Board may modify or amend any part of this Charter by unanimous consent.

5.3.6 Loan Application Process

We examined the green fund loan application forms from Harvard, Miami University, Iowa State University, and the University of California- San Bernadino. Some of these application forms had open-ended, qualitative questions (i.e. Iowa State), and some had specific, quantitative questions (i.e. Harvard). These different application formats reflect different target applicants; some funds aim to involve students in order to maximize educational opportunities, and some funds work mainly with operations departments (similar to Dartmouth's FO&M) in order to decrease emissions and increase savings as much as possible. The DRGF is aimed at both students and FO&M in order to enhance educational opportunities and sustainability. As such, we have created two separate application processes.

To apply for a project, an application form and a budget must be submitted to the Committee at least one week prior to a Committee Meeting. If this deadline has passed, the project will be considered at the following meeting. All proposals must have a clear target, financial plan, implementation plan, and time line. Local, state, or federal incentives for renewable energy or efficiency projects should be considered for all proposals. Exact costsavings numbers should be used when possible, but educated estimates may be used when exact numbers are costly or not feasible to calculate. Information about a similar, successful project at Dartmouth or another school will be useful.

FO&M proposals should be submitted to the board in their final form. The budget should include detailed, itemized lists of the costs involved in each aspect of the project (materials, construction, etc), as well as details of estimated savings and how these were calculated. The proposal also must include evidence of alignment with the underlying goals of the DRGF, particularly cost-effective projects that improve the environmental sustainability of Dartmouth College, and opportunities for student involvement where possible. Other community members not in FO&M or on the Big Green Board may submit qualitative proposals and then work on construction details and numbers in conjunction with FO&M and the Big Green Board. Loans for these proposals shall be capped at \$10,000 and paybacks must not exceed 5 years. Only after a clear target, financial plan, implementation plan, and time line are laid out will the proposal be voted on. Proposals must align with the overall goals of the DRGF, and will therefore be assessed for the following criteria:

- Environmental sustainability
- Cost effective use of funds with positive net returns
- Student participation and education where applicable
- Measurable financial and environmental results

5.3.7. Loan Disbursement and Repayment

Repayment schemes at other universities varied greatly. Some funds, such as Harvard's, charge only a 3% administrative fee on top of the inflation-adjusted cost of the loan. These funds have other means of growing, such as repeated donations from the endowment. Other funds, such as the fund at Miami University of Ohio, charge the loan recipient 100% of estimated savings until 150% of the loan is repaid.

An institution's Return on Investment (ROI) plays a large role in determining whether or not a RGLF is a viable option. For example, the first five years of Harvard's GCLF funded 35 projects with a 34% annual Return On Investment (ROI) and an annual savings of \$880,000 and 8.8 million pounds of CO2, amongst other pollutants and emissions (Levy et al., 2000, p. 225). Currently Harvard's GCLF is funding 153 projects with \$4 million in savings and a median ROI of 27% (Presidents and Fellows of Harvard College, 2009). The payback schedule is based on the estimated annual savings, adjusted accordingly with the 3% administrative fee (Gauthier, personal communication, May 12, 2010; Presidents and Fellows of Harvard College, 2009).

Miami University's ROI is experienced from a different process of repayment. 100% of projected savings are used to repay loans until 150% of the inflation-adjusted initial cost is returned towards project-use with an expected payback of less than 10 years. The same percentage of projected savings is used to repay the loan until 100% of the initial inflation-adjusted cost is returned for projects with expected payback of more than 10 years. Their investment criteria includes cost effective use of the fund, measurable outcomes, terms of payment plan, level of student participation, and potential to achieve green results (Prytherch, personal communication, May 6, 2010).

We expect savings paybacks to be the main source of fund growth, and so we propose the following loan repayment structure: The project recipient will make interest-free payments to the DRGF (adjusted for inflation) according to the timeline agreed upon during the application process. The project recipient will pay 90% of projected yearly savings back to the fund each year, retaining the remaining 10%. Repayment will continue until 120% of the initial project cost (adjusted for inflation) has been repaid, after which the project recipient retains 100% of project savings into perpetuity. Alternative financing structures may be employed, but only with the unanimous consent of the Board. At the discretion of the board, flexibility should be considered especially in times when energy cost volatility requires modification in payment plans, such as unexpectedly high oil prices. Any financing structure that may cause the DRGF to deviate from its stated mission will not be permitted.

5.3.8. Investments

The DRGF Board may also invest in traditional investment strategies that align with the overall mission of the fund, such as green mutual funds, community investments, or other revenue-generating initiatives. Fiscal, social, and environmental responsibility must be taken seriously, and no investment strategy may be employed if it compromises the financial viability of the fund. Additionally, all investments must be relatively liquid so as to not tie up funds for proposed projects. Viable on-campus investments must always be placed at higher priority than off-campus investments.

5.3.9. Seed Money

We examined how other Institutions raised seed funding to identify several ways to potentially fund the Dartmouth Revolving Green Fund (DRGF). Auburn University's RLF proposal suggests five possible sources of initial seed funding: direct administrative funding, student fees or voluntary contributions paid with registration fees, grants, alumni contributions, and payroll deduction options for employees (Buildings Working Group at Auburn University, 2010, p. 5). Auburn is currently trying to determine if it can dedicate part of its endowment to RLF seed funding, since there may be legal restrictions on endowment allocations for the purpose of forming an RLF. In 1993 Harvard's president Dr. Neil L. Rudenstine set aside \$1.5 million to establish a revolving loan fund under the newly formed Resource Conservation Incentive Program. The original \$1.5 million was reincarnated into its current form at \$3 million with funding again allocated by the president. The fund doubled to \$6 million and then doubled again to \$12 million in recent years (Gauthier, personal communication, May 12, 2010).,

In 2009, the College's Trustees voted to allocate \$12.5 million to complete 200+ energy efficiency projects over the next 5-7 years (Campus Survey, 2010). The \$12.5 million was set aside from the college's operating budget, and some of these funds are already designated for projects being carried out by Facilities, Operations and Management (FO&M): A \$1.7 million dollar lighting upgrade across campus is currently underway; \$1 million is being spent on automated controls and management for buildings; \$700,000 has gone towards energy metering; and future projects, such as heat recovery in the biggest energy users, including the Burke (which has a \$3 million dollar price tag), Vail, and Moore laboratory buildings (Bruce Dunn, personal communication, May 6, 2010).

Designating the remaining funds as the initial capital for the DRGF would be a viable method for ensuring future energy efficiency projects are funded, that initial capital in the fund could maximize the number of projects funded, and include projects with larger initial costs. Including these larger projects would also help the fund to grow more quickly. The administration at Miami U. started a Green Fund with \$50,000 of capital improvement funds (David Prytherch, personal communication, May 6, 2010). Harvard is the most prominent example of successful endowment by a university administration. An endowment of \$1.5 million from the president was followed with an addition \$3 million, also from the president. The fund

114

then doubled to \$6 million and then doubled again, to its current \$12 million (Nathan Gauthier, personal communication, May 13, 2010).

Many colleges and universities use a student green fee, assessed through tuition or activity fees, to begin and grow a revolving green fund. UCSB has a mandatory \$2.60 per quarter fee amounting to \$182,000 of revenue for their fund per year (Regents of the University of California, 2007). Brandeis, a much smaller university, charges \$7.50 per semester, which amounts to \$100,000 per year (Hannah Saltman, personal communication, May 3, 2010). Emory has surveyed student support for a fee, and has found that 71.4% of students support a voluntary fee and 35.4% of students support a mandatory fee. They have decided to implement a voluntary fee, but are still in the planning stages and do not know what kind of revenue to expect (Ryan Jones, personal communication, May 5, 2010). Student surveys will be conducted at Auburn University during the summer or fall to assess the viability of a 'student green fee,' in addition to cost benefit analyses (CBA), and the college will then vote and implement this fee if found favorable (Williams, personal communication, May 5, 2010).

As part of the Dartmouth campus survey conducted by ENVS 50 this spring, we asked questions to gauge undergraduate interest in a fee to fund sustainable initiatives at Dartmouth. About 524 people (12.5% of the student population) responded. The majority of students would participate in a voluntary fee by donating \$1 or more per term, and a smaller majority would support the establishment of a mandatory fee (see Figure 5.1). These results suggest that a green fee would be an acceptable policy at Dartmouth and potentially a large source of revenue for a green fund.



Figure 5.1 Student support for a "green fee".

We analyzed the survey results to quantify potential revenue from a voluntary green fee (see Appendix 5.3 for a more detailed discussion of calculations). If students were allowed to write-in their preferred donation amount on a tuition form or some other document, we could expect to raise \$123,237 per year—assuming they accurately reported their true willingness-to-pay on the survey. More likely, students would choose whether to donate a set amount by selecting an "opt-in" or "opt-out" option. Our calculations show that the optimal fee would be \$15.50 in this case; about 35% of students would participate, generating yearly revenue of about \$66,591.

There is already a precedent for gifts directed specifically at energy efficiency or sustainability projects (e.g., solar thermal system installed on the Sustainable Living Center), and we believe that many alumni could rally around sustainability when giving to the College. There are two different designations for alumni-supported funds at Dartmouth: restricted and unrestricted. Restricted funds are requested for specific projects like a building, and have strict requirements about how much money must be raised before use of the fund can begin, as well as limits to how money is dispensed. Unrestricted funds are designated for a broad range of uses at

Dartmouth, called "buckets". Examples are financial aid and athletics (Katie Kobylenski, personal communication, May 10, 2010).

The DRGF could potentially fall under either category of fund. A capital campaign to raise money for the fund would create a large amount of initial capital to start the fund, and therefore the fund would benefit from being classified as a restricted fund. The creation of a more general, unrestricted "bucket" for sustainability that alumni could choose to donate directly to (via a check box on donation forms) would keep money flowing into the fund consistently through time, boosting the fund's growth in slower increments.

Class gifts and matching gifts are other tools the College could take advantage of to start or grow the DGLF. The Wellesley Class of 1957 started a green fund that gives students awards ranging from \$1,000 to \$10,000 for sustainability projects (Salop, 2009). The UMass Amherst Class of 2010 has a class gift goal of \$40,000 that will start a revolving green fund (University of Massachusetts Amherst Development Office, 2010). Another creative possibility is for alumni to match a student fee going toward the DRGF. The College Fund has an alumni database that could be used to identify a subset of alumni interested in sustainability at Dartmouth, which might be helpful in the development of either a restricted fund or alumni matching campaign.

To our knowledge no other school has invested some of its endowment in energy efficiency projects. However, the Sustainable Endowments Institute will announce a new challenge this fall to colleges and universities around the U.S. They will ask schools to step up and invest part of their endowments in energy projects instead of just using operations money. Their ultimate goal is to have between 50 and 100 schools and \$1 billion committed. Dartmouth therefore has a unique opportunity as it organizes its energy efficiency funding mechanism (Mark Orlowski, personal communication, May 10, 2010).

Since August 2008, Dartmouth has received funding for various sustainability projects, including a \$100,000 grant for projects to institutionalize sustainability, which was spent on an assessment & indicators consultant (Campus Survey, 2010) and resulted in the production of the Dartmouth Sustainability Assessment and supported the development of a Campus Energy & Sustainability Management System. \$330,000 was awarded to the College by the state of NH Greenhouse Gas Reduction Fund to use smart grid technology in the implementation of the Campus Energy & Sustainability Management System for the continuous commissioning of

117

campus buildings (Campus Survey, 2010). Other grants may be available for energy efficiency projects and the creation of a revolving green fund and should be investigated further.

Student government may provide an important pathway for students to develop a green fund. Swarthmore's student government discovered they had \$43,000 of unexpended student fees. A student referendum decided that the unused funds should start a Revolving Green Fund (Carr Everbach, personal communication, May 6, 2010). Emory's student government has money designated for "campus improvements" that wasn't being utilized. They voted to place this money in a revolving green fund (Ryan Jones, personal communication, May 5, 2010). Dartmouth's Student Assembly should be examined as both a funding source and a vehicle for implementation of perhaps a small-scale revolving green loan fund that primarily funds student projects with lower initial capital costs.

Funding by or involvement with academic departments might enhance the learning value of the DRGF. Departments interested in issues of energy efficiency or financing could contribute to the fund and use it as a learning tool for classes, research, etc. Environmental Studies, Engineering, and Economics are a few examples. The Macalester green fund was given \$7,000 from their Environmental Studies department (Association for the Advancement of Sustainability in Higher Education, 2007).

5.4 Implementation of Revolving Green Fund at Dartmouth

In order to determine the financial and environmental performance of our green fund, we decided to model several scenarios of building efficiency upgrades. We began by consulting with Bruce Dunn of FO&M to determine which campus buildings are top priorities for efficiency upgrades that the green fund could finance. Bruce informed us that the most critical buildings were Baker/Berry Library, the Hanover Inn, Thompson Arena, Dana Library, the Hopkins Center, and the West Gym.

A lighting upgrade in the West Gym has a low capital cost of \$59,000 and a significant 3.7-year simple payback. We suggest this as FO&M's first project under the DRGF. The new energy monitoring system will give FO&M the capability to measure lighting load reductions, and a smaller project such as this would be a perfect test run for the loan fund.

Based on Mr. Dunn's suggestions, we chose three other projects as our 'top priorities' based on their initial capital cost and the time it takes for savings from those projects to cover the

initial cost (payback period). These are Dana Library, Thompson Arena, and Baker/Berry Library. All three of these projects are significantly more involved than lighting upgrades, and thus require a higher upfront cost. These three projects will include not only lighting upgrades, but also a retro commissioning and HVAC (heating, ventilation, and air conditioning) improvements. Retro commissioning involves a recalibration of controls and assessment of metering accuracy to determine which systems require replacement. The HVAC system will be upgraded to meet air code requirements and reduce heat loss due to ventilation.

As shown in FO&M's Strategic Energy Conservation Plan (SECP), these projects will have the following capital cost and simple paybacks:

West Gym:	\$59,000	3.7 years
Dana Library:	\$171,810	11.1 years
Thompson:	\$215,850	4.4 years
Baker/Berry:	\$560,415	4.0 years

The DRGF allows FO&M to pursue their efficiency upgrades as planned while ensuring funding for future projects. Our model results (below) show that a relatively small amount of starting capital will result in high returns. A revolving green fund with an initial endowment of \$850,000 will provide enough capital for all four efficiency upgrades and pay itself back within seven years. This will result in a CO2 reduction of 593.5 metric tons per year, not to mention immense cost savings to the College in the future. As shown in the Institutional Comparison section, revolving green loan funds at other colleges have proven to be efficient mechanisms for sustained growth, and the following financial analyses show that Dartmouth can reap the same benefits.

5.4.1 Modeling Fund Performance

We developed a MicrosoftTM Excel-based "Green Fund Performance Calculator" to assess how the fund would perform under different circumstances. The calculator allows us to easily alter explanatory variables including: the projects being funded, the structural economics of the fund, starting endowment and yearly donations to the fund, future energy price projections, and discount rate. It then automatically generates a report on the financial and environmental performance of the fund through 2030 (See Appendix 5.4 for more details on how the calculator works).

Using the Green Fund Performance Calculator, we model the results of implementing the four projects discussed above. We assumed that the fund will begin operating in 2011, so the first project can be financed in 2012 (this is "Year 1" in our models). We assume that a maximum of one project can be implemented per year. We establish fund parameters as follows: 90% of savings from each project is paid back to the fund until 120% of the initial capital cost has been repaid. We use electricity and fuel oil price projections through 2030 from the U.S. Energy Information Administration. The EIA publishes both "low" and "high" price scenarios (EIA 2009); we average energy prices from the two scenarios to generate a mid-range estimate that we believe best reflects the probable path of energy prices in the U.S. We use a discount rate of 5.5%, a typical value used by FO&M and the College at large in budget calculations.

It is important to first establish the order in which the four projects will be implemented. Preliminary model runs indicate that implementing those with the best paybacks first minimizes the number of years it takes to get all four projects off the ground. However, ordering the projects according to initial cost (cheaper projects first, more expensive projects later) maximizes combined net present value (NPV) of all four projects through 2030. This has the added advantage of allowing the smaller, more easily implemented projects to go first. They can function as pilot projects, and lessons learned from them can be leveraged to ensure that larger, more complicated projects implemented later run smoothly. Therefore, we model the projects in order of capital cost.

We then conduct several preliminary model runs, changing various parameters to gauge their impact on performance. First, we vary the payback rate (between 50% and 100% of yearly project savings) and the percent of loan value repaid (between 100% and 150%). We find that these factors have a moderate impact on financial and environmental performance. In general, the more "fund-friendly" (i.e. larger) these variables are, the better the fund performs in terms of combined NPV and total carbon emissions reduction. This is because capital flows back into the fund more rapidly, allowing additional projects to be funded sooner and, therefore, allowing the benefits of those projects to begin accruing sooner. Second, we vary the discount rate between 5% and 10%. This can have a drastic impact on NPV, depending on when the projects are implemented. If projects are conducted further in the future, their benefits are more heavily

120

discounted; in these cases, raising the discount rate by 5% can reduce NPV by at least an order of magnitude. Because discount rate is used only in nominal budgetary calculations, it has no impact on environmental performance. Third, we examine the differences between EIA price projection regimes. This has a large impact on NPV calculations and a moderate impact on environmental performance. Under the "high" price scenario, projects generate considerably more savings—especially if they are implemented far in the future, when energy prices are expected to be much higher. Furthermore, projects repay their obligation to the fund more quickly in the high scenario, allowing the capital to be loaned out to other projects more quickly. This slightly improves the total emissions reductions generated by the fund. Therefore, a green fund can act as an effective buffer against unstable and/or rising energy prices.

They key variables we wish to explore are the initial endowment of the fund and the yearly income that it receives. As we have shown, altering the structural parameters of the fund generally has moderate and predictable effects; however, differences in funding can drastically alter the performance of the fund. Exploring different funding options will allow College decision-makers to select the best option for meeting their performance goals. Therefore, we run three separate models for different funding scenarios: one with high start-up capital, one with low start-up capital supported by a voluntary student fee, and one with a student fee only. The results are shown below.

5.4.1a. Scenario 1: High Initial Endowment

Endowment: \$850,000

Yearly Income: None

In this scenario, we assume enough seed money has been allocated to the fund to allow all four projects to be implemented in the first four years. We assume that no additional money is donated to the fund subsequently, so its only source of returns is project paybacks.

Project	Year	Initial Cost	Payback Time	NPV (to 2030)	Total CO2 Reduction (to 2030)
West Gym	1	\$51,620	5	\$167,254	0
Dana	2	\$171,810	8	\$163,185	1,375 tons
Library					
Thompson	3	\$215,850	4	\$601,955	2,526 tons
Baker/Berry	4	\$560,415	4	\$1,748,784	5,322 tons
Total		\$999,695	5.25 (ave.)	\$2,618,188	9,222 tons

Table 5.4. Four Projects Under Scenario 1.

Figure 5.2. Fund Balance Over Time in Scenario 1.



Figure 5.3. Savings Over Time Under Scenario 1.



5.4.1b. <u>Scenario 2</u>: Low Initial Endowment with Green Fee

Endowment: \$80,000

Yearly Income: \$66,591

Here, we assume that the fund begins with a much smaller endowment: enough capital to fund the first two projects in the first two years only. The fund is supported by a voluntary student fee of \$14.50 per term, which will generate an estimated \$66,591 per year. (see Appendix 5.3 for willingness-to-pay calculations). In total, the fee would generate \$66,591*19 years = \$1,265,229 by 2030.

Table 5.5	Four pr	ojects	under	Scenario	2.
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Project	Year	Initial Cost	Payback Time	NPV (to 2030)	Total CO2 Reduction (to 2030)
West Gym	1	\$51,620	5	\$167,264	0
Dana	2	\$171,810	8	\$163,185	1,375
Library					
Thompson	4	\$215,850	4	\$555,432	2,368
Baker/Berry	8	\$560,415	3	\$1,145,164	3,903
Total		\$999,695	5 (ave.)	\$2,031,045	7,645

Figure 5.4 Fund Balance Over Time in Scenario 2





Figure 5.5 Savings Over Time Under Scenario 2.

5.4.1c. Scenario 3: Green Fee Only

Endowment: None

Yearly Income: \$66,591

Here, we assume that the fund receives no endowment; it operates exclusively from the yearly income of a voluntary student fee.

Project	Year	Initial Cost	Payback Time	NPV (to 2030)	Total CO2 Reduction (to 2030)
West Gym	1	\$51,620	5	\$167,265	0
Dana	3	\$171,810	8	\$148,232	1,294
Library					
Thompson	5	\$215,850	4	\$511,334	2,210
Baker/Berry	9	\$560,415	3	\$1,003,280	3,548
Total		\$999,695	5 (ave.)	\$1,830,109	7,052



Figure 5.6 Fund Balance Over Time in Scenario 3

Figure 5.7 Savings Over Time Under Scenario 3.



5.4.2. Lessons from the Scenarios

Our model shows that the green fund is an effective mechanism for turning a relatively small amount of starting capital into excellent financial and environmental returns. While the same benefits could be derived from conventional investments, a green revolving fund is a simple tool for ensuring that savings are leveraged into even greater future benefits.

These three scenarios indicate that investing more capital in a green fund up-front produces universally better outcomes (scenarios 1-3 represent a progression from high to low initial endowment). This produces a higher combined NPV because benefits accrued earlier are discounted less heavily. It also produces a larger carbon emissions reduction and larger total

profit, because projects can begin accruing benefits earlier. There are also more qualitative benefits to implementing projects more quickly. They can begin to generate positive publicity for the College, improve sustainability rankings, and provide a marketing tool for soliciting future donations. Finally, projects implemented more quickly can serve as a more effective hedge against rising instability in oil and electricity prices.

5.5. Conclusions

Dartmouth College has continuously shown that it is a global leader in many fields, including environmentalism, as we have the Dartmouth Outing Club, numerous environmental groups and initiatives, and one of the oldest Environmental Studies departments in the country. In recent years, other schools have made strides ahead of Dartmouth in sustainability, and one effective mechanism has been the establishment of revolving green funds. Harvard University leads the way with its fund that has provided the capital for many state-of-the-art sustainability projects. There are currently fifty-five colleges and universities in the United States and Canada that either have, or are in the process of creating, revolving green funds. With its great resources, history, and leadership, Dartmouth could easily join these ranks. The establishment of a revolving green fund at Dartmouth would allow our tradition of leadership in sustainability to continue.

The fund will not only serve Dartmouth in terms of sustainability, but also financially. The plan we have created outlines a project with great potential for relatively high returns on investment that rival those of the college's endowment. The fund will also make the College less vulnerable to volatile and rising energy prices.

Various groups, including FO&M, Environmental Studies courses, and Engineering courses, have already compiled large amounts of data related to various efficiency and sustainability projects around campus. However, sufficient funding or infrastructure does not exist to achieve these project goals. Our report provides a solution for both. There are multiple sources of potential seed money, and a possible regulation process has been laid out. Our project created a synergy between multiple sources of already existing data, and used it to implement an efficient, cost and energy saving process.

We hope to see the fund be established and grow, and eventually allow Dartmouth to orchestrate endless upgrades and projects that ensure efficiency and sustainability. The fund

126

would provide a channel for the implementation of innovative ideas from students, faculty, and staff. It would be a learning opportunity, both for the students who apply to it, and for Dartmouth's management to see new, feasible ways to further sustainability at Dartmouth. We see the fund as a means of harnessing and using the brilliant and creative activism in our community. We hope that, over time, it will create enough profit to address numerous sustainability issues, including those with less promising paybacks. With continued hard work and dedication, this vision can become a reality.

Chapter Six: Conclusions

6.1 From Rhetoric to Realization

Our conclusions are intentionally brief. It is our firm belief that if the recommendations highlighted in this report are promoted and adopted by the students, faculty and staff of Dartmouth, the College will go a long way towards becoming more sustainable. To summarize, these recommendations include:

- Promote the norms and values of sustainability amongst students (Chapter Two) by

 (a) offering an accessible and desirable sustainability-oriented course for non-specialists;
 (b) enabling sustainable behaviors; and
 (c) providing financial incentives for sustainable behaviors.
- Adopt a variety of educational programs designed to increase general awareness regarding sustainability efforts on campus, with a particular focus on incoming students, students in their first year, and alumni (Chapter Three).
- Strengthen the administrative commitment to sustainability (Chapter Four) by (a) generating a clear vision of Dartmouth's institutional goals, highlighting sustainability as a core issue; (b) increasing the capacity of a well-situated sustainability office; and (c) rethinking the true long-term costs and benefits of sustainability initiatives.
- Immediate creation of a Dartmouth Revolving Green Fund—with full administrative support—in order to provide financial support for crucial projects (initially focusing on energy consumption and carbon emissions) and, eventually, to assist Dartmouth in becoming a global leader in sustainability in higher education.

In this fashion, Dartmouth College will be able to overcome the substantial barriers to sustainability in higher education and build bridges to a more sustainable future.

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Appendices¹

Appendix 2 (Chapter Two): Interview Transcripts

Interview #1

Background: Female, '10, Greek, not a varsity athlete, white, from California

When you hear the word "environment" or "sustainability," what comes to mind? What are your general thoughts on the environment and all that is associated with it? Or what do you associate with the environment? What about environmental groups on campus?

Global warming, recycling, Alaska. A lot of env issues people aren't aware of because they aren't relevant to them, esp at Dart where disconnect between what we use and any repercussions. Env groups just as much value as any other group – sharing an interest finding way to expand to others – valuable; also good way for people to work out what they believe and what matters to them.

What environmental practices, if any, do you engage in?

I recycle religiously, try to tell other people why. Grew up out of town and had to take all garbage to dump - a big part of being aware of it. Try to urn off lights and comp but kinda forget a lot.

Do you make an effort to conserve energy? Why or why not? If so, how?

Hard to remember b/c if told frequently turn out...stickers on light switches noticeable, pretty cool.

Have you ever taken an ENVS course? why/why not? If so, what did you think/was it helpful?

No envs - lot of interests, many classes wish I could still take.

Do you consider yourself an environmental person?

Yeah.

What do you think the College should make as its environmental priority? (And how do you think environmental initiatives compare to other priorities on the college's plate?)

Seems like the college should be focusing on bigger inst things – publicizing them in a way that makes student action also something that makes sense. Energy saving buildings a good idea, but college does other things extremely contrary to that – makes it seem stupid.

¹ We have organized the appendices according to chapters. This is reflected in the numbering of the appendices.

I think Dart a place where you dev one priority you really care about because very consuming...to be like activist about this and this and this. All interconnected that said. In the top third of my inst priorities.

How do you see a student's role in this?

Students should be focusing on lifestyle changes that would be easy and would make sense for students to make, cultural shifts around things as basic as recycling – people are like "why should I do that" which is ridic because it seems so easy. I think that can go a long way.

How was this interview for you? Are there any questions you would have liked to have seen? Was anything unclear? Do you have any suggestions for us about interview or survey format?

Survey fine...fill in the blank better for blitzing out. Usually when people send surveys I don't think about it much.

Keep not overtly political, don't tell them its about sust

Do you recycle, why or why not as a start Do you think other people do here, is that a problem

Recycling an accessible issue – when do you recycle? Everything, when convenient, never

Idea to get people to conserve energy: people back when they use much less than avg elec

Interview #2

Background: Female, '11, not Greek, varsity athlete (xc), white, from California

How often do you recycle?

Daily, whenever something's recyclable, always

What environmental practices, if any, do you engage in? Do you make an effort to conserve energy? Why or why not? If so, how?

Pull out chargers when leave room Always turn the lights off when leave the room Don't flush toilet when go to the bathroom at night Carry a spoon Try not to use trays sometimes Try to use reusable plates and cups when making and buying food

Have you ever taken an ENVS course? why/why not? If so, what did you think/was it helpful?

Nope. Sounds kind of interesting, but I have a greater interest in other subjects and at this pt trying to finish major and minors and distribs. I would much rather study other things. I would take it for a science distrib possibly. I'm more of a humanities, social science type. But I've heard good things about the dept.

When you hear the word "environment" or "sustainability," what comes to mind? What are your general thoughts on the environment and all that is associated with it? Or what do you associate with the environment? What about environmental groups on campus?

Recycling Taking care of our earth Being economical I geuss too

Do you consider yourself an environmental person?

I don't know if I would label myself like that, but its important to me.

What do you think the College should make as its environmental priority?

I don't know

And how do you think environmental initiatives compare to other priorities on the college's plate?

For the college, number one priority is for students to learn and to have those resources in a variety of ways with diff clubs and groups – faith, athletics (are balanced here with learning)

I would see it as part of student efforts to learn about the world and make the world better, which is part of the college's role in educating. The env movt is an ed movt also so it fits well and a life practice, and we're living away from home so it's ideal for that. So it's pretty integrated into the ideal of the college's educating. In my opinion it has a higher moral person so it would go above chess club and social clubs and go along with social justice efforts and faith groups. So I would say pretty big, pretty high priority in terms of how much recognition and funding it should have.

How do you see a student's role in this?

Promote events and efforts to be sust, other students need to be open and aware of them, openminded towards seeing what they're about. Which ideally at a liberal arts college most students would be open minded to that or to a lot of things

How was this interview for you? Are there any questions you would have liked to have seen? Was anything unclear? Do you have any suggestions for us about interview or survey format?

Could ask about past efforts to promote sustainability and what students thought of them, whether engaged in them or not and why
Don't think I'd be defensive – could put it at the end of the survey to make it less awkward, so they feel more comfortable.

Interview #3

Backgroung: Female, '10, Greek, not a varsity athlete, Mid-Atlantic, not on financial aid

When you hear the word "environment" or "sustainability," what comes to mind? What are your general thoughts on the environment and all that is associated with it? Or what do you associate with the environment? What about environmental groups on campus?

Vegetarianism, recycling, green. I think its neat that the SLC puts on the dinners that are educational and sustainable and they bring different tips that you can do...that might just be you.

What environmental practices, if any, do you engage in?

I recycle paper and bottles and cardboard. I put my computer to sleep. I don't eat meat very often.

Do you make an effort to conserve energy? Why or why not? If so, how?

Ummm...

Do you turn off lights?

Oh yeah, of course! I don't think of it as an env thing, it's just like if I'm leaving a room why would I leave the light on?

Have you ever taken an ENVS course? why/why not?

No. It seems kind of science-y. And it's just not really my thing, I geuss I'm more into humanities.

Do you consider yourself an environmental person?

I don't know.

What do you think the College should make as its environmental priority?

Probably energy use in buildings, right? I feel like the college must spend a ton of money on heating, and I don't know if there's a way to do that more efficiently, but it couldn't hurt.

And how do you think environmental initiatives compare to other priorities on the college's plate?

I think the college's top priority should be classes, the hiring of professors, class size. Compared to that, sustainability is a substantially lower priority, but I still think it should be something that the college can consider.

How do you see a student's role in this?

I geuss it would be nice if, which they're doing, students who know a lot about sust show other Dart students who aren't as informed shortcuts they can do that are sust and easy. Honestly, Dart students aren't going to do something time consuming, but if it's convenient, they might. Eg survey with explanation – Megan *(mutual friend)*: any question that requires me to think more than 30 seconds, I'm just not going to do it. Things need to be easy.

How was this interview for you? Are there any questions you would have liked to have seen? Was anything unclear? Do you have any suggestions for us about interview or survey format?

Delightful! Absolutely the highlight of my day!

Appendix 3.1 (Chapter Three) – Survey Questions Utilized to Direct Focus Group

- Sustainability Behaviors
 - What do you think sustainability is?
 - How sustainable do you consider yourself? (1-5 scale)
 - Have you noticed the green stickers around lights?
 - Do you have a mini-fridge?
 - Do you wash your clothes in hot or cold?
 - What are some reasons you think it's good to turn off lights?
 - Student elections which ways did you notice they reached out? Were they effective?
 - Do you remember sustainability teaching from DOC Trips?
- UGA
 - How much did you listen to your UGA?
 - What was your floor meeting attendance?
 - Do you remember things from the meetings you had?
 - Anyone ever been a UGA?
- Green Fund
 - Would you pay to make Dartmouth green?
 - How do you feel about reward systems for dorm floors?

Appendix 3.2- Mini-Fridge Ad in *The Dartmouth* for Incoming Students



Appendix 3.3- UGA pamphlet

This pamphlet is intended for use by UGAs in first-year dormitories, to be used as an educational reference about sustainable behaviors. Behaviors discussed are also relayed in the video (see below).





The Green Stud wants YOU to:

- take shorter showers
- use the cold cycle for laundry
- hang-dry your clothes
- keep your food in your community fridge

To find out why, check out his video on Youtube!

Appendix 3.5 – Educational Video DVD (see enclosed or go to http://www.youtube.com/watch?v=jUl6kp2MwTg)

Appendix 5.1 (Chapter Five): Proposed Charter and Covenant, Dartmouth Revolving Green Fund

Mission

The mission of the Dartmouth Revolving Green Fund (DRGF) is to encourage environmentally sound technologies and practices on Dartmouth's campus. It will finance innovative projects that reduce the College's environmental impact, improve the educational environment, and generate net positive financial returns. The DRGF will engage students, staff, faculty, and administrators in the decision-making and implementation process. The fund will further the broader academic mission of the College while helping it to meet greenhouse gas reduction targets and become a green leader among campuses worldwide.

Once start-up capital is received, the DRGF will function as an independent fiscal entity managed by a committee of Dartmouth community members. It will grow over time by collecting cost-savings from the projects it funds and reinvesting them in similar projects. This structure will provide substantial cost-savings over time, while providing opportunities for engagement and hands-on learning for the entire Dartmouth community.

Goals

- To increase the use of sustainable design and environmentally sound technologies and practices on Dartmouth's campus.
- To facilitate cost-saving green projects and ensure that a portion of the returns are used to finance similar projects in the future.
- To provide students, staff, faculty, and administrators with opportunities to move the College toward sustainability and carbon neutrality.
- To provide an educational opportunity for Dartmouth students interested in sustainable and energy-saving projects.
- To ensure that the most beneficial and profitable green projects do not go unfunded due to capital constraints.
- To buffer Dartmouth's budget against rising energy prices.
- To transform Dartmouth into a national leader in sustainable practices and demonstrate that sustainability and financial viability are not mutually exclusive.

Structure

The fund will be managed by the Big Green Board ("Board"), a committee including:²

- The Director of Sustainability Initiatives, who will serve as the non-voting chair of the Board.
- Two undergraduate students, (1 appointed by Student Assembly, 1 by the Sustainability office).
- One staff member with technical expertise, appointed by Facilities, Operations, and Management
- One faculty member, appointed by the Environmental Studies Department

² This proposed committee is large and has members who are most likely very busy, and thus might have trouble meeting as a group. Since the currently proposed committee has an even number of members, we suggest that each position be reanalyzed, and that either the Director be non-voting, and/or one to three members could potentially be eliminated.

- One administrator, appointed by the President of the College
- One trustee or alumnus, appointed by the Board of Trustees
- The Chief Financial Officer

Non-student Board members will serve for two-year terms, while student members will serve for one-year terms. Terms shall begin on the first day of the fall quarter. Due to the continuous nature of the fund, it is imperative that student members of the Board be "on" for at least two consecutive terms, and available via email to maintain responsibilities during "off" terms. Board members may be reappointed if agreed upon by the appointing party. In the case of resignation, the appointing party in conjunction with the Board must choose a replacement as soon as possible.

Fund Management and Procedural Process

The Board will manage and maintain the fund, assess and vote on project proposals, disperse loans, manage the repayment process, and help with implementation of projects when required. Anyone can propose a project, but the maximum cost, payback, and application process differ among types of applicants (See Loan Application Process below). It is expected that Facilities, Operation, and Management (FO&M) will serve as the primary user of the funds in the early years, as they already have developed efficiency project proposals. However, community members with ideas are encouraged to work with FO&M and the Big Green Board to develop proposals with a clear target, financial plan, implementation plan, and time line. Only proposals with these criteria will be voted on. All applicants must follow the application process outlined below.

The board will communicate remotely to discuss day-to-day fund management. Small proposals (those requesting 10% of the current DRGF balance or less) may be voted on remotely. The Chair must submit such proposals to the Board via email. Board members then vote on the project via email to the Chair within two weeks. Unanimous consent is required for proposals voted on remotely. If any Board member does not approve, the proposal must be presented in person at the next formal meeting.

The Board will formally meet at least once per term while classes are in session, excluding Summer Term, to discuss larger proposals, policy, investments, and management strategies. The date and time of this session must be publicly announced via the DRGF website at least two weeks in advance. Potential project recipients requesting a loan of more than 10% of the BRGLF balance must present their proposal to the Board in person during one of these meetings. If multiple projects are presented at the same meeting, all proposals must be heard before a vote is taken. The Board can then vote to deny, approve, or delay voting until a later date to facilitate Board deliberation or refinement of the proposal(s).

Any proposal may be modified by the Board before approval. In this case, the original applicant will be notified within 72 hours and will be given the opportunity for an appeal hearing.

Upon passing a proposal, the Board and non-board participants must proceed with the implementation plan as quickly as possible. Students and staff who are not on the board should be integrated into the implementation process as much as possible, especially advertising and publication.

Members on the Board are responsible for maintaining ongoing reports on the activities of the DRGF to summarize projects contributing to the College and keep track of the financial status of the Fund. The Board may modify or amend any part of this Charter by unanimous consent.

Loan Application Process

To apply for a project, an application form (Appendix C) and a budget must be submitted to the Committee at least one week prior to a Committee Meeting. If this deadline has passed, the project will be considered at the following meeting. All proposals must have a clear target, financial plan, implementation plan, and time line. Local, state, or federal incentives for renewable energy or efficiency projects should be considered for all proposals. Exact cost-savings numbers should be used when possible, but educated estimates may be used when exact numbers are costly or not feasible to calculate. Information about a similar, successful project at Dartmouth or another school will be useful.

Proposals

FO&M and Board-Member Proposals

FO&M proposals should be submitted to the board in their final form. The budget should include detailed, itemized lists of the costs involved in each aspect of the project (materials, construction, etc), as well as details of estimated savings and how these were calculated. The proposal also must include evidence of alignment with the underlying goals of the DRGF, particularly cost-effective projects that improve the environmental sustainability of Dartmouth College, and opportunities for student involvement where possible.

Student and other Faculty Proposals

Other community members not in FO&M or on the Big Green Board may submit qualitative proposals and then work on construction details and numbers in conjunction with FO&M and the Big Green Board. Loans for these proposals shall be capped at \$10,000 and paybacks must not exceed 5 years. Only after a clear target, financial plan, implementation plan, and time line are laid out will the proposal be voted on.

Criteria for Evaluation

Proposals must align with the overall goals of the DRGF, and will therefore be assessed for the following criteria:

- Environmental sustainability
- Cost effective use of funds with positive net returns
- Student participation when possible

• Measurable financial and environmental results

Loan Disbursement and Repayment

Repayment schemes at other universities vary greatly. Some funds, such as Harvard's, charge only a 3% administrative fee on top of the inflation-adjusted cost of the loan. These funds have other means of growing, such as repeated donations from the endowment. Other funds, such as the fund at Miami University of Ohio, charge the loan recipient 100% of estimated savings until 150% of the loan is repaid. These funds are typically small, and rely on savings paybacks as the sole source of fund growth. We expect savings paybacks to be the main source of fund growth, and so we propose the following loan repayment structure:

The project recipient will make interest-free payments to the DRGF (adjusted for inflation) according to the timeline agreed upon during the application process. The project recipient will pay 90% of projected yearly savings back to the fund each year, retaining the remaining 10%. Repayment will continue until 120% of the initial project cost (adjusted for inflation) has been repaid, after which the project recipient retains 100% of project savings into perpetuity.

Alternative financing structures may be employed, but only with the unanimous consent of the Board. At the discretion of the board, flexibility should be considered especially in times when energy cost volatility requires modification in payment plans, such as unexpectedly high oil prices. Any financing structure that may cause the DRGF to deviate from its stated mission will not be permitted.

Proposed Dartmouth Revolving Green Fund (DRGF) Covenant

This covenant is intended to establish a relationship between the Fund and Dartmouth College. To guide the fund and prevent any use of funds contrary to its intended mission, the covenant outlines actions that are prohibited and those that are encouraged.

Mission

The mission of the Dartmouth Revolving Green Fund (DRGF) is to encourage environmentally sound technologies and practices on Dartmouth's campus. It will finance innovative projects that reduce the College's environmental impact, improve the educational environment, and generate net positive financial returns. The DRGF will engage students, staff, faculty, and administrators in the decision-making and implementation process. The fund will further the broader academic mission of the College while helping it to meet greenhouse gas reduction targets and become a green leader among campuses worldwide.

Once start-up capital is received, the DRGF will function as an independent fiscal entity managed by a committee of Dartmouth community members. It will grow over time by collecting cost-savings from the projects it funds and reinvesting them in similar projects. This structure will provide substantial cost-savings over time, while providing opportunities for engagement and hands-on learning for the entire Dartmouth community.

Goals

- To increase the use of sustainable design and environmentally sound technologies and practices on Dartmouth's campus.
- To facilitate cost-saving green projects and ensure that a portion of the returns are used to finance similar projects in the future.
- To provide students, staff, faculty, and administrators with opportunities to move the College toward sustainability and carbon neutrality.
- To provide an educational opportunity for Dartmouth students interested in sustainable and energy-saving projects.
- To ensure that the most beneficial and profitable green projects do not go unfunded due to capital constraints.
- To buffer Dartmouth's budget against rising energy prices.
- To transform Dartmouth into a national leader in sustainable practices and demonstrate that sustainability and financial viability are not mutually exclusive.

Appropriate Projects

DRGF money shall be used only for projects that are in complete alignment with the intended goals of the fund. Funding a project consists of all proposed aspects of the implementation process that have been approved by the DRGF Board (management committee), and could include (but is not limited to) construction and material costs, education, advertising, metering, and maintenance. The Board shall have the discretion to ensure that funds support only projects that are cost-saving and have a positive impact on sustainability at Dartmouth. The Board should consider both smaller, short-payback projects and larger, longer-term ones, especially those that are educational or research-based.

Examples of Appropriate Projects

The following is a list of viable sustainability improvements for the DRGF to furnace. The list is by no means exclusive, but it should give a good idea of the type of projects that the Fund is meant to support.

- *Efficiency Improvements:* Installation of high efficiency pumps, lighting, boilers; weatherization and insulation; energy recovery ventilators.
- *Water Conservation:* Installation of low-flow appliances; systems which recover or reuse wastewater.
- *Renewable Energy:* Installation of on-campus and community renewable energy systems such as geothermal, solar thermal or photovoltaic, wind turbines, biomass.
- *Renewable Fuels:* Production of renewable fuels, such as biodiesel from agricultural waste or dining hall waste oils.
- *Green Building:* Investment in green building designs, such as green roofing, passive solar heating, and elimination of conflicting practices.
- *Sustainable Agriculture:* Investment in processes that recycle and reuse agricultural materials.

Examples of Inappropriate Projects

- *Fossil Fuels:* Projects that use fossil fuels should not be invested in, unless the project quickly and significantly leads to a net decrease in fossil fuel consumption and greenhouse gas emissions.
- *Non-Renewables:* Funds should never be invested in projects using unsustainable practices, such as large hydroelectric dams, or nuclear power.
- *Credits or Offsets:* Funds should never be used to purchase carbon offsets, renewable energy certificates, green tags, or any other credits. Rather, the DRGF should focus on projects that provide cost-savings while improving the sustainability, leadership, and image of Dartmouth College.
- *Budget shortfalls:* Funds should not be used to cover budget shortfalls for the College, except by investing in appropriate projects that reduce College costs.
- *Salaries:* The Fund is not intended to cover faculty or staff salaries, except as direct wages for projects when the Board deems appropriate.

Investments

The DRGF Board may also invest in traditional investment strategies that align with the overall mission of the fund, such as green mutual funds, community investments, or other revenue-generating initiatives. Fiscal, social, and environmental responsibility must be taken seriously, and no investment strategy may be employed if it compromises the financial viability of the fund. Additionally, all investments must be relatively liquid so as to not tie up funds for proposed projects.

Appendix 5.2: Project Application Forms

Dartmouth Revolving Green Fund Application Form: FO&M Proposals

FO&M proposals should be submitted to the board in their final form. Please attach a budget that includes detailed, itemized lists of the costs involved in each aspect of the project (materials, construction, etc). The proposal also must include evidence of alignment with the underlying goals of the DRGF, particularly cost-effective projects that improve the environmental sustainability of Dartmouth College, and opportunities for student involvement where possible.

Project Title: Project Location:

Project Executive: Name: Title Phone: E-Mail: Secondary Contact: Name: Title Phone: E-Mail:

Describe the objectives of the project.

What are the estimated cost savings after the project is completed? What will be the source of these savings (i.e. reduced heat load)? Will the benefits outweigh the costs of construction/implementation? Please provide calculations.

What is the estimated environmental impact reduction? Include calculations of estimated emissions reductions, water use reductions, etc.

Are there examples of similar projects that have been successful? Please provide details.

Project Timeline:

Total estimated project cost:

Matching funds or in-kind support:

Requested Funding from DRGF:

Anticipated payback period:

Signature of Committee Chair:_____

Signature of Project Executive:_____

Signature of FO&M Manager: ______

Dartmouth Revolving Green Fund Application Form: Students & Other Faculty Proposals

Project Title: Project Location:

Project Executive: Name: Title Phone: E-Mail: Secondary Contact: Name: Title Phone: E-Mail:

Describe your project. What will the funding be used for, and how will it make Dartmouth more sustainable?

How will your project be implemented? What departments will oversee the project and what resource will they need?

How will the success of the project be measured? Please provide an estimate of any cost savings, emissions reductions, or other qualitative or quantitative improvements. Will the benefits outweigh the costs of construction/implementation?

Are there examples of similar projects that have been successful? Please provide details.

Project Timeline:

Total estimated project cost:

Matching funds or in-kind support:

Requested Funding from DRGF:

Anticipated payback period (of BGRL funds only):

Signature of Committee Chair:_____

Signature of Project Executive:_____

Signature of Associated Department:_____

Appendix 5.3: Maximizing revenue from a voluntary student "green fee"

We conducted a random survey of Dartmouth students via email to assess potential participation in a voluntary green fee, one possible source of funding for a green fund. About 547 students responded. In the survey, we described how a green fund would work, then asked:

How much would you voluntarily donate to support the fund (per term) if you could easily add it to your tuition (by simply checking a box on a form)? \$0 \$1 \$5 \$10 \$20 Other:_____

There are a couple of different ways in which students who wish to add a green fee to their tuition could be charged. In each case, the results of the survey must be interpreted differently.

Write-in Amount

One option is to allow each student to write in his or her exact willingness-to-pay (WTP) on a tuition form. The mean WTP reported in the survey was \$9.79 per term. If students were able to write in their exact WTP on tuition forms and did so accurately, this would amount to a total potential income of

\$9.79 x 3 terms x 4196 students = <u>\$123,237 per year</u>.

Fixed Amount

However, it would probably be more practical to simply have each student check an "opt-in" or "opt-out" box on a tuition payment form to decide whether to pay a fee of a fixed amount. The question then becomes how large to set the fee to maximize revenue. There are two competing effects: a higher fee generates more revenue per donation but causes a lower participation rate, and vice versa. This can be solved mathematically using the data we collected.

The table below shows the probability that an average student will donate at each of several possible fee amounts (a few outliers above \$25 have been removed).

Fee Amount	Probability of Donation	Expected Donation (Prob. x Amt.)
\$0	100.000%	\$0.00
\$1	73.360%	\$0.73
\$5	64.215%	\$3.21
\$10	40.954%	\$4.10
\$20	21.471%	\$4.29
\$25	0.199%	\$0.05

It is clear that participation declines as the fee increases. The third column (the product of fee amount and probability of donation) shows the expected termly donation per student. This is the number we wish to maximize by picking the correct fee amount. To do this, we graph the relationship between the two and fit a line to the points.



The equation below the graph represents the line that best fits the data. We maximize this line with respect to x by setting its derivative equal to 0 and finding x. Using this approach, we find that the revenue-maximizing fee size is \$14.5. If we set the fee at that level, the expected per-term donation per student will be \$5.29. Therefore, students will generate an average revenue of:

\$5.29 x 3 terms x 4196 students = <u>\$66,591 per year</u>.

<u>Conclusion</u>

If we assume that students reported their true willingness-to-pay on the survey and will also do so on their tuition forms, then these calculations clearly show that a write-in system will generate more revenue. That is because each student is able to pay precisely the amount he or she wishes (in economics-speak, the system is perfectly pricediscriminating).

In reality, however, people frequently overestimate their true WTP—sometimes by orders of magnitude (Professor Howarth, personal correspondence). When payment is actually asked of them, people often do not hold true how they said they would behave. Therefore, both of the estimates above should be seen as upper-bounds on true WTP.

However, participation rates improve dramatically when people are given an "opt-out" choice: that is, they pay the fee automatically unless they specifically choose not to. This also streamlines the payment process. We therefore believe an "opt-out" option—most likely a check box on a tuition form—is the best way to maximize revenue from a voluntary student green fee.

Appendix 5.4: Green Fund Performance Calculator

We developed a Microsoft Excel-based "Green Fund Performance Calculator" to model how the fund would perform under different circumstances. The calculator allows the user to easily alter explanatory variables including: the projects being funded, the payback rate and total payback obligation for loan recipients, starting endowment and yearly donations to the fund, future energy price projections, and discount rate. It then automatically generates a report on the financial and environmental performance of the fund through 2030. If the user wishes to alter one or more parameters to gauge their impact on fund performance, he or she can simply enter the new number in designated boxes and click the "Run" button to generate a new set of results.

The calculator tracks the fund balance over time and implements projects in the designated order once enough capital is available. Savings are calculated using electricity and oil price projections from the Energy Information Administration (EIA). A portion of these savings is paid back to the fund each year until the obligation is satisfied. Once enough capital is available, the calculator automatically implements the next project and repeats the steps above. This process continues until all projects have been implemented.

A report on the performance of the fund through 2030 is then generated. Results for each project include: year implemented, time to repay loan obligation, discounted value of costs and savings (net present value), and CO2 emissions reduction (both yearly and total through 2030). Overall results include: total net present value of all projects, total CO2 emissions reduction, and graphs of fund balance, profit, and total CO2 reduction through 2030.

Carbon emission calculations are based on No. 6 fuel oil carbon intensity data from the EIA. It should be noted that Dartmouth receives electricity as a by-product from steam production at the Heating Plant. Any remaining demand is satisfied by purchasing electricity from the grid, which is generated primarily by carbon-free hydroelectric and nuclear plants. Therefore, only efficiency improvements that reduce steam demand are considered to have carbon savings.

Model constraints:

- Assumes that the fund will begin operating in 2011 and can begin funding projects in 2012. This could be altered without much trouble.
- Assumes that only one project will be implemented per year.
- Does not account for inflation, though NPV calculations do discount future costs and benefits according to a standard discount rate.
- Currently uses only EIA energy price projections but could be modified to include other estimates.