The Sustainable University

Clark University, Environmental Science EN 103
Fall 2008 Class Report

Front Row (l to r): Joey Warren, Rachel Sensenig, Devon Grayson-Wallace, Jacqui Mitchell; Second Row (l to r): Deanna Goldner, Meghan Helmberger, Emily Schweitzer, Lauren De Levie, Gloria Torres, Marika Warden, Suzanne Edmunds, Max Wright, Stephen McCauley (instructor); Third Row (l to r): David Rée, Kate Gould, Nick Winchell, Shane Capra, Jon Bettinger; not pictured: Chad Curll

Table of Contents

Introduction **1**
Stephen McCauley, Instructor

Chapter 1: Curriculum and Research **4**
Chad Curll, Devon Grayson-Wallace, Jacqueline Mitchell, and Rachel Sensenig
Introduction 4
Sustainability Curriculum and Research at Other Universities 5
Sustainability in Clark's Curriculum and Research 13
Suggestions for Clark University 22

Chapter 2: Energy and Greenhouse Gas Emissions **28**
Suzanne Edmunds, Deanna Goldner, Marika Warden, and Max Wright
Introduction 28
Energy and GHG Emissions at Other Universities 29
Clark's Strengths and Weaknesses Regarding Energy and Emissions 35
Suggestions 45

Chapter 3: Closing the Loop: Materials and Waste Management **53**
Kate Gould, Joey Warren, Meghan Helmberger, and Shane Capra
Introduction 53
Materials and Waste Management at Other Universities 57
Material and Waste Management Practices at Clark 64
Suggestions 75

Chapter 4: Governance and Decision-Making for Campus Sustainability **80**
Nick Winchell, Emily Schweitzer, and David Rée
Introduction 80
Governance and Decision-Making at Other Colleges 81
Governance and Decision-Making at Clark 87
Recommendations 97

Chapter 5: Campus-Community Interactions **102**
Jon Bettinger, Lauren De Levie, Gloria Torres
Introduction 102
Campus-Community Interactions at Other Universities 104
Clark's Interaction with the Community 109
Suggestions 112

Introduction

By: Stephen McCauley
Adjunct Instructor, Department of International Development, Community and Environment (IDCE); Doctoral Candidate, Graduate School of Geography

This report presents the work of undergraduate students at Clark University who were enrolled in The Sustainable University course (EN 103) in the Fall semester, 2008. The course is one of the university's exemplars of a new innovative course model that promotes learning through extra-classroom activities and explorations. This semester was the fourth consecutive year in which the course was offered, and it has become a foundational component of the university's multi-dimensional effort to promote sustainability on campus. The course explores, through both theory and practice, the opportunities and obstacles associated with sustainability and sustainable development by examining the role of the university in promoting a sustainability transition. The course enrolled 19 students, which included eight first year students, five sophomores, three juniors and three seniors.

The course was organized around the central problem of understanding the how universities, as complex institutions with multiple, competing objectives, can respond to the imperative to re-organize around the principles of sustainability. Course readings and lectures focused on the major challenges to social and environmental sustainability, institutional change, the history and culture of the university, and systems of the university that are critical to sustainability, including: energy and greenhouse gas emissions, waste management and recycling, curriculum and research, campus-community interactions, and governance and decision-making at the university.

Several recurring themes emerged as we explored these topics through the semester. We explored the ways in which the university, as a broad institution, could emerge as a leader of a sustainability transition. To this end, we made note of the unique challenges that impede change at universities and of the strengths that make universities uniquely positioned to facilitate a transition. Among these strengths are: the historical commitment of the university, as a non-profit, public-interest institution, to pressing social issues; the focus on learning, experimentation, and data analysis; the concentration of a young, action-oriented demographic; and the opportunity to integrate knowledge across a range of social and natural science fields and the humanities to discover solutions to complex sustainability challenges. Particular challenges include the traditional fragmentation of knowledge into distinct disciplines; structures of institutional power that impede change at the university, and the imperative to train students in a reductionistic approach that works against the holistic knowledge needed to promote sustainability. Another recurring theme was the importance of place in discussions about sustainability. The students examined sustainability-related practices at a number of different universities and consistently found that the most effective designs were those that were tailored to the particular university context, including the ecological setting, the university's size, its endowment and financial resources, and its particular history and mission. We also focused extensively on the importance of integrating social and

environmental concerns in a broadly-defined sustainability. The students developed a working definition of a sustainable university as:

a university that pursues it's primary goals of educating students and advancing scholarship without contributing to environmental degradation or compromising the ability of other groups of people, including future generations, to meet their needs. All decisions and practices at a sustainable university must be made with a consideration of their environmental and social ramifications.

A critical aspect of the course was the series of guest lectures, field trips and guided tours that introduced students to important systems and activities associated with sustainability at the university. Guest speakers in the class included David Angel, the Provost of the University; Jack Foley, the University's Vice President for Governance and Community Affairs; Dave Schmidt, the Campus Sustainability Coordinator; Jim Collins, the university's Vice President of Planning and Finance; and Walter Wright, the Dean of the College. We were also visited by a Clark alumni, John Morrill, as part of the campus's Alumni-in-Residence program. John currently works as the Energy Director for Arlington County, Virginia, and he was able to share with us a valuable perspective on municipal level challenges to sustainability transitions. Several students from the Clark Sustainability Initiative (CSI), Ashley Trull, Kelly Kinslow, Chris Traft, and Callista Perry, also visited the class and shared information about CSI and its on-going activities. In addition to his guest lecture, Jack Foley led students on a tour of the Main South neighborhood that focused on campus-community partnerships for redevelopment. Roy Cordy lead the class on a tour of the campus co-generation facility. Dave Schmidt, in addition to his guest lecture, lead students on a tour of the campus Recycling Center. Paul Bottis, the Director of the Physical Plant, lead students on a tour of campus's two LEED certified buildings, Blackstone Hall and the Lasry Science Center, highlighting design features that allowed the buildings to earn those certifications. Finally, we visited several non-profit groups in the Main South neighborhood, including the YouthGrow farm, the Stone Soup community center and the ARTichoke food co-op. We are extremely grateful to all these people who offered their expertise to the course, and we view the opportunity to have such visitors as a unique aspect of the Clark education.

In addition to the class activities and field trips, the students experienced directly the complexities of promoting sustainability transitions by conducting action-oriented projects to advance sustainability on campus. The goal for the projects was to develop critical background research that would identify important dimensions of institutional sustainability and begin the process of preparation for successful project implementation. To this effect, the students worked in groups of three or four students around the five central components listed above: energy systems, waste systems, governance and decision-making, campus-community interactions, and curriculum and research. The students conducted research on the importance of these issues to sustainability at the university, on approaches other universities have taken to address these issues, and on Clark's strengths, opportunities and challenges regarding these issues. This report presents the culmination of these research efforts. It is our hope that the report will be useful in several ways. First, it presents background research that may be useful

for students in future offerings of The Sustainable University course as they develop their action projects. In this sense, we envision this project as being part of a continuous effort that will be carried on by students who will enroll in this course in future semesters. Second, each chapter presents a series of suggestions that might inform future decision-making and project development at Clark. One group, working on the topic of campus governance and decision-making, developed a proposal for a Residence Hall Sustainability Representative position and hopefully will see it implemented next academic year. Finally, as the document presents a broad overview of sustainability at Clark, we hope that it will serve as a statement of the university's current positioning regarding sustainability issues that could be useful in sustainability-related recruiting or fund-raising. The students received helpful assistance from a number of campus administrators and faculty in preparing their reports, including the people mentioned above, along with Professors Jennie Stephens and Halina Brown of the Environmental Science and Policy program. We are grateful for this assistance, and we hope this report makes a valuable contribution to advancing sustainability on campus.

Chapter 1: Curriculum and Research

By: Chad Curll, Devon Grayson-Wallace, Jacqueline Mitchell, and Rachel Sensenig

INTRODUCTION

Contemporary societies, including the generation currently in college, are confronting unprecedented planetary crises and needs to be equipped with sufficient knowledge to deal with this issue. The scientific community is in concurrence that environmental degradation has become so widespread and destructive that current practices cannot be sustained in the years to come. With these pressing problems a shift away from "business as usual" practices needs to be adopted by every generation.

Institutions of higher learning present a unique atmosphere for advancing the sustainable lifestyle; they are public-interest, non-profit institutions, and often shape the attitudes and values of their students. Institutions of secondary education need to be responsible for fostering a shift in the attitudes toward and implementation of sustainability to be used in the future. They must do so as they educate the generation that will be responsible for remedying the current sustainability challenges. One environmental studies professor, David Orr, even criticizes higher learning institutions for judging graduates' success according to the wealth that they accrue rather than the environmental impacts of their actions (Orr 91). It is common for the stated commitment to serving the public to be contained within a University's mission statement. The current individuals that pass through these institutions must be equipped with the knowledge and technology so that they will be able to serve the public by facilitating the vital shift in practices toward a more sustainable future.

As University students graduate and begin careers, they will assume leadership roles

regardless of the sector of their work. Whether they will be artists, scientists, business people, politicians, educators or activists, all people have a part to play in this dynamic process. For example, artists enable their audience to relate to the situation at hand and inspire them to a higher level of conscientiousness. Business people can change the current practices to place money and investments to facilitate the technological and practical developments necessary for a systemic shift. Politicians have the responsibility to frame new policies that promote innovation and change. The values and skills to create a society composed of such individuals can be instilled through institutions of high learning (Atkission).

The curriculum and research of a school is the nucleus of a university. Individuals come to a university to teach or to be taught, and it could be argued that all the other aspects of life at the university are secondary to the learning that takes place there. As centers of learning, universities are particularly well positioned to promote sustainability by shifting the attitude and practices of the university and its members so that they will make every decision based on the environmental and social consequences of that decision. One of the most effective ways for students to develop this knowledge is through the curriculum of their university.

SUSTAINABILITY CURRICULUM AND RESEARCH AT OTHER UNIVERSITIES

It is important to study how other universities have incorporated sustainability into their research and curriculum. By examining the practices of other universities, it can be determined which practices are most effective within a school similar to Clark. The ability and methods of universities depend upon their place and their size. Large universities, like Arizona State University, UMass Amherst, and UC Berkeley have the advantage of large endowments and

funding to support initiatives for new curriculum and research. However, large established schools have more difficulty on making paradigm shifts in the organization of curriculum. On the other hand, smaller universities, such as Tufts University, Aquinas College, and Paul Smith often do not have as much financial support but they can introduce major structural changes in their curriculum and departmental organization easily since there are less students and faculty to work with.

Arizona State University is a prime example of a university incorporating interdisciplinary knowledge and practices towards sustainability. The university established the School of Sustainability in 2007 with a mission to "train a new generation of scholars and practitioners" to dedicate themselves to creating a more sustainable world, especially in the context of solving problems in urban areas (ASU 2008). The School of Sustainability is one of several schools within Arizona State University that have been created as the New American University, which emphasizes learning through focusing on real-world problems that require interdisciplinary knowledge, instead of learning the theories of a single discipline (ASU 2000).

Arizona State University boasts that The New American University is the beginning of a new era of pragmatic college education (ASU 2008). For instance, research focuses on solving sustainability issues within Arizona that have arisen from the trend of a booming population in a desert area. Examples of research on sustainability include the Central Arizona – Phoenix Long-Term Ecological Research, which examines the effects between urbanization and desert ecosystems, and the Decision Center for a Desert City, which studies the decision processes used to manage water use and plan urbanization. Research involves not only graduate and undergraduate research but also K-12 programs that promote environmental awareness within

the community. For example, the Rio Salado project has middle school students in the Phoenix area revitalize a Sonorian Desert area. The success of a research program is evaluated by the societal impact it has created (ASU).

Arizona State University is much larger than Clark University; there are three campuses and over 50,000 students (Princeton Review Arizona State University). As a result, Arizona State University has a much larger amount of resources in terms of labor and funds, including state funding. Thus it can create massive structural change in its curriculum and research and transition to problem-focused learning that combines many disciplines, however it is still a major infrastructural change of reorganizing the university.

Another school with a dedicated environmental focus is the University of California at Berkeley. It is a large, public institution situated in an urban environment. It is comprised of approximately 35,000 students and is located in the urban San Francisco Bay Area. The school includes 250 faculty members and 375 classes available with an environmental focus; 80 of those classes focus specifically on environmental sustainability. Six of the university's distinct departments are explicitly concentrated on environmental studies.

One of these is the College of Environmental Design, which offers degrees in Architecture, City and Regional Planning, Landscape Architecture and Environmental Planning and Urban Design. The school aims to educate its students to create landscapes that are "beautiful, ecologically constructive, socially vital and built to endure" (College of Environmental Design, UCB 2008). The mission of the school is for its graduates to "remedy degraded landscapes, shape resilient ecosystems, and make cities compelling for all citizens (College of Environmental Design, UCB 2008)". Various other departments have an

environmental focus, including issues ranging from Environmental Health Sciences to Environmental Economics and Policy. Recent research undertaken within this college includes the Urban Sustainability Initiative, which is an international effort to assimilate the most modern developments in science and technology into the policies of the developing world (UCB 2008.).

A final example of the environmentally focused curriculum at UC Berkeley is the "Climate Action Course". In this class, students identify new projects the campus could potentially assume, as well as participate directly in action-orientated research (UCB 2008.). This class is similar to that offered at Paul Smith's College, "Campus Sustainability", as well as Clark University's course "The Sustainable University". Each of these classes utilizes their own institution as a case study and participates first-hand in that institution's efforts to reduce their environmental impacts. The pervasiveness of issues related to sustainability throughout various realms of study at UC Berkley is evidence of the increasing concern for environmental issues and Berkeley's motions to address these concerns.

University of Massachusetts Amherst a public university has about 20,000 undergraduates and 6,000 graduate students, set in a suburban environment. The university has multiple majors that allow students to explore sustainability either with in a purely sustainable or in conjunction with other majors. The building materials and wood science, environmental design major looks closer at sustainable building practices in the public and private sectors, balancing natural resources and developmental pressures. The natural resource major prepares students to deal with a range of problems around planning and managing wetlands, costal areas, and other important environmental areas. It develops sustainable

thinking in the context of human management to prevent further growth from harming these areas. Wildlife and fisheries major creates management and conversation efforts protecting the animal and their ecosystems. These students study hunted and fished populations to create sustainable practices on these resources. The plant, soil, and insect science teach students to create sustainable land, water, pesticide use, in agriculture and also apply of sustainability in the wider context of world food demand.

UMass Amherst is currently working towards creating a major in Sustainability. Their proposal consists of many aspects of sustainability. One part is agriculture and building design, which is already part of the current curriculum. The other part of the major would be to look at social and economic sustainability of the world. Some issues include cultural geography and sustainable human habitat, social sustainable and relationship to community, economic, personal, natural health, and development through non-governmental organization. This program will allow students to gain a rich understanding of many different views of sustainability compared to a purely science based view.

Tufts University is a leader in the environmental issues signing the Tallories declaration and has an Energy and Climate forum. Tufts Environmental Studies Program is an interdisciplinary major that will give students the ability to utilize social and political tools to create change. Tufts has a workshop with its teachers that helps educate people and students on climate change and how we can effect it positively and negatively; it is called the Tufts Environmental Literacy Institute. They also have a program called Climate Change, Climate Justice that is aimed at linking negative actions against the Earth to social injustices of the past and trying to bring the community together to bring about positive change

Another college, Aquinas College, focuses in a specific area, sustainability in business, instead of attempting to create a broad sustainability program like Arizona State University. The Aquinas Sustainable Business degree program promotes learning sustainable business practices that will improve the environment and communities while increasing profits over the long term. Aquinas College boasts that this is one of few undergraduate sustainable business programs in the United States. In order to earn a Sustainable Business degree one must take business, physical science, environmental studies, and sustainable business courses. By combining disciplines of ecology and business students can become knowledgeable about sustainability. Real-world experience is gained through case studies of sustainable businesses, such as Designtex, a subsidiary of a Michigan furniture company, and Ford Motor Company, and a required internship with a company or organization before graduation (Aquinas College Sustainable Business).

Aquinas College is very similar to Clark University in size and location. Aquinas College has 2,500 students, which is very close to Clark University's undergraduate student body size of 2, 320 students. Also both colleges are located in urban areas: Aquinas College in Grand Rapids, Michigan, the second largest city in the state, and Clark University in Worcester, Massachusetts, and is also the second-largest city in its state (Princeton Review). Aquinas College shows that a focus, such as on business, may be better for a smaller size college. Also incorporating sustainability into business is beneficial for businesses in urban areas.

Paul Smith's College, located in the Adirondack Mountains in upstate New York, is a small institution with a strong focus on environmental studies. The college is comprised of a couple thousand students on 14,200 acres of forests, wetlands, rivers and streams. The

college's philosophical approach is centered on sustainability and environmental responsibility; at Paul Smith's College even their way of thinking reflects this attitude of responsibility. They declare themselves "stewards of the earth" and see their "job is to… create and maintain an environment of student-centered environmental education that enhances the learning and success of all students" (PSC Community). Paul Smith's College practices this philosophy with their academic offerings, research and internship opportunities, and enthusiasm to use the Adirondacks as a living laboratory.

The college is made up of three schools, two of which offer a variety of degrees directly related to environmental studies. For example, the Division of Science, Liberal Arts and Business offers only five different programs, including a Bachelor of Science in "Biology and Environmental Science Business", a Bachelor of Arts in "Nature and Culture" and an Associate of Arts in "Liberal Arts Environmental Studies". The Division of Forestry, Natural Resources and Recreation only offers degrees that are directly applicable to Environmental Science. These range from "Vegetation Management" to "Recreation, Adventure Travel and Ecotourism".

Paul Smith's College makes full use of its environment of the Adirondack Mountains with various research and internship positions available to students that are directly related to environmental studies. For instance, the college's faculty, staff and students manage John Dillon Park, a fully wheelchair accessible wilderness park maintained to educate and inspire local citizens and tourists, particularly wheelchair-bound people, towards a greater environmental consciousness. Students perform everything from trail maintenance to leading visitors on excursions. Paul Smith's College also utilizes the Adirondack Watershed Institute as an educational resource. Faculty, students and staff maintain this forest preserve to protect

New York's watersheds. Students also participate in research to strengthen the waterways and work as water-quality stewards within the institute.

A final example of the sustainability efforts and environmental focus of Paul Smith's College is a course they offer called "Campus Sustainability: Students as Change Agents". Paul Smith's College is used as the primary case study and students are encouraged to dissect the schools systems and offer suggestions to further the sustainability efforts of the school.

Baldwin-Wallace College is a small liberal arts university similar to Clark. They have about 3,800 undergraduates and 800 gradate students. It's suburban location in Berea, Ohio, makes it unlike Clark. The college has a sustainability major that combines real world problems with theory. The major consisting of three tracks science, social science/humanities, and business administration. The program has a very well developed internship aspect built in, allowing students to use their knowledge in a practical manner. The college also has a summer workshop for the professors on sustainability that works on ways of incorporating environmental, social, and economic sustainability into all the classes.

Despite the efforts put forth by these particularly environmentally conscious institutions, colleges and universities have a long way to go to become exemplary models of sustainable institutions. One of the largest barriers seems to be the attitude of the institution as a whole. At a school such as Paul Smith's College, in which majors related to environmental studies dominate the schools' offerings, an attitude of "stewardship" is easy to maintain and implement. In a larger school such as the University of California at Berkeley, while some schools and departments within the larger University may be graduating individuals with a staunch attitude of environmental conscientiousness, it is much harder to incorporate an

awareness of environmental issues into the material of the many other departments. According to Orr (1994), the attitudes present in some majors still continue to support unsustainable social and economic practices. Other barriers include enticing the interest of professors to teach courses on sustainability, and enticing the interest of students to take the courses and convince them that learning sustainability will help them obtain careers. As an example, Aquinas College claims on its website (Sustainable Business FAQ 2008) that local businesses including Ford Motor, General Motors, Steelcase, Dow Chemical, and various small businesses are interested in hiring students with Sustainable Business degrees.

SUSTAINABILITY IN CLARK'S CURRICULUM AND RESEARCH

Clark University's History

Clark University has had a long and mixed history regarding sustainability. Once, Clark University was ahead of the curve in studying environmental issues. Fourteen years ago, Clark University attempted to create an Environmental School; students who enrolled in this school were required to fulfill their all of their Personalized Learning System (PLS) requirements through environmentally-related classes, such as an Environmental Ethics class for the Personal Values perspective, and they needed to take three courses that connected their major to environmental issues. For example, a psychology major would take a class on how cognitive behavior affects our treatment of the environment. Faculty who were passionate about environmental issues within the curriculum initiated the Environmental School. Three undergraduate classes graduated through the environmental school, but the program faced some challenges and, after the third year, the school was discontinued (Brown 2008).

The difficulties with maintaining the Environmental School reflect the general problems associated with creating innovative, interdisciplinary programs. Inter-departmental programs need a large amount of commitment from all the departments and support from administration for at least the first several years. A program such as this also needs a myriad of resources, which could put a strain on smaller universities that are more financially constrained. In addition, the Environmental School was so innovative that, at the time, admissions did not know how to market it to make it appealing to prospective students. Clark University was one of the first universities in the country to develop an entire school explicitly around topics related to the environment and sustainability, and today could be a leader in the sustainability movement in universities if these challenges had been resolved and the Environmental School had been further developed. Other schools are only now beginning to experiment with such programs.

After the closing of the Environmental School, Clark's curricular approach to sustainability shifted to the Environmental Science Major, which has its roots from a previous major entitled Science, Technology, and Society (Brown 2008). The Science, Technology, and Society major was one of the first environmental programs in the country to explore relationships between the three aspects listed in the title. This major was created by Christen Hohenser, a physics professor at Clark University, during the 1960s. Around this time the Cold War initiated concern over the affect of science, such as nuclear weapons, upon society. Through Hohenser's vision and interactions with fellow faculty he was able to create a program that offered science courses involving society. In 1985, the program changed to Environment, Technology, and Society to highlight new anxieties about the environment and its relations to

science and society. Most of the courses were still science-based, and only decades later would Clark incorporate more social sciences with an environmental major. As the global green movement shifted its focus from environmental degradation to sustainability, the Environment, Technology, and Society program was transformed into the Environmental Science major. Today, the Environmental Science major has three tracks: Environmental Policy, Conservation Biology, and Earth Systems Science. These three approaches to sustainability are more diverse than the original Science, Technology, and Society major.

Other than curriculum, research has been another tool to incorporate sustainability into learning at Clark University. Clark University has had a great legacy with research. The first president, Stanley Hall, made Clark a graduate college based on research, which was based upon his experiences of cutting-edge scientific research he saw on a tour of Europe and as a psychology professor at Hopkins, a graduate college. In 1900, Clark's founder, Jonas Clark, died and left the rest of his endowment to fund an undergraduate college, which also adopted the tradition of using research to learn (Koelsch 1987). This has given rise to the tradition of undergraduate research at Clark, which has recently obtained national attention (Loren 2000).

The George Perkins Marsh Institute was founded in the 1970s, named after George Perkins Marsh who, in *Man and Nature*, was one of the first geographers of the time to recognize humans as agents of change that can affect the environment (Clark University 2008). The mission of the Marsh Institute is to be a consortium for research centers based on the relationships between humans and nature (Clark University 2008). The four research centers within this consortium are the Center of Technology, Environment, and Development, Clark Labs for Cartographic Technology and Geography Analysis, Center for Risk and Security, and

Greening of Industry Network, which all focus on creating a healthier, safer, and more sustainable world (Clark University 2008).

This history of Clark University shows that the university did develop several innovative approaches to incorporating sustainability in the curriculum, but these efforts were hindered by the challenges of creating institutional change. The majority of new ideas merging the curriculum and sustainability have come from visionary faculty. Even with motivated and creative ideas, however, the experience of the Environmental School shows that developing innovative academic programs is no easy task.

Clark University's Curriculum

Just like every other university, Clark University's various strengths and weaknesses shape the school's offerings on the significant issue of sustainability. Clark is a small liberal arts school in an urban environment. Clark's size as well as its liberal arts context allow for interdisciplinary collaboration in academic programs and particular classes. Unlike many other schools with a strong environmental program, Clark is not situated in an environment suited to active experimentation on ecological systems, such as research on wildlife ecology, and it doesn't share many qualities with other universities that study their local ecosystems as "living laboratories" (Paul Smith's College 2008). Instead, Clark's own setting allows for hands-on research and courses geared specifically to it's environment in an urban center. Clark's "living laboratory" is the city of Worcester, with it's particular challenges to promoting sustainability in an urban environment.

Clark offers three tracks within the realm of environmental science. This is a fairly recent development; two years ago Clark responded to increasing student interest and split the

Environmental Science major into Environmental Science and Policy, Environmental Conservation and Biology, and Earth Systems Science (Angel 2008). The Environmental Science and Policy major combines a science-based syllabus with a series focused specifically on policy, which makes it particularly useful in preparing Clark's students to facilitate the shift toward a more sustainable society. The other two majors focus on different aspects of environmental science. As David Angel said (2008), "the department recognizes that because of all of this interest in global climate change there is a need to understand how the biosphere works," thus a major was created to study earth's systems.

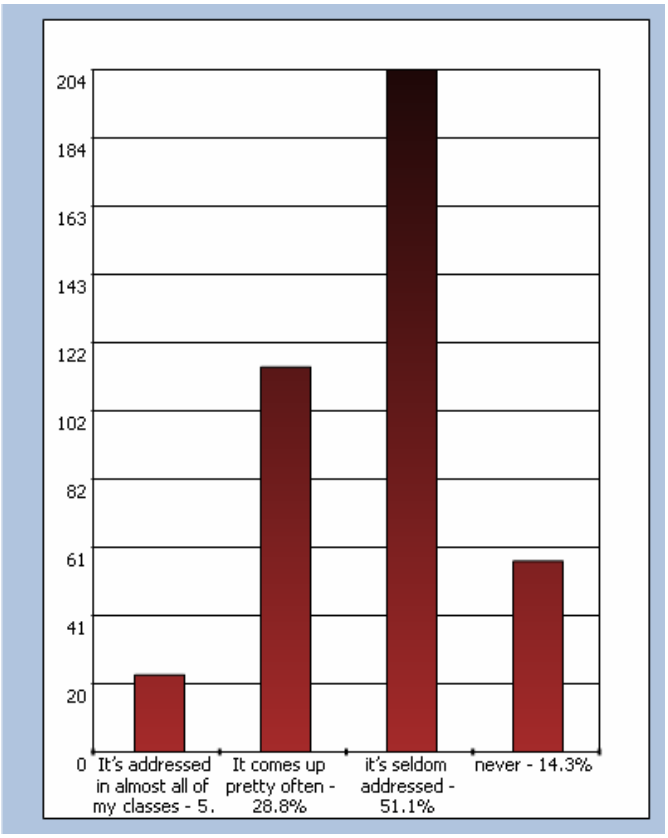

Figure 1-1. This graph represents the prevalence of sustainability topics in courses at Clark, as perceived by students. The majority of students see it as being addressed seldomly, but almost 30% of students say sustainability concerns are often addressed in courses.

In addition to these three programs, Clark offers the major of Global Environmental Studies. This program "studies the relationships of people, culture and society with the biophysical environment (GES 2008)." Within this program there are subfields in everything from the greening of industry to urban ecology. There are also other majors that incorporate sustainability into their program but are not explicitly committed to the environment, such as

International Development and Social Change, Geography, and Innovation and Entrepreneurship.

Courses for environmental science majors and non-majors alike that pertain to sustainability range from Feminism, Nature and Culture, Technology and Sustainability: Perspectives from the Global South, and Why Global Warming Matters to Forest Ecology, Arctic Systems Science, and Urban Ecology: Cities as Ecosystems (Clark Academic Catalog 2008). The courses are meant to teach about all aspects of sustainability: the nature of the current environmental and social operating systems, the pitfalls of those systems, possible remedies for those issues and potential tactics to create a shift toward more sustainable practices. These issues are approached from the perspectives of gender studies, social development, sociology, politics and other realms of social science that supplement the learning that the perspective of natural science offers. In particular, the International Development and Social Change department is involved within the Main South neighborhood surrounding Clark. Students can participate in internships and research being conducted concerning various sustainability issues ranging from local, organic farming to the literacy of immigrants (IDCE 2008).

The variety of offerings related to sustainability is a direct reflection of student interest because, as David Angel (2008) described it, Clark is a "faculty-orientated" institution. The faculty is in closest contact with the students, and the impetus for actions such as creating new majors or concentrations stems directly from the faculty's conversations with the students. This is why despite being only a few years old, the new tracks in the environmental science department are over-prescribed. As of this fall there were 18 undergraduate students enrolled in Global Environmental Studies and 32 in one of the three Environmental Science tracks, thus

roughly 3% of Clark's student body is enrolled in a major related to environmental science. However, as David Angel declared, "half the majors in the Geography department are doing work related to sustainability, lots of biology majors are concerned with the environment…" in other words, these numbers only hint at the amount of student interest in issues related to sustainability.

Overall, sustainability is so pervasive in Clark's curriculum that it is hard to delineate which programs and courses are related and which are not. It is incorporated into various other programs through individual courses, theses, faculty and students, making it impossible to list or in any way quantify the learning related to sustainability that occurs at Clark University. The only conclusion that can be drawn is that there is a large commitment among the faculty and students to preparing themselves to make informed decisions about the issues related to environmental and social sustainability and that this commitment is reflected in the diverse array of courses and programs offered by Clark University.

Clark University's Research

Clark University emphasizes research. It is one of the few universities where undergraduates can work on research along side professors, as well as develop their own research projects. Along with individual faculty research there are also research institutes and centers based on interdisciplinary scholarship to solve local and worldwide problems. Research on sustainability has been around for a while; however the recent shift of America's mindset to a sustainable lifestyle has allowed for an expansion of this field.

The George Perkins Marsh Institute is dedicated to researching the essential question: "What is our relationship with nature?" Its focus is on environmental hazards and international

development. Under this institute are four labs: The center for Technology, Environment, and Development, Clarks Labs for Cartographical and Geographical Analysis, The Center for Risk and Security, and Greening Industry Networks. The Center for Technology, Environment, and Development, which is one of the oldest and most prominent centers for the study of natural and technological hazards in the United States, Clark Labs for Cartographical and Geographical Analysis, which develops software for land cover and land use analysis. The Center for Risk and Security conducts experiments about homeland security using a risk and decision analysis perspective. The last lab is the Greening Industry Networks, which researches sustainable industrial development. Some of the Marsh Institute labs' research includes which companies report their sustainability, strengthening vulnerable communities in Worcester, the impacts of sea ice vulnerability, and risk analysis of pharmacokinetic. One research project is trying to increase sustainability science to promote more action in the field (Marsh Institute 2008)

The Clark Labs for Cartographical and Geographical Analysis are dedicated to creating programs that allow effective and responsible decision-making about land use for environmental management, sustainable resource development, and equitable resource distribution. The lab is best known for its IDRISI GIS and Imaging Processing Software. The software is used in more than 175 countries because the software is cheaper it can be used in developing countries. Some of the research projects include land cover change, land allocation decisions with GIS, and locally assessing the infestation of pine beetles (Clark Lab 2008)

One of the newest centers at Clark is the Mosakowski Institute for Public Enterprise. This institute is dedicated to bringing the knowledge acquired by research to those who could use it to improve public policy and programs. One of the institutes many objectives will be

environmental sustainability, along with education reform, access to healthcare, international development, and many other projects. It will work with researchers in collaboration with other conferences, internship programs, and research centers, including the Marsh Institute. The Mosakowski Institute will also try to involve the curriculum of both graduate and undergraduate programs, making projects more hands on and applicable to real life problems (Mosakowski 2008).

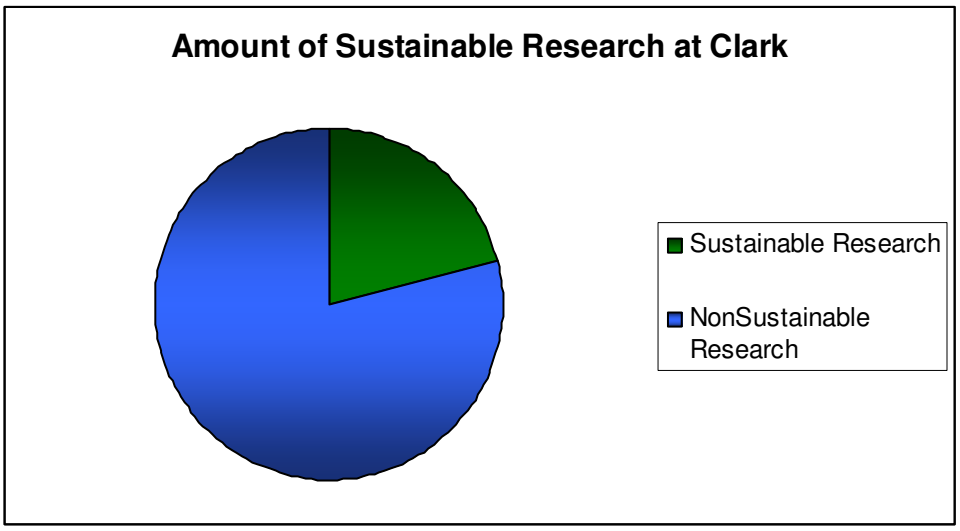

Figure 1-2. This chart shows the percentage of sustainability-related research that is conducted at Clark University. This does not include student's individual research, which are variants off the Professors research. Sustainability-related research accounts for 26% of all research at Clark.

The graduate program International Development, Community, and Environment graduate program provides an interdisciplinary approach to the environmental and social sustainability. This program also has some overlap into a few undergraduate programs. Research within this program includes risk assessment in chemical exposure, clean industrial growth, land and water use, and promoting environmental justice. Many of these programs focus internationally;

however, research on the Worcester community is also done with the Main South initiative, the Worcester County food bank, and the Worcester education partnership (IDCE 2008).

The science department of physics, chemistry, and biology do not emphasize the sustainability implications of their research, as these departments focus on explaining the environment rather than looking at human interactions with environment. However many of the projects do have a sustainable component. Biology has micro-scale focuses on three-spine stickleback and on the small-scale cell biology. The work on mosquitoes and West Nile disease and its spread is one main sustainability projects. Within this department, however, the current research could easily be tied in to sustainability and human interactions by exploring the implications of human actions in respect to disease, global change, and species resilience. The chemistry department has research on magnets and polymers. The physics department has one professor, Chuck Agosta, who currently is researching and developing a technology for making environmentally safe air conditioners, using super-conductive coils to reduce energy use (Research 2008). Research is strongly integrated into Clark University and sustainability based research is well represented at Clark.

SUGGESTIONS FOR CLARK UNIVERSITY

In order for Clark as an institution to fully embrace sustainability, it must reach outside of its campus and extend sustainable practices to the local community. In an ideal curriculum, one with an eye toward the future of Clark, a sustainable curriculum would encourage students to get involved in the community and bring sustainable practices to Main South. Engaging the students in activities and projects revolving around real-world sustainability issues would be a

key ingredient to creating a fully prepared sustainability-minded Clark University graduate. The ideal curriculum in regards to sustainability would help produce a greener campus, knowledge within the student body, and enhancement of the community.

Stepping outside of the classroom and into real-world situations helps to create a broader understanding of what students learn in books. Courses that operate as such are referred to as "active learning courses". These courses teach the student through independent and often individual projects instead of teaching theory. Two active learning courses that are currently offered at Clark University are The Sustainable University, in which students undertake an action project to implement on campus, and Ecology of Atlantic Shores, which performs individual experience in Nahant, Ma and Bermuda. These classes help bridge the gap between theory and reality, which allows the student to later tackle real world problems. These types of active learning experiences help the student to connect the broader perspective on sustainability issues to specific situations and usually allow the student the opportunity to directly promote sustainability. From a University standpoint, it enables Clark to create a richer learning environment on campus and a better community for current and future students. Increasing the number of active learning classes on campus would be beneficial to introducing and instilling sustainable practices.

Jack Foley (2008), VP for Government and Community Affairs and Campus Services, noted how the community has changed over the past 15 to 20 years and how that contributed to Clark's ability to become more sustainable. The students have become actively involved in the community and especially the schools, teaching their values learned at Clark to the next generation. The students' investments of time and effort within Main South have in turn

encouraged the community to invest in itself through programs such as Youth Grow, a community garden aimed at elementary school students, and the Boys and Girls Club, both programs in which Clark students are actively involved.

Curriculum at Clark University provides a diversity of classes for its program of liberal studies. An increase in different courses focusing on sustainability within all areas will allow for a wide diversity of the student body to gain knowledge on sustainability. This effort will necessitate hiring new professors focusing on sustainability, which will bring in their research as well. Summer workshops for applying sustainability to coursework should also be available for professors.

One of Clark's current strengths is research; it is available in almost all disciplines for undergrad and graduate students. Increasing research in the field of sustainability and promoting more interdisciplinary connections would advance an already strong point of Clark. New research based in the local area would help address local sustainability challenges, and it would reduce emissions for long-distance air travel,

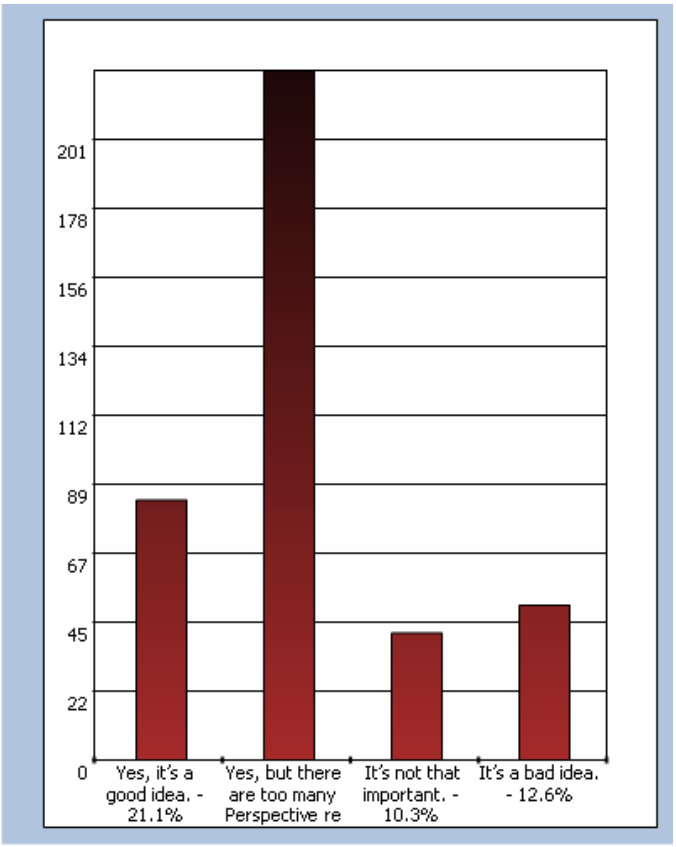

Figure 1-2: This graph shows the number of students (out of a total N of 401) that would be interested in having a PLS course requirement on Sustainability. Most people like the idea, however there are already 8 perspectives that need to be filled.

which would reduce our campus-wide emissions. The science departments of physics, chemistry, and biology offer the largest gateway for their current research to present a sustainability aspect to it through interdisciplinary collaboration. It could also be paired with international development majors so that the social science research can offer a perspective through which the natural science research can be applied, and vice versa. The students also gain an understanding of research practices that they will be able to apply in the future.

Working with other schools and universities, both within the Worcester Consortium and outside, would yield huge amounts of additional information and help further the research. Further collaborative student research projects and fieldwork would take advantage of the strengths of the various schools in the consortium to produce more valuable results.

All of these changes can be more easily accepted in the Clark community than at other universities because of its long tradition with environmental curriculum and research. Clark has had insightful faculty and students that have been innovative about sustainable curriculum before it became a popular idea. If the Environmental School had succeeded, Clark University might have become one of the first environmentally-focused schools in the United States. Although Clark may have missed an opportunity to become a leader in the sustainable movement, it can still develop to become an impressive sustainable community and institution through dedication from the student body, faculty, staff, and administration.

REFERENCES

“Academic Catalog for 2008-2009." Academics & Faculty. 2008. Clark University. 1 Dec. 2008 <http://www.clarku.edu/academiccatalog/>

Angel, David. "Interview with David Angel." Personal interview. 28 Nov. 2008.

"Aquinas Sustainable Business." 2008. Aquinas. Oct. 2008 <http://www.aquinas.edu/sb/>.

"Aquinas University." 2008. Princton Review. Oct. 2008 http://www.princetonreview.com/schools/college/collegebasics.aspx?iid=102377&uidbadge=.

"Arizona State." 2008. Princton University. Oct. 2008 <http://www.princetonreview.com/arizonastateuniversityatthetempecampus.aspx?uidbadge=>.

"Arizona State University." 2008. Arizona State. <http://www.asu.edu/>.

"Atkission." 2008. Oct. 2008 <http://www.atkisson.com/global/home.html>.

"Baldwin-Wallace." 2008. Baldwin-Wallace. Oct. 2008 <http://www.bw.edu/>.

"Berkley Univeristy of Califrona." 2008. Univeristy of California of Berkley. Oct. 2008 <http://www.berkeley.edu/>.

Brown, Halina. Personal Correspondence. 21 Nov. 2008.

"College of Environmental Design (CED)." 2008. University of California of Berkley. Oct. 2008 <http://www.ced.berkeley.edu/>.

“George Perkins Marsh: RenaissanceVermonter.” George Perkin Marsh Institute. 2008. Clark University. 8 Dec. 2008.<http://www.clarku.edu/departments/marsh/>

"Global Environmental Studies (GES)." 2008. Clark University. 1 Dec. 2008

<http://www.clarku.edu/departments/ges/>.

"International Development and Social Change (IDCE)." Clark IDCE. 2008. Clark University. 10 Dec. 2008. <http://www.clarku.edu/departments/idce/academicsgradidintern.cfm>.

Koelsch, William. 1987. Clark University, 1887-1987: a narrative history. Clark University Press: Worcester, MA.

Orr D,W 1994 Earth in Mind. Washington DC: Island Press.

Orr, D.W. 1992 Ecological Literacy: Education and the Transition to a Postmodern World. Albany, NY: State University of New York,.

"Paul Smith's College." PSC Community. 2007. Paul Smith's College. 1 Dec. 2008 <http://www.paulsmiths.edu/future/why.php>.

“Research Centers.” George Perkin Marsh Institute. 2008. Clark University. 8 Dec. 2008. <http://www.clarku.edu/departments/marsh/>

"Sustinable Buisness FAQ." 2008. Aquinas. Oct. 2008. <http://www.aquinas.edu/sb/faqs.html>.

"This is our New American University." 2008. Arizona State. Oct. 2008 <http://mynew.asu.edu/>.

"Tufts University." 2008. Tufts University. Oct. 2008 <http://www.tufts.edu/>.

United Nations, 96th plenary meeting, 11 Dec. 1987. Report of the World Commission on Environment and Development. Oxford, UK: Oxford UP.

"Univeristy of Massachusetts Amherst." 2008. University of Massachusetts. Oct. 2008 <http://www.umass.edu>.

Chapter 2: Energy and Greenhouse Gas Emissions

By: Suzanne Edmunds, Deanna Goldner, Marika Warden, and Max Wright

INTRODUCTION

The issues of energy consumption and greenhouse gas emissions are important at a global scale because the local contributions of carbon emissions and greenhouse gases (GHG), like here on campus, add up to create a global crisis. These issues are influential on the environment and sustainability because they are a cause of global warming, which leads to catastrophic changes in the environment such as severe weather patterns and alteration of natural habitats. The effects of greenhouse gas emissions lead to environmental degradation, which can be seen by the melting of polar icecaps, a decline in biodiversity as species die out due to lack of their natural habitats and substantial resources, the rising sea level and extreme weather such as hurricanes and droughts. Many of the processes involved in generating energy are major contributors to greenhouse gases. These processes involve the burning of fossil fuels, natural gas, and coal, which release large amounts of carbon dioxide and other greenhouse gases. These threats are driving nations to explore alternative energy sources and to change their lifestyles in order to stop climate change and to preserve ecosystems. Organizations and countries are beginning to redress this problem by reducing energy consumption and moving towards zero emissions. Universities worldwide are equipped and ready to influence the way people consume energy across the globe, and make the necessary global changes in greenhouse gas emissions.

Universities can become part of the movement to reduce the effects of climate change without compromising their primary goal of education. Energy and greenhouse gas emissions

are a very important aspect of campus sustainability here at Clark University and at many other campuses worldwide. As a class we defined a sustainable university as "a university that pursues its primary goals of educating students and advancing scholarship without contributing to environmental degradation or compromising the ability of other groups of people, including future generations, to meet their needs." All decisions and practices at a sustainable university must be made with consideration of their environmental and social ramifications. A university could not strive to be a sustainable campus without taking into consideration energy consumption and greenhouse gas emissions. In terms of greenhouse gas emissions on campus, it means that carbon emissions must be under control, fuel sources need to be efficiently used, and alternative fuel sources need to be explored so that there are enough energy sources left for future generations to use. The prices of new technologies on campuses must be economically viable and acceptable to the communities surrounding universities.

Clark and other universities have taken steps to research ways to eliminate reliance on fossil fuels, therefore eliminating GHG emissions, and have started to experiment with alternative energy sources. Universities are equipped with state-of-the-art technology and facilities suited to lead the sustainability movement. Also, the university influences future generations of workers and leaders of the world. If the students coming out of the universities and going into the workforce are trained and aware of the environmental issues at hand, they are prepared to deal with them. It is in this way that the universities are best equipped to deal with the problems in the environment.

ENERGY AND GHG EMISSIONS AT OTHER UNIVERSITIES

Examining other universities' approaches to reducing energy use and greenhouse gas emissions

can help to evaluate the strengths and weaknesses of Clark's initiatives. Looking at initiatives at other colleges both similar in size, values, and endowments, as well as those that differ from Clark can provide a range of options for thinking about Clark's sustainability initiative. It also helps show what is possible in Clark's future in terms of sustainability projects around campus.

When comparing the campuses, it is important to first understand their capabilities and limitations.

Fast Facts of the Worcester Consortium

- There are five consortium colleges that have signed the President's Climate Commitment
  - Clark University, College of the Holy Cross, UMass Medical, Anna Marie College, and Worcester State.
- All the five schools opted to adopt a green building policy, which was the first tangible action choice in the commitment.
- All the schools except UMass Medical also opted to purchase energy efficient appliances
- Only Clark has pledged to more than two tangible action commitments.
- Of the schools so far only three had posted their GHG reports:
  - Clark University, College of the Holy Cross, and UMass Medical
  - The other two school will be reporting their GHG catalogue in January

One school that excels in campus sustainability is the University of Minnesota, Morris (UMM). Similar to Clark, it is a small liberal arts college with about 1,700 enrolled students. Experimental programs like those at the University of Minnesota help to set high standards for universities looking to become more sustainable (University of Minnesota 2008). Furman College, located in Greenville, South Carolina, also focuses strongly on sustainability, specifically when it comes to energy conservation and reduction of greenhouse gas emissions. Like Clark and UMM, Furman is a small liberal arts college. Another leading university in campus sustainability that is comparable to Clark in size is Middlebury College, in Middlebury Vermont. Success in ambitious projects like those of Middlebury College demonstrates how small schools similar to Clark can make big achievements in sustainability practices. Amherst College is another good school to look at when examining sustainability practices at other schools. Not only is its size comparable to Clark but it is also in the same general geographic area:

Massachusetts.

It is also helpful to look at schools with endowments larger than Clark's, to help examine initiatives that are possible when capital investments are not an issue. As an Ivy League school, Harvard has taken the initiative to become a leader in campus sustainability. Though it is a much larger campus, with 6,658 undergraduates (US News and World Report 2008), it is located only an hour from Clark in Cambridge, MA. Additionally, a $36.9 billion endowment allows Harvard the luxury of being able to invest in new green practices. Yale University is another Ivy League school in New Haven, CT, and has an endowment of $22.53 billion, which allows them to invest in sustainability practices on campus. It is also much larger than Clark, with 5,311 undergraduates (US News and World Report, 2008).

Today when universities look to improve sustainability, they work on transportation projects to make that happen. At UMM, as a member of AASHE and Upper Midwest Association for Campus Sustainability, they strive to reduce their greenhouse gas emissions through their transportation program. The University owns a fleet of Toyota Priuses that offsets 21 tons of CO2 (approx. 2,200 gallons of gas) per year. They also have a Zero emissions vehicle (ZEV) that runs on electricity and saves UMM about $1,500 a year. Furman College is also environmentally conscious in their transportation. Currently the campus operates 25–30 electric vehicles and thirty-five electric golf carts that replaced 31 gasoline powered cars and trucks of Facilities Services. The school constructed car parking/charging stations, which are located throughout campus. Public Safety also purchased a hybrid Ford Escape that helps reduce emissions. Furman provides on-campus housing, available for all four years aimed at reducing fuel emissions of commuters. At Yale, they are also making improvements to the transportation sector. For its

transportation fleet, Yale has switched to partly bio-diesel and ultra-low-sulfur diesel. This has reduced the school's transportation based petroleum consumption by 20% (Worldwatch Institute 2008). The school also provides incentive for staff to live near campus or carpool.

Leaders in campus sustainability have begun to invest in Leadership in Energy Efficiency and Design (LEED) certified buildings in order to reduce environmental impact. Furman designs their buildings with energy conservation in mind. The campus's Duke Library received LEED certification silver for its innovative design and energy efficiency. The schools science center also has an environmentally friendly design. The center has a solar aquatic treatment center, a rainwater collection center, and solar thermal panels for hot water heating. The school is also performing a sustainability experiment called the Eco Cottage, which is the school's fully functioning sustainable cottage. At Harvard, twenty new and renovated buildings have been LEED certified between 2002 and 2007. Some of these buildings have energy performances of 30 to 50% above code (Worldwatch Institute 2008). 9,000 students reduced energy use by 10 to 15% by participating in Residential Green Living programs. At Yale, all new buildings require LEED certification. Eleven buildings are currently eligible for certification. Retrofitting old buildings has also helped in reducing energy waste on campus (Sustainable Institute of Endowments, 2008).

For many of these sustainable universities, reducing carbon emissions and looking for alternative sources of energy is the main priority. Many have signed the Presidents' Climate Commitment, which is aimed at reducing greenhouse gas emissions and becoming climate neutral (ACUPCC 2008). UMM's big accomplishments in sustainability come from their energy conservation efforts. UMM has the first large scale wind research turbine constructed at a

university. The wind turbine supplies power to almost all of UMM's buildings. The turbine provides 60% of the campus's electricity needs. UMM also has an on campus biomass reactor that uses corn stalks from regional farmers to generate steam to meet 80% of the heating and cooling needs of the campus. The University also just received Clean Renewable Energy Bonds to put up two more wind turbines and to put a turbine on the biomass generator. Furman College also demonstrated excellence in sustainability by the alternative energy programs they have initiated. For example, the school has a bio-diesel program which converts cooking waste into usable fuel and a program that explores wind energy as an alternative energy source. The improvements that Furman College has made to their buildings, transportation, and programs show their commitment to solving environmental issues (Furman University). In the area of energy and greenhouse gas emissions, Middlebury has already made many improvements. In addition to a carbon emissions inventory, the college has established an annual greenhouse gas monitoring and reporting system, and has committed to being climate neutral by 2016. The college has invested in solar arrays, a demonstration wind turbine, and is currently constructing a biomass facility that will use woodchips to generate power (Sustainable Endowment Institute 2008). They also have the biomass boiler, which is currently under construction with support from Biomass Energy Resource Center (BERC). Amherst is another leader in sustainable energy and greenhouse gas practices, using many innovations to become more sustainable. The college installed a new 1,750-kilowatt cogeneration facility that reduces carbon emissions to 5 percent below 1990 levels. Since 2003 Amherst has invested $200,000 per year in energy conservation projects. Some of these projects include the purchasing of renewable energy credits to offset the emissions from student computer use and the installation of solar hot water heaters for

some of the residence halls on campus (Sustainable Endowment Institute 2008). Implementing projects like these each year will bring Amherst closer to sustainability.

Harvard's goal is to reduce greenhouse gas emissions by 30% below 2006 emissions by 2016 (Sustainability Institute of Endowments 2008). The Harvard Green Campus Initiative (HGCI) has a staff of 20 full time professionals and 40 part time students. It works on projects around Harvard pertaining to greenhouse gas emissions reductions and energy conservation including green building designs, energy conservation practices, renewable energy, and greenhouse gas reduction strategies (Worldwatch Institute 2008). The HGCI calculates a greenhouse gas inventory for the entire Harvard campus. They break down the inventory by each school and by each student (Harvard University Office for Sustainability 2007). Harvard also purchases 14,000 MWh of renewable energy certificates to offset 7 percent of electricity consumption. Harvard has a renewable energy fund of $300,000 and has invested in solar energy, photovoltaic energy, ground source heat pumps, and a bio-diesel pump, and wind energy (Harvard University Office for Sustainability 2007). Harvard also has a solar capacity of 58.7 kW (AASHE). With a large operating budget, implementing sustainable practices is made easier and Harvard is able to set a high standard for university sustainability practices.

Like Harvard, Yale has committed to reduce its greenhouse gas emissions by 10% below 1990 levels by the year 2020. Yale purchases renewable energy credits as rewards for student reductions in energy usage (Sustainable Institute of Endowments, 2008). In 2005, it purchased 10,000 megawatt-hours of REC's (Worldwatch Institute, 2008). Yale also has high-efficiency fuel cells, and produces solar, wind and geothermal energy on campus. Yale's initiatives have made them a leader in campus sustainability.

Although many of the initiatives set forth by colleges and universities differ, the overall goal is the same. The largest projects being put in place are aimed at reducing overall energy consumption. Renewable energy solutions such as wind and solar power, environmentally sustainable buildings practices, and even alternatives to conventional vehicles are all being utilized. Using these schools as an example can help Clark incorporate even more sustainable practices into their campus.

CLARK'S STRENGTHS AND WEAKNESSES REGARDING ENERGY AND EMISSIONS

Presidents Climate Commitment

The American College & University Presidents Climate Commitment is a "high visibility effort to address global warming by garnering institutional commitments to neutralize greenhouse gas emissions, and to accelerate the research and educational efforts of higher education to equip society to re-stabilize the earth's climate" (Presidents Climate Commitment 2008). This pledge commits institutions to eliminate their greenhouse gas emissions by a set date by completing an emissions inventory, setting a target date and milestones to for becoming climate neutral, taking immediate steps to reduce greenhouse gas emissions, and making an action plan, inventory and progress reports publicly available (Presidents Climate Commitment 2008).

The Presidents Climate Commitment requires that the institution create a plan for achieving climate neutrality as soon as possible. Institutions must, within two months of signing the commitment, create institutional structures to guide the development and implementation of the plan. Within one year and every year after, universities are expected to compile a

comprehensive inventory of all greenhouse gas emissions from sources including electricity, heating, commuting and air travel. Within two years an action plan for becoming climate neutral needs to be developed. This should include setting a target date to become climate neutral, setting target dates for goals that will help lead to climate neutrality, and taking action to make sustainability and climate neutrality part of the curriculum and educational experience of students. It is important to expand research and other efforts necessary to reach climate neutrality, and install mechanisms to track the progress of the university's goals and actions. The Commitment also requires that the institutions take immediate action by instituting at least two of the many choices provided while the action plan is being developed. Some of these choices include: a green building policy, an energy-efficient appliance purchasing policy, an offset policy to offset air travel paid for by the institution and a policy to encourage the use of public transportation for faculty, staff, students and visitors of the institution. The university can also establish a policy for purchasing or producing 15% of the institutions electricity from renewable resources, a policy or committee that supports climate and sustainability shareholder proposals at companies where institutions endowments are invested, or the institution could participate in the waste minimization aspect of the RecycleMania competition and adopt three of more measures to reduce waste. The commitment also requires that the action plan, greenhouse gas inventory and progress reports are publicly available through the Association for the Advancement of Sustainability in Higher Education (AASHE) (Presidents Climate Commitment 2008).

Clark University's President, John Bassett, signed the Presidents Climate Commitment on June 14, 2007, pledging to help conquer the challenges of global warming. In September

2008, Clark University submitted its 2007 Greenhouse Gas Report to the AASHE, which was most recently updated in October 2008 (AASHE 2007). Clark took immediate action to reduce greenhouse gas emissions by instituting a green investing policy and a green building policy to take action while the action plan and target dates were still being worked out.

Investment Policy

Under the Presidents Climate Commitment, Clark University was required to take immediate action by implementing certain policies within the institution. Clark chose to implement a sustainable investment policy. The climate friendly investing policy is committed to shareholder responsibility. Under this policy, Clark is committed to voting in favor of all shareholder resolutions presented to the school that are designed to reduce greenhouse gas emissions. Clark will vote in favor of such resolutions when they are presented reasonably and for which "reasonable people" would agree that these actions would serve in the long-term interest of Clark as shareholders. If such resolutions are not supported, Clark will write a letter to management explaining Clark's general support for reducing emissions by the portfolio companies and the reasons why they voted against the resolution.

The climate friendly investment policy has helped Clark achieve an astonishing rating on their report card. Clark University received an A on the Sustainability Report Card for investment priorities because it invests in renewable energy funds and community development loan funds (Sustainable Endowment Institute 2008).

Green Building Policy

Another policy that Clark University instituted was a green building policy. Under this policy all new building on the Clark University campus will be designed and built to achieve a

LEED (Leadership in Energy and Environmental Design) certification silver on all buildings larger than 5,000 square feet. Clark University will strive to achieve the LEED certification silver provided that it does not increase the cost of the project by more than ten percent. The cost will be measured by evaluating the total life cycle of the building, taking into consideration all projected energy and cost savings associated with the building. Renovation to existing buildings will be required to achieve a LEED certification of silver when the cost of renovations exceeds 50% of the total replacement cost of the building. When renovation takes place on campus and the cost is less than 50% of total replacement cost of the building, LEED criteria will still be applied. In all projects, sustainable practices for operations and maintenance will be exercised by incorporating relevant factors of LEED certification standards with regards to site selection, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, and innovation in design and operations.

Clark University currently has two LEED certified buildings on campus. The Lasry Center for Bioscience is LEED certified gold. The building uses 34% less energy and 31% less water than a comparable conventional building. 92% of the construction waste from the project was diverted from the landfill. The building's triangular shape maximizes the building's southern exposure and the sunshades and light shelves help to maximize natural light while decreasing solar glare. The building is also equipped with electric lights that automatically dim when daylight is sufficient. Occupancy sensors in the rooms ensure that lights are shut off when they are not needed. The building is also equipped with an entropy wheel, which recovers heat from ventilated air. Carbon dioxide censors in the rooms allow for proper ventilation without wasting

energy. Other energy efficient features of the building include extra insulation and high-performance windows (U.S. Green Building Council 2008).

Another building on Clark University's campus is Blackstone Hall, an apartment style dorm, which achieved a LEED certification of silver. Like the Lasry Center for Bioscience, Blackstone has many innovative features to conserve energy. The windows of Blackstone are surrounded by shadow boxes that help increase natural light and reduce solar glare. The lights in Blackstone also have occupancy sensors to minimize electricity use. Many of the same features from the Bioscience Center were used in Blackstone Hall.

Clark University has also incorporated LEED standards into the renovations of Goddard Library. Although Clark University will not apply for a LEED certification on this project, they are still incorporating many of the same features from the Lasry Center for Biosciences and Blackstone Hall. The Goddard Library renovations are incorporating natural light into the buildingand placing occupancy sensors to reduce electricity use.

Carbon Counting

Clark University has always been very mindful of its green house gas emissions. On the Clark Sustainability website, there are records of carbon emissions that date back as far as the late sixties. The long-term history shows a trend of significant drops in carbon emissions around the time that the cogeneration facility was built and a slow but steady increase from 86 to 98. The latter trend can most likely be attributed to the growth in size that the university experienced during this time, and the extra energy strains that came with new research technology.

While it is very interesting to look at Clark's carbon history, it is far more useful for our purposes to examine more contemporary data. The Clark sustainability report published in 2007 is the most complete and up to date account of Clark's greenhouse gas emissions. The Clark University Sustainability Task Force calculated the campus greenhouse gas emission using a carbon calculator provided by the nonprofit company Clean Air Cool Planet. The Task Force found that the vast majority of the GHG emissions at Clark come from the boilers and the cogeneration facility (see Figure 2-1a). This makes sense because the heat and power are the most pressing energy needs and therefore contributed the most to GHG emissions. Another important figure to consider when studying GHG emissions at Clark is the most recent trends. Figure 2-1b shows that in the three years between 2004 and 2006, Clark has continued to lower its GHG emissions.

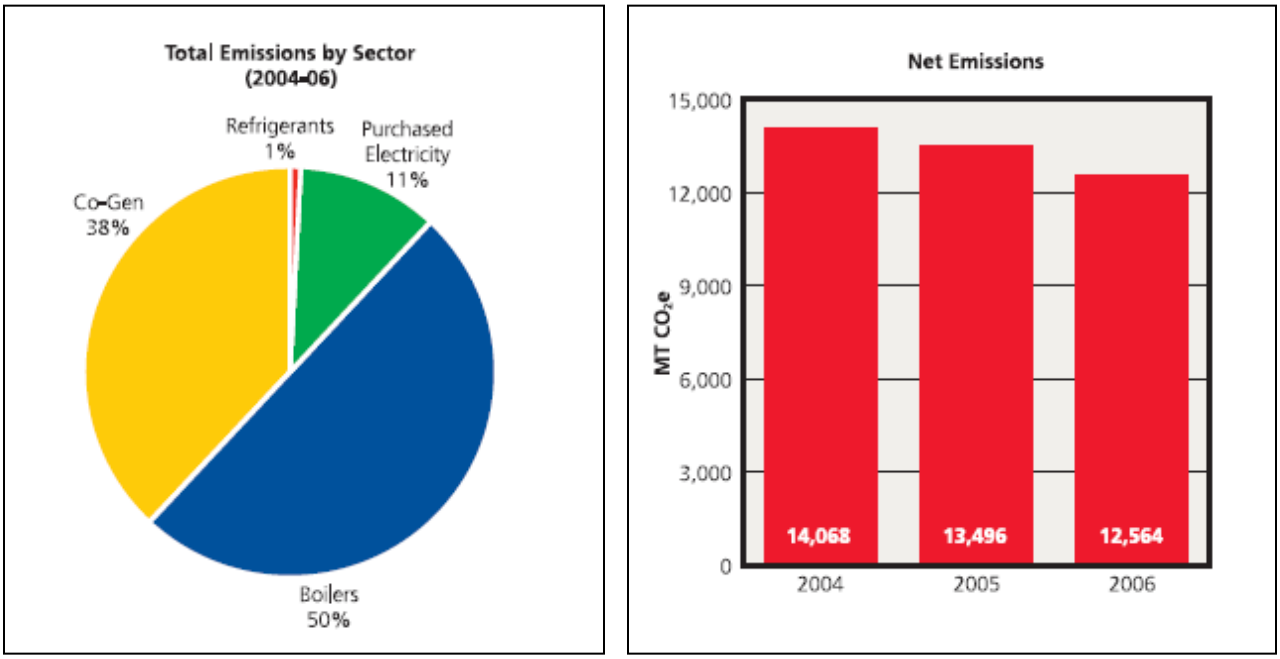

Figure 2-1. a) total campus emissions by sector, 2004-06; b) net emissions by year, 2004-2006

This is a very positive trend because as part of the Presidents Climate Commitment Clark University must put forward a tangible plan to reach carbon neutrality. During the presentation that Dave Schmidt made for the Sustainable University Class, he stated that Clark's emissions per student was only 6 MT CO2, which is very low compared to many other universities. Throughout the history of the school sustainable practice have been implemented to keep the emission per capita down and this is a major strength of the school.

Clark can also achieve carbon neutrality by offsetting the emissions that the school produces. Currently, Clark has two major carbon offsets: Student Renewable Energy Certificates, and Clark's incineration to energy disposal. The first offset is a new idea that was spearheaded by the Clark Sustainability Initiative (CSI) that allows students to opt into a program which purchases RECs to offset the emissions that they produce at Clark. The second offset comes from the solid waste on campus that is sent to a Mass Burn Incinerator. The waste is then used to create energy. This is one of Clark's major strengths in regard to GHG emissions and campus sustainability because the incineration plant produces less carbon than conventional fossil fuel burning plants and it is also a very innovative way to reuse waste that could not be recycled.

Transportation

Transportation is a very important aspect of GHG emissions and sustainability on campus. On the College Sustainability Report Card in 2008 transportation was Clark's greatest weakness and the only category where the school received a C (greenreportcard.org). Obviously this is an area that Clark has a lot of room for improvement, and the first step is to

look at the current transportation situation. Right now transportation at Clark is limited to only the escort service because there are no ride share programs or bike renting. While the escort service is very useful for students, it is not the best from a sustainability point of view. The vans themselves are old and not very fuel-efficient. While the University Police has never officially calculated the MPG of the vans, they estimated that they probably do not get much more than ten miles to the gallon, due to the city driving and the fact that the vans are old. The escort service runs from 5 p.m. to 4 a.m. every day on campus and has a fleet of three vans. When you add all that up, Clark is paying a lot of money in gas. In fact, in the first two months of the 2008 school year, Clark spent $3295 on gas. This is not to say that the escort van should no longer be used, in fact it is very important for both practical and safety reasons. Instead, Clark must explore the options that it has to improve the current system. Perhaps Clark will be able to improve their score on the next Sustainability Report Card by purchasing new vans that are more fuel-efficient, hybrid or electric.

Cogeneration

The cogeneration plant is powered by natural gas and 6% diesel to produce heat and electricity at Clark (Cordy 2008). It was built in 1982 when students came up with a solution for the high energy prices. It is one of the first grid-connected cogeneration plants in the country (Campus Sustainability 2008). Over the years, the cogeneration plant has produced 207,433,155 kWH of electricity, 197,586,000,000 BTU's of steam and 114,094,000,000 BTU's of hot water (Cordy 2008). The school's total electricity consumption in 2007 was 12,244,779 kWh. The cogen plant produces 90% of all electricity at Clark (Schmidt 2008). In addition, it captures the waste heat from the jacket water used to keep the engine at the right temperature, and uses it

as a source of thermal energy. Using this technique the cogen plant heats seven of the buildings on campus in the same way the boilers heat the buildings. During the summer months, cold water is used to air condition buildings (Campus Sustainability 2008). The cogeneration Plant saves Clark about $250,000 a year, or 8500 barrels of oil. In 24 years, the plant has saved the school $7,010,337 in electricity, $846,551 in steam and $635,051 in hot water costs. Since the plant can produce electricity and thermal energy from the exhaust and cooling jacket, it uses fuel twice as efficiently as conventional systems. If half of the electricity produced nationwide used cogeneration processes, the country could import 25% less oil.

Boilers

The boiler plant, located in the basement of Jonas Clark Hall, provides heat to the 18 of the campus buildings through steam and hot water. Underground pipes transport the steam to the buildings through the radiators. The three boilers are capable of producing 41,800 pounds of steam per hour. Oil is the primary fuel source for the boilers (Campus Sustainability, 2008). According to the campus sustainability coordinator, Dave Schmidt, the total thermal intensity of the boilers is 58.01 btu/sq ft (2008). Between 2004 and 2007, there has been a 7% decrease in net emissions reduction of carbon dioxide because of the boilers and the cogeneration plant. Energy efficient satellite boilers were recently installed in some of the buildings to reduce the inefficiency of just using the main boiler, allowing Clark to heat the buildings without having to turn on the larger boiler. However, according to Paul Bottis (2008), director of the physical plant, the biggest weakness of the heating system is the inefficient heating of the dorms. A great amount of energy is wasted from the overheating of the dorms, are there are no individual thermostats that will allow students to turn down the heat if necessary.

Projects on Campus

Other projects on campus have worked to reduce our energy consumption. According to Provost David Angel, the introduction of the new energy efficient washers and dryers has saved the school $30,000 already (2008). Other new energy saving projects includes the carbon calculator which has helped Clark estimate its carbon impact and the electricity meter for the whole campus and for individual residence halls. During renovations in Goddard Library, the building was retrofitted with a more energy efficient chiller and added other energy efficient appliances. Energy efficient heating was also introduced in the gym during recent construction (Schmidt 2008). Buildings around campus were retrofitted with air-lock doorways to reduce heat loss. The school receives cash incentives for participating with Nation Grid as an incentive to purchase energy efficient products (Campus Sustainability 2008).

Student Involvement

Student activism at Clark is very strong and has helped to promote energy initiatives on campus. One program that worked to offset our carbon emissions was the opt-in program, set up by the student run organization, Clark Sustainability Initiative (CSI). The goal was to have students purchase renewable energy credits (REC's) that would be used to offset carbon emissions by investing in wind energy. In 2006 CSI was able to get 30% of students who signed up for housing to participate in the program, raising $10,320 worth of REC's (Campus Sustainability, 2008). However the program had a big issue in that there is a time lag between buying the credits and when they are actually invested (Schmidt 2008). CSI also sponsored the dorm versus dorm competition, where students competed to reduce their electricity consumption. CSI hosted Campus Sustainability Day in the spring of 2007, with the goal of

"promoting behavioral change and environmental literacy" across campus (Schmidt 2008). GoLoco is a program that allows people to post and share rides. There is also a GoLoco internship opportunity for a student on campus.

SUGGESTIONS

Student Involvement

Student awareness, activities, interest and involvement in sustainability are high at Clark University. With its reputation for environmental consciousness, Clark has become a leader in campus sustainability in part due to its students. The Clark Sustainability Initiative (CSI) is a prevalent part of campus life, with active members who are dedicated to reducing the university's carbon footprint. By purchasing carbon credits, creating competitions such as Dorm versus Dorm, and working to increase the overall environmental literacy among the students, CSI has greatly impacted the way the school treats issues on carbon and greenhouse gas emissions. 2008 was the first year that the Dorm versus Dorm competition was introduced. It worked to decrease the amount of electricity used in the freshman dorms while also increasing student awareness of energy issues. In the future, Clark should work to encourage CSI to not only continue the competition, but also to expand it to upperclassmen dorms. With the school's help and other clubs co-sponsoring the event, it will be larger and more successful. Student involvement is the key to making important changes around Clark, and Dorm versus Dorm is a great way to implement it.

Buying carbon offsets

The purchase of carbon credits to offset emissions was a program that lasted for only

one year at Clark. In 2006, over $10,000 worth of credits were purchased. This money was then invested in alternative and renewable energy sources. However, some see purchasing carbon credits as merely a license to pollute. Purchasing renewable energy credits is also a long term investment because it takes time between buying the credits and actually having the invested wind farms produce energy to offset the energy consumed. In the future, Clark University needs to consider whether or not it is willing to make such a long term investment. Student push for the purchasing of credits would also be necessary to get the program going again. However, Clark must continue to look for ways to reduce their energy emissions, not just offsetting them. Therefore, if the program where to continue, it should not be the priority in reducing the school's carbon footprint.

Transportation

Transportation was the area in which Clark scored the lowest on the Sustainability Report Card and therefore it is the area in which there is the most room for potential change. The most important issue that we must examine in regard to transportation is the escort vans. The most obvious change would be in the vans themselves; the vans that Clark is currently using are old and have very poor MPG. Some possible alternatives that could be explored could include hybrid vehicles, vans that run on an ethanol or biodiesel fuel, or electrical vehicles. All three of these examples could provide workable alternative for the current escort vans. The largest barrier to implementing these ideas would be the initial cost of purchasing new vehicles. However, Clark is paying over $3000 dollars every two months to keep the vans in operation, meaning that in a year they spend over $12000. If Clark could implement a policy that would double the fuel efficiency from a measly 10 mpg to 20 mpg they would save $6000 a year. It

seems logical that when Clark needs to purchase new vehicles it would be cost effective and sustainable to invest in more efficient means of transportation.

Clark could also improve in transportation by offering alternatives to the escort vans. One alternative is a bike share program at Clark. This would be a great idea because riding a bike is an efficient form of transportation, especially for shorter distances, and it leaves no carbon footprint. Establishing a program like this would involve acquiring bikes and setting up a system that would make it easy for Clark students to have access to them. Another alternative that Clark could explore would be the use of zip-cars. This would allow students to rent cars hourly and it would be convenient for short trips. The difficulty with this system would be the insurance issue and cost of purchasing zip-cars. Hopefully the many other alternative modes of transportation to reduce carbon emissions and a more sustainable transportation system will be implemented soon.

Energy

Clark University was an early pioneer in the field of university sustainability. The cogeneration plant that provided heat and electricity for the university was the school's crown achievement. While the plant was well ahead of its time when it was built, it has slowly become outdated and is no longer a driving force behind Clark's efforts to become sustainable. "Regular use of cogeneration in the current configuration contributes more greenhouse gas emissions than would occur if Clark purchased all of its electricity and used the boilers to generate all the needed heat…While use of the cogen engine during this period has presented substantial financial savings, the underutilization of the waste heat effectively rendered the

operation more carbon intensive" (Environmental Sustainability Report 2007). Intensive carbon emissions become a serious issue when you are addressing sustainability, especially when the campus has made a pledge to try and become carbon neutral. The heart of the issue is the type of fuel that Clark is using to power the cogeneration plant and the boilers. Oil is inherently an unsustainable resource and therefore cannot be used in cogeneration if the goal is sustainability. One alternative fuel source that the university could look at is wood pellets and wood pellet boilers. Wood pellets are a great source of energy because they have very low moisture content meaning that they burn efficiently, are lighter and easier to transport and do not take up as much space to store as traditional biomass fuels. Another benefit of wood pellets they are considered a carbon neutral fuel source by the EPA (Pellet Fuels Institute). In fact there are already many commercial operations in schools and prisons that use wood pellet powered boilers to meet their fuel and energy needs. If Clark's goal is to become a sustainable institution it seems logical that moving toward a sustainable fuel source should be our top priority.

Dorm Efficiency

One recommendation that Clark might consider is improving energy efficiency in the dorms. Most of the dorms do not have any heating controls or monitoring systems within the rooms themselves. This can often leave a dorm room at an uncomfortable temperature, usually too hot. As a result, most students will open windows when they find their rooms are too hot (Figure 2-2). This is a sign that the heating in the dorms is inefficient. If the heating in the dorms is inefficient, Clark is wasting energy, costing the University more money and unnecessary harm to the environment. Currently the dorms temperature is varied by changing the temperature of

the water that goes through the pipes; for example, on warmer days Clark does not heat the water as much as they do on coolers days. If Clark installed thermostats in the rooms, students could control the amount of hot water they received through their heating system. This would prevent students from opening windows as a way to control their heat, making the building more energy efficient.

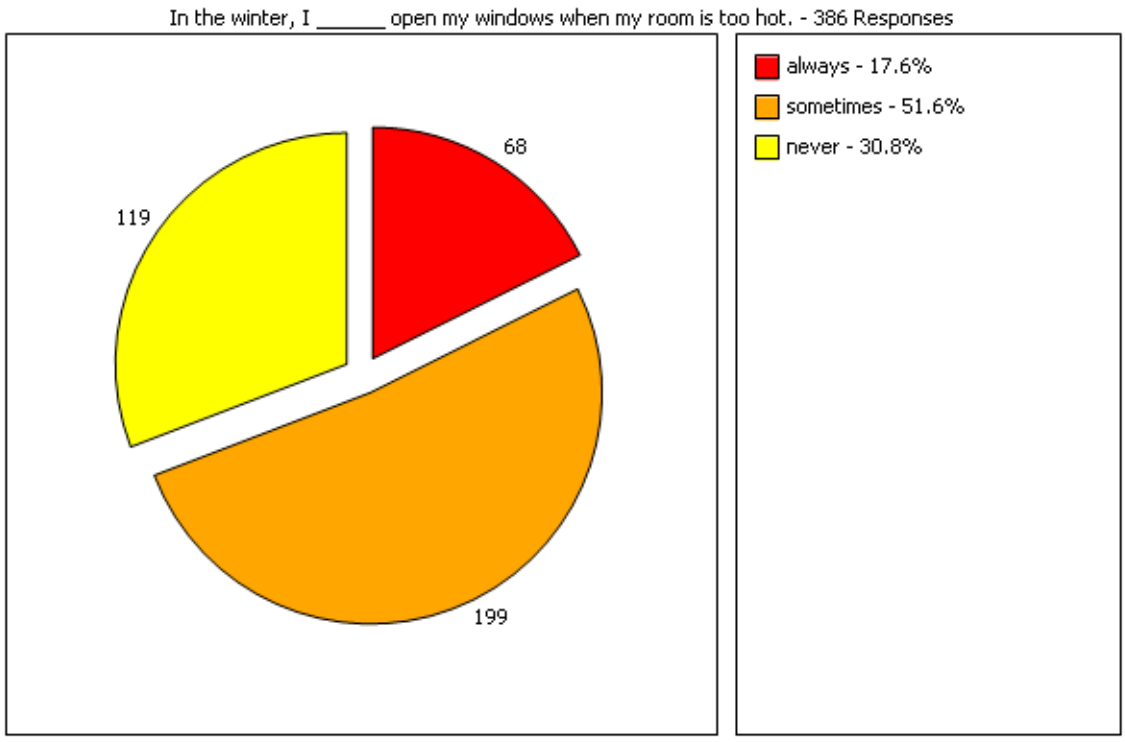

Figure 2-2. Survey question response

Another thing that Clark could do to improve their energy efficiency on campus is to have occupancy sensors for lighting. This would be specifically useful in the residence halls' common rooms, hallways and bathrooms. These are lights that are often unnecessarily left on. Reducing the number of lights left on at any given time would reduce energy consumption. Reducing energy use would benefit the environment and save Clark University money on fuel costs.

REFERENCES

AASHE. 2007 GHG Report for Clark University.25 October 2008. 10 November 2008. **<http://www.aashe.org/pcc/reports/ghg-report.php?id=194>**.

AASHE. Solar Panels on Campus. 2008. 13. Oct. 2008 **<http://www.aashe.org/resources/solar_campus.php>**.

"American College & University President's Climate Commitment." About the American College and University Presidents Climate Commitment. 2008. Presidents Climate Commitment. 17 Nov. 2008 **<http://www.presidentsclimatecommitment.org/html/about.php>**.

Angel, David. "Provost David Angel Speaks about Campus Sustainability." Clark University, Worcester. 6 Oct. 2008.

Biomass Energy Resource Center (BERC). Potential for a Biomass CHP Plant at Middlebury College. 2003. Oct 14 2008 **<http://www.biomasscenter.org/reports/middlebury-biomass-chp.html>**.

Bottis, Paul. "Tour of LEED Certified Buildings." Clark University, Worcester. 10 Nov. 2008.

“Clark Sustainability Report”. 2007. **http://www.clarku.edu/offices/academicaffairs/pdfs/sustainability.pdf** (last accessed 12/2/08).

"Clark University's Cogeneration Plant." Campus Sustainability. 2008. Clark University. 1 Nov. 2008 **<http://www.clarku.edu/offices/campussustainability/energyuse/cogeneration.cfm>.**

Clark University Environmental Task Force, “Environmental Sustainability Report”. 2007. **<**http://www.clarku.edu/offices/academicaffairs/pdfs/sustainability.pdf**>**(last accessed 11/13/08).

“Clark University Sustainability Report Card”.**<http://www.greenreportcard.org>** (last accessed 11/11/08).

"Consumption of Thermal Energy." Campus Sustainability. Clark University. 1 Nov. 2008 **<http://www.clarku.edu/offices/campussustainability/energyuse/index.cfm>**.

Cordy, Roy. "Tour of Cogeneration Facility." Clark University, Worcester. 3 Nov. 2008.

Diane McCarthy, Information collected by the University Police regarding the Clark escort services.

Furman University. Sustainability. 11 Oct. 2008 **<http://www.furman.edu/sustain/>**.

Harvard University Office for Sustainability. Clean, Renewable Energy at Harvard. 2007. 13 Oct. 2008. **<http://www.greencampus.harvard.edu/cre>**.

Harvard University Office for Sustainability.Greenhouse Gas Inventory. 2007. 13. Oct. 2008. **<http://www.greencampus.harvard.edu/ggi/>**.

"Pellet Fuel Institute" <**http://www.pelletheat.org/2/index/index.html>**(last accessed 12/2/08) .

Presentation in class by Dave Schmitt (10/27/08)

Presidents Climate Commitment.The Commitment. 2008. 10 November 2008. **<http://www.presidentsclimatecommitment.org/html/commitment.php>**.

Presidents Climate Commitment.About. 2008. 10 November 2008. **<http://www.presidentsclimatecommitment.org/html/about.php>**.

Schmidt, Dave. "Meeting with Campus Sustainability Coordinator." Personal interview. 30 Oct. 2008.

Sustainability Endowment Institute. Amherst College: Report Card 2009. 2008. 13 Oct 2008, **<http://www.greenreportcard.org/report-card-2009/schools/amherst-college>**.

Sustainability Endowment Institute. Harvard University: Report Card 2009. 2008. 13 Oct. 2008. **<http://www.greenreportcard.org/report-card-2009/schools/harvard-university>**.

Sustainability Endowment Institute. Middlebury College: Report Card 2009. 2008. 14 Oct 2008 **<http://www.greenreportcard.org/report-card-2009/schools/middlebury-college>**.

Sustainable Endowment Institute. Yale University: Report Card 2009. 13 Oct. 2008 **<http://www.greenreportcard.org/report-card-2009/schools/yale-university>**.

University of Minnesota. UMM: A Green Campus. 11 Oct. 2008. **<http://www.morris.umn.edu/greencampus/>**.

U.S. Green Building Council.Project Profile: Clark University Lasry Center for Bioscience. 2008. 10 November 2008 **<https://www.usgbc.org/ShowFile.aspx?DocumentID=4012>**.

"U.S. News & World Report." Best Colleges. 17 Nov. 2008. 18 Nov. 2008

<http://colleges.usnews.rankingsandreviews.com/college/items/2155/@@index_sb.html>.

Worldwatch Institute. Campus Greening: Harvard University, Cambridge, Massachusetts. 2008. 13 Oct. 2008. **<http://www.worldwatch.org/node/5132>**.

Worldwatch Institute. Campus Greening: Yale University, New Haven, Connecticut. 2008. 13 Oct. 2008 **<http://www.worldwatch.org/node/4921>**.

Chapter 3: Closing the Loop: Materials and Waste Management

By: Kate Gould, Joey Warren, Meghan Helmberger, and Shane Capra

INTRODUCTION

With the industrial revolution came the capacity for humans to create inexpensive, plentiful, and widely available goods. The standard of living for the poor and middle classes rose drastically; now families could ensure the basic necessities of life as well as a few of the luxuries. Early factory owners drew from the earth what was thought to be an endless supply of resources, and with the same degree of certainty disposed of waste products into an ecosystem that could filter any level of contamination. Today we understand the importance of proper waste management in sustaining the environment on both a local and global scale. The biological filtration system of the planet has been overwhelmed by our waste, and can no longer simply pass our waste streams safely through natural cycles. Something needs to be done with our waste, and to do so sustainably means the methods we use must not negatively impact the environment in a way that will risk the future generation's social and economic needs.

Solid waste streams are contaminating the environment as they come into contact with ecosystems and drinking water. The incineration of waste is releasing a continuous flow of green house gases, and other harmful forms of pollution into our air. Landfills are filling, releasing gases into the atmosphere as well as trapping still valuable or usable resources. Packaging materials alone represent roughly 50% of the municipal waste stream, items that should be designed for decomposition (McDonough and Braungart 2002, 105). Plastics and metals that could be easily recycled are simply dumped into oceans or buried. Biological

nutrients, found in our food waste and other organic waste, are being ignored as a source of further fertilization for our farmlands. There is a growing problem concerning the disposal of technical and electronic waste, known as E-waste. Disposing a television set improperly risks releasing 4,360 chemicals, some toxic and others that could be reused as valuable industrial resources (McDonough and Braungart 2002, 110). Clearly we have moved very far from the natural biological "closed loop" system outlined in the Cradle to Cradle theory. We are now creating more products than we would ever need, with an estimation of over 90% of raw materials extracted to create goods in the U.S. becoming unutilized waste directly after production (McDonough and Braungart 2002, 28). While this mass production of goods once provided the foundation on which the industrial revolution brought a higher standard of living to any nation willing to industrialize, it is no longer, and indeed never was, a sustainable means of production. If sustainability is to be the new foundation of our global society's standards of production and consumption, it is of the utmost importance that our waste management systems become an integral piece of the structure.

One concept that is important to understand is that of cradle to cradle. The cradle-to-cradle approach considers a product or material's ability to be manufactured and reused as well as that material's place in the ecosystem. The material starts off as a "virgin" or untainted one and is used to make a product. In an ideal world, the manufacturers of the product have will take measures to ensure that the key materials contained within that product can be reused afterward. Unfortunately this is not the case, and most products are not made in a manner so easily returned to the earth as a resource. In order to compensate for this unsustainable material flow, waste must be disposed of through methods both safely and conservatively.

Products normally following the standard linear flow of cradle grave create a loss in both technical and biological nutrients as well as a depletion of resources. In order to 'close the loop' waste must used and reused to its full capacity, recycled into other materials, and composted to make use of further nutrients. This lengthening of the use of virgin resources curtails not only the further need for resource extraction, but also ensures each component is disposed of in a sustainable manner that replenishes resources.

Universities today are more prepared to take on the environmental problems that our world faces more than ever before. With the raised awareness about environmental, economic, and judicial sustainability colleges and universities are taking the action into their own hands. As centers of education and innovation such institutions have been taking aggressive and progressive approaches towards promoting and enforcing sustainable practices. These Universities are doing things like building LEED certified buildings, having environmentally conscious student clubs or clubs with a focus on sustainability, running sustainable food and dining services, having multiple staff and faculty positions involving sustainability, and having progressive and sustainable energy consumption programs. Many universities have begun practicing a more sustainable form of waste disposal on their campuses. Recycling of plastic, paper, and metal has been increasingly effective and commonplace on campuses. Composting and reuse programs have begun gaining support from students and administration. While each institution handles the issue differently, as a network of educational centers colleges have an incredible potential for change. Clark can draw from each methods and innovations that would aid in our own goal of 'closing the loop.' As an educational institution it is Clark's responsibility to set an example for its students and for community of Worcester. By continuing to refine our

recycling, composting, and reuse systems Clark University can become even more of a role model. Although universities face challenges from the standards still upheld by most of society, as source of research and earning it is hoped each graduating class will be willing to make such necessary changes to the world.

The first step towards achieving such a future is to understand the extent of our own waste stream, the processes already in effect, and the changes needed to attain greater sustainability. In this report we hope to achieve this first step of gathering information both on the present practices and future suggestions. Before concentrating on Clark University, we will look at the following colleges: St. Olaf College, Chico State, Green Mountain College, Ball State University, UNH, University of Connecticut, WPI, University of Oregon, Dickinson College, Middlebury College, Skidmore College, and Scranton University and what they are doing in regards to waste management. These are all varying is size, location, and endowment, but all are on level in the way that they all see that a change needs to be made. Next, the bulk of this paper will examine Clark's own strengths and weaknesses in dealing with composting, recycling, materials use, and trash. We will observe practices that are already in place at Clark and factors of these practices that are working well, and discover what is not working so well. Lastly, we will address those characteristics of Clark's sustainability system that should be changed in the future. We will focus on what directions Clark University could take and what are affordable, easy ways to become more sustainable.

MATERIALS AND WASTE MANAGEMENT AT OTHER UNIVERSITIES

For years, various other universities across America have been taking aggressive and progressive approaches towards promoting, enforcing, and achieving sustainable practices. These schools each do things in their own unique ways, and, as both fiscal and academic institutions, serve as role models and examples for Clark University and the world outside it. Although Clark has already taken an active role in achieving a sustainable campus, we must also learn from what other universities are doing.

Other schools have instituted effective policies and have set progressive goals in regards to sustainability. St. Olaf College, which like Clark has roughly 3000 students, is committed to improving economic and ecological sustainability. One way that they do this is by having a sustainability task force comprised of students, faculty, and staff. St. Olaf College wants to eliminate the concept of waste. Another way that they do this is by creating and releasing "Green Report" about their sustainability plan. BSU wrote a sustainability statement saying that through their learning and research they were dedicated to reduce their waste and energy intake without lowering their affectability as a school. The University of Oregon is also dedicated to achieving zero waste. They want to find a way of recycling everything coming into the school atmosphere. U of O has 45 employee spots open for students who want to work as recycling collectors and processors. Dickinson College encourages their students to recycle and reuse as much as possible before sending waste off to the landfills. Like Clark's recycling program, Worcester Polytechnic Institute's recycling program relies mostly on student participation. The University of Connecticut is much different than Clark University in that the campus and student population are much larger. Chico State, in Chico, California, has made

sustainability one of its highest priorities. In order to guide its actions regarding improvement in environmental consciousness and sustainability, Chico has created several major guiding statements that reflect its commitment to improvement and progress: “Believing that each generation owes something to those who follow, we will create environmentally literate citizens who embrace sustainability as a way of living. We will be wise stewards of scarce resources and, in seeking to develop the whole person, be aware that our individual and collective actions have economic, social, and environmental consequences.” In addition to this, in 2005 Chico issued a statement saying that where possible, the campus will utilize construction materials that have been recycled, are made of renewable natural resources, minimize the use of non-renewable natural resources and minimize negative impacts upon the natural environment. Making general but powerful guiding statements such as these, is an important way that Chico is working towards a completely sustainable university. Chico State has also adopted the Renewable Energy Resolution; a resolution that states all new buildings will incorporate sustainable practices by following the LEED framework of the U.S. Green Building Council. Green Mountain college functions with a complete focus on sustainability and green practices; that is, sustainability is at the center of their efforts as an institution. The college offers a wide array of liberal arts majors, but seek to cultivate ideals of environmental responsibility, public service, global understanding and awareness, intellectual, physical, and spiritual development.

Each of these schools offers examples for Clark to build off of, improve upon, and learn from. Although Clark has already instituted several sustainability policies, such as the green

building and purchasing policies, we should continue to find other methods to improve by observing the practices of other schools.

The following section offers a general overview of recycling practices at other sustainable schools. St. Olaf College recycles an impressive 25 tons per month while making sure to use machines that are energy star compliant and planning on trying to reduce their paper use by 1% per year. UNH takes recycling to a higher level, devoting a large number of Waste Management workers to their own recycling program. This allows for more experienced, smoothly operated and systematic recycling system. Like Clark, UNH program collects materials such as paperboard, paper, glass, metal, and plastic, and in 2007, UNH began a project to provide recycling receptacles adjacent to trash cans spread throughout the campus. Middlebury College institutionalized its recycling program in 1994 and currently has an exceptionally high total waste diversion rate (compost and recycling combined) of 61%, meaning that they recycle and compost 61% of potential garbage that would otherwise be sent to landfills or incinerated. Middlebury gets its students involved by providing each of them with a recycling bin for their dorm room, as well as a larger bin located on each floor. On the other end of the spectrum of sustainability efforts is WPI, which did not create a formal bottle and can recycling program until 2008. Their recycling efforts only yield a 13% waste diversion rate. At The University of Scranton, an initiative was started to get all facilities to gather cardboard, newspaper, office paper, plastic, glass, grass and leaves, aluminum, copper, and steel. This program has recycled over 1,210 tons of material over the past ten years. Skidmore College's recycling program is even more impressive. They have a recycling tracker on their website, showing how much material is being recycled. Their website also includes an in-depth analysis

of what can be recycled in the paper and plastic/glass/cans bins, and what must be thrown in the trash. The university claims that they have made recycling easier than just throwing something in the waste bin because they have recycling sites all over campus. At The University of Connecticut, the university promotes recycling by organizing events and fun activities such as Recycle mania, an annual surge for on campus recycling.

Each of these universities has taken steps towards improving and perfecting their recycling systems and practices. From websites that track how much the university has recycled, to getting all facilities and physical plant staff involved in recycling, these schools provide valuable example of ways to improve recycling practices at Clark.

Part of waste management, waste diversion, and responsible or sustainable purchasing, is using food more judiciously--through efforts like tray-less dining at Clark--composting extra food and organic matter, and purchasing from local producers. Other schools, many of them the same ones mentioned in the previous section on recycling, have made efforts to make these things a part of their effort to achieve a sustainable university.

In 2005, the Princeton Review called St. Olaf's cafeteria one of the top ten in the United States. If they can't find any local meat they make sure and purchase meat, dairy, and seafood with reduced antibiotics. St. Olaf's cafeteria service only purchases wild or line caught salmon and seafood to preserve fish stocks. They buy fair-trade coffee, cage-free eggs, and local apples and corn when in season. The school also purchases pasta and pork from local farmer's cooperatives. All of the vegetables are from the student run organic garden, STOGROW. St. Olaf realized that a lot of their waste could be composted and used as fertilizer, so now, all of their compostable material is combined with woodchips and paper products, which they put

through a process that turns it into fertilizer within 14 days. On the Dickinson College campus, they have an all-organic café that offers organic, fair-trade, and locally grown products, including baked goods made using products from their student run garden. Like St. Olaf, Dickinson College reuses all campus clippings and trimmings from their plants combined with food waste, and then compost it and uses it as fertilizer. They have waste-to-energy plants, which convert their left over waste into electrical energy that they can use. UNH is one of the most successful in its implementation of composting. Beginning in 1997, composting at UNH was done only by students, but in 2006 the job of collecting compostable materials was delegated to the UNH dining services and the composting process to the College of Life Sciences & Agriculture. According to the UNH Composting web site, approximately 25,000-40,000 pounds of pre- and post-consumer food waste are diverted from the UNH dining halls per month. The compost is used by the garden club, on- site farms, and is sold to local markets. At Middlebury College, composting is done on-site and is estimated to divert 20% of waste annually from landfills. The dining service at Skidmore College has been looking into an upgrade to the dining hall's system of handling food scraps. Currently, plate scrapings are rinsed down a long trough, ground up in a Dispose-All, and flushed down the drain. Huge amounts of running water are used, and all the garbage goes into the sewers. New equipment under consideration would use a closed-loop water system to recycle the rinse water, and would squeeze the waste into a condensed bundle rather than flushing it down the drain. Skidmore also does not compost, but they are looking to begin that process. Skidmore has considered firms such as Capital Compost, which would haul away their food waste and use it in its own composting facility. Right now, kitchen waste (leftovers, peelings, etc.) constitutes a big

portion of Skidmore's garbage. Chico State, like Clark, uses reusable dishes and flatware as well as compostable plastics in their cafés. Green Mountain College buys 13% of their food from local producers and owns two composters, which student volunteers operate in collaboration with dining staff in order to make sure that excess food is composted.

Recycling, composting and purchasing locally are all important steps in achieving a sustainable, low-waste university. Being conscious of nutrient flows is a part of attaining a low-waste university, and these colleges are taking steps to minimize waste by reintroducing used and renewed nutrients into the nutrient "stream". Once again these schools provide good examples for Clark to learn from, as well as a reason to be proud that we are making many of the same, and in several cases, more efforts towards achieving sustainability than are the other universities. However, we must continue to learn from the examples set by these other schools.

There are materials other than those conventionally recycled (bottles, cans, paper, cardboard, etc.) that colleges try to recycle. While these materials are often less numerous than their conventionally recycled counterparts, they also often contain contaminants and toxic materials that must be disposed of properly. Other colleges are making efforts to recycle these things when possible, and to dispose of them properly and responsibly when necessary.

Although St. Olaf College is a leader in nearly all ways regarding waste management, it ran into trouble with recycling computers and computer parts. Some schools focus on recycling used building material from construction sites. Ball State University really focuses on recycling building materials. They recycle concrete and other building debris from all construction sites around campus. The University of Scranton salvages recyclable materials from demolished buildings; including copper plumbing lines and uses the funds to purchase equipment for the

Physical Plant. Other schools focus on recycling and reusing smaller items like print cartridges. UNH has a print cartridge refilling station on campus, providing students with ink for half the price of a normal printer cartridge if they make use of the program. Middlebury's waste management takes special care to collect fluorescent bulbs, batteries, and used oil for later disposal according to hazardous waste laws. The campus furnishings too are recycled; as furniture is replaced the old materials are sent to charities. WPI provides services to deal with some hazardous material, in particular E-waste. A fluorescent, sodium, HID, and metal halide lamp recycling program has also been in place for several years. The University of Connecticut focuses on reuse and waste management by sponsoring programs like the Move-Out Campaign. As a result of the Move-Out Campaign, over 2500 lbs of clothing, goods and non-perishable food that otherwise would have entered the trash stream was diverted and donated to the Windham Area Interfaith Ministry, the Coventry Soup Kitchen, and to soldiers stationed overseas in Iraq. Composting is important to them as well, for in 2007, the $600,000 budget for the design & construction of the University of Connecticut Compost Facility was approved, providing a substantial step forward in this project.

These schools each do things in their own unique ways, and, as both fiscal and academic institutions, serve as roll models and examples for Clark and the world outside it. Although Clark has already taken an active roll in achieving a sustainable campus, we must learn from what other universities are doing.

MATERIAL AND WASTE MANAGEMENT PRACTICES AT CLARK

While Clark's recycling and composting efforts have been fairly successful, they are far from the ideal goal of fully reducing the solid waste stream to a closed loop cycle of cradle to cradle. All institutions create some form of waste that simply cannot be safely or feasibly handled in a fully sustainable manner. What the university cannot reuse, recycle, or compost is known as "daily waste." Each ton of daily waste hauled away costs the university approximately 80 dollars (Schmidt 2008). While this material would usually end up in landfills, Clark goes one step further in making use of trash. The waste is transported to Millbury, Massachusetts, where it is incinerated to create energy (Clark University Sustainability Report 2007, 12). While this does release some amount of pollution in the form of emissions, it is less damaging than the pollution of coal plants. In this way Clark has a small offset in the form of cleaner energy production.

Between 2004 and 2006 the annual total non-recyclable waste stream was reduced by 111 tons, a 14% drop. This reduction in waste volume has been attributed to locking waste disposal units, as well as the recycling program (Clark University Sustainability Report 2007, 3). In the same 2 years the recycling tonnage increased by 38% (33 tons) and the percentage of waste diverted by recycling rose from 10 to 15% (Clark University Sustainability Report 2007, 3). This increased level of recycling may have been the result of further awareness and a larger number of bins.

Dump and Run

One of the more prominent programs at Clark that handles durable goods that cannot easily be recycled is the yearly Dump and Run. This program has proven to be a valuable application of consumer side reuse. At the end of the spring semester many students still have functional goods, such as furniture, clothes, books, and kitchen supplies that they cannot store or otherwise take home. All too often these durable and reusable products end up in the trash, where their potential as technical nutrients and for functional usage will be unrealized. Clark's Dump and Run program is a solution based on reuse of such would-be waste tonnage. At the end of the spring semester boxes are placed in the halls of each dorm, and students can place all of their unwanted gear in these as opposed to the dumpster. These goods are then partially given to charity based second hand organizations such as Big Brothers, Big Sisters, and Savers. What they won't take is sold at the beginning of the year in a large campus yard sale. In 2004 the program saved 12 tons, and in 2005, 13 tons (Clark University Sustainability Report 2007, 12). Dump and Run is working fairly well, with its reduction in waste and amount of participation a proof of its success. Although the program is working fairly well, storage of the to-be-donated items is often a problem, as the materials are stored in the basement of Atwood where they compete for space with many other programs (Schmidt 2008). Other colleges have implemented similar year round programs, ensuring that the maximum reuse of goods decreases the need for new products. Unfortunately, Clark is unable to implement such an intensive program due to the lack of space available for storage.

Paper Usage

Paper usage is one of the largest sources of waste on campus, with an average of 100 cases of paper purchased per month (Clark Sustainability Report 2007, 3). In 2006 we used

1,238 cases of paper, an increase of 134 cases since the previous year. In recent years the administration has recognized the enormity of this problem, and this year the Clark Sustainability Task Force has taken on the issue of paper waste and recycling as its main goal. They aim to reduce paper consumption in each department by 10% as well as offer as 30% recycled content option for all paper products. While this is a lofty goal that would reduce the number of trees felled per year for the university's paper from 720 to 453, it is one that faces many barriers (Clark Sustainability Report 2007, 15).

Fast Fact About Paper Usage

In the 2006-2007 academic school year Clark University purchased 12, 000 reams of printer/ copy paper. Out of that paper purchased, 44.58 tons were recycled.

One way in which the campus has been saving paper is through the recycling program. Recycling paper on campus works in the same manner as plastic bottles; with bins throughout campus dorms and buildings. However, unlike the bottles, paper has fewer restrictions on what can and cannot be recycled. All forms of paper and cardboard may be recycled, with the exception of paper products that have been contaminated by food or other wastes. This 'all type' system makes the sorting process that was once handled by the work-study staff at the Clark recycling center unnecessary. All paper ends up being stored and hauled from the center on Hawthorne Street. In 2007 Clark had a total of 44.58 tons of paper diverted from the solid waste stream via recycling, an increase from the previous year of 5.83. This is a promising sign that paper recycling is picking up on campus since 2005, when a study indicated that 30% of all daily waste on campus was made up of easily recyclable paper and cardboard.

For each ton of paper that is recycled the university is paid between $55-80 dollars, for each ton of cardboard Clark earns between $55-105 (Schmidt 2008). Unlike glass and other recyclables, paper products have remained in demand for the production of goods. Because each ton of daily waste costs Clark $80 dollars to dispose of, the recycling of paper is not only environmentally sustainable, but also is financially logical. By continuing to raise awareness and participation in recycling paper it can only be hoped that even higher rates are achieved in the future.

In addition to recycling our waste, the university has looked at ways of using an increased amount of recycled content paper products. In June of 2007 all departments were given the option to buy 30% recycled content paper and since 2005 campus toilet paper has been 85% recycled. The dining services the napkins have been made biodegradable in order to coincide with the composting program initiated in 2007. Starting in the spring semester of the same year, new napkin dispensers have decreased wasteful usage, yet the university still consumed approximately 1.2 million napkins. Reuse of envelopes between departments has become commonplace, a system that may have potential in other places around campus.

In order to further the preservation of our resources, many courses and departments may consider going 'paperless.' By taking advantage of Black Board, Cicada, Adobe PDF, E-mail and other Internet systems, courses could viably distribute all materials without wasting paper. Most courses at Clark make use of at least one of these electronic networks, but fully electronic courses are rare.

Perhaps the largest source of wasted paper on campus is due to unnecessary printing and copying. Our campus computer lab goes through countless reams of paper per day, a good

deal of which are instantly disposed of or placed in the recycling bin. Printing in labs is currently free of charge for students, and copying is free for professors. While this ease of access is important in providing for students and faculty alike, it often is abused inadvertently. Approximately 20 pounds of paper per person are used each year at Clark (Clark Sustainability Report 2007, 15). People print large documents accidentally, or before they are fully edited for error, wasting immense amounts of paper. In an attempt to increase awareness of the campus's tremendous paper consumption, the amount of paper used in one year was measured to be 31 times higher than the Jonas Clark clock tower.

Sustainability Task Force members Paul Cody and Justin Brooks have worked alongside ITS to tackle the problem in labs. They have implemented automatic double-sided printing in all computer labs on campus. By printing strictly double sided, campus computer labs are cutting the amount of paper used in printing multi page documents by 50%. The Task Force has discussed the logistics of a printing fee, in hopes that printing would be done with more caution and reserve (Schmidt 2008). However, this has yet to be implemented or confirmed.

Recycling

Matt Most and Dan Kallin started a part-time recycling center in 1990. The program was based out of a few basement rooms in the library. They only collected and recycled paper from around campus as well as accepted paper from the larger main south community. The full time recycling program started in 1991 to 1992. In 1992 the program moved to the house on 5 Hawthorne Street, where it continues to flourish. Seventeen part time work-study students operate the current recycling center. It is completely student-run, with minimal authoritative

management. Over the summer, there is a skeleton crew, of student employees, that keeps the recycling program moving.

Clark University's Recycling Center now accepts and collects all paper products, computer monitors, all metals, cardboard, number one and two plastic products, light bulbs, and many other reusable and recyclable materials. A few years back the recycling center had to eliminate the reusable room because there was not enough space for all the other recyclable materials. Clark can only accept number one and two plastics because there aren't sufficient quantities of those other numbers to create a return for the school. Since these plastics aren't recycled they enter the daily waste stream. Along with the regular recyclables like paper and plastic, Clark also accepts materials like florescent light bulbs and mattresses. The florescent light bulbs are taken to a special plant where they are broken and the gas is captured and disposed of in an environmentally clean manner. Currently, Clark's biggest commodities are paper and cardboard, which provide the biggest cash return. In the end, recycling pays for itself because it is more expensive to haul trash then it is to take recycling off campus. For all recycling, Clark receives a cash return depending on the product. Because recycled paper is traded on commodity markets, the school has been receiving less money for each recyclable since financial markets crashed in fall, 2008. For example, in November Clark University received $5 a ton, whereas Clark used to receive $100 a ton. Generally Clark receives $150 a ton for plastic, $55-$105 per ton of cardboard, and $100 per ton of paper. The pick-up times for recyclables are depend on the material being picked up; For example: cardboard is picked up every three weeks, paper is picked up every five weeks, and light bulbs are picked up every two and a half months. The Clark Recycling program operates with The Institution Recycling

Network or the IRN, which is a cooperative that improves financial and operating results in recycling and waste minimization for public and private organizations throughout New England (http://www.ir-network.com). The IRN is middleman between Clark and the other companies that dispose of recyclable materials in an environmentally safe way. One company that the IRN sends materials to is Empire Recycling, which mostly takes paper from Clark. As of right now, Clark does not have any plans to expand the recycling building especially with the current economic problems. But in the past there have been many initiatives proposing different changes to the recycling program and building. In 1997 the Recycling Center bought a stroke bailer in order to crush cardboard boxes and conserve space. In 2005, Clark held two-yard sales with reusable materials found among the junk from the Dump-and-Run. Normally around 10 tons of recyclable materials are found among the disposed objects of dump and run. Clark generally only recycles about %17 of the materials that it uses.

Recycling only makes up a fraction of the overall %51-diversion rate at Clark. One reason Dave Schmidt, the campus Sustainability Coordinator, believes that there is such a low diversion rate is because of the infrastructure. The bins that are placed around campus are not uniform, which makes it harder for people to identify what bins to use for what materials. He also believes that some people might think that what they do by separating their materials does not make a difference in the end. A third reason Clark has such a low diversion rate for recycling is because of the lack of education about what materials go where.

Composting

On average, Americans generate about 210 million tons of solid waste, each year. Over half this trash, 57 percent gets placed in landfills. About 56 million tons (27 percent) is

recovered through either recycling or composting, in the case of organic waste. Composting is a method for treating and reusing solid waste, therefore diverting it from landfills. Microorganisms break down organic materials to a point where they can be safely stored, handled and reintroduced into the environment. Composting is an essential part of reducing household wastes. It can be done inexpensively by every household and produces a product that can benefit the environment as a natural fertilizer for gardening or farming.

Composting at Clark University began in the spring of 2006 as a student led group project and focused mainly on the waste coming from Clark Dining Services. In 2007, the project was taken over by the Sustainability Task Force, a group of administrators, students, and faculty members that makes recommendations to the President of the University in regard to sustainability. They attempted to have three Earth Tubs installed at Clark. An Earth Tub is a small scale, on-site composting system for recycling organic materials. Complete with a bio-filter for odor management and control, an Earth Tub system provides a neighborhood-friendly and efficient composting technology. The system has been developed specifically to meet the composting needs of universities, schools, restaurants, cafeterias, hospitals, multi-unit residential homes,

Composting	Trash
Napkins, plates, straws and straw covers, forks, knives, and spoons, sauce containers, sugar packets, coffee stirrers, hot-drink cups, coke cups, to-go containers, and fruit	Cup tops, honey packets, snack bags, candy covers, sushi containers, salad containers, sandwich containers, juice containers, cereal containers, cupcake containers, chip bags, and saran wrap

Table 3-1. Products from the Bistro that can be composted and those that cannot.

and camps. However, the Earth Tubs were not successful at Clark because of insufficient space on the loading dock, and odor issues, which became a problem because of their proximity to the Admissions Building.

Clark University has recently really begun to focus on how our campus can become more sustainable through composting. Through our efforts in The Bistro, turning almost all excess food, utensils, flatware, and cups, and napkins into reusable material, we have increased the amount of materials that can be composted on campus without any significant net cost increase. We began using compostable cutlery and service ware, called Spud ware, and we installed new bins for composting. Spud ware is cutlery made from 80 percent potato starch

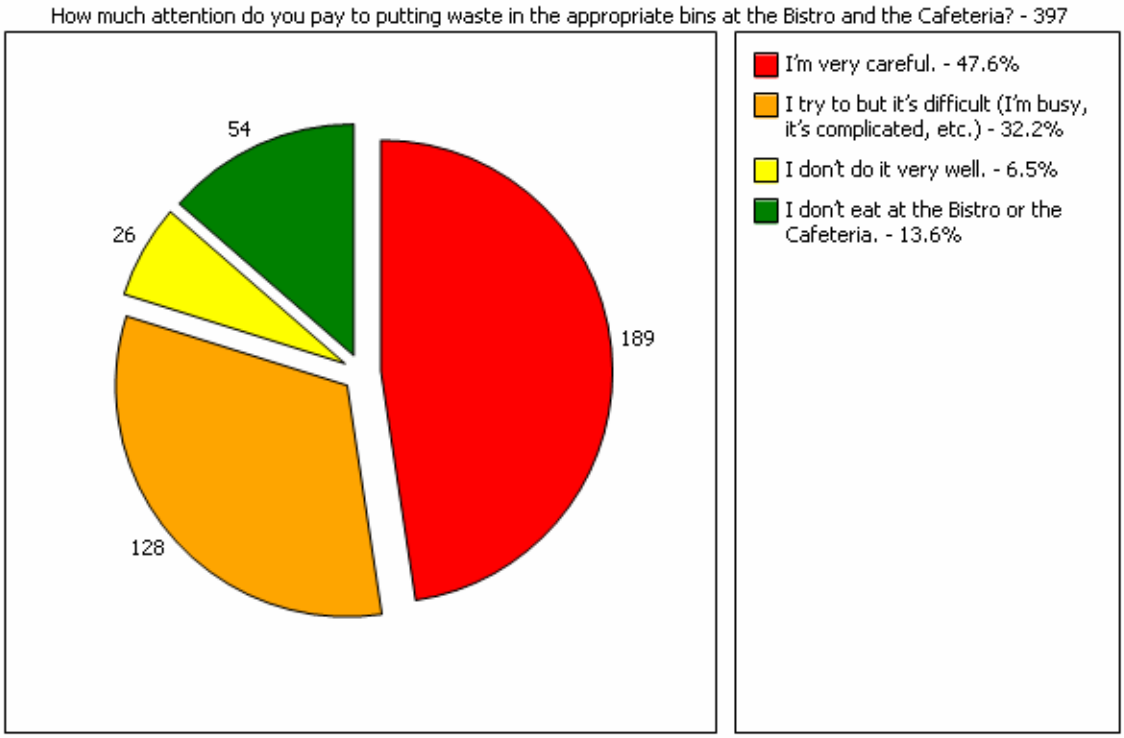

Figure 3-1. Survey question response. Of the respondents who eat at the Bistro or the Cafeteria, 49% say they are very careful about recycling their waste appropriately, and 92% are either very careful or at least try to manage their waste appropriately.

and 20 percent soy oil. They are just as strong and easy to use as plastic cutlery. Clark also collects compostable materials from the excess food from food preparation, post-consumer water, and from containers within the building. We send our compostable waste out from The Bistro to the We Care Composting Facility, because we do not yet have the means to be a self-sustaining composting facility. The large sign in the Bistro about what can be composted and what cannot is also extremely helpful to those who are unsure about what they can compost and what needs to be thrown in the trash. Since it's beginning, the composting program at Clark has offset 44 percent Clark's total daily trash.

All biodegradable material from the University Center, including Higgins Café, and animal bedding from the Lasry Center of Biosciences, is also compacted and hauled to Marlboro, where it is composted by We Care Environmental. At We Care, the waste is put into large bins where it is composted for about a week. Anything that is not composted by this time is taken out and then sent to landfills. The finished compost product is rated as Class 1 compost, which meets the standards for unlimited distribution. This means that it can be used for anything except health related issues. Clark then uses the compost as mulch on the campus grounds, thus closing the waste loop. From there, any trash created from yard and landscaping waste created on campus is composted at the Hadwen Arboretum.

E-waste

Every day, millions of people across the country dispose of their unwanted electronics improperly and unwittingly contribute to environmental degradation. From cell phones to mp3 players, and from old computer monitors to outdated televisions, countless of these products are disposed of in an irresponsible manner. The most important reason to dispose of this

electronic waste (e-waste) properly is that most electronic devices contain heavy metals that can be harmful to the environment and living things. Many times, electronics are mixed in with other waste and taken to landfills, where they are simply buried and forgotten about. Often, the heavy metals and other harmful components inside of these electronics can be washed out into the soil and streams by rainwater. These metals end up polluting the ecosystem and contaminating water. By properly disposing of and or recycling electronic waste, people can greatly reduce the negative effect that they have on the environment and can improve the lives of themselves and others by donating old and unused electronics.

According to Dave Schmidt, sustainability coordinator at Clark, we are doing a great job disposing of our e-waste. However, Clark mostly just pays for its e-waste to be disposed of by other waste management services. Due to certain regulations and restrictions, Clark must, by law, pay to have harmful electronic waste disposed of separately and properly. This means that Clark cannot mix its electronic waste with the rest of its waste. As a university, Clark follows the appertaining electronic waste management laws. Clark however should seek to spend less money on the disposal and more on the recycling and reuse of old electronics. This can be achieved a few different ways. One way to spend less on disposing of electronic waste is by donating it. Taking a more cradle to cradle based approach by donating old electronics would not only help the community, it would be fiscally beneficial for Clark. The truth is that although the problem of electronic waste management and disposal is a growing one that must be confronted, as of now, there is not that much that Clark can do to change current electronic waste disposal practices.

SUGGESTIONS

Single stream recycling would aid in Clark's efforts to recycle more materials and at a greater level. Under single stream recycling all materials that can be recycled are collected into single mass storage units, and are hauled off to be sorted by a larger distributor. This would boost all recycling on campus, including paper. However, due to the current economic downturn single stream recycling does not look as viable as it had been in the past. A switch to single stream may be the best method to reach sustainability, but financially it would be a burden on the university; each ton of single stream waste would cost Clark money, as opposed to earning a return (Schmidt 2008). This is a further example of the balance that must be struck between finance and moral responsibility within an institution seeking to become more sustainable.

More bins can be placed throughout campus in order to increase both awareness and ease in recycling paper products. Currently there are paper-recycling bins in the halls of all dorms, throughout the UC, in all computer labs, and sporadically in classrooms. Bins like those found in the Higgins University Center (which have containers for waste, compost, paper, and bottles) would be optimal in order to net the most paper waste (Schmidt 2008). However, these bulky containers do not fit in dorm hallways easily; so single type bins are used.

Further education is needed to avoid contamination in paper recycling bins, as well as create awareness of what can and cannot be recycled. If possible each paper bin should have a sign indicating which items are recyclable, but this is hard to maintain. Contamination is a greater problem in recycling paper because often food items or other materials ruin the paper already in the bin, destroying all potential for reuse (Clark University Recycling Center 2008).

Beyond recycling, paper can be easily diverted from becoming instant waste through reuse. If a paper product can be used to its maximum capacity or to its natural end, before it is recycled or composted, it aids in the conservation of resources as well as reduces costs for the university. For example, if a student prints out something and then realizes that they don't need it, they decide to use it for scrap paper or use the other side instead of recycling it right away.

In order to drastically cut down on paper use Clark should be creating incentives for professors to go fully paperless, making full use of the Black Board and Cicada systems. Publications on campus such as the Scarlet or Stir magazine could aid in Clark's overall sustainability campaign by going fully paperless via the Internet and e-mail. Often times these publications are excessively printed beyond readership, and stacks of them end up being recycled without ever being read. Unfortunately, neither publication has agreed to go fully online, due largely to the aesthetic qualities of paper (Schmidt 2008).

In addition to double sided printing in labs, ITS may find it helpful to create a system in which students must confirm their wish to print before the printer begins. This may prevent many accidental printings. Charging for printing also seems a viable, but somewhat unpopular option. If each student had a set limit of pages per semester, after which printing would require payment, the program may work. A suggestion for reusing scrap single-sided printings would be to bind them into notebooks for sale to students. Clark would support the labor efforts by work-study students.

Clark should seek to spend less money on disposal and should find ways to recycle and reuse old electronics. This can be achieved a few different ways. One way to spend less on

disposing of electronic waste is by donating it. Donating old electronics would not only help the community, it would be fiscally beneficial for Clark because it would lower the amount of money we spend disposing of these electronics. There are many organizations that take and distribute cell phones to those in need, so it would not be difficult to make a partnership with one of these organizations. While it may seem like "dumping" our old electronics on some other organization is irresponsible, it is important to keep in mind that many organizations have standards of quality for the donated items that they accept. Furthermore, there would be other benefits to donating old electronics. We could possibly deduct the price of the electronics from Clark's taxes and could make valuable contacts with organizations in the community where Clark students could volunteer. By doing this, Clark could save money by spending less on disposing of e-waste and could also become more involved in local organizations and charities.

Clark's Campus Sustainability Coordinator, Dave Schmidt, suggested that a Clark student led initiative to collect and consolidate the student body's electronic waste, would be beneficial. He says that students could create there own e-waste recycling bins to put in the entrance ways of each residence hall, using cardboard for the bins instead of more expensive plastic.

An improbable, but ideal e-waste recycling/reception setup would be to have multiple receptacles in the Higgins University Center, each with its own designated item to receive. For example, one receptacle could be for cell phones and mp3/cd players, one for used batteries, and one for miscellaneous electronics.

One way to improve recycling efficiency on the campus and in the recycling center would be to hire a full-time manager. Even though David Schmidt, as the Campus Sustainability Coordinator, looks over the program he only spends about 30% of his time on the recycling center. Hiring another manager would relieve some weight off of this position and help recycling become more efficient. Another way Clark could reduce its waste is by not purchasing plastic bottles that are numbers other than one and two. There are not enough of the other numbers to produce a return in recycling, so they are thrown in the trash. So if Clark stopped purchasing those plastics then they could reduce the amount of waste they have to pay to remove from campus. Another improvement Clark could make is creating a plastic bag collection. They could set up and area for the collection and then return them to Price Chopper or any grocery that will take plastic bags for reuse.

One long-term utopian idea would be to expand the recycling center because if there were more space they would be able to collect and reuse or recycle more materials. Because of the economy right now it is not feasible but when the markets improve maybe that option will come up for Clark. Another option would be to purchase a machine like St. Olaf College that produces fertilizer from composting material that can be used in community gardens.

Although there is quite a lot that Clark University is doing by way of composting, there is still a lot more we could be doing. One large thing that would be really helpful is putting composting bins in all the dorms. As of right now, most dorms have recycling, cardboard, and trash, but not composting. This would catch a lot of waste and turn it into something more sustainable, and it would also promote composting more on campus. It would not only compel more students to compost, but make more students knowledgeable about composting as well.

It would be essential to have signs detailing what can and cannot be composted. Another thing that we could do is compost the paper towels from the bathrooms on campus. All of these paper towels get thrown into the trash, but they could easily be composted. Clark could use the same kind of receptacles as in the bistro but improve them so there is not a problem with odor.

Clark has many more options for composting, but these actions would be much harder to implement on campus. The most obvious way that we could improve our composting system is to make Clark a self-sustaining composting facility. This would entail composting on-site and then using the compost to fertilize our green space or possibly to start up a campus garden. However, this is hard to implement because it would be very expensive. It would be expensive because Clark would have to pay for more space for the earth tubs or we would have to buy more space for an entire composting facility. It would also be hard to implement because Clark would need more full-time staff. Also, one big problem for Clark's campus is that there is not much space for such a facility. Our urban campus is already using much of its space, and the reason that the Earth Tubs did not originally work out was because they were too close to the buildings on campus. So it appears that a fully integrated composting and fertilizer facility on campus would be difficult to implement.

Chapter 4: Governance and Decision-Making for Campus Sustainability

By: Nick Winchell, Emily Schweitzer, David Rée

INTRODUCTION

The governance and administration of a university is crucial to enabling the institution to make the changes necessary to meet sustainability challenges. As non-profit, public-interest institutions, colleges and universities are looked to for new and developing knowledge, information, and habits. They are looked to because they are institutions of learning, and their central function is to cultivate knowledge and understanding. The institutional framework of colleges and universities and the life within these institutions can be seen as a microcosm of the world. Solutions to the challenges of sustainability which are applied within this microcosm can potentially be applied on a broader scale. Thus, it is very important for them to be leaders in responding to sustainability challenges.

The governance and decision-making process at any institution defines how it is run. This structure and the way it functions determine how any action is processed and how institutional change can occur. At the University level, this structure is comprised of a specific, hierarchical administrative body comprised of numerous administrative posts, boards and committees.

During our research, we found that there were five primary bodies which influenced change on campus: the administration, staff, faculty, students, and external effects such as the economy. In examining the institutional structure of universities, as well as information from

interviews, we were able to understand the dynamics between these groups on campus, and how each influences the decision-making process. While the administrative positions have direct authority over all major financial and other decisions, impetus for change is often sparked by faculty, staff and students.

In order to better understand the ways in which institutional organization at the university facilitates effective governance and decision-making for sustainability, we researched government and decision-making at other colleges as well as at Clark University. In researching other colleges we gathered information from their websites and contacted various staff and administrators who played roles in sustainability at their respective colleges. At Clark, we conducted interviews and created surveys to better understand the administrative processes and how these affected and addressed sustainability on campus.

While Clark has put an effort into environmental sustainability over the course of its existence, there are still many things which could be improved. After comparing and contrasting our findings, we have come up with suggestions that could improve governance and decision-making for environmental sustainability at Clark. This section of the report begins by discussing sustainability practices and investment at other colleges, followed by our research on Clark and a section on suggestions for improvements and additions. Data will be included throughout the latter part of the document.

GOVERNANCE AND DECISION-MAKING AT OTHER COLLEGES

Connecticut College, Middlebury College, Union College, Wheaton College, and Whitman College are all relatively small, top-performing, liberal-arts schools similar to Clark University.

These schools were researched in order to develop a better understanding of sustainability practices on other campuses in comparison to those at Clark University. We noted that most of these schools have many common sustainability efforts such as student involvement, groups, committees, sustainability staff, campus initiatives, and investment policies. In researching other colleges of similar size and orientation, we were able to understand different ways in which sustainability is and can be implemented on campuses and were also able to develop ideas for ways in which Clark University can improve its sustainability efforts.

Groups and committees

While investigating the institutional structure and functioning of other colleges with regards to sustainability, it became evident that each college had a sustainability group comprised of students, faculty, staff and the administration. While the purposes of these groups are not all exactly the same, they all work towards increasing and maintaining sustainability on campus. At Whitman, the Conservation and Recycling Committee meets on a regular basis, acting as a generator of ideas for campus sustainability, as well as a forum for suggestions and ideas regarding sustainability. At Middlebury, the Environmental Council is comprised of "students, staff, and faculty which advises the president on sustainability policies…, and provides incentives through a grants program for students, faculty, and staff to keep sustainability at the forefront (Middlebury 2008)." Middlebury also has a Sustainability Integration Program run by a team of full-time staff, which ensures that the college follows 'best possible environmental practices' on any and all possible cases. At Union College, the U Sustain program plays a major role on campus. The Goal of the program is to reduce the ecological footprint of Union College and make the institution more sustainable. At Wheaton, the Eco Club focuses on environmental

consciousness and engaging the Wheaton community in learning about sustainable living. The Environmental Model Committee (EMC) at Connecticut College focuses on developing programs and policies that integrate sustainability into all aspects of campus life to encourage sustainable living habits that students will carry with them throughout their lives.

Student involvement

We found that student involvement is an essential component of sustainability initiatives. At Whitman, a group called the Paper Campaign compelled the college to begin purchasing 100% post-consumer recycled paper and to stop the use of paper towels in bathrooms. Students have also been active in environmental investing, voting to increase their tuition by five dollars to invest in alternative energy. Students in the Campus Climate Challenge group are also working towards getting a green-house gas audit, which the President views as necessary before he signs the Presidents Climate Commitment. Taking an active role in sustainability initiatives, Middlebury students pushed the College to commit to Carbon Neutrality by 2016. This plan was drafted by students who had it approved by the board of trustees. At Wheaton, an ECCO (Environmentally Conscious and Community-Oriented) house was created as part of theme housing for the 2008-2009 academic year. The goal of the house is to encourage and educate the Wheaton community about the ecological, spiritual, social, and academic aspects of living sustainability. Student-led groups at Connecticut College include Students Against Violence to the Environment (SAVE), Sprout!, a sustainable organic gardening club, and the Renewable Energy Club.

At Middlebury, in addition to a large website publicizing all of their current and past initiatives, they also had an easily accessible feedback box for students to leave comments, suggestions and/or questions about sustainability issues on campus (Middlebury 2008).

Staff and other positions

Faculty and staff play a significant role in sustainable decision-making and initiatives with regards to the administration. Within each college that we studied, change occurs with the help of a sustainability coordinator, student representatives or interns, and involved staff members (serving on on-campus sustainability committees or groups). Whitman College, Middlebury College, and Connecticut College have sustainability coordinators, Union College has a recycling coordinator, and Wheaton College has several staff members involved in related committees and groups. In 2008 Whitman hired its first Campus Sustainability Coordinator (CSC) Intern, a paid position working ten hours per week. The CSC works closely with the administration, students, and faculty. The school is also looking to make the CSC intern into a full-time staff position. The Director of Sustainability Integration and the Sustainability Coordinator are fulltime jobs at Middlebury, promoting environmental initiatives across campus. The Sustainability Coordinator at Connecticut plays a very active role in facilitating sustainable initiatives; she has supported campus-wide environmental efforts, and "coordinates events around energy conservation and efficiency, renewable energy, waste minimization, recycling and other areas (Connecticut, 2008)."

These colleges have several paid jobs and/or positions for students, faculty, and staff that promote and facilitate sustainability on campus. At Middlebury there is a committee of representatives from each residence hall which deals with sustainability. Connecticut College

has a similar program called House Environmental Representatives (HER) in which one or two students are appointed each year to promote and educate residence halls and houses on environmental issues and encourage environmentally friendly living within the houses. The Building Environmental Representative (BER) is a voluntary staff position. Serving in one year terms, the staff or faculty member in this position acts as an environmental steward. They help and advise their colleagues on environmental issues as well as help coordinate the construction and reparation of buildings.

The jobs and positions held by faculty and staff (and hired students) and the roles they play on campus make them significant components of sustainable decision-making and initiatives in the administration. It seems that having very involved faculty and staff as well as an administration that creates jobs and positions for students is very conducive to sustainable change on college campuses.

Investments and funds

Investing in campus initiatives is a key theme in sustainability practices. Many colleges have revolving funds that fund sustainability-related projects on the condition that they will break even in a given amount of time. Revolving funds and investing in sustainability has not been a common theme of sustainability in the last decade, especially in smaller schools with lower endowments. Among the schools that we studied, revolving funds seem to be becoming increasingly popular. At Whitman College, students decided to increase their tuition by five dollars to invest in alternative energy. In addition, the President of Whitman College has now agreed to plans to approve a $100k revolving green fund. They plan on looking for lenders in the fall of 2009. Some colleges differ; according to the College Sustainability Report Card,

Middlebury "aims to optimize investment return and is currently invested in renewable energy investment funds or similar investment vehicles." While Union college has no investment policy, they do have a revolving fund for grass roots-level projects proposed by students, faculty, and staff, the funding of which is $48,000 over three years. Wheaton is lagging in terms of sustainability investment and sustainable project funds. The students, however, have significant influence on how the school invests. In 2007, after a large student effort, Wheaton trustees decided to divest from the endowment in companies associated with or conducting business in the Sudan.

Close to no information was available online regarding the investments of the colleges that we researched. However, we were able to find some information from the College Sustainability Report Card website, which shows that most colleges 1.) are not very transparent at all regarding their investment practices, and 2.) if they do disclose any information, are not very concerned with either shareholder engagement or sustainability issues. This is not true of all colleges, as evidenced in Table 4-1 below.

College Sustainability Report Card: 2009			
Colleges	Endowment Transparency	Investment Priorities	Shareholder Engagement
Connecticut College	F	C	F
Middlebury College	D	A	A
Union College	B	B	F
Wheaton College	D	A	C
Whitman College	F	C	F
Clark University	A	A	A

Table 4-1. Grades in selected categories of the 2009 College Sustainability Report Card, available at: http://www.greenreportcard.org/

It is interesting to observe that Clark University scores better than any of the other schools that we researched. Reasons for this high rating will be discussed later in this document (see pg. 16-17).

GOVERNANCE AND DECISION-MAKING AT CLARK

Through interviews and surveys we were able to explore the power dynamic and relationships among students, faculty, staff, and administrators with regards to decision-making around sustainability issues at Clark University. It was critical to interview and note the responsibilities of those perceived to have influence over and/or a key role in decision-making at Clark. President Basset, Dave Schmidt (sustainability coordinator), Jim Collins (chief financial advisor), Jennie Stephens (IDCE faculty member), and Kevin Forti (residential life and housing) were interviewed, while David Angel (provost), Paul Bottis (head of physical plant) gave us presentations on their work on and around campus. The duties of student representatives on committees were researched using secondary material. Through this process we were able to learn of the roles, abilities, achievements, and struggles/challenges of various members of the Clark community. Through surveys we were able to reach out to students at Clark and gather feedback from them about their understanding of how sustainability is being addressed on campus. In addition, David Schmidt, the sustainability coordinator, has provided us with data on energy use in the residence halls. By examining student involvement, the roles of faculty, staff and administration, and university investments, an understanding of how the various forces contribute to and influence decision-making has been generated. In order to make

environmentally sustainable change, it is necessary to understand the current governance system, how it functions, and the various power relations that exist within.

Groups and committees

There are two primary groups which deal with sustainability on Campus: The Clark Sustainability Initiative (CSI) and the Clark University Environmental Sustainability Task Force (CUES).

Established in 2006 by President Bassett, CUES is the group on campus with the most influence on the environmental decisions made by the administration. It is comprised of students, faculty, staff and administrators, and is chaired by the Provost. This group's mission is quite expansive, and includes mandates to "promote environmental sustainability at Clark by increasing awareness of environmental and sustainability issues on campus, researching environmental impacts of University activities and making recommendations for improvement, and coordinating activities related to the environmental sustainability of the University (Clark 2008)." This has grown to include coming up with a plan for how Clark is going to reach carbon neutrality by 2016 in order to meet the goals of the President's Climate Commitment (PCC). CUES meets once a month and has accomplished some of the goals mentioned above; however, some members of the task force are uncertain about their core mission and appear content to only work on a plan for carbon neutrality. While this is a project of utmost importance, it seems that there are other pressing issues on campus which could be addressed by CUES as well.

CSI is a student-led sustainability organization on campus. They are a non-hierarchical group made up of a core of students who rotate roles and responsibilities in order to distribute the workload and responsibility to all those who wish to be involved. Ashely Trull, a member of CSI,

holds a seat on CUES which serves as a means through which students can have their voice heard by the administration.

CSI is a very active group, working on initiatives such as the Bike Share program, which aims to provide bikes for all students around campus, and pressuring the administration to act on issues that they find relevant, such as signing the PCC. All of their activities are grass-roots level, and getting approval from the administration to go ahead with larger projects is a very laborious process which involves a huge amount of commitment from group members. Some members have many ideas of how to improve sustainability on campus, such as enlarging or re-vamping the co-gen plant, but do not feel that their efforts will come to fruition. When interviewed, the students seemed to feel that sustainability is a priority on campus. They acknowledge that there are a few very active faculty and staff, but there is a bit of a frustration with the speed of change in the administration. Despite the President's Climate Commitment being signed in June 2007, some students feel that real change has been slow to follow.

Student Involvement

Student Involvement has always been a key factor of sustainability at Clark University. Throughout Clark's history, students have been a driving force in the implementation of sustainability practices on campus. Most of these initiatives began as student-run-projects and many have evolved into work study positions for students or as formal initiatives overseen by a staff member. Some projects which were started and/or conceived of by Clark University students include the recycling program, the construction of the cogeneration plant, the bike-share program, pushing for the signing of the President's Climate Commitment, and the dorm vs. dorm competitions. Currently, all of these projects have become important and prominent

practices on campus. Students, often working through CSI, were the main reason for the implementation of these sustainability practices.

At Clark University, students who are interested in sustainability on campus can also take environmental courses in order to become more educated about sustainability, or take part in CSI (Clark Sustainability Initiative), the on-campus student-led sustainability initiative.

Students have held prominent roles in sustainability on campus in the past and present. Other than CSI and classes that address sustainability, students do not have any other clear means for making change on campus with regards to the sustainability practices. However, the administration has proven to be very supportive of many student-initiated sustainability projects such as recycling, composting, and the bike-share program.

According to Ashley Trull, a student-member of CSI, the school is trying to make sustainability a priority, but feels that it is moving towards the goals of the recently signed President's Climate Commitment at a slow pace due to the bureaucracy of the institution. Ashley also believes that students are one of the biggest "push forces" for change, and that "there is great potential for positive collaboration between student initiatives and the administration."

Staff and other positions

Campus Sustainability Coordinator

David Schmidt is the Sustainability Coordinator at Clark. As such, he is in charge of the recycling center, works with energy management on efficiency, and is responsible for general sustainability awareness and initiatives on campus. Schmidt is also involved in physical plant projects such as measuring electricity consumption in buildings. He collects and analyzes data to monitor campus energy use and to gauge what and where action should or needs to be

taken. While he is a member of CUES, Schmidt does not have much power in terms of decision-making. He is more involved with the technical pieces of projects such as data collection; however, this does ultimately feed into the decision-making process on another level. While he does not directly influence decision-making at the administrative level, his collaboration with others provides the data that feeds into the major decisions at hand. Schmidt is also an advisor to the Clark Sustainability Initiative (CSI), the student environmental group on campus.

Faculty

While this section focuses on only one professor, there are many on campus who are actively engaged in sustainability. Professor Jennie Stephens has come into contact with governance and administration in her teaching, research and advocacy of sustainability at Clark. As a professor in the Environmental Science and Policy program within the International Development Community and Environment (IDCE) department and as a teacher of courses such as Sustainability Science and Sustainable University, she has been active in integrating important, real life issues into her curricula. Her goal is to challenge student's simplistic assumptions about environmental problems and to encourage students to understand the complexities of both the cause of and potential solutions to sustainability challenges. The IDCE department at Clark focuses on real world problems and international challenges. Within IDCE, faculty are encouraged to and have the ability to integrate sustainability and environmental awareness into their courses. In general, however, while professors can occasionally incorporate sustainability into a lesson or project, Stephens believes that this theme could be at the essence or core of all academic programs; some colleges and universities have adopted education for sustainability as part of their core mission. As a professor, Stephens can

contribute to governance and decision-making through teaching, research, and service to the university. Since student activism is essential to bringing important issues to the administration's attention, more informed students are helpful and also students who are skilled communicators and have learned about effective ways to promote social change are valuable to the community. As a result of being on CUES, Stephens is involved in, able to influence and vote on prospective sustainability initiatives on campus, most of which currently are in connection with the Presidents Climate Commitment. While she is connected to the administration through CUES, Stephens feels that most of her influence vis a vis sustainability is through education and increasing the knowledge-base and skills of students who want to engage in promoting social change toward a more sustainable society. She also is involved outside of Clark University in an international network of colleagues who are interested in promoting the role of universities in promoting sustainability.

Executive Vice President

As the Executive Vice-President, one of the heads of construction, physical plant, operations, recycling, compost, trash removal, and finances, Jim Collins has many roles and responsibilities as well as significant influence on campus. As the chief advisor, there are many individual department heads that carry out the tasks that he oversees and report to him on their progress. By having a position on CUES, Collins is able to influence the planning and implementation of the carbon neutrality plan for the university as dictated by the Presidents Climate Commitment. The business manager at Clark also reports to him regarding the purchasing policy of the university as well as food service contracting. While he knows a lot about Clark's investments and has some influence over it, he does not directly decide where the University's endowment

is invested. As a staff member on the investment committee of the board of trustees, he does help to create the investment policy. As the chief financial advisor, Collins has influence over the budget and therefore has some say in where the money goes. This is an important decision-making position with regards to sustainability initiatives because the economic costs and benefits of renewable energy are a large factor in whether or not universities invest in them. Finances are at the core of any institution, and having influence over such funds is a significant responsibility.

Director of Physical Plant

Paul Bottis has been the director of physical plant at Clark since 1985. He takes responsibility for all of the daily maintenance of the university, management of utilities production and operations, telecommunications department, and rental properties. As head of physical plant, Bottis has oversight of energy use at Clark. As a result, he is very involved in the construction of new buildings and searches for ways in which to cut down on energy use. In addition, he is the project manager for construction projects and new buildings at the university, two of which, the Lasry Bioscience and Blackstone Hall, received LEED (Leadership in Energy and Environmental Design) Gold and Silver certification. While he does not personally carry out these tasks, as head of physical plant, Bottis directs the energy use in buildings on campus. In order to reduce energy consumption, the heating system is on a timed schedule, programmed to turn on at specified hours when rooms are in use, and to turn off when they are vacant. Buildings and construction projects at Clark have large implications in our energy use and it is important to be able to execute such projects with the least environmental impact possible. As the project manager, Bottis has influence over the sustainability of the

construction and design of buildings on campus. Bottis is also a member of CUES, however does not attend regularly as Tom Wall and David Schmidt, other members of the department, are present at the Task Force meetings. With plans for future expansion of the campus, it is crucial to have someone to facilitate sustainable development as well as make rational choices with regards to what types of energy are used.

President

John Bassett is the president of Clark University. His responsibilities include representing the school to the outside world, going to conferences, heading capital campaigns, and managing external affairs and relationships of the university. Although Bassett is responsible for many of the external affairs of the University, he remains involved with initiatives on the campus, often through the work of deans and vice presidents. As president of the university, Bassett signed the Presidents Climate Commitment in June of 2007, which played an important role in underlining Clark's work with environmental sustainability. Agreeing to the terms of the policy forced the administration to formalize previously informal sustainability practices and initiatives at the university, and back them with official documents. While the president is mostly charged with representing Clark off-campus, he has played an integral role in sustainability initiatives at the university.

Provost

As Provost and Vice President for Academic Affairs, David Angel has many duties. Working with faculty and staff, this position entails the oversight of most activities, projects, initiatives, etc. that relate to academic and student affairs on campus. The difficulty arises in the breadth of responsibilities he has, and the wide range of interests he has to take into

account before proceeding with any plans. With a background in economic geography and environmental issues, Angel is very conscious of the significance of sustainability on campus. However with multiple and sometimes competing needs and interests on campus he must weigh the priority to be given to sustainability relative to other commitments of the University. As the head of CUES he has a significant influence on environmental policy and initiatives on campus, specifically aiming to uphold the Presidents' Climate Commitment to become carbon neutral.

Investments and funds

Sustainability in Investment at Clark is not a top priority. While there are some efforts towards investing sustainability, these are all based on either student pressure or the interests of those serving on the Shareholder Responsibility Committee, or the Investment Committee; there is no formal policy urging sustainability in investment. The goal of those involved in investing is to get the best returns. If that happens to mean investing in sustainable technologies or companies, then that will be done. However it will be done for primarily financial, not ethical reasons. Clark invests in renewable forests and some alternative fuels amongst other things, but also invests some in conventional fuels.

Clark is as transparent as it can be about its endowment, if any questions are asked. No information is readily available (e.g. online), and all must be asked for from the right person, making it slightly more difficult to access. The university controls about 80% of its endowment money, the remaining 20% being invested in companies which don't disclose who or what they invest in. Details on investment are given out feely for the monies that Clark controls (80%), however they are not published on the web as that effort has not been made yet.

All final investment plans are voted on by the Board of Trustees (BOT). A committee of this Board, the Investment Committee (IC) decides who and what to invest in. The IC is influenced by students, the members on the Board, those of the Committee on Shareholder Responsibility (CSR) and outside influences such as the economy. The CSR is comprised of members of the Board of Trustees, administrators, faculty and an undergraduate student representative on each committee. The CSR "deliberates and makes recommendations or decisions, on proxy votes" (College Sustainability Report Card, 2008), giving all shareholders a say in the investments. Amongst most of the administration there is a general lack of knowledge and interest in understanding how our endowment is being invested. Everybody seems to trust the judgment of those on the Board of Trustees and its respective advisory committees.

When comparing Clark to the other universities that we researched for this report, it quickly became evident on the College Sustainability Report Card that Clark far out-performed other schools in terms of investment (see page 7). This is largely due to the level of transparency which exists, as well as the existence of the shareholder committee, which holds a student as one of its members and has a history of making decisions and recommendations based on proxy votes.

Conclusion

Clark University has been acknowledged for being progressive in tackling sustainability issues. As the world becomes increasingly concerned about the environment and future, Clark University realizes that it must be a role-model for implementing changes to meet sustainability challenges at the institutional level. Clark University has made recent efforts towards sustainability, one of the most noteworthy being the signing of the President's Climate

Commitment in 2007, for which the university must establish and commit to a plan by 2009 to become climate neutral by late 2016. All of these decisions are made through the dynamic processes of the administration and its influences such as the need to respond to ongoing changes and pressures from outside the university (the environment, economy and society), students, faculty, people who work in physical plant and other offices.

We believe that Clark is well positioned to make more changes towards sustainability. There is great global pressure for any and all institutions to change, as exemplified in the current student body. However, change must not only come from the grass-roots, student level, and in order to implement the best possible change, a significant amount of action needs to, and can be, taken by the administration. Most institutions, including Clark, were not created with sustainability in mind. Business as usual needs to be changed in order for the entire campus to become truly sustainable. This is a very difficult transition to make as it requires fundamental changes to the framework of the institution.

RECOMMENDATIONS

Residence Hall Sustainability Representatives

This idea was taken from Harvard University and Middlebury College, both of which have similar programs. The purpose of Residence Hall Sustainability Representatives (RHSR) is to incorporate sustainability into the daily lives of students in ways that are relevant to their lifestyles. Promoting sustainability outside of the classroom is another way in which the consciousness of students can be raised about environmental issues and how they relate to their lives. Having a representative in each residence hall also allows for students not taking

environmental courses to become more aware of the importance of sustainability. This position is a means through which more of the Clark community can become engaged with and educated on sustainability.

- *Responsibilities of RHSRs*: Raise awareness, educate, and encourage are the core actions of the RHSR. To promote sustainability throughout the residence halls, they could: create posters and other means of publicity that inform students on specific issues relevant to sustainability; hold educational events, such as films or information sessions; to serve as individuals who students could approach if they had questions regarding sustainability; work in conjunction with RAs to conduct residence hall programs; hold intra-residence hall and inter-residence hall competitions to reduce energy; in contact with administration regarding ways in which to make residence halls more sustainable. The representatives of each residence hall would form a committee, the head of which would have a spot on CUES task force. The committee would be a group in which RHSRs could discuss the implementation of their responsibilities in the residence halls.

Additional sustainability coordinator positions

After interviewing David Schmidt (sustainability coordinator) it became evident that there were many responsibilities under this job title. Managing the recycling center, general sustainability and education, and energy management and data projects are the tasks of the sustainability coordinator. It is difficult for one person to put enough effort into all these tasks to fully address and manage them. If this job were divided into three, each managing one of the listed responsibilities, more attention would be devoted to each duty and the issues would be better dealt with. It is important that managing recycling, providing general sustainability education,

and dealing with energy management and other projects each receive significant attention, which can be better done with more positions specifically devoted to each task. The jobs of the sustainability coordinator are essential to our campus and we would benefit greatly and make more progress with more focus on each.

More feedback opportunity from students

If Clark were to interact with students on sustainability and get their feedback, the campus would benefit greatly. The administration of sustainability decision-making and governance would greatly appreciate grass-roots level input for sustainability, as the students are the vast majority of the population at Clark. We recommend that Clark institutes an easily accessible online feedback system, such as that used at Middlebury College so that there can be a more open, convenient flow of information between the student body and that of the administration.

More transparency on investment

Clark is almost as transparent as it can be with its investment policy, allowing anybody who asks to have whatever information they want. However, they do not try to share it. While it is not yet a common practice, a few colleges and universities such as the Universities of Texas in Dallas and Austin, post their investment holdings online. We recommend that Clark post its investment policy on its website; while information is given to those who ask, not everybody knows who to ask, or where to start looking for that person. Posting this information online would increase the ease with which it can be accessed, and therefore the transparency of investment at Clark University.

Work with other universities

Working on sustainability and resource issues with other schools in Worcester, such as Holy Cross and WPI, could prove to be a resource for Clark University. For example Clark could hold lectures on sustainability for the schools of the Worcester-Consortium, and establish relations for creating more sustainable campuses. Clark could also utilize other schools such as WPI to gather information and data related to sustainability. The Consortium could collaborate to purchase sustainability-related items such as solar panels in order to receive discounts which would make the prospect of installing such items more financially feasible.

Make policies and statements of principles concerning actions

It would be beneficial to Clark to create more policies for its sustainability efforts. Clark does much in terms of sustainability, however most of what it does is not done because it is mandated; it is done because it makes sense economically. As evidenced with efforts for LEED certification, when these goals are documented and made into policies, it ensures that all of the details are covered, and that more is done. We recommend that the administration sort through different areas where it has made sustainability efforts in the past and create policies and statements that guide decisions in this area so that when similar situations emerge in the future, the best possible practice can be ensured. This could also help in promoting the school as an environmentally conscious and friendly institution.

REFERENCES

"About LEED Certification." Wheaton College. 18 Nov. 2008 <http://wheatoncollege.edu/science/csii/leed.html>.

Bechtel, Brendan, Sarah S. Goodwin, Bryan Costa, and Suzanne L. Nagi. "A Compilation of Potential Objectives and Strategies to Minimize Campus Climate Impact." Middlebury College. 9 Feb. 2003. 20 Nov. 2008 <http://community.middlebury.edu/~cneutral/es010_report.pdf>.

"Clark University." Clark University. 10 Oct. 2008 <http://clarku.edu>.

"Clark News: Sustainable University." 4 Nov. 2008 <http://www.clarku.edu/alumni/clarknews/fall07/sustainable.cfm>.

"Connecticut College: State of the Environment Report for 2006-2007." Connectic. <http://www.conncoll.edu/green/greenliving/greenlivingdocs/emcannualrpt_2006-07.pdf>.

"Dining With Wheaton." Wheaton College. <http://www.campusdish.com/en-us/csne/wheaton/sustainability/>.

"EMC Accomplishments." Connecticut College. <http://www.conncoll.edu/green/greenliving/7417.htm>.

"Sustainability Committee Homepage." Wheaton College. <http://wheatoncollege.edu/student/clubs/eco/sustainability/>.

"Wheaton Trustees Approve Sudan Divestment Policy." Wheaton College. <http://wheatoncollege.edu/news/2007/05/22/wheaton-trustees-approve-sudan-divestment-policy/>.

AASHE. AASHE. 18 Nov. 2008 <www.aashe.org>.

Union College. 17 Nov. 2008 <www.union.edu>.

Middlebury College. 20 Nov. 2008 <http://www.middlebury.edu/>.

Whitman College. 18 Nov. 2008 <http://www.whitman.edu>.

The College Sustainability Report Card. 2 Nov. 2008 <http://www.greenreportcard.org/>.

Chang, Audrey B. "The development of Stanford University's Guidelines for Sustainable Buildings: A student perspective." By Barlett and Chase.

M'Gonigle, Michael, and Justine Starke. Planet U: Sustaining the World, Reinventing the University. New Society, 2006.

Chapter 5: CAMPUS-COMMUNITY INTERACTIONS

By: Jon Bettinger, Lauren De Levie, Gloria Torres

INTRODUCTION

The way in which the university interacts with its surrounding community is perhaps the most important and most challenging topic that faces Clark University. Sustainability in this context is a future-oriented approach that focuses on the economic and social problems within a community in connection to the environment. Examining sustainability at a college campus allows for a more specific view of interaction between people in a given area. Since sustainability requires a shift in lifestyle, this microcosm of a larger picture is an ideal testing ground for more environmentally friendly practices. The university not only acts as a small-scale spectrum when looking at sustainability, but also as a catalyst for the Main South neighborhood. Pure ecological sustainability is not enough; there needs to be long-term focused relationships with every*one* around us, not just everything.

The alliance that can be formed between an institution and it's surrounding community has the ability to drastically change the ways sustainability can be implemented on college campuses. Partnerships like the one between Clark University and University Park Campus School, which has been featured in national publications, are prime examples of a symbiotic relationship that allows both parties involved to expand their horizons. Clark, a small liberal arts school, recognized for it's research opportunities is an ideal candidate for this type of partnership. Working with Clark, UPCS has been able to set the, "bar is high at this small public high school, and the hurdles are unusual. The school has earned international recognition and

numerous accolades for its ability to take low-performing students and turn nearly all of them into first-generation college-bound teens" (Philadelphia Inquirer, *Clark U. Helps Make Mass. High School A Success*; March 21, 2008). This form of learning is unlike many other public schools in the area. UPCS forces their students to not just find the right answer, but to understand how they got there. The partnership formed not only allows students from Worcester to get a great high school education, but also have the option of a higher education at Clark if they so chose.

Unlike other communities, the university has a unique ability to both educate people, and to take them from familiar surroundings. When there is constant movement within classes as students graduate, and come in as first year students new types of communal relationship are formed. This characteristic has the capability to nurture a new sustainable lifestyle, but obstacles within the institution must be overcome. In many cases, the prestige of an institution is what sets the guidelines and targets regarding the urgency of priorities to the university. It is important to recognize that "the standard measures for educational quality will have to be changed to account for how institutions and their graduates affect the biotic world" (Orr; *Rethinking Education*, Part Three). Most importantly, the balance between growth academically and sustainability practices must be considered in conjunction with the interests of the community.

When discussing the ways in which an institution can engage with the community, capacity building programs that benefit both parties are an obvious choice. Implementation of a program that does anything less than raise the capacity of both parties involved would not have a permanent footing in the community-building process. This type of partnership has the

ability to implement positive cycles of people from within the neighborhood using resources, working hard and going back to the neighborhood. This perpetual cycle aids recruitment and encourages qualified individuals to stay within the community rather than relocating. Although programs such as these are crucial when discussing the influence that a university can have on the surrounding community, the philosophical message that is sent can be just as influential. This type of message that can be sent to the community is a key part that acknowledges the fact that as long as a partnership is built, innumerable changes can be made.

This section will examine the connections between Clark University and the surrounding areas of Worcester. Clark has an active and engaged student body as evident by the many student interest groups along with survey results that looked at their view on the current state of community service. Changes are constantly being made, and the tides are turning toward a more sustainable lifestyle.

CAMPUS-COMMUNITY INTERACTIONS AT OTHER UNIVERSITIES

Before examining the campus-community relationship of Clark it would be helpful to get some perspective of what other comparable schools are doing. This will help give Clark's own actions and policies some context, which helps us examine it more thoroughly.

One important aspect of campus-community interaction is some sort of office of community interaction, an administrative branch that can reach out to the surrounding community on an institutional level. Trinity College has an Office of Community Relations (OCR), of which the main goal is to maintain positive relations between the campus and community. The OCR works with locals to figure out the city's most pressing issues and help make changes. For example, in 2007, the OCR helped with the opening of the Koeppel Community Sports

Center, where more than 10 community groups and 1,000 Hartford schoolchildren participate in skating programs. Yale University, in New Haven, CT is similar to Trinity in that it also has an office dedicated to the surrounding community: the Office of New Haven and State Affairs. The main purpose is to support and make its resources available to public schools throughout New Haven. The University of Chicago has an Office of Community Affairs as well, but they have another office that seems equally important. It is a Community Service Center that facilitates the connection between students, faculty, and staff and organizations throughout Chicago.

One type of involvement that has been gaining popularity over the years is the partnership between universities and local schools. Obviously Clark has a very successful one, but we certainly are not unique in this area. Yale, for one, has a variety of different partnerships with magnet schools in its area. One is between Yale's School of Medicine and the Hill Regional Career Magnet High School. Yale also shares some of its art school's resources, such as facilities, studios, and galleries, to help enrich the curriculum of the Cooperative Arts and Humanities High School in New Haven. Yale also has a student-teacher partnership with about 20 of the local public schools, where aspiring teachers spend two years for about 10 hours a week teaching. Temple has a very strong partnership with local schools as well, which leads to its placing roughly 200 students and 250 student teachers into local schools every year.[1] They also collaborate with the local administration to keep their curriculums strong and relevant.

Another important aspect of community relations is adult education. The connection between education and quality of life is obvious, and by providing continuing education opportunities, an institution is also providing opportunities for locals to improve their quality of

[1] http://www.temple.edu/community/education.html

life. Temple University has an adult literacy and GED program, focused on helping locals pass the GED test, while also building reading and writing skills. Temple is also home to a program known as Move Up, which offers intensive basic education for people on welfare. The idea of Move Up is to get people back on their feet while the literacy and GED program is meant to push people forward. It should also be mentioned that both of these programs are completely free for residents.

Yet another form of community interaction that takes at other schools is department specific service, of which Temple seems to be the leader. The service from students at Temple's Ambler College – which specializes in landscape architecture and horticulture, proclaiming themselves 'Temple's green campus – takes a quite obvious form. Because much of their curriculum is founded on ecological sustainability, they do a great deal of work to improve the environment of the surrounding community, often doing locally specific research and projects. They also hold a summer camp for local children and other various classes throughout the year. The school of music and dance holds free weekly instrumental lessons for approximately 125 kids from the local public schools (50% of whom are bellow the poverty line).

Their College of Engineering has a quite inventive 20 year old program known as Philadelphia FIRST (For the Inspiration and Recognition of Service and Technology) that holds robotics building seminars and hosts robot battles between local high-schools. The geography department has a program known as bITS (Building Information Technology Skills) which educates inner city youth on the use of computers and associated information's systems. One of the motives of this program is to create more interest in science, technology, engineering, and math in some of the under-represented demographics such as African-Americans,

Hispanics, and females. The political science department has a program called VOICES that is said to empower the local urban youth and use their voices for positive social and political change. The Theater department produces Shakespeare yearly for public school students in hopes to introduce them to, and spark an interest in, classical theater. The Tyler School of Art was one of the most remarkable programs (second only to the School of Education). They have their students on many different levels of involvement, from teaching art classes daily in a local public school to helping out with a free weekend art seminar, to the Tyler Art Start, a portfolio development program for local kids who are trying to pursue a college education in art.

It is important to look at this model of community service because department based service seems to be more effective. It is distinctly different from handout models, and instead focuses on educating people, helping them to help themselves and giving them the tools they need to lead a better life into the future. Not only will the students and faculty do a better job for the people they are serving helping because they are in their element, but they will also be more comfortable, and more likely to go out into the community.

When examining campus-community interactions at universities across the nation, it can be difficult to grasp the full spectrum of initiatives and the obstacles that different initiatives face, due to the breadth and diversity of place-specific issues communities face. In Worcester, Massachusetts, there are several schools in the consortium with similar surroundings and goals that should be examined. Clark University, as well as other schools in the consortium, has been working towards making Worcester a more conducive place for campus and community interaction.

Although these other Worcester schools have been working towards making Worcester a better place, public information was vague in regards to community service opportunities, and in most cases students were not the leaders in these efforts. For example, Worcester State College, a public, 4-year, state school just down the street from Clark, had absolutely no student groups focused on community service. This could be because of the amount of commuters who feel disconnected from the community. Worcester State does have a Speech-Language-Hearing Clinic that allows graduate students to follow speech pathologists and help people from the community. This form of outreach can be beneficial, but it still requires that clients pay for the service, and although "fees for services are assessed and may be adjusted dependent on the ability to pay"[2] it still requires monetary compensation, which some clients may be unable to supply.

The College of the Holy Cross, also located in Worcester, is closest to Clark in terms of undergraduate enrollment, and has seemingly been doing a great deal for the Worcester community. Holy Cross' service organization has received a $2,500 grant from the Greater Worcester Community Foundation (GWCF) to develop rehabilitation programs in prisons as a transition for soon-to-be-released inmates. The cycle of keeping people in the community and allowing them to become reconnected rather than alienating them could help Worcester grow into a safer, tighter, and cleaner community.

If there is one thing one can gather from the different efforts of all these schools, it seems to be that there are countless ways a college or university can engage the surrounding community. There are certain common traits such as adult education, public school aid, and

[2]http://worcester.edu/academics/Shared%20Documents/SpeechLanguageHearingClinic.aspx

offices dedicated to facilitating community service. Though each of these programs at each school may have a common heading, they all operate completely differently. The reason there are so many unique programs is because each community is so unique, with its own set of problems that need their own set of solutions. Thus the most important thing we can do to improve our own community is to examine it and determine if our existing programs are effective, and if not, try to discover new ways of positively affecting the community.

CLARK'S INTERACTION WITH THE COMMUNITY

Often times, a private institution like Clark can be easily removed from a community that is so different. However, Clark distinguishes itself from other institutions that may be placed in similar locations because of the number of programs it has that work with the community, and more than anything, because of the acknowledgement that it gives members of the community. Local residents, business-owners in the Main South, and Clark University have an understanding of one another; they work together to achieve a level of social sustainability that would not be possible otherwise.

Clark University and its relationship with surrounding Worcester is an outstanding model of the kind of partnership and social sustainability that can develop between an institution and the local community. Clark University works with Worcester in a number of ways. According to the Clark website, more than half of all undergraduates volunteer in the community. The Community Engagement and Volunteering (CEV) Center is a place on-campus where students and faculty can go to learn about getting involved and making a difference in the Main South. The CEV Center can provide information about community agencies and

volunteer needs, so whatever students or faculty members are looking for, they are sure to find a wide array of volunteer opportunities in Worcester.

Furthermore, the University Park Partnership (UPP) is a collaboration between Clark and its surrounding community. UPP incorporates neighborhood residents, as well as local organizations and institutions. A significant aspect of UPP is the Community Development Corporation (CDC), an organization that works on the revitalization of the Main South community. The CDC has worked with Clark University on a University Park Neighborhood Restoration Project that focuses on five main aspects of the development of the Main South: public safety, economic development, physical rehabilitation, social/recreational development, and educational opportunities (CDC 2008).

Public safety ties into all of the aspects of Main South development, and is reiterated through the encouragement of neighborhood crime-watch groups, as well as an increased number of Clark police patrolling the neighborhood. Economic development of the area is built upon a foundation of first-time homebuyer programs, small business and home improvement loans, and down payment assistance. A number of the homes being bought through the first-time homebuyer programs are local properties that have been completely renovated. Along with this, physical rehabilitation of the community can be seen with increased street lighting and more recreational space. Such space includes Clark athletic fields that are used by youth in the community, as well as the Boys & Girls Club. Furthermore, a number of weekend and after-school athletic programs are provided, along with a Clark University summer camp. Finally, education is a significant aspect of Main South development, and is perhaps most demonstrative of Clark's commitment to its surrounding community.

The University Park Campus School (UPCS) is part of an effort by Clark and local community development organizations to help make positive changes to the economic and social environment of the Main South. Clark worked with Worcester Public Schools to open UPCS in 1997, and was created with the purpose of preparing every one of its students for college. The belief that these children are capable of such success is so strong, in fact, that students living in the UPCS area for at least five years are eligible for free tuition at Clark University.

Since its beginning, UPCS has set remarkably high standards for children that most likely would not have been able to have many educational opportunities otherwise. Serving children in grade 7-12, UPCS has maintained these standards with incredible success. According to the UPCS website, all students are from the surrounding impoverished community and are selected by lottery. About 75% of students receive free or reduced-price lunch, more than two thirds speak English as a second language, and 61% are students of color.Perhaps even more impressive is the fact that all students have passed Massachusetts' MCAS graduation exam on the first try, and the majority score at advanced levels. Every student that has attended UPCS has gone onto college and 98% of these are first-generation college students.

This award-winning school would not be possible without the partnership between Clark and the community, with the help of the CDC. It is evident in the way in which students interact with the Main South that Clark has maintained a level of social sustainability with the community, but without the encouragement of faculty and community initiatives like the CDC, it is likely that such sustainability would not be nearly as prevalent. The joint effort of everyone

involved has really allowed for Clark to be socially sustainable, to maintain a relationship with the community and keep members of this area happy.

SUGGESTIONS

After completing research on other universities and on Clark itself, we have realized that Clark has a clear understanding of the importance of community-campus sustainability. Clark offers a variety of programs for students to work within the community, and more than that, Clark has made a genuine effort to keep itself as part of the community, rather than separating itself from the neighborhood as many universities choose to do. That being said, there are still a number of things that can be done at Clark to ensure the maintenance—and perhaps even the improvement—of social sustainability.

Required community service for all undergraduates could be a route that Clark might want to take in the future. The community would undoubtedly benefit from the significant amount of effort put into the community, and students would learn about Main South, its residents and its challenges. There may be some resistance due to scheduling conflicts (with so many groups, athletic commitments, and jobs on-campus), or students feeling that they should have the choice of what they want to do in their free time. If students are able to move past this, however, the generosity of students would help to address current issues of social sustainability, thus allowing for other problem areas to be recognized.

Looking at the community could involve all of the colleges in the Worcester Consortium. Using UPCS as a model would be a great jumping off point for the other colleges in the area. Each college could look at UPCS and its success rate and perhaps create schools that are somewhat similar to it, allowing for greater academic success in Worcester. While funding,

structure, convenience, and time are all issues, it is clear that, based on the success of UPCS, similar schools would allow for Worcester to significantly improve its education reputation.

Another idea is that of a required Week One presentation. Week One is the freshman orientation program, in which first-year students participate in a variety of activities to help get them acquainted with Clark and the surrounding neighborhood. A few years ago there was a Week One presentation on the renovation of many Victorian houses in the area, which introduced students to some of the efforts and activities that Clark is doing in the neighborhood. Increasing student awareness of Clark's activities in the neighborhood is important because it connects students to the issues. However, there has not been a presentation about community service opportunities or other ways for students to get involved in community development projects themselves. First-year students have an opportunity to talk to administration about community service at some of the Week One events, but for many it is difficult to approach administration in the first week of school. As shown in the above chart, the overwhelming majority of freshmen want to help the community, but they haven't for one reason or another. A presentation during Week One that lists and explains the community service options for

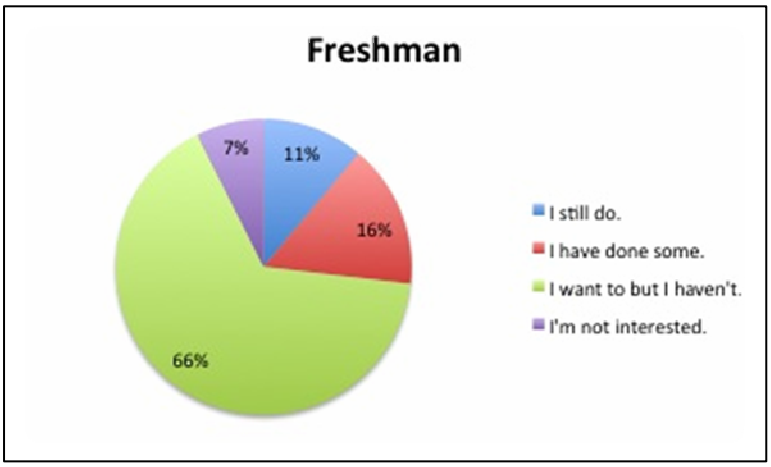

Figure 5-1. Response among freshmen to survey question on whether students participate in community service

students at Clark would be a great way to stress the importance of social sustainability, and provide an easy and stress free opportunity for service.

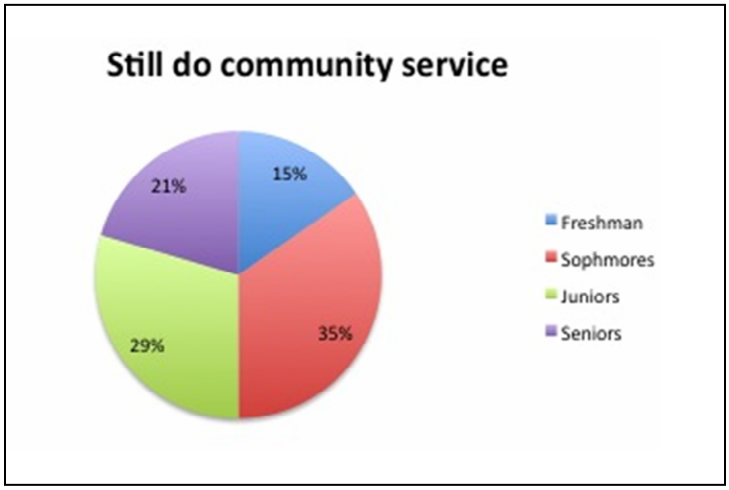

Figure 5-2. Percentage of students, by year at Clark, who currently participate in community service. This chart makes it clear that once someone begins community service at Clark, they pretty much stick with it through commencement. Thus the real challenge is getting students involved in the first place.

during Week One. The attendance for the service would be mandatory, but giving students a number of options of where to work would most likely alleviate any apprehension about working within the community. Before arriving at Clark, when choosing their first-year seminar, students could also pick a place at which they would want to partake in community service, such as Abby's House, the Boys & Girls Club, or the YMCA. Or, if having students choose would be too difficult, perhaps each PA group could have a designated place to work that would be related to the first-year seminar for that group. This might also guarantee that students would be placed in an area of interest.

A third idea for Week One would involve giving tours to first-year students around Main South as Jack Foley did for our class. This could be a different mandatory activity that would raise awareness about the impact Clark and the Community Development Corporation (CDC)

have had on the neighborhood. If Jack Foley were willing to give the tours, that would be great, but if not, someone involved with CDC could give the tour. Even better, a student studying urban development or sustainability at Clark could give the tour. The best option for a tour guide could be someone involved in Week One; the Orientation Coordinator or one of the countless other student advisors during orientation could give the tour to first-year students. Those taking the tour might be more interested in the information being presented by an upperclassman rather than by an administrator.

Using the last three ideas mentioned, the most important improvement that Clark could make when it comes to campus-community interactions is to raise awareness among students about Clark's work within the community. All of the aforementioned ideas can help to bring Clark's community work to light, but they are all bigger projects. These projects would be particularly helpful, considering that almost 40 percent of students would like to participate in community service but haven't. This could stem from not having the knowledge of options or resources available to do so. Even simply putting a section in Synergy about sustainability, community service opportunities, or notable points of Clark's work in the community would help to raise awareness, and it's something that wouldn't take too much time or money to plan and implement. The biggest aspect of sustainability, whether it involves going "green" or maintaining a social sustainability, is the future. The growth of the community and the university is dependent on future generations, and starting now is a way to guarantee that future generations have some sort of foundation on which to build upon.

Appendix One: Courses at Clark University related to Sustainability

Biodiversity
Forest Ecology
Ecology of Atlantic Shores
Marine Biology
Conservation Biology
Environmental Toxicology
Environmental Chemistry
The Economics of Natural Resources and the Environment
Why Global Warming Matters
Why Global Warming Matters II
Global Change, Regional Challenges
The Natural Environment of New England
Introduction to Environmental Information Systems
Native Americans and Natural Resources
Weather and Climate
Introduction to Environmental Geology
The Keeping of Animals
Arctic Systems Science
Suburban Sprawl Under the Microscope
Living in the Material World
Economy and Environment
Who Fears What and Why: Social Theories of Environmental Risks and Hazards
Landscape Ecology
Feminism, Nature and Culture
Technology and Environmental Assessment
Decision Methods for Environmental Management and Policy
The Climate System and Global Environmental Change
Groundwater Hydrology and Management
Urban Ecology: Cities as Ecosystems
Tropical Ecology
Problems of Globalization
Population, Environment and Development
Culture, Consumption and Class in Local and Global Contexts
Discovering Environmental Science
International Perspectives on Environmental Programs and Policies
The Climate System and Global Environmental Change
Global Environmental Justice
GIS and Land Change Science
Comparative Environmental Politics
Controlling Capitalism
Raced Nature, Gendered Developments: The Political Economy of Environmental Conservation
Technology and Sustainability: Perspectives from the Global South
Green Business Management
Environmental Ethics
The Corporate Planet