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Exploring German and American Modes of Pedagogical and Institutional Sustainability: Forging a Way into the Future

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A Thesis Presented by

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Glossary of Abbreviations

(alphabetical)

(5C) Shorthand for the five undergraduate Claremont Colleges

(ACUPCC) American College and University President's Climate Commitment

(ACEA) European Automobile Manufacturers Association

(ASU) Arizona State University

(BFS) Bernard Field Station

(CAP) Climate Action Plan

(COA) College of the Atlantic

(CUC) Claremont University Consortium (all seven colleges)

(EA) Environmental Analysis

(EC) European Commission

(EC) European Community

(EE) Environmental Education

(EIS) Environmental Impact Study

(ESD) Education for Sustainable Development

(EU) European Union

(FBFS) Friends of the Bernard Field Station

(FCRE) Firestone Center for Restoration and Ecology

(FDP) Free Democratic Party

(FDR) Federal Republic of Germany

(GBP) Green Bike Program

(GDR) Democratic Republic of Germany

(GHG) Green House Gas

(GMO) Genetically Modified Organism

(KGI) Keck Graduate University

(LCP) Large Combustion Plant

(LEED) Leadership in Energy and Environmental Design

(LEEP) Leadership in Environmental Education Partnership

(NAU) Northern Arizona University

(OCC) Oakland Community College

(PP) Precautionary Principle

(WHO)World Health Organization

(PZ) Pitzer College

(SAUCE) Schools at University for Climate and Energy

(SBFS) Students for the Bernard Field Station

(SD) Sustainable Development

(SPD) Social Democratic Party

(WWC) Warren Wilson College

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Introduction

This thesis has been a long and ever-transforming process as well as a personal journey. It is a broad and encompassing work, with a unique approach and formula. Thanks to an upbringing that has strongly connected me to nature, my relationship to the natural environment transcends the material or physical realm, and grants me personal clarity in my passion and purpose for the world. My personal motto is: without our environment we cease to exist. It is my strong belief then that the key to preserving or restoring our reverence and respect for the environment rests on the moral and ethical quality of the education we provide our youth. Growing up in both Germany and the United States, has given me perspective of differences between German and American environmental ethics and their underlying social and political influences. In this thesis I wanted to further explore these cultural and political differences and their bearing on the quality and content of education, particularly higher education that integrates issues of sustainability and environmental concerns into their pedagogy. The ultimate intention of my work and research is not to create a strong thesis argument in the traditional sense that it must be proven and fortified throughout. On the contrary, I wish this paper to be seen as a collection of progressive ideas and models, combined with my own experiences and views on these topics, and also inspiring others within academia as they approach the very real issue of global climatic change. I decline to pack my work into one statement, as over the past months I have consistently failed to describe my project to others in a singular way. But, were I to give a "thesis" statement, I might say that there exists, well within our reach, the potential for transforming our education systems to mirror the universal and critical need of harmonizing human activities with the natural world. Educating

for sustainable development is the key to any further advancement of human existence; some (educational) institutions are well on their way toward establishing this balance, while others still lag far behind.

Beginning with the socio-political foundation of the German environmental ethic, this thesis moves to explore more systems and policy-orientated approaches by the German government in addressing the critical global issue of Education for Sustainable Development (ESD). Germany's social and political commitments to the environment have allowed it to entertain the prospect of becoming the world's first green economy. Their economy, despite the recent global decline, has continued to remain strong. This can largely be attributed to a boom in alternative energy investments and applications, providing hundreds of thousands of jobs. This requires an educated workforce. In December and January of this year (2011/12), I had the opportunity to travel in Germany and briefly explore how educational institutions are working to educate new generations in furthering national environmental ethics. I discovered that ESD was not just a priority for alternative energy markets or universities, but that federal and state levels of government as well as the United Nations have given this area high priority through logistical and financial support.

The second part of this thesis moves on to look at how colleges and universities in the United States are incorporating the unfolding paradigm of ESD into their operations and curricula. After seeking out those colleges and universities that have taken progressive steps and produced exemplary models for addressing institutional and curricular sustainability, I have chosen and am briefly describing a handful to support my thesis. In the last three chapters I explore curricular and institutional sustainability and ESD from various positions, such as

curricular reform, modes of student engagement, and the more technical aspects of operational carbon neutrality. Another dimension that is emphasized is the necessity and strength of exploring mutually enhancing efforts that originate from both the institution's upper-governance structure (top-down) and from student involvement (bottom-up). This section is an in-depth case study on the sustainability efforts of Pitzer College, which includes my own commentary. The final component of this thesis is a synthesis of the many topics and models approached in this project, both national and international. I have compiled these findings into a more summary-like "action plan" that, in the form of examples and guidelines, I willingly offer up for interpretation and adaptation so their use may be applied in various contexts. It is both implied and explicitly stated throughout, that these models of pedagogical and institutional sustainability that I have explored, are intended for application in the American liberal arts setting. However, in no way do I intend to infer or categorically limit their transferability to other stages or settings of education, where they may also be applicable and have and potential for success.

Chapter One

Green Roots in Germany

This first chapter explores the socio-political context out of which German public environmental awareness arose in order to better understand the present atmosphere. Examining the roots of German environmental policy and its intimate connection to social movements and public sentiment that were influenced by environmental disasters, is a discussion dominated by acid rain responsible for the subsequent "Waldsterben," the disastrous effects of Chernobyl, and the birth of the German Green Party. The final challenge is recognizing and directing public sentiment into more binding regulatory policy for industry.

A Timeline and Context for Policy Incentives in Germany: An Overview of the Drivers behind Environmental and Clean Energy Politics

1.1 The *Precautionary Principle* and Germany's Historical Relationship to the Environment

To understand the socio-political context out of which a common level of environmental awareness arose in Germany, it is important to begin by going back farther than when actual policy relating to the environment became evident within the political culture. In most scenarios under a somewhat democratic governance system, sentiment relating to the environment must first take root within the ranks of the populace before it manifests itself in more concrete political stances or actions. In the case of Germany, the country's international leadership on environmental issues is a direct result of and response to real grassroots citizen action. There were two significant disastrous environmental events that galvanized and united a broad social movement which greatly changed the political sphere and stance on environmental issues. The first occurrence invoking great citizen response in the early 1980s was the "*Waldsterben*" (forest dieback) which marked a rapid decline of forest health in Europe and was directly attributed to acidification in air pollution; in Germany it was the prized Black Forest that came "under attack." The second major event was the 1986 Chernobyl nuclear disaster in Ukraine which left a plume of nuclear fallout for hundreds of miles across Europe.

This disaster came at a time when nuclear energy and armament were highly contentious topics in German society, and Chernobyl served as a breaking point for anti-nuclear sentiment and public outrage. It should be noted however, that environmental disputes had even earlier roots in Germany; in the protests and veritable battles around the very construction of nuclear power plants and the development of nuclear waste storage sites in the 1970s (Brand, Büsser, & Rucht., 1983). Moreover, Germany may well be said to suffer from a kind of "nuclear complex" as can be seen in the history of nuclear technology in electricity generation as well as military applications. Both dimensions of technology have been inextricably linked to consequences of the stationing of nuclear weapons on German soil by the two opposing blocks (USA and USSR) of the Cold War period. The 1980s sharpened this [fearful] mindset, first by President Reagan's decision to upgrade the US nuclear arsenal, and secondly the Chernobyl reactor catastrophe which occurred shortly thereafter.

A building wave of public environmental concerns fueled by these events (and even the media) led to the official formation of the German Green Party (Die Grünen) in 1980 and the Party's subsequent remarkable success. By 1994 the Greens became Germany's third largest Party with 7.3 percent of the vote and 49 seats in the Federal Parliament (Shreurs & Papadakis, 2007).

There was one other critical element in German politics and policy-making that is worthy of attention: the *Vorsorgeprinzip* (Precautionary Principle, PP). In any German-American comparison, the Precautionary Principle makes a profound difference in historical context in terms of how the starkly different governments and economies conducted themselves, particularly with regard for the environment. The PP functions on the basic presumption that

there is significant advantage to acting proactively rather than reactively. Furthermore, it is assumed that wherever there may be perceived risk, while even in the absence of scientific evidence, the burden of proof (that the action will not induce future harm) lies on those responsible for taking the action. This principle became a strong part of political and economic culture beginning with the rise of Nazi Germany. Indeed, Adolf Hitler, though for military and strategic rather than environmental reasons, set about making Germany as self-sufficient as possible. Inherent in this principle, was the recognition that damaging or mishandling the country's natural resources was unsustainable for its future in economic terms, and later on, specifically the war effort. Green politics in Nazi Germany were likely connected with propaganda efforts, however it should be noted that conservationism was an ideal most likely first held by the "romantic" Weimar-era politicians before it bled over into Third Reich politics (Brüggemeier, Cioc, & Zeller, 2005).

Though over the decades the PP became ingrained in Germany's political culture, it did go underground—at least with regards to the environment or long-term sustainability—under a split Germany that was more focused on rebuilding the country after the war. While rampant industrial growth served to both rebuild the country, and as a means of coping/healing the German psyche, it also led to environmental damages that became impossible to ignore by the 1960s. In the late 1970s and early 1980s the PP resurfaced with new purpose in the political spectrum. Although the PP in politics was not *directly* responsible for filling Green seats in parliament (the era's social movements were), it is quite evident that it has played a very important role in shaping policy decisions relating to the environment.

A core component of German early environmental policies comes from the concept of *Vorsorge*. This partially defined and better understood as "damages done to the natural world should be avoided in advance in accordance with opportunity and possibility" (O'Riordan & Cameron, 1994).[1] Furthermore, according to Boehmer-Christiansen, *Vorsorge*

> …means the early detection of dangers to health and environment by comprehensive, synchronized (harmonized) research, in particular about cause and effect relationships…, it also means acting when conclusively ascertained understanding by science is not yet available…, to significantly reduce environmental burdens… (O'Riordan & Cameron, 1994)

The *Vorsorgeprizip* (PP) can be further deconstructed in terms of the five principles it employs in policy and regulatory settings: *Vorsorge, Verursacherprinzip, Kooperation, Wissenschaftliche Vertretbarkeit*, and *Gemeinlastprinzip*. The *Verursacherprinzip*, essentially "the polluter pays" concept, is reached through a consensus of all at-stake parties, and provides a foundation for consideration, incorporation and mitigation of environmental concerns in the regulatory and policy decision making process. *Kooperation* (cooperation) is simply the concept and structure of consensus building. *Wissenschaftliche Vertretbarkeit* is the principle of economic feasibility or tolerability. This principle can be further understood in terms of managing the cost benefits of specific firms proportionally, and yet applying them to broader sectors or even the whole of the economy. This principle is designed as a foundation and a broad [industry] approach that supports the practice of *Vorgsorge* even beyond the state's ability to persuade or subsidize. *Gemeinlastprinzip,* known as the Common Burden Principle, serves as a conceptual mechanism for the state to address inequality or incipient bankruptcy by creating public funds justified through the PP (O'Riordan & Cameron, 1994). It is a crucial instrument as it is the only

[1] In the following I explore the concepts using the original German expressions as I find it more accurately fitting and more practical in terms of explaining them.

mechanism that begins to take into account the value of common (free) resources. The PP is thus a multi-faceted concept and policy approach. However, perhaps one of the more important assumptions it relies on, is that suggestions of irreversible (economic) damage, warrant *precautionary* measures; such damages often result from inaction on environmental issues. Interesting in today's debate, is that any climate action in politics or policy is almost solely (and perhaps arbitrarily) based on "sound science" in most parts of the developed and developing world. According to O'Riordan & Cameron, supportive science may be crucial in *initially* recognizing threats to the economy, environment, and the public. As long as a credible threat exists, it's dependent on government to create (*Vorsorge*) policy which protects itself even in the absence of actual scientific *proof*—as long as there is a significant chance of irreparable damage occurring through negligence. These pillars of European and specifically German policy-making have fostered an evolution of modern policy practice, which considers issues of environmental concern much more seriously than many other countries, for instance the United States and Great Britain.

When the Precautionary Principle resurfaced under the alias of environmental policy in the early 1980s, it had some catching up to do. In other words, the policies of the 80s began as a reactive effort to repair environmental damages that had already occurred as a consequence of Germany's second industrial revolution. Once these policies were seen as appropriately addressing concerns of the day, such as air pollution and energy security (the nuclear struggle), environmental politics could go forward in a proactive manner; this approach became the rebirth of the PP – and for the right reasons this time around.

By the 1970s, air pollution in West Germany was so bad that measures were introduced to combat it. In the German Democratic Republic the pollution levels were substantially worse, notably in the heavy industrial area around Bitterfeld. Traditionally, issues of environmental concerns were handled by the individual states to address, but the mid 70s saw a push for a more federal approach to the situation. Following a 1972 constitutional amendment transferring regulation of environmental protection to the federal level, the Federal Environmental Agency was formed in 1974 (Shreurs & Papadakis, 2007). Simultaneously, a coalition between the Social Democrats (SPD) and the Free Democrats (FDP) began a relentless economic push for greatly expanding the network of nuclear power plants in Germany. The resulting emergence of citizens' initiatives regarding environmental protection was perhaps the single largest contributor in the subsequent formation of the Greens Party in early 1980.

In the early 1980s, while the nuclear debate continued to simmer with intensity, the issue of air quality came to the forefront due to the new tragedy that was acid rain. As Boehmer-Christiansen and Skea point out, the German forest (*Wald*) carried particular cultural and literary motifs that ran deep into the country's roots, resulting in the forest being seen as an innocent victim subjected to rampant economic growth (Boehmer-Christiansen & Skea, 1991, p. 61). The newly formed Greens, gauging the immense public concern over forest degradation, seized the opportunity to politicize the acid rain issue and bolster their voting constituency. The resulting regulation and legislation can be largely attributed to serious public and political concerns over the alarming rate of pollution-related forest dieback (*Waldsterben*) in West Germany.

Between 1982 and 1983, Germany's decision to adopt a comprehensive clean-air package became one of the country's first pillars of environmental policy. The largest, single most effective and stringent component of the package was the *Grossfeurungsanlagenverordnung-GFAVo,* which became the model for the subsequent European Community (EC) Large Combustion Plant Directive (LCP), implemented harsh regulations on emission allowances by electric utilities (a primary polluter). The overall clean-air package also placed emission regulations on motor vehicles, with Germany leading on the issue, a 1989 European agreement was reached. Germany however, opting to go further on its own, devised an approach to more efficient, lower-emitting vehicles (Boehmer-Christiansen & Skea, 1991). As German economists foresaw significant costs associated with the damages of acid rain, a large scale retrofitting plan for combustion plants in Germany seemed justified (*Vorsorge*) even in the absence of direct proof of causality.[2] Due to the new regulatory parameters set by Germany for sulfur dioxide emissions, from 1975 to 1988, the emission levels fell to 37 percent of previous years. [3] This was a significant achievement, as sulfur dioxide emissions in United States, for example, only fell to 80 percent of the level in 1975 during the same time period (Boehmer-Christiansen & Skea, 1991).[4]

[2] In 1986, power stations accounted for more than half of all sulfur dioxide emissions and transportation accounted for nearly two-thirds of all nitrogen oxide emissions in the Federal Republic of Germany. However, the science was much disputed as for the actual causal relationship of emissions, acid rain, and the Waldsterben phenomenon (with 10–25% foliage losses) that scientists guessed peaked at 56% of German forests being damaged in 1986 (Boehmer-Christiansen & Skea, 1991, pp. 35-39).

[3] It should be noted that Germany first explored Air Pollution Control policy and regulation as early as 1933 (Brüggemeier, Cioc, & Zeller, 2005).

[4] Modern air quality management had strong roots in the US as well, particularly in Los Angeles, California during the early-mid 1940s, where severe smog episodes caused from vehicles quickly raised health concerns (US Environmental Protection Agency, 2010).

1.2 Chernobyl

As the concerns over forest dieback continued—eventually morphing into more comprehensive policy, the issue of nuclear power literally exploded in the political arena following the Chernobyl disaster of April 1986. Already in 1979 an estimated 100,000 protestors gathered in Hanover and another 150,000 in Bonn later in the year, to protest nuclear armament and the prospect for nuclear energy development. By 1986, as the German government stood poised to expand its nuclear energy program, a once-again outraged citizenry took to the streets in the tens of thousands (Shreurs & Papadakis, 2007). Moreover, by the time Chernobyl occurred, the anti-nuclear movement was already well organized, and its political influence was a significant.

According to the World Health Organization (WHO) an estimated 5, 936,000 people were directly affected by radiation within the countries of Belarus, Ukraine, and the Russian Federation. This impact study did not include potential long-term health effects such as cancer from nuclear fallout over middle Europe. Particularly in Greece and Germany, more recent studies conclude that cancer rates in children have increased as a long-term result of Chernobyl (Radiol, 2006). One such study covering 1980-2003, showed an increased risk for cancer in children under 5 years of age, particularly for leukemia, whilst living in proximity (<5 km) to nuclear power stations (Claudia Spix, 2008). Even this example sustains concerns over the issue and keeps it from fading from public memory. Though about 95 people died directly from the event and severe radiation exposure, the WHO estimates the death toll to potentially rise to a total of 4000 people (World Health Organization, International Atomic Energy Agency, United Nations Development Programme, 2005). Additionally, an undisputed 2006 Greenpeace report,

estimates that up to 200,000 excess deaths will occur as a result of Chernobyl (Greenpeace, 2006).

In early 2011, government officials from 50 countries came together to discuss the continued site security of Chernobyl, endeavoring to cover and seal the existing sarcophagus in a massive steel dome and construct a "safe" storage site for spent fuel elements. Of the 740 million Euros still needed for the projects, the G7 countries and the EC have planned 400 million Euros in aid, with Germany alone pledging up to 42.4 million Euros (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit, 2011). Many Germans no-doubt, still remember removing the top soil from their gardens and thoroughly washing any fresh fruit or vegetables in the direct aftermath of Chernobyl. These memories, augmented by Germany's continued (compulsory) financial support, keep the consequences of Chernobyl from fading from public memory. Government actions and warnings in the Federal Republic of Germany immediately after Chernobyl ranged from restricting or forbidding the grazing of milk cows to closing public spaces like swimming pools and playgrounds (Renn, n/d (made available 2010)). Though such a catastrophe rarely occurs, the more recent Fukushima disaster confirms that the social and environmental costs of this kind of catastrophe fuels contention over nuclear energy as a viable option at all. On the other hand, there is good reason for this debate: the prospect for nuclear energy is greatly enhanced by the continued success of countries like France, which satisfies nearly 80 percent of its energy needs from nuclear power (Grubler, 2010). Further enhancing the prospect for nuclear as an energy source, is the fact that it is widely considered to be a so-called "clean" energy source. Others, like Germany, maintain that the waste that is associated with this technology make it a highly dangerous and unsustainable option.

1.3 Rise of the German Green Party

While governments around the world may continue to consider nuclear energy an attractive option, one thing is clear: the majority of the German citizenry does not. This sentiment is underscored by the formation and rise of the world's foremost Green party. Though Germany's Greens were not the first Green party to exist, they certainly remain unparalleled in their success, and have served as a model for the subsequent formation of green parties around the world. Germany's Greens were born out of a series of politicized actions and movements, which built a focused political platform and received enough votes in local elections to eventually gain seats in the European Parliament.

Two of the primary drivers in the formation of the Greens were the student movement of the late 1960s and the related fiercely oppositional campaigns to atomic energy in the 1970s (Sandford, 1986). Anti-nuclear energy sentiment that had been brewing over the previous decade or more, exploded to the forefront, forcing the discussion of new forms of renewable energy to occur at a policy level. This development aided in establishing the party's strong and uncompromised position on nuclear energy and became a unifying party foundation and platform.

Though many ideas behind the party sprang from the movements in the 1960s and 1970s, the so-called organizational beginnings stemmed primarily from "citizens' initiatives" whose increasing prevalence was focused on both environmental and social concerns in the Federal Republic of Germany, particularly during the mid-1970s. In the rubble of the GDR nearly two decades later, a parallel effort comprised of citizens' initiatives, gave birth to Bündnis 90 (Alliance 90) in (former) East Germany—a coalition to combat environmental issues (Shreurs &

Papadakis, 2007). Meanwhile, in West Germany, politicians who identified themselves as Greens began gaining council seats at local levels by 1977. Two years later, these same "Greens" were able to attract over 900,000 votes and gained representation in the European Parliament. Finally, as per the West German electoral law, in 1980 the Green Party came into existence at the federal level when the 5 percent voter margin threshold was crossed thus enabling them to gain parliamentary seats. By 1983, Greens captured 5.6 percent of the vote, giving them 28 seats in the Bundestag, and representing the first new party to join the political constellation of conservatives, liberals, and social-democrats in about 20 years (Sandford, 1986). The Greens, likely due to a combination of continued concerns over acid rain as well as the explosion of anti-nuclear sentiment following Chernobyl, had their largest Party victory in 1987 when they received an astounding 8.3 percent of the vote (considering the party landscape in Germany and the youth of the Green movement) (Shreurs & Papadakis, 2007). Although policies with an environmental premise were certainly not new to politics before the official formation of the Green Party, the Greens provided the parliamentary representation necessary to keep issues of environmental concern on the table—and not just in moments of environmental crisis.

In 1989, when Germany finally became unified, the progress that was made in environmental regulation in the West, became overshadowed by serious environmental damages in the East. This was the case even despite the prior formation of Alliance 90 (Bündnis 90) in East Germany which had focused on citizens' initiatives regarding environmental protection and the establishment of democracy. Responding to a degraded environment in

former East Germany, the western model of environmental regulation was transferred over, provoking both positive and negative economic outcomes (Shreurs & Papadakis, 2007).[5]

In a unified Germany, Alliance 90 and the Greens entered into a coalition, and by the 1994 election had captured 7.3 percent of the vote, becoming the third largest party (displacing the FDP) with 49 seats in parliament. Over the following years, numerous party coalitions were formed, which effectively maintained the environment as an important political issue. These coalitions usually heightened the success of all parties by consolidating voters and diversifying issues and interests; additionally the tradition of interest groups and industrial organizations formally cooperating with the government, has been an important factor in the success of environmentally oriented policies. One example of a particularly important policy realm that came from coalition building was the poignant furthering of a political agenda that phased out nuclear energy and ushered in feed-in tariffs for promoting renewable energies (see Chapter Two)(Shreurs & Papadakis, 2007, pp. 105-106).

1.4 Bridging Sentiment and Policy over the Past Decade

In retrospect, first acid rain and then the Chernobyl disaster were events that internalized environmental concerns for the German people and served to crystallize their anti-nuclear sentiment that paved the way for the Greens in the late 70s and early 80s. This social phenomena and display of anti-nuclear sentiment was vividly demonstrated in March 2011; the Japanese Fukushima Daiichi nuclear meltdown prompted the immediate shutdown of 7

[5] Due to the extremely different climate of social factors, environmental conditions, and industrial infrastructure, the transfer of an established mechanism for coping with environmental degradation resulted in turbulent economic conditions and employment consequences.

German nuclear power plants and resulted in a concise phase-out strategy for the remaining 10 plants over the next 8 years. The gradual but steady increase of attention placed on environmental issues over the past 15 years is reflected by a near doubling of voting percentages and party membership in the Greens— receiving 10.7 percent and 12.1 percent of the vote in the Bundestag and in the European Parliament in 2009, respectively (Bündnis 90/ Die Grünen, 2010). Moreover, the sheer existence of an environment-focused party in the German multi-party spectrum has forced others to pay attention to these issues and has contributed to an overall greening of Germany's politics.

One area central to the issue of promoting renewables has been the raising of awareness for the individual citizens' carbon footprint—a significant part of a person's carbon footprint in today's world comes from personal transportation. This issue is twofold: educating the public and allowing them to make informed decisions on the one hand, and regulating industry so they provide the public with viable and responsible options on the other. In January 2000, Directive 1999/94/EC of the European Parliament came into force. The purpose of this legislation was to "ensure that information relating to the fuel economy and CO_2 emissions of new passenger cars offered for sale or lease in the Community is made available to consumers in order to enable consumers to make an informed choice". This directive also includes a requirement that any advertising display both fuel economy and CO_2 emission data for every vehicle and that violators would be prosecuted (European Parliament, Council, 1999).

Emission reduction strategies for personal transportation in the EU in general is currently directed at getting car manufacturers to reach a target of an average of 120 grams of

CO_2 per kilometer between 2012 and 2015 (ca. 160 grams in 2009) (Achtnicht, 2009).[6] It appears that public opinion is consistent with the politics on the issue. It is commonly recognized that Germans are very conscientious about environmental issues and, according to Achtnicht, "on average they are willing to pay substantial amounts of money to fulfill their responsibility in this regard." Achtnicht found that this was more true of certain demographics: generally women express more concern than men, people under 45 years more than older people, and those with a higher level of education more than those less educated (Achtnicht, 2009).

The EU has gone about reducing emissions (even before having ratified the Kyoto Protocol in 2002) in many multi-lateral and cooperative ways. One example is the voluntary CO_2 reduction agreement between ACEA (European Automobile Manufacturers Association) and the EC (European Commission) signed in 1999, which recognized the industry's need to address escalating levels of transportation-induced CO_2. Though overall emissions reductions have been achieved in Germany since Kyoto, "the transportation sector has shown a 21.9 percent increase in CO_2 emissions between 1990 and 2002" (Fontaras & Samaras, 2007). This is the first agreement of its kind and is widely recognized and used in studies to project potential outcomes in other parts of the world. Since then, Japanese and Korean automotive manufacturers have come to similar agreements with their respective governments (Fontaras & Samaras, 2007).

Additionally, the EU has recommended and pushed for an increase of renewable energy sources in all energy sectors. One example of this effort is the tax-exempt status of bio-ethanol

[6] Though some of the following statements lump Germany into the European Union, it is assumed that Germany plays a central role in making policy decisions, per it being the strongest EU member state.

as a gasoline replacement between 2002 and 2009. Interestingly, the only major political party to disagree with this initiative was the liberal FDP, who argued against it on grounds of potential environmentally detrimental effects (Henkea, Kleppera, & Schmitz, 2005). Overall, Germany has made significant strides in the reduction of CO_2 emissions, and an important part of that has been collaborating with the automotive manufacturing industry.

Transportation is just one example of an area where environmental policy is directly tied to the actions and responsibilities of a country's citizenry. To address each and every nuance of the relationship between environmental policymaking and the many actors it affects, from private citizens to corporate entities, would be a lengthy and complicated process—especially in the case of Germany. Suffice it to say, Germany continues to make significant progress on issues related to the environment far beyond just the transportation sector.

Presently, perhaps the greatest environmental obstacle for any developed country to address is reforming the energy sector as a whole. Deriving energy from renewable sources is a primary concern, as it is the deciding factor in the survival of our planet. Germany has taken a leadership role in the development and application of renewable energies. Germany's long-standing tradition of recognizing the importance of environmental protection, whether via the politically ingrained Precautionary Principle, or the socially ingrained rejection of potentially environmentally destructive economic practices (nuclear), has resulted in a solid foundation of environmental ethics. A unique condition of contemporary German politics is that due to their deeply engrained cultural environmental ethic, priority of the environment is a much less embattled issue and thus usually evades party-line politics (unlike the United States). A clear example is Germany's response to the Fukushima nuclear disaster, which served as a driver for

redoubled efforts in sustainable energy development. Renewable energies such as wind and solar power have now become critical in protecting the environment and instrumental in building an economy that is not reliant upon destructive practices. What these technologies are and how they are utilized, along with their social and economic implications, is the subject of the following chapter. Ultimately, it is the education of the youth and the professional training of workers that holds the key to the development of sustainable technologies and a transformation of both personal lifestyles and economic practices to ensure the safety of our planet.

Chapter Two

From Energy to Education.

This next chapter has two parts. First I explore alternative energy options, their economic implications for these options and the job market the sectors employ. Second, I review the research done on sustainability in Germany by institutes and universities. I conclude that research and education must be developed and supported as a mechanism for providing an adequately trained professional workforce to meet these new technology (employment) demands.

2.1 Renewable Energy Sources in Germany

Germany is well on its way to establishing the world's first green economy, having satisfied 17 percent of its electricity needs through renewable energy in 2010—a greater than one-percent increase per year in the past decade. With its many successes and high levels of cooperation among all sectors, Germany expects to increase this number to 35 percent in 2020. By 2050, Germany will meet at least 80 percent of its electricity needs and at least 60 percent of its total energy consumption needs from renewables (Röttgen, 2011). Germany, with its long and interesting past experience with both nuclear arms and nuclear energy, has been buoyed by social and political movements founded in anti-nuclear sentiment. The result has been several decades of public pressure and policy measures that have aggressively addressed the issue of nuclear power through the introduction of high safety measures, promoting transparency to the public, and innovation in order to avoid using nuclear power where possible. A by-product has been an equally aggressive stance to support the development of renewable energy sources. Most recently, as a response to the Japanese Fukushima Daiitchi nuclear power plant disaster in March 2011, German Chancellor Angela Merkel ordered the permanent shutdown of eight nuclear plants, and Norbert Röttgen, the head of the Federal Ministry for Environment, Nature Conservation, and Nuclear Safety (BMU), announced that the

remaining nine nuclear plants in Germany will be offline by 2022 (BBC News, Berlin, 2011). As nuclear energy generation in Germany accounted for 23 percent of energy consumption, this decision of phasing out nuclear energy altogether by 2022 has an immense impact on energy policy decisions (Statistisches Bundesamt Deutschland, 2011). Consequently, Germany has begun to lead the world in creating green-tech jobs and, through innovation and cooperation, to build a competitive global economy in renewables. Although the latter was a German effort even before the Fukushima disaster, renewed public pressure on the issue has solidified the vision of a nuclear-free country's future, and is fueling the establishment of the world's first globally competitive green economy. At present, renewable energy sources account for over 20 percent of the country's electricity consumption and over 11 percent of the country's total energy consumption (see Figure 1) (AGEE-Stat, 2012).[7] Below, I provide a brief overview of Germany's current state of renewable energy sources, their integration into the overall energy production and consumption landscape, and the employment options enabled by this sector.

As of 2010, the most significant single source of renewable electricity supply was wind generation at a share of 36.5 percent of all renewables (see Figure 2), amounting to 7.6 percent of the total electricity consumption in 2011 (AGEE-Stat, 2012). In 2010, of the 374,400 jobs in the renewable energy industry in Germany, an estimated 96,100 were in wind generation

[7] It is important to note that there is a significant distinction between the total share of one source of renewable energy and the percentage of electricity needs that are satisfied via that renewable source. It should be noted that in 2010, renewable energy (RE) sources accounted for 10.9 percent of Germany's *total energy* consumption (figure 1) (Energien-Statistik, 2011, p. 14); this number should not be confused with RE shares met for electricity demands only, which in 2011 was 20 percent (AGEE-Stat, 2012).

Figure 1

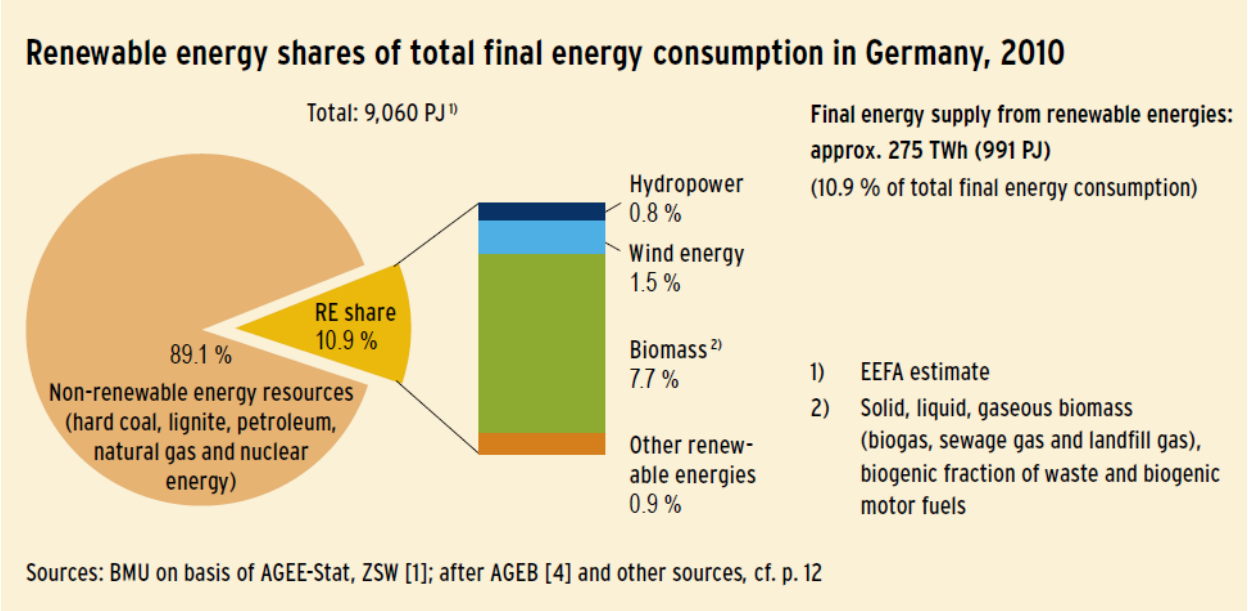
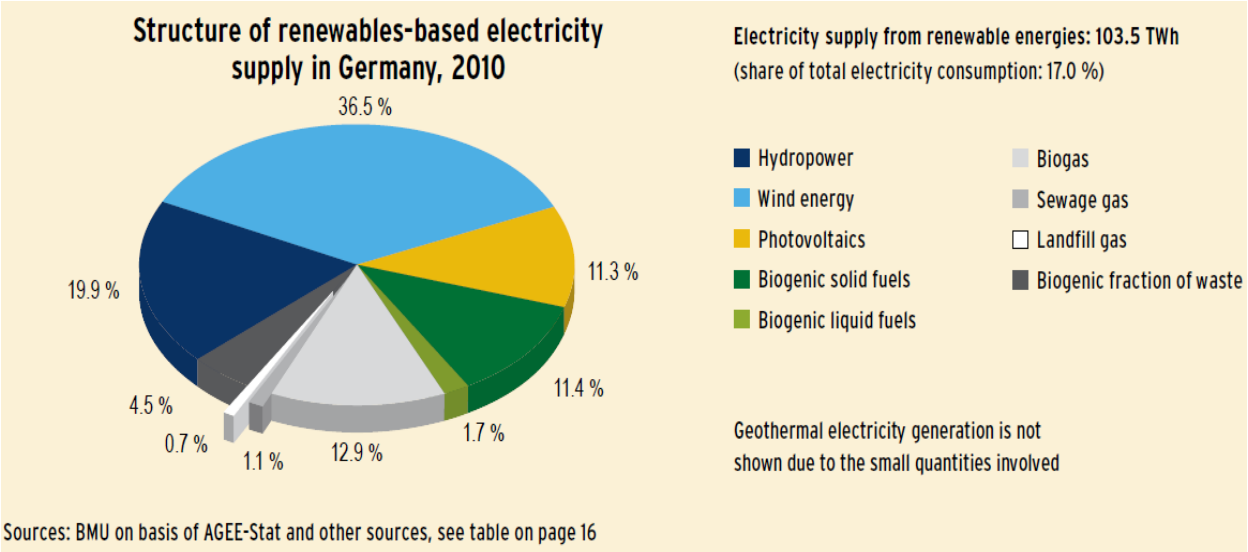


Figure 2



plants and installations (Energien-Statistik, 2011). Wind energy installations, although they produced at an inconsistently low rate for their overall capacity, produced about 37.8 TWh last year. [8] To address energy needs resulting from a reflex response and strategy by the government to phase out nuclear energy, offshore wind turbine installations have spiked.

[8] Because wind energy generation is so variable and based on weather patterns, the "installed capacity" may be very high, whilst the overall year may be considered to see less favorable energy generating conditions.

Specifically, although *offshore* wind generation in 2009 only accounted for 0.007 percent of total *electricity* consumption, the Fukushima disaster prompted the German government to plan major wind farms in the North Sea. In 2011 offshore wind facilities accounted for 0.09 percent of total energy consumption—a sizable jump from 2 years previous (AGEE-Stat, 2012). Already only six weeks after Fukushima, 21 turbines, each 425ft tall, were being erected to supply 50,000 households with clean energy (Dohmen & Jung, 2011). Furthermore, billions of Euros in subsidies and loans have been set aside in an ambitious plan that is targeted at producing the equivalent energy of 20 nuclear power plants (or 25GW) through offshore wind farms by 2030 (Dohmen & Jung, 2011).

Germany's second largest share of renewably generated electricity (but not all energy) is met by hydropower and accounts for 19.9 percent. However, proportionally, it accounted for a meager 7,600 green jobs in 2010 as compared to the employment opportunities of wind and solar.[9] Nevertheless, hydropower has very high potential as a Europe-wide renewable energy source, considering its potential application on Europe's western coasts in the Atlantic Ocean. Independent of the rest of Europe, Germany has great hydropower generation potential in the southern parts of the country where alpine flows combined with steep slopes provide optimal conditions for developing this resource (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety). There are three systems used to create energy: the run-of-the-river power plant, the reservoir power plant, and the pumped storage power plant. The river power plant is the most commonly used system in Germany and has an efficiency rate of

[9] Though wind and solar require more labor during their initial production and installation phase, demand has remained high. Additionally, wind energy will ensure the longest term employment prospects, as turbine maintenance and upkeep is quite labor intensive.

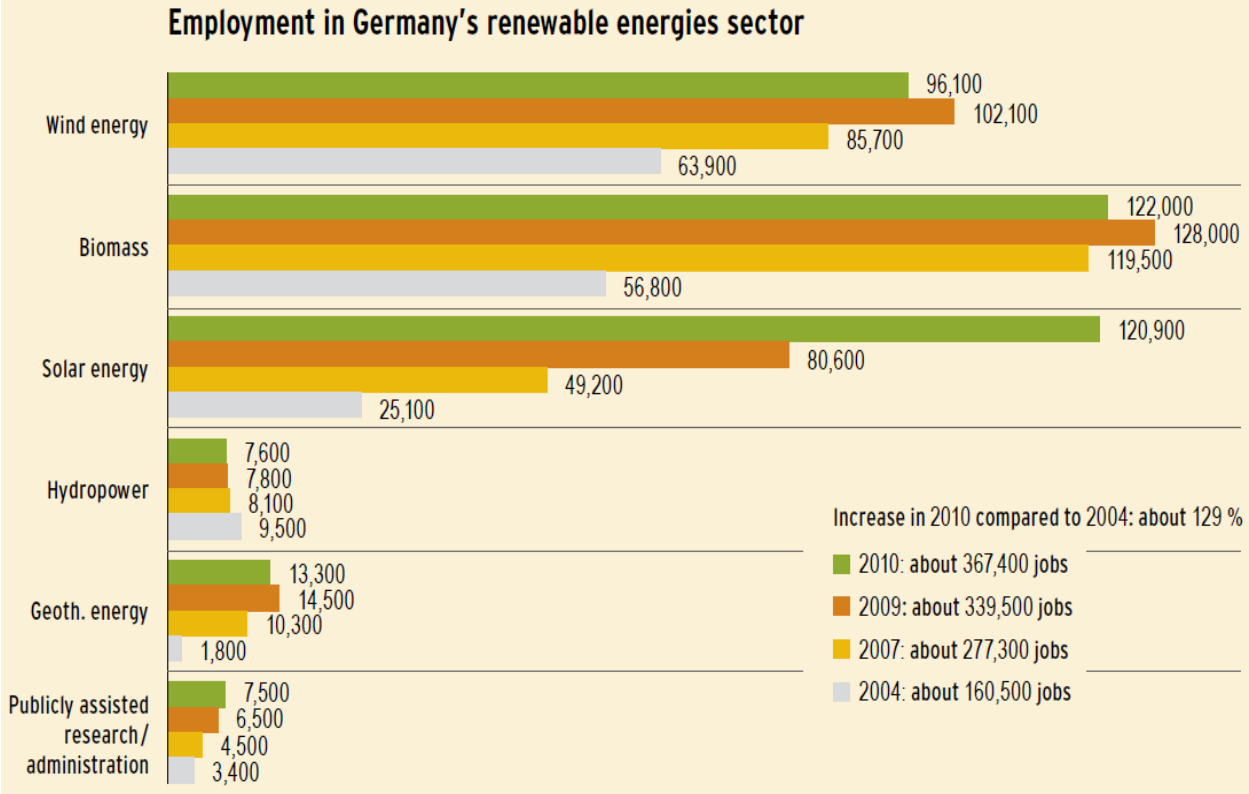
up to 94 percent. These three types of hydropower generating facilities (especially the first) have the capacity to store power on-site and deliver electricity on demand, allowing them to significantly contribute to grid stability. The pumped storage power plant consists of two lakes or reservoirs with the greatest possible amount of elevation difference between them. A positive function of this is that water can be pumped back up into the top reservoir using excess energy during non-peak times, such as at night. In this way, the grid is stabilized and the top reservoir remains replenished in a system that fully sustains itself (Deutsche Energie-Agentur GmbH (dena)). Overall, hydropower in Germany accounted for 3.4 percent of the *total energy* supply in 2010 (Röttgen, 2011). However, the run-of-the-river type of energy generation is already widely used and therefore has limited potential for much further expansion.

The most significant recent renewable energy boom came in the form of large-scale investments and policy incentives, such as the feed-in tariff system for private photovoltaic (solar) generation. Photovoltaic (PV) energy generation rose a staggering 75 percent in the course of one year (from 2009-2010), standing currently at 17.320 MW (9.914 MW in 2009) and accounting for 2 percent of the country's total electricity consumption—82 percent higher than the previous year. In terms of the *renewable* energy share itself, solar accounted for 11.8 percent in 2010 (Energien-Statistik, 2011).[10] Some analysts expect the 2 percent total energy supply figure to potentially rise to 25 percent by 2050, as Germany already owned nearly half of the world market in Photovoltaics in 2007 and outpaced Japan as the world's number one PV installer (Worldwatch Institute, 2011). Germany's sudden boom in of PV manufacturing, installing, and technology development for domestic use and export was made possible by the

[10] Latest statistics show that PV generation stood at 19,000 GWh and accounted for 3.1 percent of Germany's total energy consumption in 2011 (AGEE-Stat, 2012).

German Renewable Energy Act. Under this act, the feed-in tariff system, born in 2004, was continually revised and became more appealing and economically stimulating. In 2010 alone, there were nearly 250,000 PV installations (Gipe, 2011), and green-tech employment in the PV sector jumped from 25,100 jobs in 2004 to 120,900 jobs in 2010—an increase of over 381 percent during the six-year period (Figure 3) (Röttgen, 2011).

Figure 3



Source: BMU [62], [63], [38] Retrieved from: http://www.erneuerbare-energien.de/files/english/pdf/application/pdf/broschuere_ee_zahlen_en_bf.pdf
For more updated (2011) statistics see Appendix A (German Only).

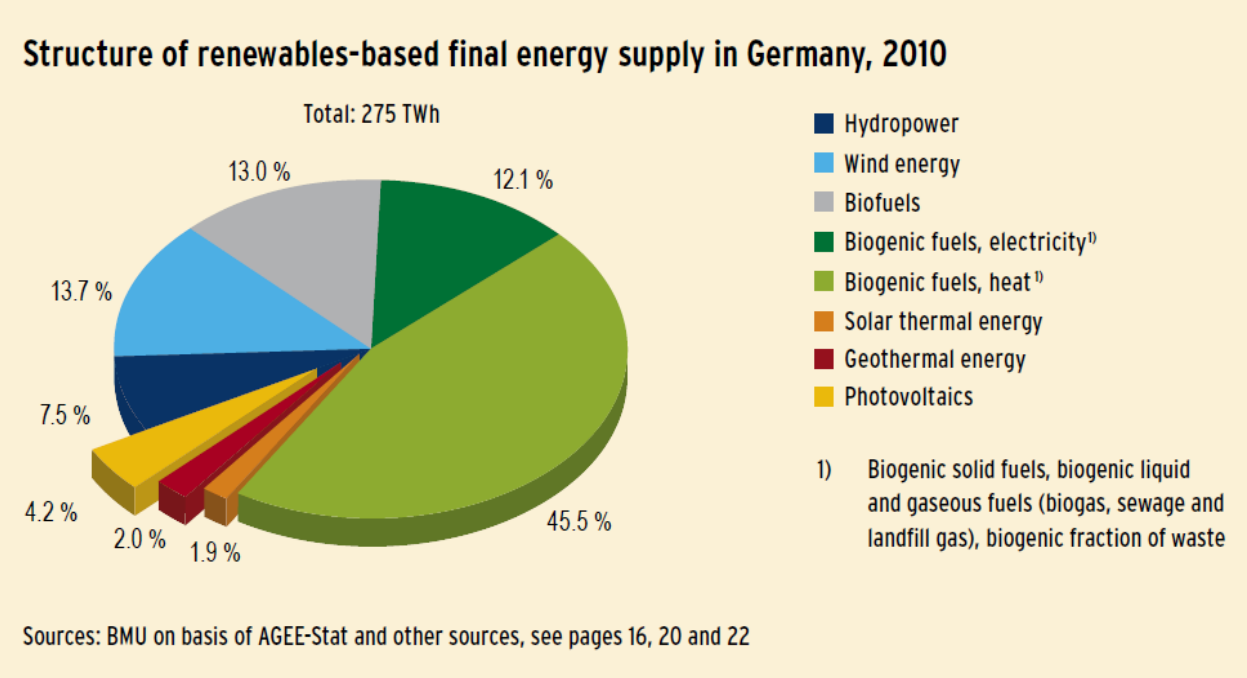
The point of a feed-in tariff system is to provide consumers with a financial incentive for installing private renewable energy systems that are connected to the grid. The consumers are then paid a fixed remuneration for what they generate. As PV was the highest paid option within the feed-in tariff plan, the aforementioned installation boom occurred in part because of

the security of the investment which had a 20-year guarantee. When these incentives were utilized at a much-higher-than anticipated rate, the result was a depreciation of total costs in manufacturing and installing—subsequently bringing down the value of the feed-in tariffs over time (Bundesverband Solarwirtschaft (BSW), 2010). Because of the possible annual 3 percent decline in feed-in tariff values (BSW, 2010), consumers have been increasingly motivated to take advantage of these incentives, in many cases even as a "business" or financial opportunity.[11] In the long term, this trend is postulated to be a win-win situation because higher investment rates drive demand and innovation, which over time slashes the costs associated with new technology development and application. Simultaneously, the more participants in a feed-in tariff system, as well as in a smart grid system, the faster the country becomes more energy independent and can realize significant savings on the high cost of importing energy sources to meet domestic consumer demands. Free-standing and rooftop solar systems are probably the most widely applicable of the renewable energy options because they can be incrementally assembled to match the specifications of any structure, ranging from small home systems to large industrial parks.

The sources of renewable energy in Europe and especially in Germany are diverse (see Figure 4). In 2010, the energy production of biomass/bio-energy increased by about 19 percent from 2009, and accounted for approximately 11.9 percent of the renewable energy share in Germany (Energien-Statistik, 2011). Biomass can be broken down into several categories to specify solid, gaseous, or liquid forms; a significant portion of bio-energy is derived from

[11] "Business" refers to the tax code classification of a private citizens' investment of a rooftop solar installation.

Figure 4



sewage and waste processing. The combined categories of bio-energy accounted for 7.7 percent of Germany's total energy consumption in 2010, and the industry employed 122,000 workers (Röttgen, 2011, p. 14). Germany has outlined a detailed roadmap for bio-energy production and its potential. One of the unique functions of bio-energy generation is that not only does is it generate significant employment opportunities, but it creates value (Aigner & Gabriel, 2009). The value creation is derived from the fact that bio-energy production can be a means of waste processing by taking commercial, industrial and agricultural waste and producing energy with it. More specifically, the bio-energy production cycle relies on landfill waste, wastewater, any forms of organic waste, as well as non-food energy producing crops, which can be used to heighten gas yields. Currently the base materials used as bio-materials are liquid manure and various anaerobic bacteria brought together in an oxygen-free environment. The result is a biogas that is anywhere from 55-70 percent methane, which can be used in

combined heat and power systems (CHP) or further refined into fuel for natural gas-powered vehicles.

Perhaps the most widely used type of energy derived from bio-mass is heat. Combined heat and power plants (so-called co-generation) can be size/capacity optimized and can have high efficiency rates; additionally they can be connected to the grid or be an excellent solution for off-grid or remote areas (Deutsche Energie-Agentur GmbH (dena)). A further detailed breakdown of bio-energy sources as a percent of the total renewable energy production reveals a complexity of root sources: biogas (12.9%), biogenic solid fuels (11.4%), biogenic fraction of waste (4.5%), biogenic liquid fuels (1.7%), sewage gas (1.1%), and landfill gas (0.7%) (Röttgen, 2011). The simplest breakdown can be characterized as biomass, biofuel, and biogas. Common examples and applications of these three categories would be wood pellets made from wood waste products for heating(biomass); bioethanol made from various agricultural stocks containing sugar and starch for [vehicle] fuel (biofuel); and liquid manure and solid waste for CHP (biogas) (Deutsche Energie-Agentur GmbH (dena)).

An important area of the renewable energy sector in Germany, especially when considering the displacement of greenhouse gas emissions (GHG), is the inclusion of fuels derived from renewable resources. The three forms of alternative fuels used in Germany are biodiesel, bioethanol, and vegetable oil. Biodiesel accounts for 4.3 percent, bioethanol for 1.4 percent, and vegetable oil for 0.1 percent of the total fuel consumption; combined, alternative fuels amount to 5.8 percent of Germany's fuel consumption (Röttgen, 2011).

Other renewable energy sources not discussed above include geothermal and solar thermal. Both methods only comprise a very small percent of the total share of renewable

energy generation in Germany with surface and deep geothermal and solar thermal totaling only 2 percent and 1.9 percent respectively, among renewable energy types. Geothermal energy generation was hardly a significant contribution to Germany's overall electricity consumption at an estimated 0.005 percent. Other geothermal and solar thermal generation is only accounted for in the final energy consumption (FEC) of heat. In 2010, solar thermal energy only accounted for 0.4 percent of the total FEC of heat. Similarly, deep geothermal and near-surface geothermal energy accounted for 0.02 percent and 0.4 percent respectively, of the total FEC of heat. Geothermal energy generation employed approximately 13,300 workers in its sector in 2010 (Röttgen, 2011).

The most recent approach to energy independence from the German government was to introduce new efficiency measures through the application of a national smart grid—a means of sensing needs and predicting energy uses. But Germany already thinks beyond its national borders. A European smart grid would be a renovation of the current outdated energy supply systems through micro and macro inputs. A broader and more comprehensively controlled system would allow for clean energy contributions to come from wind farms in the North Sea, solar installations in the south, and hydropower from the Atlantic. A cutting edge component would be the addition of micro sources coming from every home, business, and property owner who has the ability to generate energy on-site which will be fed into the smart grid (European Technology Platform for Electricity Networks of the Future, 2007). As of 2010, all new buildings in Germany are required to install smart meters, connected to a 24-hour high speed internet connection, which allow for more accurate real-time monitoring, and eventual annual household consumer savings. Sources have reported however, that the smart grid

system still awaits a full range of legislative backing, to alleviate the consumer costs associated with the startup of this new technology (Frei, 2010).

Finally, it is important to briefly examine the economic impact of Germany's lead in renewable resource exploration. One of the dominant skeptical questions of the day is: will Germany have what it takes to see an economic return on their far-reaching investments in innovation, technology, and application of all these renewable energy sources? This is not an unfounded concern—as in 2010 alone, the country invested approximately 26.6 billion Euros in the construction of these renewable energy installations. Photovoltaics alone accounted for 73.4 percent of that figure (19,500 ml. EUR). So far, an analysis of the economic boost as a result of constructing these installations has shown that last year an estimated 11.1 billion Euros in economic impetus was generated (Röttgen, 2011). Amid the debate of the long term sustainability of Germany's rate of incentives and investments is one very heartening aspect: throughout the global economic crisis of the past three years, Germany's economy has continued to strengthen through the stability of these assets and technologies in the renewable energy sector.

Germany's remarkable recent accomplishments in renewable energy generation and subsequent applications bring us to an important subject when explored in social and economic terms: [environmental] education and employment. A simplified generalization of the number of jobs supplied as a result of Germany's progress in the industry was given above; not discussed were the educational and professional implications of these numbers. The German government's crusade for bolstering its alternative energy sources is both a challenge and a blessing in economic terms. One challenge, among many, is supplying an adequately trained

professional workforce to meet the manufacturing, installation, and maintenance demand for all this new technology. The blessing is the economic stimulus via hundreds of thousands of green-tech jobs flooding the market.[12] People suited for these jobs don't just appear overnight however, and training and education therefore is a most critical underlying factor in ensuring the initial accessibility to the new green-tech job-market in the first place. Germany's expansion in the development of renewables, by its very nature, created a demand for trained professionals. In response, education at all levels underwent and is undergoing the appropriate steps to supply these professionals to meet evolving economic and job-market conditions. Trade schools, research institutes, and universities are on the move to offer up the appropriate curricula, learning opportunities, and training to meet the "green economy" demands. As a result, a remarkable influx and expansion of environmental education programs and opportunities has simultaneously begun to trickle down to ever-younger pupils, effectively opening their minds and broadening their aspirations for newfound career paths and lifestyles. As I will explore in Chapter Three, our world leaders have increasingly recognized that environmental education among our youth is critical to our planet's survival. However, reaching that conclusion must be complimented by the excruciating task of actually making it a reality. In the case of Germany's strides toward a greener economy, top-down decisions in favor of protecting the environment, has led to one of the world's most successful movements of bottom-up social and environmental education and ethics building.

[12] During the economic collapse of 2008, Germany remained one of the most stable economies in the West, even seeing growth in some sectors—arguably due to its huge investments in a greener economy.

2.2 Study and Research on Sustainability in Germany

With the issue of environmental protection and sustainability exploding in the German marketplace, the demand on public and private educational institutions and research centers to produce a workforce specializing in these areas of study is likewise rapidly increasing. In the past several years, 1.5 million people (or 3.8 percent of all German employees) had jobs in the environmental protection and sustainability sectors, outpacing Germany's well-known auto industry. By 2003, Germany was producing 18.8 percent of the world's share of exports in goods and services related to environmental issues (Haan D. G., 2009). Education in sustainability-related fields is shown to be premier in Germany, with significantly more outlets and [student] opportunities as well as higher participation in these programs and courses, than in the United States or in European countries with high standards such as Sweden.

One significant driver in the explosion of programs in sustainability-related studies is the recent shift from reactive to proactive environmental policy and consumer behavior. These changing conditions range from shifting values and heightened awareness among individuals and groups, to developing business and corporate responsibility measures aimed at more equitable production processes, as well as the elimination of [polluting] externalities. The argument for economic policies that reflect sustainability measures is being supported and further substantiated by these conditions. There are significant long-term financial, environmental and human health incentives for reducing pollution in the production process. The varied aspects that lower costs and improve environmental and health conditions, include optimizing the use of resources to minimize initial raw material needs, reducing the amount of waste, to make products that are more easily disposed of, and to make products with more

recyclable components. In order to achieve these objectives however, the workforce must consist of adequately and properly trained experts to facilitate this national and global transition towards more sustainable economic practices. Sustainability-related programs, seminars, or interdisciplinary studies that focus on environmental protection and have content on sustainability, become the critical foundational resource.

In an effort to document the strengths of Germany's widespread institutional approaches towards sustainability and resource conservation, The Federal Ministry of Education and Research conducted a study to determine the number and types of study programs that address these issues. They were able to establish a list of 325 study opportunities which they categorized into the following groups: Single Sustainability related Seminars (14.2 percent), Explicit Sustainability Programs (30.8 percent), and Programs with Sustainability related Study Focus (54.6 percent). Furthermore, these opportunities were offered through non-university facilities, university facilities, and research institutes under which they had their own sub categories:

<u>Distribution of University Facilities:</u>

- University affiliated Institutes (9)
- Interdisciplinary/cross-faculty Centers (45)
- Faculties, Facilities, and Chairs (84)

<u>Distribution of non-university Facilities:</u>

- Facilities of Research Institutes (34)
- Regional Facilities (9)
- Federal Facilities (7)
- Other (12)

<u>Research Institutes (62 non-university facilities; 135 university facilities) and Distribution areas of offered Sciences:</u>

- Interdisciplinary (132)
- Natural Sciences (118)
- Humanities, Social and Behavioral Sciences (84)
- Engineering Sciences (78)
- Life Sciences (63)

What these data show, is that in a global comparison, Germany is doing an outstanding job in providing education and training for tens of thousands of individuals who are entering a rapidly expanding national and global green jobs market. The German Renewable Energy Federation (BEE) estimates that by 2020 an additional 285,000 renewable energy jobs will be added to the market (Haan D. G., 2009). The breakdown by (renewable energy) sectors earlier in this chapter showed us this estimate may be outdone by newer models and statistics. Each developing sector will bring about its own bundle of new employment opportunities; for example, a recently popularized issue is that of nutrition through organic and sustainable agricultural practices, which in 2009 employed over 160,000 people (Haan D. G., 2009).

As a result of Germany's progressive political approach towards the environment over the past decade, there have been several significant outcomes: the first and most obvious is the safeguarding of the environment, secondly it has resulted in an undeniable short term economic boost, but most importantly it has stimulated the widespread prioritizing of environmental education and has spurred conscious social change that is wary of unsustainable systems.

Chapter Three

Sustainable Development: from Concept to Classrooms and Communities

Chapter Three begins to examine the broader governmental frameworks and policies that provide incentives for environmental education. This chapter first takes a look at measures overseen by UNESCO as the broader picture on sustainable development, and then narrows down to specific agendas and curricula such as "Transfer 21" which helps lay the foundation for the broader notion of sustainable development through sustainable/environmental education. Finally the chapter assesses some specific learning approaches or student projects that aim to enhance environmental education among youth.

The 1987 Report by the World Commission on Environment and Development, known as the "Brundtland Report", was the first document wherein the notion of "sustainable development" was widely recognized and formally discussed. One of the priority objectives contained in this report was the notion to "meet the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland, 1987). In 1992 the United Nations Conference on Environment and Development (UNCED) met in Rio de Janeiro, producing the "Rio Declaration" which established twenty-seven principles for achieving Sustainable Development (SD). These principles were augmented by "Agenda 21," a document that served as a foundation for achieving further development goals. Perhaps the most critical element of "Agenda 21" was its emphasis on education as a means for achieving long term SD by requiring balanced environmental, societal, and economic considerations while still attempting to improve the quality of life. The guiding principles for achieving these objectives are intergenerational equity, gender equity, just and peaceable societies, social tolerance, environmental preservation and restoration, poverty alleviation and natural resource

conservation (UNESCO U. N., 1995-2011). The four identified educational objectives underlying SD are:

- Improve the quality of basic education
- Reorient existing education programs to address sustainable development
- Develop public awareness and understanding
- Provide training for all sectors of private and civil society

However, at the 2002 Johannesburg ten-year reunion it became evident that these educational and general goals had been a bit over-optimistic, and required a more refined approach for achieving the long-term SD objectives. The UN "Decade of Education for Sustainable Development" (ESD) represented the new approach that was developed by the world leaders present at the conference. Already apparent in its title, ESD was initiated on a non-conventional basis, with its general initiative coming from the expertise of economists and politicians—not just educators. In December 2002, after professionals and world leaders came to the general and somewhat obvious conclusion that education was the key to sustainability, it was announced that 2005–2014 would be called the "Decade of Education for Sustainable Development"; this project became an official, decade-long top priority of UNESCO (UNESCO U. N., 1995-2011).

UNESCO defines ESD as follows:

> "Education for Sustainable Development (ESD) is a learning process (or approach to teaching) based on the ideals and principles that underlie sustainability and is concerned with all levels and types of learning to provide quality education and foster sustainable human development – learning to know, learning to be, learning to live together, learning to do and learning to transform oneself and society."

Under this definition, the interpretation of the process of SD is very open—open to the approaches most fitting or congruent with a particular cultural value system, social or political climate, pre-existing and projected spatial environmental characteristics specific to countries or

locales – as well as to educational parameters. The priority that UNESCO (and ESD) places on SD reflects an important step and a proactive approach towards recognizing what is at stake by refusing to act on issues of environmental concern. It also makes clear to stakeholders of all kinds what they stand to gain or lose, especially in economic terms. Though the definition of a stakeholder extends equally to preservationists as to profit-oriented corporations, it is generally the latter that have greater control over the outcome of both ends of the stakeholder spectrum. Environmental protection groups do not create the threat of unsustainable development. Conversely, corporate entities often view their primary purpose as propelling the economy by providing employment and products for the market, regardless of environmental damages. It is here that environmental protection groups play an important role in providing expertise and a counter narrative, critical for shaping the decision making process and the vision [of SD] for the other stakeholders. Therein lies the ultimate challenge: to bring together stakeholders across the broad spectrum of issues and interests, and to achieve the level of collaboration necessary for addressing the bigger picture, such as the Millennium Development Goals (MDGs), in which SD serves a critical function (UNESCO E. f., Definition of ESD, 1995-2011). One important approach toward these lofty MDGs and SD goals is through education (ESD). Education for Sustainable Development, by virtue of the very implications of education, impacts the individual and over time can induce a consciousness shift. The resulting behavioral changes that can spread to groups, organizations, and even policy spheres, may eventually influence the way governments conduct themselves and set priorities.

First however, as was recognized in Rio, the teaching of environmental and social justice issues must be a universal and primary goal. How can ESD be recognized on the ground, and

how can educating the youth on critical environmental issues become a successful reality? One answer is the sub-program called "Transfer-21." *Transfer-21* was a German follow-up program to "Agenda-21" that received 13 million Euros in state and federal funding over a five-year period from 2004 to 2008, and had participation from 200 schools in Germany. Specifically, *Transfer-21* of ESD was overseen by the Fed-State Commission for Educational Planning and Research Promotion (Bund-Länder-Komission für Bildungsplannung und Forschungsförderung (BLK)), and was coordinated via the Free University in Berlin. Although the initial funding for this project was only guaranteed through 2008, the*Transfer-21* project/program has been successful and is currently still running in 13 of the 16 states (Bundesländer), with individual projects continuing to find ways to receive funding (Haan P. D., 2004-2009). For example, the state of Bavaria still offers significant financial resources through its Ministry of Environment (Haan D. G., 2012). In Germany, between the initial 20 million Euro investment in environmental education, which began in 1998, and the subsequent yearly contributions of 300,000 Euros by the UN decade for ESD which began in 2002, elements of *Transfer-21* have been extended to approximately 3000 schools—roughly 10 percent of all German schools (Haan D. G., 2012).[13]

In 2007, *Transfer-21* published a guide entitled *Education for Sustainable Development at Secondary Level: Justifications, Competences, and Learning Opportunities*. This guide does just what its title suggests, by laying out a comprehensive rationale in line with child development and is built on the concept of *Gestaltungskompetenz* (shaping competence). The

[13] After the main concept of "Transfer-21" was established in the first 200 schools, research primarily provided/incentivized the remaining funding for the estimated 3000 involved schools. Other funding comes from sources like the state, the schools themselves, donations, or corporate entities wishing to fulfill their corporate responsibility portfolios (see "Leucthpol" which is financed to a tune of €20 million) (Haan D. G., 2012).

three pillars of *Gestaltungskompetenz* are 1) interdisciplinary learning, 2) participation in the local area (community), and 3) innovative structures within the school. The overall concept and means for *Gestaltungskompetenz* can be understood twofold: first by establishing connections to existing statutory curricula, school subjects, areas of learning, internal school curricula and school programs; and second, pursuing innovation and development in school programs by presenting a variety of learning opportunities including evaluation and assessment (Transfer-21 Program (working group), 2007).

This presentation of learning opportunities is further explored by the 39 "Lernideen" (informal lesson plans) compiled by the "Quality and Competences" working group of *Transfer-21*. The approaches and topics broadly range from social justice issues like Fair Trade, children's role-playing simulations and games, to saving energy and water in the school. Below is an example of one of these "opportunities," deconstructed in detail; its major concepts have been translated from *Lernidee* number 9 "Strong and Weak Sustainability." This particular lesson meant for 9th and 10th graders, is loosely formatted as an informal quiz and it also outlines what materials are needed. The lesson plan indicates that it should take students 90 minutes to complete and gives the areas of study to which it applies (interdisciplinary in this case).

First the students are given a text which they must read and understand. In this case it speaks to the individual and collective responsibilities they have to the various forms of capital, from social to ecological, in order to leave a habitable planet behind for future generations. Secondly, it briefly outlines the concepts and implications of "strong" and "weak" sustainability, introducing some more advanced logistical terminology such as the "constant natural capital rule" (CNCR), and the "non-declining utility rule" that characterizes and contextualizes long-

term sustainability. The students are then asked to clarify some of these terms and enhance their comprehension of the text through online research links that are provided for them.

The second part of the exercise stresses working collaboratively with a partner to explore 12 themes or topics that fall under the categories of strong and weak sustainability measures, as well as unsustainable ones. For example: solar energy, new zero-emission building, and nuclear energy, respectively. For this, cut-outs of the 12 exemplary concepts are supplied along with a chart so students can place the "actions" into the three sustainability category columns where they belong. Once the students have comprehended these concepts relatively well, they are asked to embark on an envisioning exercise to think about what the world will look like in 2050. They also are to envision what concepts of strong or weak sustainability should best be pursued and in which context so that they meet favorable future ecologic, social, and even economic outcomes. They are asked to hypothetically explore a future world that develops on the trajectory of each of the three scenarios of applied sustainability (or not). Finally, they present their projections in a creative way, whether in writing or visually (Böhme, 2007).

Aside from having established a foundation and rationalized justifications for the present competences and learning opportunities, it is also important to develop and evaluate on an individual basis the quality and success of schools that integrate ESD. So that schools can independently evaluate themselves and have a strategic template for improvement, the *Transfer-21* Program working group on "Quality and Competences" compiled a guide in order to develop a baseline criteria and set of principles. This guide is divided into the following nine areas of self-assessment criteria:

1. Learning culture
2. Learning groups
3. Competencies
4. School culture
5. Opening of schools to the outside world
6. School management
7. School Program
8. Resources
9. Staff development

Each of these 'objective' areas provides a list of principles and criteria, setting a basis for self-assessment. In addition, a list of possible evidence (indicators) that these principles and criteria are being met is provided for each of the nine areas. The final column suggests possible learning arrangements and methods for achieving said objectives; this is a helpful tool as it is not only useful for self-assessment but it also encourages setting further-reaching goals (Quality and Competences working group, 2007). The idea of accurate and consistent documentation regarding the development of ESD objectives within participating schools is stressed so that they may establish a strong sense of direction and understanding of where they have progressed in meeting their ESD objectives/indicators, and what developmental steps should be taken within a realistic timeframe.

Overall, ESD can be seen as a transformative visioning exercise, it advises what actions to take, and with which actors to collaborate. These are often connected to the environmental, cultural, social, economic, and political contexts of each individual ESD school and the geographic area in which it is situated in. In practice, this process is an all-inclusive one, it integrates personal student learning through critical thinking and reflection with broader systemic thinking, partnership building, and finally participation and decision-making processes (UNESCO E. f., Characteristics of ESD, 1995-2011). Thus, *Transfer-21* is one possible and

practical means for achieving the educational objectives outlined in the UN Decade for Education for Sustainable Development.

Education for Sustainable Development in Germany however, goes far beyond the 'strategy' and 'competence' guide pamphlets or the 39 *Lernideen* put out by the *Tranfer-21* working groups. Since the initiation of the UN Decade for ESD, an impressive number of impactful projects have sprung up everywhere across the German Bundisländer. These official German projects of ESD are remarkable success stories of the hands-on cooperative implementation of Sustainable Development Goals that seemed hardly realistic less than ten years earlier, at the 2002 Johannesburg conference. In Germany alone, according to the database website for ESD Decade Projects (http://www.dekade.org/datenbank/), there are currently over 1,465 projects led by 1,695 individuals, at 1,339 institutions (UNESCO, 2005-present).

These "official" decade projects may be integrated within a schools' actual curriculum, or outside of it; they may take the form of a weeklong dedication to addressing any social or environmental cause in the classroom, on the school grounds, or within the greater community, but are usually planned over the course of several years. The learning implications and positive social and environmental effects of these many different types of projects vary greatly. One example is a project entitled Internationaler Schulbauernhof Hardegsen (International Farm School, in Hardegsen) and was featured during the week of January 24th, 2011. This project began in 2005 and is still in full-swing today. A farm in Niedersachsen made itself available on a year-round basis for visiting school field trips, for youth and adults, to come and experience the many chores and thrills of farm-life. They participated in everything from preparing a home-

sourced healthy breakfast to milking cows and digging up potatoes. A window into sustainable agriculture, valuable cooperation and community building opportunities, and a place for people from around the world to meet while exploring the many wholesome activities found on this farm, are among the myriad benefits this project boasts, (UNESCO , 2011). According to their website, activities for visitors and schoolchildren include:

- Caring for the animals
- Field and garden work
- Milk and grain processing
- Cooking and food preserving
- Trading and repairing
- Landscape conservation
- Renewable energy
- Ecological agriculture laboratories
- Excursions and media workshops

All of these activities vary by the seasons, making for an exciting and constantly changing environment. An additional dimension to this project, as with many others, is the integration of cultural values and traditions into the planned activities. For example, around Easter the tradition of dying and decorating eggs becomes a part of the scheduled learning activities. The object of this project like many others is to create an educational venue that engages both young and old in interactive, interdisciplinary, and exciting learning opportunities that are directly in line with the SD goals that have been deemed critical to the future of life on earth (Unger, n/d). With hundreds of highly educational and successful projects like this one in existence, and many more sprouting up every year, Germany truly is on a remarkable path towards activating student minds and cultivating a new generation that nurtures the

conscientious approach towards our natural environment that has been lacking for generations in advanced/industrialized Western society.

Chapter Four

Germany's Environmental Education Approaches: Examples from Freiburg and Berlin

This chapter focuses on my personal research and findings from a recent visit to the Albert-Ludwigs University in Freiburg and the Free University in Berlin. I will describe some of what I consider to be Freiburg's best approaches to environmental education and training in administrative and curricular models; and I will briefly discuss some student and faculty environmental initiatives. For the FU in Berlin, I will focus on the "Schools at University for Climate and Energy" (SAUCE) program, with a view to its transferability to the United States.

The goal of my German-based research has been to find educational approaches that appear particularly unique, effective, and transferable for reforming and expanding the ESD and environmental education in the United States. For this it is important to bear in mind the contrast between the education systems in the two countries. An in-depth comparison between German and American education systems would be the topic of another paper; however, the following graduate-level curricular approaches would only need to be adjusted to the capacities of an undergraduate audience for their obvious benefits to be made transferable. While abroad, I came to realize that the efforts of student organizations on American liberal arts campuses were in many ways equivalent to those that German students were involved in during their secondary education. Higher education in Germany is subject oriented, whereas undergraduate activities and involvement in student organizations as exhibited the United States, is more broadly focused. Nevertheless, when leaving this key difference aside, even German graduate-level curricular models have excellent application potential for undergraduate institutions in the United States. This appears especially true for the subject area of sustainable development, whether it is explored in the form of official institution-led, or

unofficial student-led, environmental awareness and education efforts. While throughout this chapter I infer that many of these approaches have transferability in the US, or even that some parallel efforts may already exist, this chapter focuses entirely on Germany; Chapter Five will proceed to examine the American achievements in EE and ESD.

4.1 Albert-Ludwigs University Freiburg

Albert-Ludwigs University in Freiburg lies in the southwest corner of Germany. The university, which is divided up into institutes based on subject areas, has taken notable strides on many levels in order to become more environmentally sustainable. It offers a wide range of courses and programs that deal specifically with understanding and preserving our natural environment. During my visit, I spoke to the director of the Masters Program on Environmental Governance (MEG) and the director of the Renewable Energy Management Program (REM), and also a Professor at the Forest Ecology and Management Institute. From my conversations and further research online, I gathered some of the ways in which the University approached issues of environmental concern. I break these down into the following four categories:

- University initiatives
- Student initiatives
- Curricular approaches
- Overall frameworks

Success of sustainable initiatives at the University of Freiburg can be significantly measured in terms of incentivizing behavioral change. One such incentive was a major funding award from the University head office, which promised a hefty 50 percent slice of the year's allotment of the "general University fund" to the Institute which could reduce its energy

consumption by the greatest amount (but at minimum of 5–10 percent). Because of this irresistible incentive to participate, all eleven faculties competed to receive the extra funding, resulting in an overall 8 percent decrease in energy consumption. Another effective and notable effort was the formation of a working group called *Nachhaltige Universität* (Sustainable University). This is a collaborative body that works to develop its own environmental initiatives as well as helping to direct outside initiatives that are brought to them by others. For example, one of the projects this group oversees is the yearly calculation of the amount of tons of CO_2 that is reduced/avoided via active institute-wide initiatives and specific activities such as the production of solar energy. This working group is open and accessible to all who wish to be a part of it (Freiburg A.-L. U., 2012).

In 2007, a state-sponsored solar initiative happened to coincide with the University's 550^{th} anniversary. To commemorate this, the University did a mass-installment of solar arrays that had individual peak generating capacities of 550 KW. To finance this initiative, they explored several approaches. First and foremost, they utilized the state financed incentives for which system costs were subsidized at a flat rate of 5 percent for at least a 20-year period. Second, they offered shares that could be purchased by faculty, students, and other interested parties at 50 percent of the usual cost (€500 instead of €1000); in this way the overall solar investment (not including state subsidies) was financed by 1/3 through the University community. The additional 2/3 was paid for by outside investments (Adler, Managing Director "Centre for Renewable Energy" Freiburg University, 2012). The way in which the overall state-subsidized program works is that the [University] rooftops are essentially donated to the state, which then sends an authority to inspect the security of the investment (soundness of the roof,

etc.). If everything is to code, all energy generated on-site is delivered to the public grid system. Only when a solar array or system is 100 percent privately financed (as is the case with the University Hospital), can its owner exercise freedom in reinvestment schemes, for example, applying the saved costs to future system installments. The final initiative area, which the University developed to promote sustainability, is what they called "soft measures." These measures are smaller actions (usually originating from students but adopted by the University) that raise awareness or conserve energy and resources in small-scale ways, for example through posting little stickers above all the buildings' light and heating switches as a reminder to be cognizant of energy usage.

The second approach to sustainability at Freiburg University occurs in the form of student-led initiatives. Though many of these initiatives are not unique or entirely original to Freiburg, they are nonetheless important steps. One example of a student-led initiative was in response to the very high levels of coffee consumption, which produced significant amounts of paper waste. The proposed and implemented initiative was to provide or sell reusable to-go cups; this eliminated waste while providing additional incentive by way of offering discounts on beverages for reusable cup users. Another initiative promoted by students was to drastically lower the use of bleached and first-time use printing paper; this was supported by in-depth analyses of paper, printer, and ink use statistics. As a result, the institution and students now use 90 percent recycled paper, and a special justification form is required for any request for non-recycled paper (for example certain types of photo paper). Another student initiative was to color-code all waste containers so that not only was it absolutely clear which things should be deposited where, but the process would train a student's eye and develop certain new and

responsible habits when disposing of waste. Finally, another approach that students used was to promote an initiative for a specific cause: in one instance students collected empty printer cartridges and recycled them, using the revenue to donate to a local charity.

The aspect of Freiburg's sustainability efforts that left the greatest impression on me, were the program structure and curricular approaches taken by two of their master degree tracks. An in-depth evaluation of the MSc. in Environmental Governance (MEG) program revealed its primary components to consist of core classes, electives, "research skills," an internship, two to three case studies, a student/class project, and a master thesis. My particular angle of interest when examining these approaches, is to search out the most impactful and suitable practices, for which to engage students within their community in environmental issues. Three further elements that interested me the most in terms of their transferability and application to a United States liberal arts setting, were the internship, the case studies, and the student project. Although I draw upon approaches and designs from a Masters Program, one must bear in mind that despite the different configuration of higher education in Germany as compared to the United States, these models could be made transferable with relative ease.

As part of a two-year Masters program, students undertake two different case studies. This program structure gives students the opportunity to work outside of the institution and produce real-world palpable results out of which, ideally, they themselves as well as the subjects of the study stand to benefit. Case studies can be focused on the university or an outside entity. One example was the Institute of the Faculty of Forest and Natural Sciences building, which had a sizable open-air quad in the center and was surrounded by five-story walls. Because the building was old, all the inside facing windows needed to be remodeled in

order to lower energy costs from high levels of heat loss. The case study produced a recommendation for an atrium over the inner courtyard. When it was built, it ended up saving 30 percent of the entire building's energy costs. Another case that engaged students in the community was a study they did for the local branch of the Pfizer (pharmaceutical) Corporation. The students conducted an analysis to gauge whether a solar thermal heating system installed at the Pfizer industrial plant, would be economically and ecologically sufficient to lower the level of energy dependence to the standard that was being mandated at the time. This engineering-focused study concluded that such a system would in fact meet the required objectives; both the students and the local industry profited in different ways from their collaborative and creative involvement in achieving their goals.

At Freiburg, a critical component of a student's education is conducting internship work in a professional setting. In the instance of the masters programs I am discussing in this chapter, the internship examples below (see Table 1) are ambitious high-level projects of a caliber that I am not suggesting would be feasible or appropriate for undergraduate levels of education in the United States. However, the value gained by working on a directed project outside of the students' home institution, is an invaluable experience of personal and professional growth and intra-cultural understanding. The merits of such an approach, especially focused in an area of environmental concern and sustainable development, would be worthy of development and eventual adoption, especially within well-connected university networks in the United States. In the case of Freiburg graduate students, they are very much encouraged to study abroad, and to work within the potential employment sectors for which they show the greatest interest. Additional objectives of their internships are to gain an overview of a specific subject, an

understanding of the overarching structure of organizations—how they function both internally and externally --and to become familiar with the "everyday work experiences" within a professional workplace (Freiburg A.-L. U., 2012).

Preliminary list of Internships from 2011 (selection)

Table 1

INTERNSHIP PROVIDER	INTERNSHIP TOPIC	CITY	COUNTRY
Genesis Foundation	Biomass power plants/ forestry	San Carlos	Philippines
GIZ Namibia / Ministry of Lands & Resettlement	Land reform policy	Windhoek	Namibia
GIZ Peru	Environmental education	Lima	Peru
Govt. of Samoa	Pacific Adaptation to Climate Change (PACC) program	Apia	Samoa
Fraunhofer ISE (Solar Energy Systems)	Thermal energy storage	Freiburg	Germany
Eagle Foundation	Re-forestation	Mindanao	Philippines
GIZ China	Food safety, pollution	Beijing	China
IUCN	Biodiversity and sustainable land use	San José	Costa Rica
UNESCO - HELP Programme	Hydrology - Environment, Life & Policy Program	Paris	France
GIZ Uganda	RES & EE promotion	Kampala	Uganda

Source: http://www.meg-uni-freiburg.de/38/

Another component of some of Freiburg's programs involves not only individual student projects, but projects or events that the entire class works on together. One example of such a class project was a forum that brought together world renowned speakers like Vandana Shiva. Another was putting on a Green Jobs Fair or even orchestrating a preproduction project of *No Impact Man*.[14]

The final component that I mentioned above is the overall approach or framework that the University takes towards sustainability. Aside from providing strong institutional support for

[14] A man and his family attempted to live in New York City for one year without having any carbon footprint.

sustainability proposals, the matrix structure of the University supports further interdisciplinary achievement. The success of this final component of sustainable development rests essentially on rearranging main subdivisions of faculties and institutions in more propitious ways. The university's organizational matrix is particularly effective in the departments relating to natural sciences. To conceptualize how this functions, imagine the faculties as vertically arranged while the institutions and centers (scientific centers) are arranged horizontally, interconnecting the faculties in an interdisciplinary way within the institutions. Under this flexible network structure, "institutions can be quite easily set-up or closed as needed" (Adler, Managing Director for Centre for Renewable Energy (ZEE), 2012). Uniquely, more rigidity is placed on the faculties (subjects) rather than the institutions, giving the curriculum and the individual studies of students more flexibility. This structure ensures that all departments and faculties are designed to be accessible and above all extremely interdisciplinary in working with other disciplines that are related. For example, an elective within the MEG program may be a course in the REM program, and the faculty is interchangeable—teaching outside of their specific programs (institutes and scientific centers). The aim of this approach, especially prevalent within the masters programs, is to ensure higher job placement and success rates of graduates in a more diversified workplace and job market. These students are effectively more prepared to face multi-faceted, interdisciplinary responsibilities. For example, graduates from the REM program receive an equally comprehensive skill set that is applicable to both the social and technical aspects in the field of renewable energy as well as receiving a solid base for political applications of their field.

The University of Freiburg also exhibits its commitment to the environment through placing priority on the development of a strong working base to connect all renewable energy-related projects while still facilitating new initiatives, such as the development of new master-level courses, etc. Overall, a great deal of collaboration goes into connecting the many environmentally oriented projects, initiatives, and courses at the University, making it a role-model institution at the forefront of engineering inventive and resourceful approaches toward environmental issues, global climate awareness, and international interdisciplinary problem solving.

4.2. The SAUCE program at the Free University in Berlin

One successful approach for achieving a heightened level of environmental consciousness among today's youth is the Schools at University for Climate and Energy (SAUCE) program, which presently has eight European partner Universities in six countries. The program grew out of the need for an education system and a curriculum that mirrored the critical environmental issues of today's world. The evolving global political framework and international scientific community is increasingly informing us of the grave dangers of the global climate and energy crisis that in the long-term threatens our way of life. The SAUCE program, according to one ambitious parent and research fellow at the Free University in Berlin, is one plausible and successfully proven approach for addressing the educational deficit of energy and climate issues within curricular models around the globe. In a personal interview she conveyed to me her surprise and disappointment that her daughter was not being sufficiently informed and educated about contemporary climate and energy concerns. Due to a

lack of priority and resources for such issues at her daughter's school, and because the teachers themselves were inadequately informed, their ability to teach schoolchildren about important global environmental issues was seriously limited. In response, this dedicated parent, enlisting the help of many others, rolled out an educational program that shortly thereafter spread internationally. SAUCE heightens environmental awareness among thousands of children between the ages of 10 and 13 every year (Braun-Wanke, 2012).

The basic structure of SAUCE is to compile a variety of topics and hands-on student activities pertinent to sustainability and energy issues, and to develop an interdisciplinary program that allows them to engage in these topics in various formats. The programs are "transportable" and designed to make use of the resources and strengths offered in their specific geographic areas. The programs take place at an affiliated universities, making use of their facilities and resources (faculty and students among those), while still enlisting the expertise and resources of participating local NGO's, research institutes, or field specialists (and even forging partnerships for this specific purpose). Prior to the weeklong SAUCE program, a workshop for teachers may be offered so that they become informed well enough to teach and aide in the program's activities and lessons. The program generally takes place once in the spring and once in the fall, both times for one week, and is designed to benefit all participants; teachers, pupils, and all the other parties involved, each contributing their own expertise (Bointner, Braun-Wanke, Duchkowitsch, Kranzel, Piening, & Watts., 2011).

The overall impetus for a program like SAUCE was born out of the international lack of environmental education within mainstream curricula, pertaining to energy as well as climate issues, and the ensuing social and political implications of ignoring these concerns. The *practical*

rationale behind this SAUCE program format is to connect universities, research institutions and schools. It achieves this by facilitating a variety of experiential approaches designed to spark the children's interest and imagination while encouraging them to engage in issues of environmental protection and energy conservation in an interdisciplinary, critical, and hands-on way. By holding the program at a university, it offers a space to younger students that is exciting, state of the art, and surrounds them with "grown-ups" that they can look up to and emulate. Because of the significant resources that institutions of higher education often have to offer compared with the [often] under-funded elementary schools, the issues examined can be made more accessible, comprehensible, and exciting to schoolchildren (Bointner, Braun-Wanke, Duchkowitsch, Kranzel, Piening, & Watts., 2011).

The SAUCE program is structured to include a variety of hands-on activities or workshops and lectures. One program schedules between 25 and 50 single exercises/activities for 1,000 to 2,500 children over a weeklong period. An objective of the exercises is to involve the pupils both emotionally and personally; this is achieved through every possible dimension, ranging from science experiments to games and role-play. The bottom line is that the majority of the learning is interactive. According to the SAUCE Handbook, the focus is specifically on "the scientific, technical, social and cultural dimensions of climate change as well as renewable energy and efficient energy use." Included under this umbrella are the following topics (Bointner, Braun-Wanke, Duchkowitsch, Kranzel, Piening, & Watts., 2011):

- Energy and climate change policy
- Renewable energy
- Climate science
- Sustainable mobility
- Sustainable architecture and urban planning

- Resource protection and recycling
- Product design
- Energy saving and efficiency in everyday life
- Any other climate and energy topics relevant to children's everyday lives.

Also listed in the Handbook for the innovative teaching and learning approaches are:

- Art and design workshops
- Creative writing
- Experiments
- Simulation games and visioning exercises
- Excursions and guided tours
- Hands-on activities
- Theatre, film and dance
- Games, quizzes and shows.

*A compiled list of workshop and lecture descriptions can be found in the SAUCE Resources Guide available from cf. www.schools-at-university.eu

A separate form of value creation accrues for the host university and its counterparts and collaborators. For example, SAUCE becomes a valuable opportunity for the host university to contribute to the community in a constructive way by providing a space for critical dialogue surrounding sustainable development and its social, economic and political ramifications. Furthermore, while addressing these issues and developing a unique SAUCE program for the area, a network of local actors and issue experts working towards common goals on sustainability issues and initiatives emerges, thereby creating the potential for new partnerships (in regional SD). This is not only advantageous to the university as an image enhancement, but to all parties involved, while at the same time building a sense of community and identifying and establishing common objectives. Another such added value to the university is the side effect of inspiring program participants or their parents to consider [for

their children] higher education, and perhaps even to pursue degrees at that particular university. Even more specific, is the immediate value gained by the children from working and learning in the university setting. It provides an exciting new climate for them to learn by reaching beyond the everyday learning in their unchanging school environment. Just consider the eagerness of students embarking on an educational field trip.

The SAUCE program is entirely voluntary for participating institutions; this gives its structure even more flexibility and adaptability in various settings. Moreover, when initially organizing a SAUCE program, it is important to design it so that it best fits the specific resources and strong points of its geographic location; to showcase the expertise of those involved with the program; to fit into the university profile; and to adhere to a more localized set of environmental issues for a clearer understanding of their specific factors which enables the program to function successfully and build relevant solutions. This is best achieved through the carefully planned selection of on-site resources (specific professors, scientists or even students), and nearby climate experts, NGO's, research institutes, businesses, celebrities, speakers, or other potential partners. The Handbook also strongly suggests working closely with media and PR personnel in order to achieve a variety of objectives, ranging from awareness-raising for the cause (program) itself to attracting potential investors, such as those corporate entities that have [corporate] social responsibility programs or portfolios on which they are looking to act (Bointner, Braun-Wanke, Duchkowitsch, Kranzel, Piening, & Watts., 2011).

Though SAUCE program is designed so that it is reflective of the more specific highlights, strengths and resources of a particular setting or community, its approaches are meant to be transferable to other settings. The mere fact that SAUCE quickly became successful in six

countries (Germany, Austria, Denmark, Latvia, the Netherlands, and the UK) illustrates its effectiveness in adapting its developed approaches to many different curricular frameworks, while also containing a plethora of different localized collaborative actors playing important roles in supporting SAUCE in its mission. The prospects for transferring the SAUCE model to the United States are bright, and the masterminds who developed these approaches are eager and prepared to provide the needed support for passing this model on, so that it may become established worldwide.[15]

[15] To explore the possibility of beginning a SAUCE program at your institution, see Appendix B for a contact list of project coordinators and for program directors in the six participating European countries. Also in Appendix B, you will find the abridged SAUCE program checklist.

Chapter Five

American Models for Sustainability in Higher Education.

America today has no standardized or national approach for addressing the internationally recognized concern for sustainable development and its component of environmental education. There are, however, certain institutions that have taken initiative on their own to address these critical issues. Chapter Five will examine several examples of colleges in the United States that have taken unique approaches toward shaping their institutions, so that students graduate with heightened levels of environmental consciousness and literacy and vision for SD. This chapter gives a limited overview of some of the efforts that are being made in America, despite the gross lack of governmental support for SD in higher education.

Across the United States today, numerous higher education institutions are examining their environmental impact on planet earth. This view is two-dimensional: first there is the actual carbon footprint resulting from institutional operation, and second there is the potential impact graduating students have upon post-college society. Will these graduates be fully equipped to address contemporary global environmental challenges? Though both of these issues are closely intertwined, they require different kinds of problem solving and approaches to institutional evolution. On the one hand, upgrading new structures (all of which eventually need renovating and rebuilding) in order to meet LEED standards and buying carbon offsets can often be smoothly worked into the budget.[16] On the other hand, redesigning entire curricula to reflect our evolving collective consciousness can be quite a different and painstaking process. American colleges and universities are at different stages in addressing the dearth of ecological literacy within our educational systems—founded on our unsustainably designed society.

[16] Leadership in Energy and Environmental Design (LEED) buildings have lowered environmental impact in material sourcing, construction and operations.

Though our government does not yet reflect the sustainable-design needs of society that are recognized by scholars and the global scientific community by providing official government funding, many institutions have taken up the challenges of addressing aspects of ESD on their own. Some institutions have excelled in one way or another or even at both: becoming carbon neutral and reforming their curricula to emphasize issues of environmental concern. In this chapter, I outline some of these efforts. I further break down institutional sustainability and pedagogical sustainability into three overall categories showcasing the specific achievements of American institutions as they have performed in the key areas of 1) curricular reform 2) modes of student engagement and 3) the technical aspects of carbon neutrality.

5.1 Curricular Reform: Learning from Northern Arizona University and Oakland Community College

Perhaps the most critical issue to address in offering students an environmental and sustainability-focused education is the need to comprehensively integrate such narratives into the general curriculum. Whereas erecting LEED certified buildings is attractive for improving the institution's image and has significant long-term financial impetus, educational reform is much more painstaking, less visible to the outside, and is often time and cost-intensive—and is also confronted with dissenting forces wary of change. Despite these challenges, many colleges and universities across the country have been at the forefront of recognizing the growing societal need of producing environmentally literate graduates. Some institutions have actively begun to evaluate ways of reforming education to reflect these developments; and an even smaller number have been exceptionally successful at implementing strategies for change. The two

examples in this section show different approaches for curricular reform. Both scenarios effectively impact the whole student body and theoretically equip graduates with the foundation needed "to be successful in their adult roles of family member, worker, and educated citizen" (Rowe, 2004).

Northern Arizona University in Flagstaff, Arizona

In 1995, NAU which had a student population of about 20,000 launched the *Ponderosa Project*, aiming to infuse sustainability into the curriculum. After its inception and over the first seven years the project saw participation by over 100 faculty across diverse disciplines, while over 120 courses in the curriculum successfully integrated environmental and sustainability issues (Chase & Rowland, 2004).

> "The changes that faculty made in their courses represented a broad range of possibilities. Some faculty used environmental issues as examples in their courses to illustrate key concepts or ideas within their disciplines, while others introduced environmental content directly. Others consciously changed their orientation so that students are regularly reminded that the material they are addressing is linked to visions of sustainability, and, finally, some created class or individual projects that address environmental concerns." (Chase & Rowland, 2004, p. 97)

The process of redesigning a course requires significant effort, especially if the entire subject matter is to be framed in a new way. As incentive, professors, who worked extra hard to develop integration strategies for including sustainability in their courses, were rewarded with a financial "good-will" gift of a $1000 stipend.[17] Many NAU students are Native American, which also helped the University to secure funding for the *Ponderosa Project* from the US Department of Energy (DOE), as many of their facilities bordered Native American lands.

[17] Over time, as funding decreased, stipends were lowered to $500

Strengthening these relations and building awareness of climate and energy issues, was in the interest of the DOE (Chase & Rowland, 2004, pp. 97-98). Though initially perceived as "extra work", it became NAU's goal to naturally incorporate sustainability dialogue into a wide range of course materials, eventually leaving behind the preconception that this integration could only occur with outside funding.

As participating faculty began examining sustainability via interdisciplinary systems-oriented approaches, they soon discovered that incorporating this new material did not mean they had to give up what was previously considered to be vital course content. In fact, in their lives as students and as citizens, it appeared that this new approach helped them to understand the ways in which their learning connected them to relevant societal issues (Chase & Rowland, 2004, pp. 99-100).

This process did not however, come without significant hurdles. The departments themselves had relatively rigid boundaries—yet conceiving a sustainable future required flexibility in establishing interdisciplinary methodologies. Facilitating this integration process necessitates a support mechanism. It became clear early in the process that experts from both inside and outside the institution needed to be utilized, in order to give professors an optimal base of understanding and expertise, for contriving methods in the classroom that effectively linked their respective disciplines with real-time environmental content. Aside from academic support, funding and some form of overhead guidance structure also proved to be crucial. Although NAU was fortunate to have received adequate seed money for the *Ponderosa Project* from the DOE, Chase and Rowland stress the importance of early and consistent funding in any attempt to replicate this model. They also highlight the need for key supporters, "limited"

leadership, and project oversight. Throughout this journey, NAU was careful to avoid over-powering extant campus groups and their efforts related to environment and sustainability (to not monopolize the issue), while instead turning to them for insight and participation. They approached this through horizontal leadership structures wherever possible. It was important to not become "all things for all people" and running the risk of usurping the influence of those other campus groups that still held important functions. This was achieved through establishing a clear focus for the mission of the *Ponderosa Project* (Chase & Rowland, 2004, p. 104).

But what was the fundamental process for successfully implementing sustainability content into such a variety of courses? The answer is: workshops. Faculty and administration relied heavily on workshops scheduled throughout the year and especially during the summer (the time when professors were most engaged in revising the content and structure of their courses), to facilitate dialogue, exchange knowledge, and exercise group visioning. One example of an added environmental perspective was a course called "Medieval Art." In one part of the course,

> "...students are led to consider early efforts at reforestation in early thirteenth-century France, which came in response to rapidly diminishing resources as wood was being harvested to support the production of stained glass windows, an art form that required extended firing at high temperatures (Chase & Rowland, 2004, p. 98)."

A challenge that arose was reaching beyond the initial nearly exclusive focus (of workshops) on helping faculty revise what they taught in individual courses. Three years on, a new and critical discussion was added of what students would actually *learn* as a result of those many course revisions.

> "This shift in focus on what is taught to what is learned was consonant with assessment efforts across the university and effected what has become a national dialogue about the role of higher education in our society. Such a shift was important, for it led us to

> reshape the workshop core consciously around curricular issues broadly understood. …At the same time as we began asking faculty to articulate what the students would learn in their courses, we began to ask them to articulate what students should learn about sustainability through the whole curriculum" (Chase & Rowland, 2004, pp. 101-102).

The continued success of integrating sustainability into the curriculum relied on frequent (re)evaluations of the effectiveness of approaches and support mechanisms. Establishing a steering committee to explore effective avenues in influencing faculty understanding of sustainability issues, was an evaluation process that distinctly defined the future direction of the University. As one can see from NAU's website today, they have come a long way since 1995, and they now boast an impressive list of environmental and sustainability focused programs and initiatives.[18]

Oakland Community College outside Detroit, Michigan

Whereas NAU chose to approach environmental education and sustainability by infusing such content into specific courses to eventually transform the overall curriculum, in the mid 80s, members at OCC already began campaigning for a stronger top-down approach. Today, comprised of five campuses, OCC is one of the nation's largest community colleges with over 77,000 students in attendance (Oakland Community College, 2010). At the time when activist, educator and entrepreneur Debra Rowe began to envision implementing a graduation requirement, OCC only had about 24,000 students. The requirement was to revolve largely around understanding the global environment and sustainability. Such an initiative would prove to be immensely challenging. Indeed, it took about 12 years for Rowe to accomplish her goal in

[18] http://www.greenguide.nau.edu/toc.html

swaying a huge institution with multiple campuses (four at the time) and to break the long-standing paradigm of "man conquering nature." This setting is best characterized in her own words:

> "In my early years of teaching, I dismissed the possibility of such a requirement as politically impossible, given the power structure, the territoriality of the faculty, and the dominant philosophical-conceptual paradigm. Yet I was moved to action by the fact that almost all our students completed their degrees without any course work in environmental literacy, much less sustainability as a larger framework" (Rowe, 2004, p. 139).

A few of the challenges she faced were creating discussions to rise above territoriality, developing presentations of concepts and frames, environmental scanning, handling difficult people, creating politically acceptable choices, building powerful coalitions, and implementing key strategies (Rowe, 2004, p. 139).

In the end, success was measured by many approaches. However, one more poignant way of framing her issue was by posing the question: "what do our students need from the college to be successful in their adult roles of family member, worker, and educated citizen?" This question had two crucial effects. First it served to counteract the territoriality of the departments by looking beyond any one discipline—a challenge that confronted Rowe early in her efforts. Second, as this question had no easy or straightforward answer, it spurred OCC to conduct a reevaluation of its curriculum to gain confidence that it was one accurately reflecting societal needs and trends. To address this universally relevant question, OCC initiated a taskforce to conduct a literature review, the results of which were combined with the results of campus discussions regarding this "soul-searching" process. In 1990, the Future Institute at OCC initiated Environmental Scanning as a way to bring issues of the growing "sustainability paradigm" to the general attention of the College community. Aguilar defines Environmental

Scanning as a "systematic collection of external information in order to lessen the randomness of information flowing into the organization and provide early warnings for managers of changing external conditions (Aguilar, 1967)."

As the prospects for a potential evolution of OCC's curriculum grew, in accordance with the findings of their various probes, the working groups began to compile a list of core competencies that graduates should have for adult success (Rowe, 2004, p. 146). Once the list of re-centered core competencies began to fall into place, workshops once again became the vital ingredient in moving forward. As can be imagined, successful attendance of these workshops was a challenge, and various incentives were explored as a means of influencing faculty to join the envisioning process. One such way to involve faculty was to conduct workshops on the sustainability attributes of extant courses, in order to frame old material with a new lens that considered the environment. Finally, all faculty were asked to describe how they would meet the new core competency learning objectives, as well as assess the effectiveness of the course content.

Though admittedly Rowe's account of this 12-year process was far more complicated and political than I can present it here, the point is that regardless of the setting, with enough effort and dedication anything is possible. In 1999, OCC's College Academic Senate passed a list of 10 competencies, one of which was "understand the global environment." They developed a committee to oversee the implementation of these ten learning goals into the undergraduate curriculum (Rowe, 2004, p. 147). Only 2 years later, over 200 courses were submitted to be approved to meet the recently revised attributes (though not all sustainability qualifiers) of the new competencies (Rowe, 2004, p. 153). By 2002, institutional soul-searching and all of the

accompanying changes prompted an all-out curricular reform. Despite the lengthy and difficult process, OCC managed to fix a vision for, and stand on a principle of, environmental sustainability which for its time was astoundingly progressive, especially considering the size of their institution.

5.2 Modes of Student Engagement

In the college and university setting, students are viewed as transient: they make their way from all corners of the world to spend roughly four years of their lives living and learning on the institution's campus before dispersing again to spread their individual gifts. While many students may even make their decision on which institution to attend based on what modes of engagement are offered (i.e., sports, student organizations etc.), the real challenge is making student engagement opportunities become something that continues to have an impact on the community and student even after graduation. In terms of the opportunities they choose to offer, each institution goes about this in their own way. Some have gone so far as integrating these opportunities directly into their curriculum

Engaging students environmentally, in most scenarios, explores projects and efforts in real-time. What I mean by this, is that many campus efforts culminate in one-time events (albeit often repeated annually or bi-annually) with the intent being to raise awareness among students. An example of such an effort at the Claremont Colleges is an energy challenge in the dorms, the aim of which is to [competitively] conserve energy and curb consumption. Aside from obvious educational benefits, this form of student engagement is relatively superficial with regard to impacting student behavior uniformly across the campus or in the long term. A singular event such as an energy challenge is even less likely to impact an individuals'

relationship to community, self, and the environment. One college stands out in my research, as having pioneered a model for designing an institution-wide curricular approach for instilling a lasting [environmental] vision and understanding in its students. This approach has demonstrated long-term effects in student engagement with the environment, with the community, and with awareness of the self.

Warren Wilson College: Student Engagement through the Triad Model

Warren Wilson College is located outside of Ashville, North Carolina, in the Swannanoa Valley of the Blue Ridge Mountains, and has a student body of about 900 undergraduates and 100 graduates. With 300 acres of farm, an organic garden and livestock,[19] 600 acres of forest, and miles of recreational trails, WWC is the perfect laboratory for the progressive curriculum that it offers. The Triad model at WWC is a one-of-a-kind curricular approach in higher education:

> "The Triad consists of three interwoven strands of experience: academics in the liberal arts tradition, a campus-wide work program, and service learning. The Triad is infused with a sustainability ethic and cross-cultural understanding— integral parts of the College's history and founding philosophy" (WWC, 1996-2012).

Academics: Students are required to meet the objectives laid out in a version of general education requirements. These learning areas are more or less standard across the realm of liberal arts academia. Once one or more majors are declared, as is standard, students are expected to meet the objectives and course requirements for their field/s of study. Finally, in

[19] Similar to College of the Atlantic (discussed below), WWC also has its own farm which satisfies an average of 16-18 percent of on-campus food needs. The total contribution of vegetables is 20-35 percent year-round—but can reach as high as 60 percent during harvest. The WWC farm has a yearly budget of $22,553; five to ten students working about 15 hours a week keep the farm operational (Hall, 2011).

preparation for receiving a degree from WWC, students must craft a letter to the college faculty and staff reflecting on their experiences and post graduation plans (WWC, 1996-2012).

Work: Warren Wilson is what many call a work college. The idea here is that rather than hiring laborers to keep the college functioning, the majority of labor is performed by the students, who in return receive a tuition break. Each week all students must complete 15 hours of work taking part in over 100 different work crews. These crews vary greatly in their function and focus area, but span all disciplines of study at the college. Work crews deal with everything from more administrative tasks like working in the Admissions Office, to being a Peace and Social Justice Research Assistant, and working more hands-on in Auto Shop or Blacksmith Shop. In the beginning, students are placed in work crews that teach them to be professional, productive, and creative in working environments in which they may not normally volunteer; later on they are granted more freedom in choosing their work crews (See http://www.warren-wilson.edu/work/ for a list of work crews). While working, students gain a better understanding of themselves, as they learn to be efficient and dependable. Additionally, the lasting legacy and impact from their participation (work) in the community, gives them a sense of pride.

Service: In order to graduate, WWC currently requires its students to contribute at least 100 hours of service work to the community. Students can accomplish this in a variety of ways. Students learn to be effective at community engagement, they develop a sense of civic responsibility, and they learn to build community partnerships (WWC, 2012). Two ways in which students fulfill their service requirement is through "service trips" and through local partner organizations. During fall and spring breaks, students may choose to go on 40 hour service trips; for example building trails in a National Park. Weekly programs (transportation

provided) gives students the ability to work in the community with nearby organizations on important issues such as curbing Mountain Top Removal—a serious environmental concern in the Appalachian Mountains (Hall, 2011). All in all, students may choose from seven different options in order to meet their service learning objectives (WWC, 2012):

1. Break trips: weeklong service trips with destinations all over the country.
2. Issues workshops: students address specific topics over the semester focusing on advocacy and policy; often working with professionals and elected officials.
3. One time trips: only a few hours in one day; they work with agencies around the community.
4. Weeklies: a set yearly schedule for six days a week; students spend 1-3 hours every week on a semester, year-long, or drop in basis, organization dependent.
5. On your own: students wishing to volunteer in a non-profit of their own design; they are on their own for transportation, but can receive other kinds of support from the college.
6. Course-based service learning: a popular approach which integrates service components such as field trips into an academic course.
7. Events: students, faculty, and staff organize service-related events in the community every year.

Through WWC's unique Triad model, students are taught valuable lessons that extend beyond a theoretical classroom basis. They actively learn in a way that enhances their understanding of civic responsibility and community values, as well as develop a sense of self. By living and working in the outdoors, they foster a relationship to nature and the environment, which in most colleges and universities is merely the subject of a course lecture. The sum of the above described qualities and approaches provide us with a proven and exemplary sustainable model for student engagement that is impactful for the college, the community, and the student, both in the short and long-term.

5.3 Technical Aspects of Carbon Neutrality

As I will show in Chapter 6, *Pitzer College: A Case Study*, the road to carbon neutrality is as long and difficult as it is multi-faceted and complex. In the United States today, there exist a handful of principally binding agreements that institutions have the option of signing. These agreements are a helpful and methodical strategy in developing a timeline for achieving carbon neutrality. The most commonly signed agreement is the American College and University Presidents' Climate Commitment (ACUPCC). The ACUPCC leaves it up to the institution to set a goal which it feels is within its means. Once an institution does so, they must agree to produce progress reports and outline clear future actions, as well as provide transparency in their documentation, as they craft their own means toward carbon neutrality—whether that is in the year 2020 or 2050.

Examining carbon neutrality must take into account all areas of operation associated with the college—from the emissions of trucks delivering food to the cafeteria, to on-campus irrigation, to flight emissions associated with study abroad programs or student commuting. As commuting is often a largely inflexible area of alternatives, purchasing carbon offsets is generally the most commonly utilized approach. As noted above, architectural innovation (LEED) that explores sustainability through conservation or the integration of technological features like on-site alternative energy generation, are the most straightforward ways of proceeding. I present in this section, examples of three institutions that through different models have made notable strides toward carbon neutrality. The University of Arizona in Phoenix deploys an ambitious on-site alternative energy plan as a primary mode for achieving

their carbon neutrality goal for 2035 (Network, 2011).[20] Oberlin College and Conservatory in rural Ohio exhibits one of the most sophisticated green buildings ever constructed, as they use both technical and pedagogical innovation in reaching their 2025 carbon neutrality goal (Oberlin College, 2010). Finally, the lesser known College of the Atlantic has been able to offset 100 percent of their carbon emissions since 2007. Furthermore, COA is on track toward achieving a 100 percent renewably-powered campus by 2015 (College of the Atlantic Center for Human Ecology, 2009).[21] COA, among their many achievements, displays a remarkable model for sustainable food sourcing and production to supply students with healthy and sustainable eating options on campus.

Arizona State University: Solar City

At Arizona State University, sustainability measures and environmental commitments were not hatched by a few ambitious students or faculty members. ASU, unlike the majority of colleges jumping aboard the sustainability band-wagon, came at sustainability in a very strong top-down way, with the University President calling the shots (though many students and faculty have since taken initiative). ASU, while relatively young, between its four campuses has a student body of over 72,000, making it the nation's largest public university (ASU, 2011); it also has two additional research parks (Bentzin, 2008, p. 176). President Crow, who previously chaired the ACUPCC Steering Committee (2008-2010)[22], took initiative on many fronts to address the issue of the changing global climate, in the world of academia—especially at his

[20] ASU plans to be carbon neutral in all areas other than the scope of transportation, by 2025.
[21] Not subsidized by carbon offsets.
[22] Currently Crow sits on the 20 person committee (American College and University Presidents' Climate Commitment, 2012).

home institution where unsustainable development and water shortages are significant concerns in the Arizona desert.

In 2004, ASU developed its Office of Sustainability Initiatives within the President's Office. In the same year, ASU established the Global Institute of Sustainability (GIOS), making possible the subsequent launch of the world's first School of Sustainability in 2006 (Bentzin, 2008, p. 278). ASU's top-down approach offers some great insight into the changes that can be made over a very short period of time, even at a massive university, to significantly reduce the impact of its operations on the environment. By 2007, GIOS effectively became the umbrella organization across ASU's four campuses and successfully and strongly institutionalized sustainability. The Institute was responsible for four distinct areas: education, research, campus operations, and outreach/engagement (Bentzin, 2008, p. 279). Although ASU has many great attributes, as can be seen from their Sustainability Action Plan (http://sustainability.asu.edu/practice/), in this particular section I focus on their application of solar energy that is nationally unparalleled.

Having reached 10MW of on-campus solar energy generating capacity by September 2011, ASU further intends to double that capacity by 2014—a supply great enough to power roughly 5000 Arizona homes for one year. ASU currently claims the largest application of photovoltaics of any university campus despite having begun their solarization effort as late as 2004, with a solar parking structure. Now ASU has over 46 installations (more than 40,000 panels)—a number that is rapidly increasing (ASU, 2012). In mid-March of this year (2012) ASU bumped up their capacity to 16MW. ASU's application of photovoltaic arrays has often greatly added value to its LEED-standard buildings, raising the standard for which they are rated. For

example, in 2007, the installation of rooftop solar panels aided ASU's achievement of LEED-platinum certification on two of their buildings—the first such rating in the state of Arizona. ASU also takes steps to enhance the generating capacity of installations by including technological features such as (axis) tracking systems which, throughout the day, help position the panels for maximum sunlight exposure. If ASU meets its goal of producing 20MW across their campuses by 2014, they will be able to sustainably satisfy 40 percent of their current peak electricity load (ASU, 2012).

Perhaps the greatest challenge, especially for smaller institutions that wish to invest in solar, is the cost of completing on-site solar projects. This issue can be greatly compounded by the fact that many colleges and universities, as long-standing valued members of their respective communities, have often reached agreements with their energy providers who give them substantially lowered rates on utilities. While the region's over 300 days of sunshine no doubt contributes to ASU's success in solar energy generation, their provider's (Arizona Public Service) energy prices are expected to increase by over 40 percent in the coming years (ASU, 2012). In the case of ASU, it was in the University's best (economic) interest to essentially contract out these solar projects. In actuality, the University only owns two of the dozens of installed PV arrays. The vast majority are owned and operated by two solar developers (CarbonFree Technology and Independent Energy Group) under a 15-20 year contract— after which system ownership will be up for discussion (ASU, 2012). Another substantial cost associated with the application of solar energy, is employing solar research and development professionals who are needed for evaluating factors such as where to locate the arrays, the soundness of rooftops, or the best applied technologies for enhancing the generation capacity

of individual installations. A combination of ASU's pool of professors specializing in solar technology and research, their student involvement, their strong engineering program, and their multidisciplinary effort titled LightWorks specifically exploring alternative energy, positions ASU for continued success in this particular area of institutional sustainability.

Two other areas worthy of mention, is ASU's commitment to lowering transportation-related emissions, and making efficient use of underground-sourced air-cooling and ventilation systems. In ASU's first effort to lower transportation-related emissions, they provided free public bus transit tickets for students, faculty, and staff, resulting in an increase of one-way public transportation uses from 400,000 to 1.2 million in the first trial year (Bentzin, 2008, p. 280). Since then, the network and means for alternative transportation options and services have expanded greatly. Under one of ASU's athletic fields, a 5.5 million gallon cistern retains and cools water at nighttime during non-peak hours; during the day the water is used for air-conditioning (Global Institute of Sustainability, 2012). Despite being the country's largest public university, and therefore theoretically one of the more challenging ones to bring uniform change to, ASU has shown remarkable success in their top-down approach to sustainability.

Oberlin College: Innovations in Green Building

Although Oberlin's sustainability efforts were not uniform across its campus, it gained national recognition for having constructed one of the world's most sophisticated green buildings. The Lewis Center, which is designed to be a zero energy and climate neutral building, was the first of its kind on any college or university campus in the United States. Its high-performance sustainable design features include:

- Extensive daylighting and high efficiency daylight harvesting electric lighting systems

- Passive and active solar heating
- Well insulated building envelope with triple glazed low-e-coated argon gas-filled R-7 windows in the atrium and an insulating earth berm on the north side of building
- Passive cooling ventilation system using enthalpy sensors and automatically controlled operable windows in the atrium
- Geothermal heat pumps to provide ground-source heating and cooling— using twenty four 240-foot deep wells
- Locally harvested natural slate floor in atrium for thermal storage and radiant heating and cooling
- 60 kW and 100 kW photovoltaic (PV) arrays on the roof and over the parking lot, respectively, collectively produce 30 percent more electricity than the AJLC uses annually
- Extensive outdoor air ventilation rates coupled with air to air heat recovery to maximize indoor air quality and energy efficiency
- Innovative waste water treatment system utilizing a Living Machine and grey water recycling for toilet flushing and irrigation
- Sustainable landscaping design that includes restored wetlands (with 50 emergent and open water wetland plants endemic to Ohio), stormwater capture and a cistern to maintain water level of on-site wetlands, and a organic orchard and vegetable garden maintained by students
- Extensive use of green products such as sustainably harvested wood, interface carpet panels, recycled steel I-beams, and acoustical panels made of agricultural straw waste
- Over 150 environmental sensors installed throughout the building and landscape to permit extensive and continuous monitoring of building system performance.
- On-going student and faculty research involving the Living Machine and all building systems to better understand how the building works and to continuously improve its performance (Orr D. W., 2008, p. 163).

The construction of the Adam Joseph Lewis Center for Environmental Studies (AJLC) arose out of the practical need of housing a rapidly growing academic department. Department Chair, David Orr took on this evolution of the College as an educational challenge and an opportunity to experiment with fusing ecology and design. In light of his creative and innovative approach, the College President chose to support the endeavor, but on the condition that those involved were responsible for their own fundraising from lower priority donors. From the start,

and necessarily for its survival, this project had to appeal to investors based on unconventional grounds, such as being part of a cutting-edge experiment. The philosophical impetus behind such a project as detailed by Orr—of whether "organizations that purport to advance learning themselves can learn to recalibrate their mission and operations to the larger facts of global ecological change"—is both brilliant and a test. The political aspects of pulling off such an operation at the time however, were significantly murkier (Orr D. , 2004).

During its initial design, the Lewis Center took into account the following seven functions and characteristics:

1. Be integrated with the curriculum
2. Evolve with advancing technology
3. Discharge no waste (i.e., drinking water in, drinking water out)
4. Use sunlight as fully as possible
5. Use only wood from forests certified as managed sustainably
6. Minimize use of toxic materials
7. Be integrated with the landscape as a single design system.

This innovative project, which began in 1995 and required $7.1 million to complete, also enlisted the help of experts from around the country.[23] The Lewis Center experienced several threats to its completion as well as rounds of tug-of-war between the college facilities and administration, the engineers, and the designers and architects. However, it was considered nearly complete by early 2000 (Orr D. , 2004, pp. 170, 165).[24]

The Lewis Center went on to receive a handful of well deserved awards in design and architecture, including recognition from the US Department of Energy as being one of thirty Milestone Buildings of the Twentieth Century (Orr D. , 2004, p. 168). Among the many takeaways from this groundbreaking project, is the now-evident answer to Orr' fundamental

[23] This cost was not uncommon for its size and purpose when evaluated on a sq. ft. basis.
[24] Phases of significant technological improvements continued well into 2002.

question of whether institutions can evolve with the ecological realities of today. Not only were his seven objectives met, but the hard work and unrelenting dedication of those involved, showed the world that architecture and ecology can be combined in a way that is highly modern and technologically advanced, while still cost effective and sustainable.

College of the Atlantic: Sustainable Food Sourcing

College of the Atlantic is a very small private College that is located in Bar Harbor, Maine, and has a student body population of only 370. As its primary area of study is ecology, it is to be expected that COA be a leader in carbon neutrality early in the game.[25] However, having offset all of its carbon emissions by December 2007 and on track to have a 100 percent renewably-powered campus by 2014, is truly remarkable—even by the standards of the ACUPCC signatories. Indeed, the ACUPCC was only established in the year 2007. This College excels in all areas of pedagogical and institutional sustainability. One area that is particularly well integrated into this College's culture, is the Beech Hill Farm—a commonly utilized academic resource.

Beech Hill Farm, located in the Town of Mount Desert, is situated roughly ten miles from the College campus— yet its function to College operation and culture is quite significant. Its Mission Statement reads as follows:

> "Beech Hill Farm produces certified organic food for COA and the Mount Desert Island (MDI) community, while using methods that maintain the integrity and health of the land, and work toward environmental and economic sustainability. Beech Hill Farm is a base for understanding agriculture as a central concern of human ecology for College of the Atlantic students and faculty (College of the Atlantic, 2012)."

[25] COA has one major: human ecology; students can approach this area across all disciplines.

The farm itself is 73 acres in size. Five acres are used in active crop rotation while an additional 2 acres are orchards (College of the Atlantic, 2012). The Farm is not just a College resource, but a community project that involves many members; it is also used as an educational tool for summer camps and local schools. An integral part of the Farm is its Farm Stand which markets up to 80 percent of its produce and products to the community. Aside from fresh produce, the Farm Stand sells locally sourced eggs, meats, preserves, honey, dairy products, berries, baked goods, juice, and other specialty foods (College of the Atlantic, 2012).

Although specific percentages as to what amount of food served on campus comes directly from Beech Hill Farm were not available, in the summer and fall months COA sources up to 75 percent of their food locally. In addition, COA makes a commitment to the environment by having 1/3 of meals during the week be vegetarian only (reducing emissions related to meat production and transportation) and less than 10 percent of COA's food is pre-processed (greatly reducing packaging, among other things). During summer and fall, compost from the kitchens and dining areas go to the Beech Hill Farm, whereas during the other seasons it is processed by work-study students at the Community Garden (College of the Atlantic, 2012).

Although many colleges and universities around the country have models for locally sourcing some of their food or even growing their own produce, I chose to showcase COA's model because of how central they have made food sustainability topics to their operations and College culture. The level of student [community] engagement that is effortlessly achieved through Beech Hill Farm's community-integrated design, many institutions have set up entire departments and offices to facilitate. The organic nature of this structure— co-mingling education with the institution's operational and functional necessities— is just one way COA

demonstrates its ability to smoothly integrate environmental sustainability and ecological literacy into the institution's fundamental existence.

Closing Thoughts

The present challenge lies in closing the gap between the environmental realities of our endangered earth, and the views and competencies students will possess when they step outside of academia. Without much governmental support, educational institutions are tasked, to confront a dominant worldview that supports unsustainable development and a corroding relationship between people and nature. Providing young adults with a foundational understanding of environmental concerns and the skills to take on such daunting issues as global climate change, are indeed challenging prospects. Yet, these are challenges we must take on. Addressing overarching aspects of institutional sustainability (such as becoming operationally carbon neutral) is inextricably linked with the curricular and pedagogical approaches and models that are ultimately needed for students to contribute in preserving the planet. However, these two important strands are bridged and bound by how students engage themselves in the college and university communities over the course of their short stays. The examples in this chapter are not intended to promote any one way over the other as the "correct model", but rather to highlight how some institutions are beginning to tackle the challenge of evolving beyond mankind's dominant and abusive relationship with the natural world.

Chapter Six

Pitzer College: A Case Study for Institutional and Environmental Sustainability

This chapter examines Pitzer as a case study to highlight an American liberal arts college that, although not the trend-setter in all dimensions of institutional and curricular sustainability, does continue to stand out as a learning environment with commitment to environmental sensitivity. Pitzer recently completed and submitted to the ACUPCC their updated Climate Action Plan; I will summarize and deconstruct the main components of this document. The CAP suggests dozens of specific actions for lowering the operational environmental impact and it cites a number of ways to induce student behavioral change. I therefore propose two more comprehensive initiatives, one of which I have been actively pursuing the implementation of.

Founded in 1963, Pitzer College is the fifth member of the Claremont College Consortium, a cluster of undergraduate liberal arts colleges in Southern California. Over the past few decades Pitzer has distinguished itself in the world of academia as an institution with effective interdisciplinary approaches grounded in strong values of social responsibility, community engagement, and service learning. Along the way, intercultural understanding has become a celebrated learning objective, especially as Pitzer was able to establish one of the most highly participated-in study abroad programs in the country. Although always a part of Pitzer's "activist" culture, environmental action and responsibility has been a more recent development in the college's pursuit of institutional and curricular priorities.

I have chosen Pitzer as an example for the simple reason that, over the past four years I have dedicated a significant portion of my time at the College advocating for environmental causes and raising awareness about environmental issues in the Claremont community. I have participated in several relevant internships, while being a leader of several student environmental organizations and a two-year participant in the college governance system,

representing the student body on environmental concerns. In this capacity, I have gained insight into both the internal workings of the college processes, the obstacles, as well as the great potential a liberal arts college like Pitzer has to make gains on the front of environmental responsibility and sustainability.

Where in the previous chapter, I drew upon several exemplary models and approaches by other undergraduate institutions in the United States, the focus of this chapter is to take a single institution and draw up a more intricate and all-encompassing view of its sustainability dimensions. This chapter will break down these dimensions into six areas:

1. Stated principles, commitments, and current data
2. Past achievements
3. Programs, courses, and assets
4. Current and budgeted initiatives
5. CAP recommendations and the future outlook
6. Strengthening the CAP

It is important to note the intersection between stated values and objectives of the institution, since these provide a foundation for action on climate issues. The Climate Action Plan that the college has recently completed may come to bear significant weight in the longer term and within the Colleges Tactical Planning.[26] The CAP has established 2007-2008 as a base year to identify the necessary actions to achieve a 20 percent reduction in emissions by 2020 and an 80 percent reduction by 2050—a benchmark shared by the state of California as well as other colleges and universities across the country. The elements explored in this plan are curriculum, research, community engagement, and the potential for greater student leadership

[26] Although not a direct participant in the current Climate Action Plan (CAP) reevaluation process, I have a solid understanding of its contents through personal experience and will therefore freely cite and reference this CAP.

in campus activities of environmental concern. Together, addressing these areas is intended to contribute to both short and long-term behavioral change.

6.1 Stated Principles, Commitments, and Current Data

In 2007, Pitzer signed an agreement with the American College and University President's Climate Commitment (ACUPCC) to reduce emissions. This agreement calls for participating institutions to develop and implement plans to become climate neutral. Prior to signing the agreement, Pitzer had implemented a Campus Master Plan (2001), a Landscaping Plan (2002), and a Housing Master Plan (2003) that included a commitment to environmentally sensitive design, building to LEED standards, and a continued dedication to low water landscaping. The current Tactical Plan also includes funding a Pitzer post-graduate Environmental Fellow position to work with others on the environmental needs of the College, an increase in funding for student-run environmental organizations and sustainability initiatives, and their continued dedication to the ACUPCC (Wolfsen, Coughlin, Fine, Grady-Benson, & Shubin, 2012).

Recently, Pitzer demonstrated commitment to the environment when the College's governing body adopted the *Statement of Environmental Policy and Principles* to integrate socially and environmentally conscious practices into college operations and the education of its students. These policies and principles read in part:

> "Pitzer College strives to incorporate socially and environmentally sound practices into the operations of the College and the education of our students. … We are thus committed to principles of sustainability, and dedicated to promoting awareness and

> knowledge of the impacts of our actions on humanity and the rest of nature." (Pitzer College, n/d)

Furthermore, *Environmental Sustainability* is identified as one of Pitzer's five core values that distinguish its approach to education; this core value is highlighted in the following statement:

> "Sensitivity for and preservation of the environment is a key value of Pitzer College. Campus landscaping utilizes drought-resistant, native plants and the College is proud of its many LEED-certified sustainable buildings. Students shape their daily activities, programming and studies to ensure they leave the environment and the world stronger than how they found it. Students interested in environmental issues will find Pitzer an exciting living and learning laboratory."

Pitzer recognizes that in order to successfully implement measures of its CAP (outlined in this chapter), it will require the coordination of faculty, staff and student activities with respective priorities. A [permanent] oversight Climate Action Committee of staff, faculty and students is recommended to review action taken, update the CAP, and approve progress reporting every two years to ACUPCC. As Pitzer further envisions steps toward carbon neutrality, it intends to evaluate and develop the potential for student involvement and leadership in all campus environment-related activities in order to encourage student behavioral change in both the short and long term. Actions taken by the colleges' governing body, as part of the curriculum, and through community engagement opportunities are intended to be the foundation for Pitzer's commitment to an emissions reduction timeline.

In the future, Pitzer has expressed commitment to coordinating with the Environmental Fellow on efforts such as reducing the usage of natural gas or lending stronger support to student-run initiatives such as the energy conservation challenge. The proposed Climate Action Committee will also be responsible for tracking these efforts and identifying priority areas for the Environmental Fellow to address with students. The CAP estimates that conservation

efforts such as these have the potential to reduce electricity usage by at least 5 percent annually. Furthermore, it is estimated that the future construction of LEED certified buildings (as per Housing Master and Tactical Plans), will reduce natural gas usage by 30 percent, equipment and systems improvements will result in an additional reduction of 10-15 percent, and that overall, each new generation of systems and equipment will likely produce an additional 20 percent reduction in natural gas usage. Also important is the increased on-campus application of renewable and recycled resources such as solar power and grey water treatment. Pitzer's efforts are to be reflected in three ways: the renewable content of Edison-supplied purchased electricity, on-campus energy generation, and joint campus [energy] generation through the Claremont University Consortium.[27]

I have identified four important Green House Gas (GHG) emission areas, and will provide a brief overview of these data. [28] (See Figure 1 for a visual breakdown of all GHG emissions, and see Appendix C for a detailed data chart of individual sources of GHG emissions).

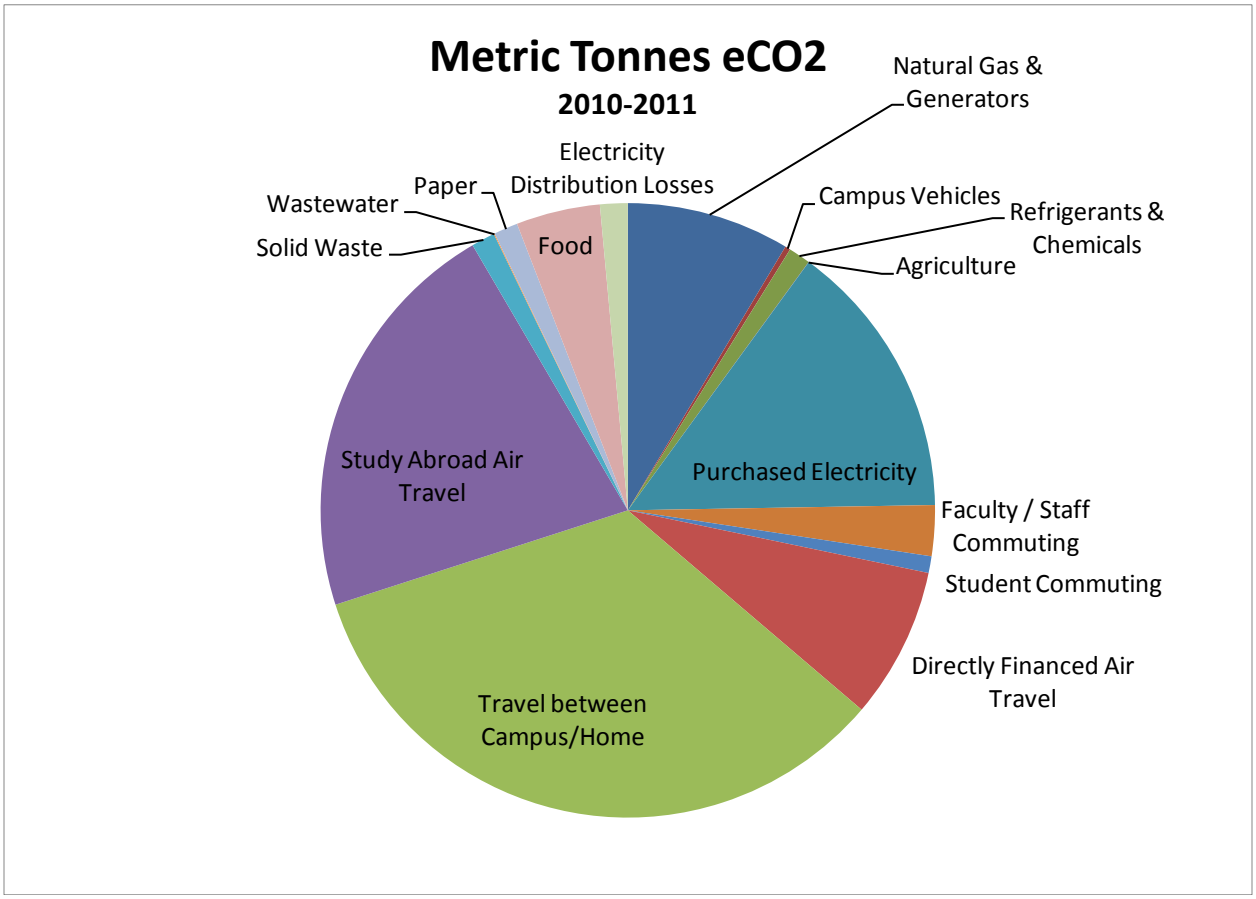
- Food operations
- Transportation
- Individual resource and utility use
- Solid waste

Food Operations: Although not the primary source, GHG emissions related to running on-campus food operations are significant. Eleven weekly food shipments supply food for McConnell dining hall, the Grove House, and the student-run Shakedown Café. Although shipments are delivered from the greater Los Angeles area, for example, three of those

[27] Edison supplied purchased electricity will be affected by California law which currently requires utilities to get 20 percent of their generation from renewable resources by the end of 2013, 25 percent by the end of 2016 and 33 percent by the end of 2020.
[28] In the CAP, these areas are broken down much more extensively and arranged under 3 "scopes."

shipments (from Sysco Foods) generate 271.5 lbs of CO_2 per shipment. The weekly food budget is $35,000, of which 1/3 is spent on produce (~50% locally grown), 1/3 for meat products (~15% organic) and 1/3 is spent on "dry" products (~15% organic).[29]

Figure 1



Source: 2011-2012 Pitzer College CAP

Transportation: As can be seen from the figure above, travel related emissions are by far the largest source of emissions and well as the most challenging to address. The highest source of travel related emissions are those resulting from student travel to and from campus as Pitzer students come from all parts of the country and the world. The second most significant source of emissions comes specifically from study abroad. Thirdly, smaller sources of emissions come

[29] Overall, 22% of annual budget is dedicated to locally produced foods.

from air-travel that is directly financed by Pitzer as well as daily commuting to and from Pitzer's campus (Wolfsen, Coughlin, Fine, Grady-Benson, & Shubin, 2012). Part of the difficulty in addressing GHG emissions from air-travel, is that two of Pitzer's most highly prized values— student body diversity and intercultural understanding through study abroad— inherently entail large travel-related carbon footprints. At present time, the most plausible method for offsetting significant GHG emissions from air-travel is through carbon emission offset schemes (purchases). Currently, Pitzer does not purchase carbon offsets. The CAP indicates that current emissions related to air travel are estimated to be 3,057 $mTCO_2e$ and would require an annual investment of $80- $100, 000 to offset.

Individual resource and utility use: This is the broadest scope of GHG emission sources, and ranges from electricity and water use to how much paper is used on an annual basis. The totals of these GHG sources can be observed in Appendix C. In sum, Pitzer uses approximately 2,554,000 sheets of paper per year (amounting to GHG emissions of 119 $mTCO_2e$), produces 1,329.8 $mTCO_2e$ in GHG emissions from purchased electricity annually, emits 777.4 $mTCO_2e$ from natural gas, and 4.3 $mTCO_2e$ in wastewater—and equivalent to 8,947,584 gallons per year. *Table 1* shows the percent-breakdown of emissions, next to actions the CAP suggest be taken to mitigate them.

Solid waste: Although solid waste is not a major source of GHG emissions, it is a very *visible* source; it is an area that can play a significant role in terms of changing personal behavior and raising awareness about sustainability among students. One of the key areas outlined in the CAP is the issue of food waste and composing, an area of notable student involvement (composting club etc.). It is a predetermined priority of the incoming Environmental Fellow to

Table 1

Emission Source	% of Total (2010)	Direct Actions	Indirect Actions
Natural Gas	13%	Conservation, New LEEDs, renovation, solar thermal	
Electricity	22%	Conservation, New LEEDs, renovation, solar, CUC solar	Edison renewable %
Commuting	7%	Travel reduction, electric/hybrid campus vehicles, Travel offsets	Vehicle Emissions improvements
Refrigeration, Chemicals	2%	Continued monitoring	
Campus Vehicles	0.3%	Convert to Hybrid/Electric	
Directly Financed Travel	12%	Consider Travel Offsets	
Study Abroad Travel	32%	Consider Travel Offsets	
Solid Waste	2%	Reduction, composting, purchasing	
Water, waste water	1%	Conservation, new construction, renovations, waste water treatment on campus	
Paper	2%	Reduced usage, purchasing recycled content	
Food prep and waste	6%	Local purchasing, composting	
Electricity Dist Losses	2%	Reductions proportional to usage	Renewable content

Source: 2011-2012 Pitzer College CAP

assist clubs like EcoCenter, Composting, and Gardening Club to develop effective awareness campaigns around the issue of waste and food waste.

6.2 Past Achievements

As noted in the introduction of this chapter, Pitzer has given sustainability significant attention over the recent years. Pitzer was the first college in the nation to sport a residential development project of its size that was also Gold-standard LEED certified. Furthermore, Pitzer College is positioned to become the first college in the nation to have all Gold LEED certified (minimum) residence halls as a result of its three-phase construction project currently underway.[30] An updated GHG emissions inventory shows that emissions related to energy usage have been reduced by 8.5 percent thanks to these efforts in green building in addition to increased in renewable energy use and on-site generation. The College has installed one solar array generating 17.0 kWh and will be adding an additional 73.5kWh in the fall of 2012. While these systems will supply a mere 2 percent of total campus electricity needs, additional plans for solar are included in the Campus Master Plan (Wolfsen, Coughlin, Fine, Grady-Benson, & Shubin, 2012).

An area in which Pitzer is recognized for its leadership, is the institution's avid integration of water conservation methods into landscaping by using low water intensive plants (succulents) and designing campus grounds to capture rain water. In addition to Pitzer's efforts in landscaping and water conservation (which extend to features implied within the LEED dorms such as dual-function flush toilets and low-flow shower heads), Pitzer's President has recently

[30] Phase 2 of the Residential Life Project scheduled to be completed by fall 2012, is on track to receive LEED Platinum certification.

endorsed the concept of a Claremont College's initiative to implement a campus-based wastewater treatment facility. The proposed system will provide the capability of converting campus waste water into non-potable water, supplying landscape irrigation needs. Although only in its preliminary and exploratory stages, this water reclamation project would have significant positive environmental effects and great long-term financial incentives for the College and Consortium.[31]

Although outside the scope of significant emissions sources, Pitzer is recognized as having one of the most successful college bicycle co-ops. Starting in 2001, *The Green Bike Program* (GBP) has grown to involve and affect nearly all students on campus. Students can work (both paid and unpaid) to fix bikes, they can come and learn to repair their own bikes or purchase parts, or they can participate in the bike raffle each semester to receive an alternative means of transportation around the community. The GBP and its staff actively work to create a unique community space and learning environment where the "bicycle culture" is promoted as an important community activity and a viable alternative means of transportation.

Other steps the college has taken, include for example, a community garden plot, a student-run garden (which on occasion provides herbs to on-campus eateries), and efforts to go paperless in some campus offices. The CAP estimates that paper use has been reduced by 20

[31] Dustin Zubke HMC '13 spent this summer researching Claremont's water usage and found that the colleges use an average of 780,000 gallons per day. Of that, 55 percent is used for irrigation and the rest is for domestic use. Zubke found that a water reclamation system on the 5C campus could save anywhere from $2 million to $24.9 million depending on the water prices over the next 20 years (Wolfsen, Coughlin, Fine, Grady-Benson, & Shubin, 2012).

percent since 2007-2008.[32] The campus is currently expanding the use of online forms to further reduce paper usage and filing.

One important part of Pitzer's campus and culture are the two student-operated cafés, the *Shakedown* and the *Grove House*. It is the mission of both of these locales to provide a locally sourced, organic, and sustainable, menu for Claremont College students. Food is purchased locally within a 150 mile radius of campus from dozens of sustainable, mostly organic farms. In Addition, both these venues feature menus that reflect the season, they use safe all natural cleaning products, and do not provide throw-away products and to-go containers.

Also food-related, the main campus dining hall has taken a handful of positive sustainability actions. For example, food waste that is generated in the food-prep process is all composted, and since 2008, McConnell has been a "trayless" dining hall, reducing consumption of water, electricity and natural gas related to washing trays.[33] Additionally, paper waste has been greatly reduced by providing students with reusable to-go containers. [34] Aside from Pitzer's direct actions, the college's food provider, *Bon Appétit*, is dedicated to social and environmental sustainability as well. In *Bon Appétit's* "Farm to Fork" initiative, their commitment to buying local produce and to sustainable farming practices is highly visible. Some of these standards include the direct purchase of seasonal ingredients from small local farmers within 150 miles, food that is prepared within 48 hours of harvest, and menus based on seasonality and availability of regional fresh produce. *Bon Appétit* strives to support farmers

[32] The Admissions Department has initiated a significant reduction in paper usage by converting to CDs for information distribution and striving towards a paperless office.
[33] A recent study of 186,000 meals served at 25 institutions found eliminating trays reduced food waste per person 25 to 30 percent.
[34] 100% recyclable paper to-go containers are still available by purchase.

who do not use pesticides, genetically modified organisms, hormones or antibiotics (Bon Appétit Management Company, 2012).[35]

6.3 Programs, Courses and Assets

Although not reflected in all of the college's decisions and dimensions, a number of programs, courses and college assets do distinguish Pitzer as an institution with dedication and integrity in sustainability issues and environmental concerns. Four of these areas are particularly noteworthy:

- The Robert J. Bernard Biological Field Station (BFS) and impending Robert Redford Southern California Center for Sustainability (also known as the Redford Conservancy)
- The Leadership in Environmental Education Partnership (LEEP)
- Study Abroad in Costa Rica: The Firestone Center for Restoration and Ecology (FCRE)
- The Environmental Analysis Program (Consortium-wide)

Located in a sea of development, the BFS is an 86 acre field station and invaluable biological and educational resource for all Claremont Colleges students, and is conveniently located directly adjacent to the Colleges. The BSF is used regularly for both a preserve and a resource for biology (and other sciences), environmental analysis, and LEEP students. With its contentious past, the BFS has unified preservationist and environmentalist students and Claremont residents alike for several decades now.[36] More recently, Pitzer has taken the lead

[35] Chickens, turkeys, and cows are antibiotic and growth hormone free, all grass-fed beef, seafood purchases follow the sustainability guidelines of the Monterey Bay Aquarium Seafood Watch program, cage-free and certified humane shell eggs, milk and yogurt from cows not treated with artificial Bovine Growth Hormone, and ethically aligned coffee (Bon Appétit Management Company, 2012).

[36] In 2001, demonstrations against development proposals on the BFS, culminated in national media attention: a lengthy standoff with riot police resulted in numerous of arrests as students chained themselves to concrete-filled trashcans and blockaded the Pendleton Administrative Building (CUC Offices) — prompting their removal by forklift. Also at this time, local non-profit Friends of the BFS brought a lawsuit against CUC targeting the legality in which the EIS was conducted by the newly established Keck Graduate University as they expanded into the

on preserving this rare coastal sage-scrub habitat and small remaining sliver of Southern California biodiversity, with their forward motion on the Redford Conservancy initiative (see next section). As the BFS is home to many native and even endangered species and organisms, the students of Pitzer College are dedicated to protecting and preserving this ecosystem against further development via the long-standing student organization, Students for the Bernard Field Station (SBFS).

In the LEEP Program for environmental education, Pitzer students design and teach environmental science curricula at the BFS every spring to elementary school students from several nearby schools. As a year-long participant of this program, I can attest to its immeasurable impact on schoolchildren who otherwise may never get the opportunity to study nature in the outdoors. Furthermore, I learned from some of these students that the LEEP program was one of the ONLY opportunities for them to escape their urban setting, and experience an unaltered natural environment. College participants in the LEEP program also stand to gain immensely through this place-based environmental learning opportunity. In the time I have been here, I have come to regard LEEP as one of Pitzer's most critical contributions to the notion of environmental responsibility and sustainability-oriented awareness building.

The greater part of the Pitzer in Costa Rica program is focused on Culture, Environment, and Ecology.[37] The Firestone Center for Restoration Ecology is located on the south-central Pacific Coast of Costa Rica and houses classroom and outdoor/community based activities with strong emphasis on environmental issues. The final month of the program is reserved for a

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western portion of the Field Station. Concerns over KGI's active research into the use of GMOs fueled this debate. The settlement resulted in a 50 year no-development agreement for the central portion of the Field Station, under the condition the FBFS would agree to never again bring any legal action (or any action at all) against ANY future plans the Colleges may choose to pursue on this land—or nullify the settlement.

[37] Of the semester long program, one month is language intensive, and the homestay is near Alajuela, Costa Rica.

self-directed relevant independent study; more often than not, students choose to address environment-related issues through research and hands-on projects. Overall, "the program features local collaborative resource management with a focus on human and tropical ecology, the study of reforestation and sustainable agriculture/permaculture practices, and community-based education, including intensive language and culture studies (Pitzer College, 2012)."

The final area that I see as integral in offering students a perspective on contemporary environmental issues in a variety of methods is the Environmental Analysis program. Students who wish to make EA their primary field of study can choose from three that are well established, and one new track:

1. Environment and Society: Explores humankind's relationship with the nonhuman world, human origins, cultural ecology, and the impact of human populations on earth. Requires an additional environmental internship, and capstone seminar.
2. Environmental Policy: Investigates the politics, economics, and ethical implications of ecology. Requires an additional environmental internship, and capstone seminar.
3. Environmental Science: Encompasses the study of biological systems, ecology, natural resources, and conservation. Strongly recommends an environmentally focused semester abroad to the Firestone Center in Costa Rica.
4. Sustainability and the Built Environment: Brings an innovative broad-based interdisciplinary liberal arts perspective to problems related to sustainable architecture and infrastructure in rural, suburban, and urban environments.[38]

Many EA courses are interdisciplinary and can count towards other majors. The option of environmentally-based internships and independent studies also offer a valuable window into social and environmental issues found in the greater Claremont community. An office that provides significant support for students wishing to explore these areas is the Community

[38]In January 2011, Pitzer College requested $150,000 from CUC to proceed in developing this new track of the EA major. The development of this track coincides with the establishment of the Redford Conservancy which is intended to aid in providing innovative approaches for students to have direct impacts on the world by using classroom knowledge to analyze current ecological issues related to the rapid growth of sprawling urban areas, with a focus on design.

Engagement Center (CEC). This resource provides support as a professional connection for internships in the area. CEC, as well as the Dean's Office, often provide limited financial help for students you are undertaking projects that require funding. For a more complete list of some of the most notable environmental internship offerings offered either under the EA department, the Ontario Program, or the CEC, see Appendix C.

A key asset of the College is the very important element of student involvement in clubs and organizations. At Pitzer, there are many environmentally themed opportunities for student involvement, all of which receive some funding. Visit Appendix C for a complete list of current Pitzer or affiliated clubs and student organizations relating to the environment.

6.4 Current and Budgeted Initiatives

Currently there are several further initiatives that Pitzer has formally budgeted and is developing. Although some of these were briefly mentioned above, it should be noted that the following are not completed projects, but are at varying stages of their implementation. The four primary in-progress initiatives are:

1. Sustainability Coordinator/Environmental Fellow
2. Sustainability Orientation Program
3. Robert Redford Conservancy for Southern California Sustainability
4. Continued sustainability efforts in McConnell Dining Hall

1. For the next several years, the overall emissions reduction programs would benefit greatly from a part-time sustainability coordinator. The role of the Coordinator/Fellow will be to provide continuity of programs and initiatives contained in the CAP. An intentional effort supported by a coordinator will provide consistent leadership and

updates on sustainability progress to students, faculty and staff. This position is currently funded in the Tactical Plan.

2. A strong need for improved campus-wide education on sustainable living practices. Has prompted the inclusion of a yearly Sustainable Living Orientation in Welcome Week for new students. This orientation will include an overview of Pitzer's CAP, a tour of College sustainability features including the LEED certified dorms, alternative energy sources, etc., an info session about food service and Pitzer Garden, and a forum on sustainability in daily life. "This forum will include information on proper composting and recycling procedures, how to reduce waste, and how to maximize energy and water savings in the dorms. A 'green clubs fair' will inform students of the opportunities to get involved on campus" (Wolfsen, Coughlin, Fine, Grady-Benson, & Shubin, 2012).
3. After receiving a $13.5 million trustee gift, Pitzer is moving forward with the Robert Redford Conservancy for Southern California Sustainability Initiative. The initiative will work to preserve the invaluable Bernard Field Station, as well as develop a center dedicated to the study of environmental sustainability, with a focus on sustainable design and architecture. The college aims to acquire a portion of the BFS, which will include acreage for preservation, as well as the existing structure of the "Infirmary." This building will be converted into a working classroom and research area.[39] In conjunction with the creation of this center, Pitzer has just hired a new EA faculty member and created a new EA track titled "Sustainability in the Built Environment." The

[39] Through this initiative, Pitzer hopes to inspire the other Claremont Colleges to follow in the spirit of preserving the BFS for ecological conservation and as a unique educational resource.

job description for the new professor has been approved, and this new professor is to start working by fall 2012 (Wolfsen, Coughlin, Fine, Grady-Benson, & Shubin, 2012).

4. *Table 2* shows the currently planned and budgeted actions that McConnell Dining Hall is working on, as well as their potential for reducing GHG emissions.

Table 2

Current Plans in the Running	Estimated GHG Reduction Impact
▪ Replace kitchen appliances with more efficient models (e.g. Energy Star).	Since refrigerated storage is a major use of energy in the kitchen, this reduction would cut the food preparation/ storage emissions by roughly 40%.
▪ More Local Food initiatives: - Monthly "Locals Only" - Local breads, bagels, and tortillas. - Certified humane, grass fed local ground beef by March 2012	Cut food transportation emissions, support local businesses, contribute to behavioral changes and education
▪ Reusable to-go cups	Reduce paper by an estimated 50%, though this would increase water usage for washing.

Source: 2011-2012 Pitzer College CAP

6.5 CAP Recommendations and Future Outlook

The important function of Pitzer's CAP, ahead of providing current emissions data, is to design a set of solutions which over a given timeline, will help Pitzer to achieve carbon neutrality. Lists of specific actions to reduce GHG emissions in the areas of transportation to-and-from campus, study abroad, and food preparation, can be found in Appendix C. Overall, emissions related to transportation have increased by 32.7 percent primarily as a result of the growth (and success) of the Study Abroad Program. Emissions reportable to the ACUPCC have increased from 4826 MT eCO_2 to 5362 MT eCO_2, an increase of 11 percent of 2007-2008 inventories. The 2011-2012 CAP calls for a 20 percent decrease of current levels by 2020.

New construction, improving equipment efficiency, and on-campus energy generation have the potential to significantly reduce GHG emissions in the long-term. Buildings that are renovated are estimated to improve energy efficiency by at least 15 percent. Pitzer's plan recognizes that each new generation of lighting, equipment and electricity systems are expected to improve efficiency by 20 percent and currently planned projects are aimed at improving overall energy consumption over the next ten years by a minimum of 11 percent.[40] Additionally, LEED buildings on campus are expected to perform 25 percent better than existing facilities and will improve energy usage accordingly. Finally, each new generation of systems and equipment is anticipated to reduce an additional 10-20 percent in electricity consumption (Wolfsen, Coughlin, Fine, Grady-Benson, & Shubin, 2012).

Colleges who are bound by a consortium model can encounter difficulties when acting on their own interests and values. For example, because CUC receives a phenomenal deal on electrical utility rates from SoCal Edison, the cost of generating on-campus solar energy at current rates (of return on investment etc.), is higher than the cost of purchasing through the power company. The result is zero (mid-term) financial incentive for individual colleges to install more solar arrays to meet their potential rooftop capacity. In this case, Pitzer's decision to expand the solar generation capacities within their master plan is a choice made in accordance with the value of environmental sustainability embodied in the institution. An additional motivation is achieving higher LEED ratings on buildings as they are based on a point system. CUC does not currently have an action plan to include on-campus generation; however,

[40] Per analysis in conjunction with Larry Burik, Assistant Vice President-Campus Facilities (Wolfsen, Coughlin, Fine, Grady-Benson, & Shubin, 2012).

as alluded to earlier in the chapter, they are in full support of the Consortium Grey Water Initiative, for which a professional engineering study is underway.

Specifically for Pitzer and its CAP, Phase II of the Campus Master Plan does include a grey water system which is designed to accumulate shower and sink waste water and provide treatment to filter and treat the water for use in irrigation. Though this tactic will be replicated in future constructions, the potential of total water savings has not yet been determined. The current CAP recommends that a comprehensive renewable energy component to the Campus Master Plan (in conjunction with CUC) be prepared by 2014 (Wolfsen, Coughlin, Fine, Grady-Benson, & Shubin, 2012).

As is strongly emphasized in the CAP, future success in the process of Pitzer becoming carbon neutral, will rely on a combination of student initiated behavioral change and consciousness shift, as well as significant top-down action from the College's governing bodies; finally the College must continue to make environmentally friendly architectural and curricular development plans, and invest strongly in them. To facilitate this process, the College recognizes the need for a sustainability coordinator to work with the administration and student body to oversee sustainability initiatives. Finally, the CAP calls for the immediate formation of a Climate Action Committee which will be organized with representatives from the Faculty Executive Committee, Staff Council Representatives and the Student Senate's Executive Board to give guidance to, oversee, and integrate sustainability related issues into campus operations (Wolfsen, Coughlin, Fine, Grady-Benson, & Shubin, 2012).

6.6 Strengthening the CAP

My level of involvement and commitment has taught me much about the inner workings of the college and its governance. I therefore feel compelled to add that in reality, the aforementioned CAP will likely have no great or immediate effects on the operation and direction of Pitzer College. Most of the concrete actions and commitments outlined above have already been within the College's "intent" or "interest" to undertake, or are currently being implemented. Despite the commendable efforts and dedication of my friends who have worked hard to compile this report, the CAP has very little teeth. This is not a failing of their imagination, but rather a matter of technicalities: for any of these actions to be realized Pitzer must recognize recommendations from their CAP as top institutional priorities, and fund them accordingly. Furthermore, when compared with institutions and efforts from the last chapter, Pitzer's trajectory for becoming carbon neutral (40-50 years from now) is a rather definitive indication that funding environmental initiatives (and carbon neutrality measures) is not a principle priority of the institution. In this final section, I will offer my own commentary and suggestions for how this plan may be strengthened.

The purpose of my input is to look at the broader function of specific action areas and propose concrete initiatives that combine the variously approached and ambiguous needs identified as "changing student behavior," and doing so with decisive top-down action. The following two approaches combine efforts in two primary areas. First a garden or farm would offer a broad opportunity and application for on-campus involvement (not to mention the potential for significant emission reductions). This option would engage students on a *voluntary* basis. And second, to develop Pitzer's pedagogy to require all students to consider the local

and global implications of their actions on the environment. This would engage students through the curriculum on an *involuntary* basis, to be fulfilled through their own design.

Voluntary Approach: Pitzer Farm/Garden

A central aspect of campus life is food and dining options. I would consider one of the "hot topics" among students to be food and food justice—this makes it an opportune area in which the College should initiate serious action. A large campus garden (2.5 to 4 acres) would present several great opportunities in all three areas of reducing emissions, engaging students, and providing a living lab to be incorporated into the curriculum/course offerings. Pitzer should consider a significant investment in this project for the following reasons:

- A year-round growing climate makes this a worthwhile investment
- Being a central installation on Pitzer's campus would enhance the awareness of food sourcing and sustainability for all students resulting in…
- A potentially significant impact on student's behavior
- It would lower Pitzer's carbon footprint by localizing a portion of food production for on campus dining services (up to 5-7 percent). Furthermore, the construction of geodesic domes would allow crops to be grown in winter, raising the overall yield significantly
- It could provide students with a work-study opportunity (further enhancing awareness)

If such a project were integrated in an even further interdisciplinary and comprehensive way, the following additional benefits could be explored:

- Provide space for new educational opportunities in course design within the Environmental Analysis concentration, with particular relevance to the new EA track of Sustainability in the Built Environment. With the limited space afforded by Pitzer's campus, methods in agroecology and urban food production would provide unique educational opportunity and its application would be both (geographically) highly relevant and sought after.
- It could serve as a resource for new programs such as those bringing children in from outside elementary schools for hands on learning.

- It can bring students together to work side by side with the people that prepare their food, building community and valuable relationships. This has great potential if, for example, working several hours a week in the garden, would be a part of dining hall workers job descriptions.

According to Tessa Hicks, Assistant VP of Pitzer's Community Engagement Center, one of the current shortcomings among Pitzer partnerships that facilitate student engagement within the greater community, is a lack of "efforts that are linked to larger longitudinal projects that go beyond providing short-term service to making real, concrete, sustainable change in a concentrated area (Hicks, 2012)." Having this resource on Pitzer's campus would make space for long-term community partnerships. Academic and other resources that are abundant on campus could benefit the greater community while bridging students with localized issues in sustainable agriculture.

Graduation Requirement: Environmental Responsibility

An obvious challenge is how to go about uniformly elevating the level of ecological literacy among all students. Over the past two years, I have been developing an initiative to address this challenge. As noted in the opening of this chapter, there lacks a curricular framework for students to understand the basic knowledge of the impact their lifestyles have on the environment—despite Pitzer's many stated values and commitments. To change this, I have designed an educational objective and graduation requirement of "Environmental Responsibility." This would be added to the current six learning objectives that Pitzer expects of its students to actively engage in. My objective reads in part:

> By developing a nuanced understanding for the environments students come from and live in, and by becoming more informed on contemporary environmental issues, students will be at the forefront of a global trend recognizing the imperative of co-inhabiting this planet. This Objective is a reflection of the core values of Pitzer, among

them, producing students that possess an understanding of the local and global environmental implications of their individual actions. Through a fulfillment of this Objective, students will explore innovative and practical approaches that seek to engage them in more meaningful ways and prepare them for brighter prospects for the interactions of humans and nature.

I propose that this objective be fulfilled through successful completion of an appropriate single credit course (or 2 half credit courses), or an approved internship or independent study. Some of these options include:

a. Service and community engagement activities/projects with an environmental focus.
b. Courses to be defined and that are identified as satisfactory under the proposed Environmental Responsibility Guideline (ERG).
c. New course offerings that might develop in areas such as urban planning, sustainable design, sustainable agriculture, etc.
d. Prior approved internships through credit or non-credit options.
e. Special courses that feature experts (like visiting or resident professors) that choose a sustainability-orientated issue outlined in the College's CAP for students to address/solve/plan/design during the semester (as opposed to hiring outside help or authorities).

If implemented, this requirement would have significant impact on the institution. Having the expectation that students graduate into the world with some tangible basis for understanding contemporary environmental concerns, will certainly further students educational experience. In addition, as this learning objective would complement already stated values, it will shape the college's culture and further distinguish the school from other colleges, as prospective students seek out more wholesome learning environments. A central approach in my proposition rests on the level of freedom students have for fulfilling this requirement. It challenges students to evaluate how the environment relates to their field of study. As every field has some aspect of an environmental dimension, not only would a requirement like this compel students to enroll specifically in environmental courses, but it will

challenge them to think of the environment and sustainability in the context of their individual fields of study.

Although admittedly biased, I view this approach as one that has significantly more potential for concretely influencing student behavior than the many scattered (even if well devised) approaches in Pitzer's CAP. Here is my reasoning: assuming it is already difficult to harness student involvement and administrative support on small initiatives (take composting for example), then what are the odds of getting both top-down and bottom-up collaboration for recognizing success on dozens initiatives throughout the college? My requirement, if properly integrated would serve as a virtual umbrella, under which students would have the opportunity to work in interdisciplinary ways to improve the environmental quality of Pitzer's campus. As all students will be challenged to find various paths for critically engaging in environmental and sustainability issues, many mutually enhancing benefits will incur between Pitzer and its students and within the greater community. See Appendix D for a full overview of my proposal.

Chapter Seven

Forging a Way into the Future: General Applications in the Liberal Arts Setting.

The purpose of this final chapter is to synthesize some of the national and international approaches that have provided me with progressive views on addressing the global deficit in ESD. My intent is to show the general applicability of these concepts within higher education—specifically American liberal arts institutions. My involvement in various environmental endeavors here in California, and my research abroad in Germany, has both been an exciting journey and personal growth experiment. Here I combine ideas for ESD that others have pioneered with my own ideas, in order to craft a blueprint or catalog of insights. These models can be approached through the critical areas of mission and design philosophy, curriculum and pedagogy, student engagement, and finally ways of funding carbon neutrality.

In the American liberal arts setting, colleges and universities have freedom to craft their mission based upon their strengths, priorities, and values, while also defining the expectations they have of their students. Furthermore, highly selective institutions carefully evaluate the personal attributes of individual students, so that they be the "right fit" for the institution and vice versa. As we have seen from Chapters Five and Six, this freedom allows institutions to approach operational and curricular sustainability in various ways. In evaluating these efforts, and drawing from my own experience at Pitzer College, I contend that under most scenarios, sustainability (including EE and ESD) must be addressed from two angles: via a level of understanding from the student body, with students directly initiating efforts (bottom-up), and from the faculty and administration making strong institutional commitments (top-down). However, the actual political influence of the student body is dependent upon the governance structure of the individual institution. The college governance structure for Pitzer for example, relies heavily on student involvement, while much larger institutions like Arizona State

University (though not considered “liberal arts”) can achieve much more from strong top-down decision making. In bridging these differences, I propose a flexible blueprint for possible actions that liberal arts institutions can consider, as they strive to address all facets of sustainable operation and ESD. I will include anecdotes, narratives, and my own rationale in this chapter.

7.1 Mission and Design Philosophy: Potentials and Pitfalls

As Germany speeds toward having the world’s first Green Economy, the decision of Federal and State governing authorities to provide significant financial support for ESD is increasingly well substantiated. Meanwhile in America, politicians are still debating whether climate change is real. With congressional gridlock halting any progress on legislation of significance relating to environmental protection, the development of baseline emissions caps or the allocation of funding for ESD on a national scale is not yet on the horizon. In other words, in the absence of pressure from above, colleges and universities must respond to pressure from below, in order to remain both credible and competitive within the world of academia.

It is no secret that greening their institutions curricula can initially be quite costly. Considering the already high cost of operation, the more secure the investment, the more likely it will be a priority of the institution. Functioning on the presumption that the further out the return on investment (ROI), the riskier the action, can be a hindrance to genuine foresight and long-term visioning. In this section, I reiterate and propose several approaches to consider that are top-down. I hope they may prove useful in setting sensible institutional priorities that are

rooted in extant or new/revised values, and that they inform a view toward formulating long-term vision regarding institutional purpose.

Potentials: Looking Long-Term

The first and foremost step an institution should take is to reaffirm its purpose. Assuming that most students and their parents struggle with the high cost of higher education, its benefits should be well defined: have students been given (access to) every necessary tool they need to be successful upon graduation? Does the institution define success more intelligently than just landing their graduates high paying jobs? These questions may seem obvious; yet how many students will graduate into the world this year without a clear understanding of the local and global implications of their actions on the environment? If there is one thing that motivates me personally, it is the understanding that without our environment we cease to exist. Assuming this is fundamentally true, should not then teaching the next generation about the environment be paramount within our education systems?

Mr. Orr's musings of whether "organizations that purport to advance learning themselves can learn to recalibrate their mission and operations to the larger facts of global ecological change" (Orr D. , 2004) is a question that every institution must ask itself. By engaging in such dialog, institutions will find themselves asking questions regarding the long-term needs of society as opposed to short-term concentration on less meaningful statistics like graduation rates, or post-graduation job placement. I do not intend to dismiss the importance of the latter— my point is merely that in the greater scheme of things any $250,000 dollar degree is not only a shameful waste, but potentially seriously [ecologically] destructive if a

graduate becomes the next climate skeptic in Congress or CEO of ExxonMobil. That being said, of course corporate CEO's and government officials, considering their position of power, above all others *should* possess a foundation of ecological literacy.

A redefinition of an institution of higher learning's fundamental purpose will make seeing the long-term less of a challenge. Because effective efforts in promoting ESD are dependent upon a long-term outlook, re-centering an institution's values and goals can provide foundation for setting priorities in ESD and allocating funds appropriately.

Challenges: My Experience with Pitzer

In my attempt at instituting an environmental graduation requirement for all students at Pitzer College, I have learned much. My eyes have been opened to some of the political pandering, fear of change, lack of will, and short term thinking that plagues the governance process; this climate seemingly arises as a result of over-burdening faculty. I have great respect for all that professors undertake and offer us as students, yet I am also continually made aware of the unhealthy ratio of words to action. I am learning to understand this divide as less of a failing on anyone's part, and more of an inherent result of mixing the young and ambitious who are ready to take on the world, with the older and slightly more pragmatic who have long settled into a much different lifestyle and emotional state. Even those members, who are tenured, must still have mutually beneficial and strong working and personal relationships with their colleagues—and not only for four years, like undergraduate students. Complacency is a further element I have encountered. On the one hand the institution must be alert to remain competitive in attracting applicants and striving for ever higher levels of recognition. However

on the other hand, I have observed that relentless self-promotion which dwells only on the institutions' strengths, can come to discourage serious self-evaluation. Unfortunately it also lengthens the intervals during which this process occurs, thus hindering the long-term visioning and soul-searching that is necessary for objectively redefining the institutions mission, values, and future trajectory.

To give a specific example of self-promotion and advertising that diverges from the reality of an institution's curricular mechanisms for accomplishing its stated values and learning objectives, I once again return to Pitzer College. Pitzer has clearly stated values regarding environmental sustainability and sensitivity in its mission statement, it is one of five core values of the college, and is reiterated in various other core self-defining texts. In addition, the college's sustainability features (the LEED dorms for example) are heavily touted as having national significance (arguably mis-contextualized). Certainly these are great accomplishments well deserving of recognition, but there is no curricular mechanism that guarantees that by the time students graduate they will actually be cognizant of the local and global impacts their actions have on the environment. Living in LEED-standard dorms is no guarantee that students will learn anything substantive about the environmental impacts and unsustainable nature of acquiring resources for constructing the average building. To develop this understanding these concepts must be integrated into the curriculum and modes of student engagement. My proposal for a *Environmental Responsibility* graduation requirement that was expounded in the previous chapter, would offer a way of achieving the aforementioned imperative. According to the self-image Pitzer promotes, such a requirement as mine would logically be one eagerly

embraced by the college.[41] However, the last months have shown me that faculty and institutional support for such a leap forward, is [perceived to] be limited. Thankfully, a recent discussion within the College's governing body has restored hope in me that the merits of such a curricular recalibration will not be lightly discarded.

The actions and rationales are potentially limitless for how institutions can direct sustainability and ESD in a top-down way. Below is a table displaying some possible approaches that have been explored in this paper by forward-thinking institutions; mixed in are a handful of my own suggestions.

Institutional Approaches:

Table 1

Action	**Rationale**	**Example/ Section**
Required internship	Requiring students to complete an internship that relates directly or in an interdisciplinary way to the environment, will broaden the student's understanding of the universal applicability of environmental issues in a "real-world" or professional setting.	ALU Freiburg Pgs. 52-58
Required case study	A case study on the student's home institution or an outside organization that is optionally within the student's individual discipline, that requires him/her to solve an issue related to the environment that has great potential beyond just classroom learning, but applies those efforts in ways that make the world a more sustainable place.	ALU Freiburg Pgs. 52-58
Establish core value relating to the environment	Establishing the environment or sustainability as a stated value of the institution, creates positive pressure for that value to be uniformly recognized within curricular offerings. Can also have the potential effect of a guiding and informing institutional decisions	Pitzer Pgs. 87-110

[41] To read the full overview and context of my proposal, see Appendix D.

Establish educational objective or core competency related to sustainability or the environment	Identifying such an objective or competency would be greatly beneficial in integrating issues of environmental concern or ESD into the broader curriculum. It is certainly a logical first step in any subsequent, more binding efforts like the requirement described below.	OCC Pgs. 70-74
Institute a graduation requirement relating to environmental responsibility	To establish such a requirement for all students is one of the strongest top-down approaches an organization can take, and has the greatest value if properly instituted. It is to expect all graduating students to have achieved some level of comprehension for sustainability and global environmental concerns.	My proposal Appendix D Pgs. 106-110; Pgs. 150-158
Establish center for sustainability	By establishing a center, the institution has taken a significant step in recognizing the importance of sustainability and ESD, and financially investing in this area. This center could have a broad range of responsibilities including but not limited to: ▪ Providing logistical and financial support for environmental organizations on campus ▪ Providing input for curricular changes and helping to design courses that are environment-related ▪ Become a co-managing location for environment-related fields and visiting faculty [outreach] ▪ Overseeing campus "soft initiatives" by student groups or the administration ▪ Coordinating internships and cooperating with outside partners (i.e. for case studies) ▪ Overseeing the development and implementation of campus climate actions or plans	NAU, ASU Pgs. 67-70; Pgs. 78-81
Create an open working group or Standing committee for sustainability	Although a voluntary or an elected committee often have the weakness of being comprised of already overburdened students, faculty and staff, they do still have great potential for addressing sustainability and ESD at an institution. Many forms of initiatives can originate from such a group or committee; they can design and regularly update strategies for the institution's climate action plan; and they can be a center or support mechanism for student-led campus-wide environmental initiatives.	ALU-Freiburg Pgs. 52-58

Attracting investors	By crafting unique approaches, trustee members or outside donors/investors may become interested and provide valuable financial assistance for sustainability related initiatives. Further consider, that many donors who may not give major endowment contributions, might become enthusiastic about a specific cause (i.e. a solar project)	Various, Oberlin Pgs. 81-84

Aside from more general top-down approaches an institution can take with respect to the quality and parameters of its education, *Table 2* shows some examples of operational approaches necessary for long-term emission reduction strategies. (For a more detailed context and possible approaches please see Chapter Six). The following measures, coupled with active student engagement, serve to raise awareness for local and global environmental concerns by urging students to connect to and realize the consequences of their individual actions more tangibly. Taking measures and educating students regarding the environmental costs of operating the institution has greater potential for inspiring student involvement, and moves them to engage explicitly with community environmental concerns.

Operational Measures:

Table 2

Area	**Potential/Rationale**	**Example/ Section**
Transportation	Introduce measures and policies that deincentivize students from having their own vehicles on campus as well as influencing faculty/staff/student commuting habits through measures such as: ▪ higher parking [permit]fees ▪ switching the campus fleet to hybrid and electric vehicles (introducing charging stations) ▪ providing transportation voucher discounts or semester/year-long public transportation passes ▪ give tangible incentives for faculty/students/staff to walk or bike	ASU, also see University of Washington's campus fleet program (not discussed in this paper) Pgs. 78-81

Food Services	Invest in sustainable food sourcing. In most cases these services are catered. However some companies like *Bon Appétit* are relatively sustainable and environmentally conscientious in their operation and sourcing [parameters]. For additional non-catered or student-run on-campus dining operations, significant freedoms can be explored via sustainable sourcing and ingredients/preparation etc.	Pitzer, COA, WWC Pgs. 87-110; Pgs. 84-86; Pgs. 74-78
Energy-use	There are several dimensions in renewable energy use and application on campuses. There are ethical grounds for purchasing alternative energy from utilities as well as for the purpose of cataloged emissions reductions. Other effects and incentives can include: ▪ Long-term financial savings ▪ Raising awareness with visible installations ▪ Educational uses in classes and programs ▪ Self-sufficiency ▪ Lowered environmental impact	ASU, ALU-Freiburg Pgs. 78-81; Pgs. 52-58
Water-use	Opportunities for reducing water use and dependence on outside sourcing/importation include but are not limited to: ▪ Meeting LEED building standards ▪ Low water-intensive landscaping ▪ Rainwater collection ▪ Grey water systems	Pitzer, Claremont Colleges Pgs. 87-110; 143-149
Waste elimination	The first and foremost strategy for emissions reduction is to eliminate the potential for waste. Some measures could include: ▪ Purchasing local products (especially food) to reduce the amount of packaging necessary for shipping and travel ▪ Eliminating paper use in college operations where possible ▪ Using reusable containers where possible (such as to-go food and beverage containers)	Pitzer, ALU-Freiburg Pgs. 87-110; Pgs. 52-58
Waste disposal	Once measures have been taken to reduce initial waste, equally important is how the unavoidable waste is processed. Measures to lower the environmental impact of waste can include: ▪ Clearly marked recycling receptacles ▪ Separation of toxic or electronic waste ▪ Compost collection and processing wherever possible	ALU Freiburg, see COA and WWC (not discussed) Pgs. 52-58

7.2 Curriculum and Pedagogy

As an institution recalibrates its mission and values, it must realign its curricular offerings to reflect contemporary societal dialogues. Institutions have done well in updating their academic subject areas to reflect current events. For example in the Political Studies discipline a great number of new courses have sprung up that discuss the War on Terror and its implications. Even in environmental fields, it has become quite obvious that students are entering higher education ready to take on contemporary environmental issues. One professor recently mentioned to me that she perceived nearly half of newly admitted students (at Pitzer) to have [personally] indicated environmental analysis as one of their possible concentrations of study. In the same breath she expressed how exciting and equally terrifying this was—because the institution didn't have the support mechanism and resources for meeting this new demand. This example goes to show that updating the course material is not the primary issue in the environmental field, but rather giving it the priority it deserves: large-scale program expansion and an integration of environmental perspectives into all other disciplines is becoming a necessity in academia. Just as institutions across the country are hurrying to become more sustainable in their operations, they must also work to address the breadth of their offerings to meet the demands of entering students.

In the United States there still remains a significant cohort of college-bound students, who (not necessarily for lack of desire) have no foundation of ecological literacy. This is an area that really should be addressed much earlier in their educations, through programs such as the German models discussed in Chapters Three and Four. Students, who lack environmental

perspectives during their earlier development stages, are much more at risk of never branching out into this area unless offered these educational foundations. An independent study project on urban sustainable agriculture in an inner-city middle school in Pomona left a lasting impact on me. I grew up in the Sierra foothills with no visible neighbors and attended a private Waldorf (liberal arts) school, situated on 40 acres of rural land. Setting foot on the school campus at Freemont Academy opened my eyes: how can these students, who have no interaction with nature, who are surrounded by brick and concrete, and quite literally imprisoned by guards and wrought-iron fencing, ever be expected to become future stewards of the environment? If only they could share in my daily childhood pleasures of climbing trees, building forts, and playing in the mud… Conversely, these basic childhood needs that an urban lifestyle deprives the child of, I saw flourish in a most beautiful way when I taught fifth-graders environmental education in Pitzer's unique LEEP program (see Chapter Six). The kids would beg that they not be put back on the bus, so that they could continue running about, and experiencing the thrills of the 76 acre Bernard Field Station.

Out of a necessity for engaging both college and university students who arrive with a general lack of eco-literacy, and school children in urban and suburban settings, I advocate that programs like LEEP and SAUCE or *Transfer-21* be developed wherever possible. Undergraduate students have much to gain from learning the basics of environmental education, so they can pass this knowledge on to their much younger peers. And, as the developers of SAUCE point out, when younger students are in the presence of young adults to which they look up to and emulate, learning instantly becomes cool and exciting—much less burdensome then having to sit still and listen to Mrs. Smith talk about biology for an hour. An ideal situation would give

students an outdoor learning environment, coupled with classroom activity such as the LEEP program structure provides. However, as this is not always possible, the more classroom based SAUCE and *Transfer-21* models have been proven quite successful and broadly applicable. *Table 3* shows some possible actions to take that have the potential to drastically change both the quality and experience an education offers students and their surrounding communities. Incorporating some of these features to raise the ecological literacy of students into the curriculum and pedagogy are key steps in ESD.

Curricular Approaches:

Table 3

Action	**Rationale**	**Example/ Section**
Internships	Internships through independent study, internships classes, or departments/centers have the same merits as described above. They provide an important base for hands-on student learning.	Pitzer Pgs. 87-110; 143-149
Case studies	Incorporating an environmentally themed case study into the structure of a class is a way of extending textbook learning beyond the classroom which may have a possible impact on the operation of the institution or outside entities. Case studies are an excellent example of critical problem solving on issues that may not be otherwise budgeted.	ALU-Freiburg Pgs. 52-58
Class Design	Similar to the effects of a case study, designing courses so that they have a higher purpose or more advanced end objectives, has significant potential for both student learning and tangible effects on the community. Such strategies and impacts may include: ▪ Classes taught by resident or visiting professors to undertake [sustainability] projects that leave lasting impact ▪ Pinpoint a specific sustainability design feature or challenge, and address it through (interdisciplinary) methods within a course (i.e., designing a grey water system for an upcoming	Various, NAU Pgs. 67-70

	building phase) ▪ In courses that are taught regularly, work with community partners to initiate hands-on [course] components for students to critically engage course topics through ongoing mutually benefitting community projects (i.e., having to do with environmental quality or justice)	
Service Trips	Offering credit or non-credit service trips of an environmental cause (40hrs) and/or working with outside NGO or action groups during winter and spring breaks to give students an exciting opportunity to gain experience in addressing pressing community environmental issues, presumably anywhere in the country.	WWC Pgs. 74-78
Independent studies	Independent studies are an excellent tool for students to broaden their horizons and experience personal growth by allowing them to chose their focus of study and learn to tackle an issue or conduct in-depth study/research on their own accord.*****	Pitzer, COA Pgs. 87-110, 143-149; Pgs. 84-86
New offerings	It is vital that the institutions and faculties continually work to ensure that course offerings mirror contemporary environmental and ESD concerns by either updating the material in extant courses or designing new ones.	Pitzer EA Pgs. 143-158
Weekly programs	Weekday set programs in the community, ideally with arranged transportation, allow students to build valuable relationships with causes and community members. This option would involve partnerships with outside organizations either already a part of a particular class or department or solely for the program purpose.	Pitzer, WWC Pgs. 143-158 Pgs. 74-78
Community engagement	Similar to many options described above, having a defined objective or campus resource that concerns itself with providing meaningful ways for students to engage in their immediate and greater communities, by extension can have great potential for offerings that handle environmental issues. This approach could be realized in different ways: ▪ hands-on components in courses ▪ Establishing its own center on campus ▪ Emphasizing available [voluntary] ESD related student engagement opportunities	Various, Pitzer Pgs. 143-158

Required Class Project	Similar to the case study, a required class project that has greater applicability or purpose than just its shelf value is a way for students to involve the material of their studies in more meaningfully. Such an option also allows students freedom of applying environmental issues normally not examined in other disciplines.	ALU-Freiburg Pgs. 52-58
Continuous self-evaluation	A regimented and well documented process of evaluation on the effectiveness of curricular change can prove very instructive over time.	*Transfer-21* Pgs. 41-51
*	Institutions responsibility to establish guidelines and to provide options and partners that give students an environmental/ ESD concentration.	

7.3 Student Engagement

As mentioned above, in most cases EE and ESD is a challenge that must be approached in various ways. Were the institution to take strong sustainability measures that would impact students, and do so against their general will, it could result in serious consequences. For example, Pitzer College has the number one rated dining hall between eight others within the Claremont Consortium. It has even gained recognition as the second "best food" in the nation by *Newsweek*. If tomorrow Pitzer decided to serve 50 percent less meat without consulting the student body, they would immediately lose revenue from other Claremont Colleges and would receive significant negative feedback, which could greatly impact Pitzer's position in the national rankings.[42] Unfortunately, although theses rankings are far from accurate or objective and in many cases damaging (see Orr on college rankings), our society does put an inordinate emphasis on them. This example illustrates that the overhead operational goal of achieving carbon neutrality is built on the foundation of a strong curriculum which places emphasis on

[42] Within the Claremont Consortium, all students with meal plans can freely eat at the various (8) dining halls. However, each time a student eats somewhere other than their home institution, their home college must pay that college where the student eats. In this way, PZ has maintained its dining hall as a source of revenue from the other colleges in the Consortium.

achieving a baseline level of ecological literacy among the student body. To frame this more explicitly for our example above: students must understand *why* reducing meat consumption is necessary for sustaining the planet. In addition, the student understanding of ESD and environmental concerns is strongly tied to their behavior and the activities in which they regularly engage. Ultimately, in a small liberal arts setting, where students often have significant input in the direction of the college, student behavioral change is key in supporting larger institutional goals of achieving carbon neutrality. The final side to this proverbial triangle or pyramid then, is a strong offering and support mechanism for voluntary student engagement opportunities. Understandably each and every institution has their own model for how they engage their students on campus and in the nearby community. The following and rather brief list contains some possible insights that place emphasis in areas with highly relevant application in EE and ESD, as well as great potential for raising levels of student awareness to contribute toward long-term behavioral change.

Student Engagement:

Table 4

Action	**Rationale**	**Example/ Section**
Farm/Garden	Giving students the opportunity to work in an on-campus farm or garden to help cultivate the food they eat has numerous benefits: ▪ It is a visual reminder of environmental sustainability ▪ Can be a formal educational resource around which to structure new course offerings ▪ Connects students to nature ▪ Connects students to food justice issues ▪ Fosters an understanding for the importance of health and nutrition derived from equitably and sustainably harvested resources	WWC, COA Pgs. 74-78; Pgs. 84-86

	▪ Can be a resource for outside groups or partner programs (like incorporating EE programs of nearby elementary schools ▪ Lowers operations' related carbon emissions	
Partner Program	Establishing strong partnerships with local non-profits or schools can open the doors for mutually beneficial programs like LEEP (PZ). Making these partnerships and programs long-standing, allows them to become ingrained in an institutions culture or even curriculum (PZ ONT)	Pitzer (LEEP) and Ontario Program Pgs. 87-110, 143-149
SAUCE	The development of this program or a version thereof is best applied in a setting where real access to EE/ESD in nature is limited. The SAUCE program's benefits are multi-tiered (see Chapter Four).	FU-Berlin Pgs. 59-64
Community Engagement through clubs and student organizations	Here, I refer to various on-campus student clubs and organizations that have an environmental focus. It is important that the institution take steps to ensure proper support (financial too) so that these groups can foster personal growth by allowing students to develop their own strategies for change. Student organizations are also critical in canvassing for specific issues, serving to educate and capture the interest of other students regarding environmental causes.	Various

7.4 Funding Carbon Neutrality

As established in the opening of this chapter, operational and curricular sustainability must first receive recognition as a priority, before initiatives are likely to receive any significant funding. Once it is decided these areas are to be developed, procuring funds for investing in LEED construction or solar energy installations often comes with different costs than funds associated with shifting the curriculum. I don't profess to have much experience in this area, but I feel it may be constructive to reiterate some of the avenues for financing options that have become visible through my research. Finally, long-term planning is particularly critical

(and attractive) when considering the financial impetus for becoming carbon neutral. The following are some avenues and considerations related to the daunting issue of addressing financial implications for the advancement of ESD.

- State Incentives: The United States lacks a national framework for supporting sustainable technologies and alternative energy development. Much like educational institutions, individual states have taken it upon themselves to legislate for SD; California is particularly progressive on this front, and is commonly referred to as America's equivalent to Germany (policy wise). Colleges and universities often have more promising financial support mechanisms available to them from the state, or even specific utility companies, than from the Federal Government.
- We saw from NAU and OCC that the seed monies that allowed them to redesign their curriculums came from the Department of Energy. Currently advertized on the DOE's website (http://www.science.doe.gov/grants/) are grants available for diverse applicants. Federal funding, when available, should by all means be utilized.
- In the case of Oberlin, the funding that made the construction of the Lewis Center possible was obtained on an unconventional basis. As SD advances, creative and modern approaches to [architectural] design are poised for elevated recognition for their potential achievements; certain investors are more interested in being associated with these groundbreaking projects. This gives further incentive, as it did at Oberlin, to be particularly ambitious in developing projects of sustainable design.
- One possible way of overcoming the initial anxiety of how to fully finance an individual initiative, like on-campus solar installations, is to follow ASU's lead in exploring lease

agreements for corporate/business owned and operated installations. Under this commonly utilized approach, the ownership of the system will transfer after an agreed upon time span, without any up-front purchase requirement.

- A wise long-term strategy requiring perhaps only one up-front significant expenditure, particularly suitable for the expansion of an on-campus solar installation, is to use a reinvestment scheme. If an institution can acquire an initial grant or donation that would cover for example the cost of a system to offset 2-7 percent of annual energy costs while reinvesting the yearly savings in further installments, both the savings and the electricity offsets could compound. Eventually, the investment will pay for itself with only one initial down payment.

The four areas discussed in this chapter are intended to narrow down the vast scope of this thesis into some more feasible applications for approaching EE and ESD in a liberal arts setting. What I have been able to cover in my quest for a better understanding of these issues over the past months is in no way complete. I sincerely hope this multicultural and diversified view on attaining higher levels of ecological literacy in the education of our youth; the challenges of greening our institutions of higher education; and the practice of future visioning for a more sustainable prospect in man's interactions with nature, will prove helpful to others, somewhere along the road.

Closing Thoughts

In exploring both German and American approaches and models for sustainable development and environmental education, one thing is clear: no single model is more effective in achieving these ends. Both countries distinguish themselves through uniquely different approaches. The strength in Germany is the level of support offered by the State to develop educational programs with environmental focus, while still maintaining a relatively rigid education system and structure. In the United States, the diverse education models and school structures of private educational institutions provide room for innovation of institutional and pedagogical sustainability dimensions to be explored on an individual basis.

The most obvious lesson to be learned from Germany's approach and stance on Education for Sustainable Development (ESD), is that with governmental mechanisms of significant support for initiatives in sustainable design, and more narrowly environmental education, the country-wide impact and success is much greater. Naturally these investments in [the] future are carried on the backs of the taxpayers; however, as we learned from Achtnicht's study (Chapter One), the average German is willing to pay a substantial sum towards fulfilling a responsibility in this regard (Achtnicht, 2009). Were we in the United States to attempt measures directing more taxpayer money towards ESD, we would be up against seemingly insurmountable political odds. Though in theory, such a thing is possible as the shaky state of our economy already requires significant re-envisioning in terms of government spending. For example, were we to reduce spending on our world conquest military defense budget, much more could be allocated fort SD and education in general. Subsequently, federal environmental policy efforts that are currently in hopeless congressional grid-lock, would have better chances

at supplementing the baby steps of individual states' legislative bodies. Indeed, the city and state level is really the only place where any significant environmental policy is being considered. Despite the lack of an overall federal benchmark or framework, some states like California continue to make progress at levels comparable to European environmental policy, but unfortunately others continue down the wrong road. By remaining steadfast in its green policy pursuits even during the global economic downturn, Germany gives the perfect impetus for expanding the green economy. Brilliant in this design is that education will be compelled to follow in order to provide the job market with appropriately educated workers.

While policy approaches may be broadly applied, one thing that cannot easily be transferred is the cultural, socio-political roots of public sentiment and conception of the natural environment, such as those valued by the German people. Common values within a democracy *should* not only shape the policy playing field, but become engrained in education systems to begin with. Although not fully explored in this thesis, the historical widespread German basis and evolution of environmental ethic was not mirrored by the United States in any comparable cultural or political sense. Why not? - It is a question that is slightly ethereal but nonetheless critical. Addressing this is the topic of another research project, but it may provoke a variety of preliminary answers, ranging from how small Germany is compared to the United States, to the fact that Americans have never been affected by a major nuclear accident. However, I raise this point only since understanding the underlying causes for exactly why we have a deficit in ecological literacy and environmental policy in the US, is important as we move forward in addressing global environmental concerns. It has a bearing on how we design

approaches for overcoming the current, unsustainable and destructive paradigm. As a closing thought, I offer my own interpretation of why this may be.

America has long constructed for itself a dream that hard work and integrity would lead every man to success in his endeavors. Both his success and the extent of his endeavors are limitless. This view is supported by an ideology of conquering the unknown—once a physical reality in the expansion of the Western Frontiers. It later became a strong metaphor that lived on in the "American Dream." Inherent and inextricable in this vision of conquering the wild is the notion of a superior Man conquering an inferior Nature. As man conquered the continent, geography, native peoples, and elements proved inferior to the great abilities of the Western European Man. To ponder on the great (American) accomplishments of the last two centuries is to consider countless versions of conquering nature; from felling the redwood, carving passages for the railroad through the Sierra Nevada, hydro-mining for gold, to scaling Mt. Whitney. Our activities underscore the cultural dominance over nature (not necessarily with malicious intent), and continue to sculpt our environmental ethic as a nation. How can we begin to transcend this dominant unhealthy paradigm which, rooted in our national identity, has evolved to have such detrimental effects on the environment? It is my hope that the many views and models presented in this thesis will in some small way prove useful for going about the larger task ahead of us, as we explore ways of breaking old habits and systems, so that we may come to coexist on this beautiful planet.

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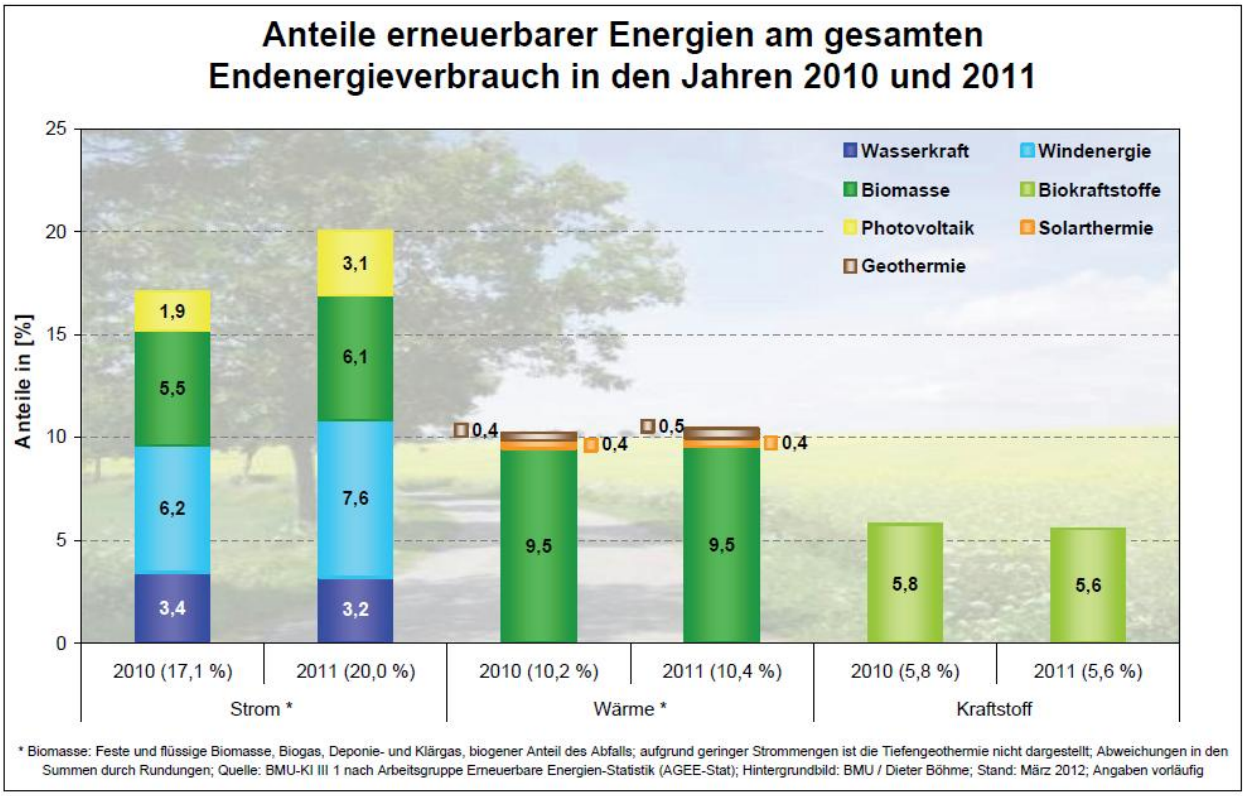
Appendix A

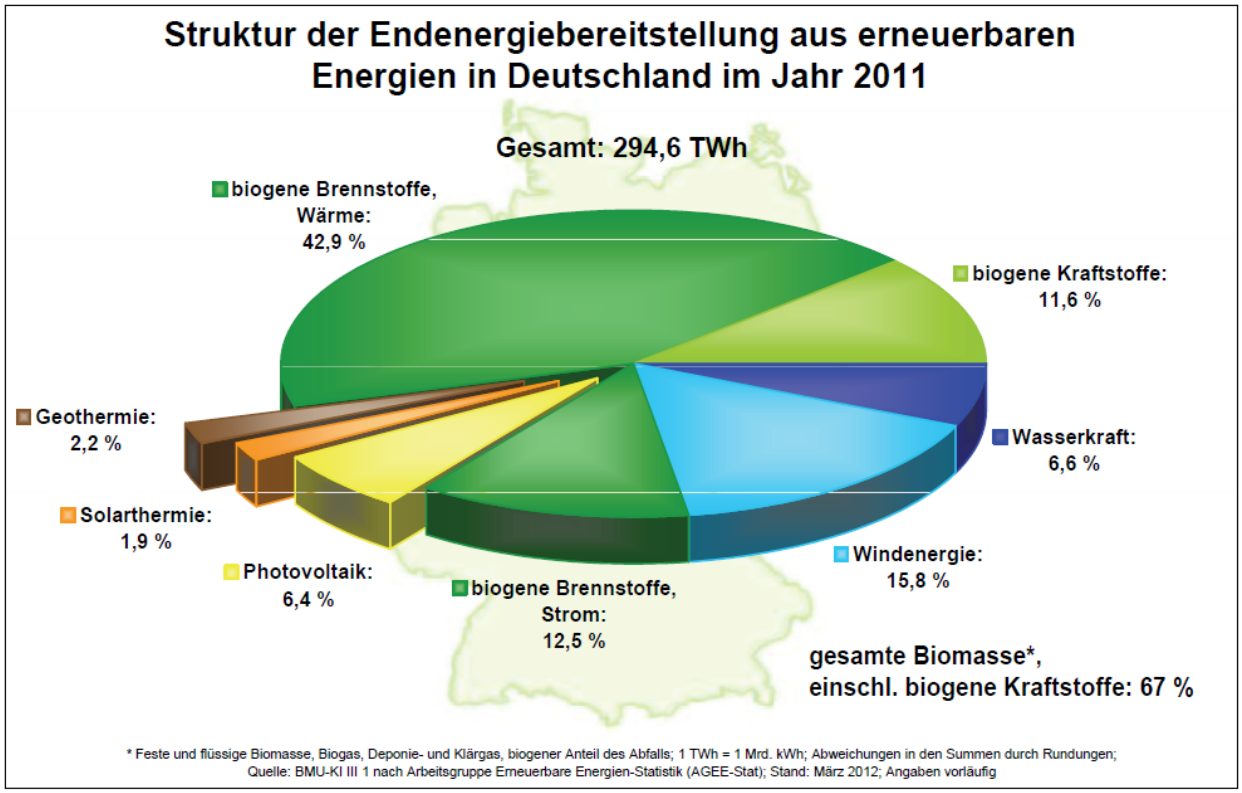
German Energy Statistics: Tables and Figures

Share of Renewable Energies at their final energy consumption levels for 2010 and 2011



Source: BMU-KI III 1 nach Arbeitsgruppe Erneuerbare Energien-Statistik (AGEE-Stat); Hintergrundbild: BMU / Dieter Böhme; Stand: März 2012; Angaben vorläufig
Retrieved April 26, 2012, from http://www.erneuerbare-energien.de/files/pdfs/allgemein/application/pdf/ee_in_deutschland_graf_tab.pdf

Structure of final energy supply from renewable energy sources in Germany in 2011



Source: BMU-KI III 1 nach Arbeitsgruppe Erneuerbare Energien-Statistik (AGEE-Stat); Stand: März 2012; Angaben vorläufig
Retrieved April 26, 2012, from http://www.erneuerbare-energien.de/files/pdfs/allgemein/application/pdf/ee_in_deutschland_graf_tab.pdf

Source of renewable energies and their contribution in Germany from 1990 to 2011 (with % in share of total electricity consumption)
Source: BMU-KI III 1 nach Arbeitsgruppe Erneuerbare Energien-Statistik (AGEE-Stat); Stand: März 2012; Angaben vorläufig
Retrieved April 26, 2012, from http://www.erneuerbare-energien.de/files/pdfs/allgemein/application/pdf/ee_in_deutschland_graf_tab.pdf

Beitrag erneuerbarer Energien zur Strombereitstellung in Deutschland in den Jahren 1990 bis 2011

	Wasserkraft [1]	Windenergie	Biomasse [2]	biogener Anteil des Abfalls [3]	Photovoltaik	Geothermie	Summe Stromerzeugung	Anteil am Bruttostromverbrauch
	[GWh]	[GWh]	[GWh]	[GWh]	[GWh]	[GWh]	[GWh]	[%]
1990	15.580	71	221	1.213	0,6	0	17.086	3,1
1991	15.402	100	260	1.211	1,6	0	16.974	3,1
1992	18.091	275	296	1.262	3,2	0	19.927	3,7
1993	18.526	600	433	1.203	5,8	0	20.768	3,9
1994	19.501	909	569	1.306	8,0	0	22.293	4,2
1995	20.747	1.500	665	1.348	11	0	24.271	4,5
1996	18.340	2.032	759	1.343	16	0	22.490	4,1
1997	18.453	2.966	880	1.397	26	0	23.722	4,3
1998	18.452	4.489	1.642	1.618	32	0	26.233	4,7
1999	20.686	5.528	1.849	1.740	42	0	29.845	5,4
2000	24.867	7.550	2.893	1.844	64	0	37.218	6,4
2001	23.241	10.509	3.348	1.859	76	0	39.033	6,7
2002	23.662	15.786	4.089	1.949	162	0	45.648	7,8
2003	17.722	18.713	6.086	2.161	313	0	44.995	7,5
2004	19.910	25.509	7.960	2.117	556	0,2	56.052	9,2
2005	19.576	27.229	10.978	3.047	1.282	0,2	62.112	10,1
2006	20.042	30.710	14.841	3.844	2.220	0,4	71.657	11,6
2007	21.169	39.713	19.760	4.521	3.075	0,4	88.238	14,3
2008	20.446	40.574	22.872	4.659	4.420	17,6	92.989	15,1
2009	19.036	38.639	25.989	4.352	6.583	18,8	94.618	16,4
2010	20.956	37.793	29.085	4.781	11.683	27,7	104.326	17,1
2011	19.500	46.500	31.920	5.000	19.000	18,8	121.939	20,0

Anmerkung: bis einschließlich 1999 (Klärgas: 1997) beinhalten die Angaben zur Stromerzeugung aus Biomasse nur die Stromerzeugung der Kraftwerke der allgemeinen Versorgung sowie die Einspeisung privater Erzeuger; der eigen genutzte Strom der Industrie wurde nicht erfasst;
1) Bei Pumpspeicherkraftwerken nur Stromerzeugung aus natürlichem Zufluss; 2) Feste und flüssige Biomasse, Biogas, Deponie- und Klärgas;
3) Anteil des biogenen Abfalls zu 50 % angesetzt;
Quelle: BMU-KI III 1 nach Arbeitsgruppe Erneuerbare Energien-Statistik (AGEE-Stat); Stand: März 2012; Angaben vorläufig

Appendix B

Schools at University for Climate and Energy

The Abridged SAUCE Program Checklist:

- **Set program dates:** check the school calendar and teachers' planning patterns before you set your SAUCE program dates
- **Decide on program structure:** exchange with educators and teachers on the most suitable program structure—day-long events or single workshops
- **Communicate with presenters:** make sure to reconfirm time and place with the presenters shortly before the program starts.
- **Procure technical equipment:** make sure your equipment communicates with the presenter's equipment and have the presenters plan a time for a test-run of the presentation on site.
- **Connect with university staff:** maintain a good working relationship with university staff, particularly with the technical and maintenance staff and the cleaning services to ensure support for unexpected hiccups.
- **Guide teachers through the campus:** send out precise directions and put up signs, provide a telephone contact for communicating last minute information.
- **Document your events:** if you want to use photographs for PR or documentation, use a high-quality camera and make sure to receive prior documentation permission ahead of the event.

Contact the Project Coordinators and Program Directors

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Appendix C

Pitzer CAP: Tables, Figures, Lists

Emissions Data Summary

This section summarizes the Pitzer College's GHG emissions. All emissions data are reported in metric tons of carbon dioxide equivalent (mTCO2e). This chart is replicated from the Clean Air-Cool Planet model.

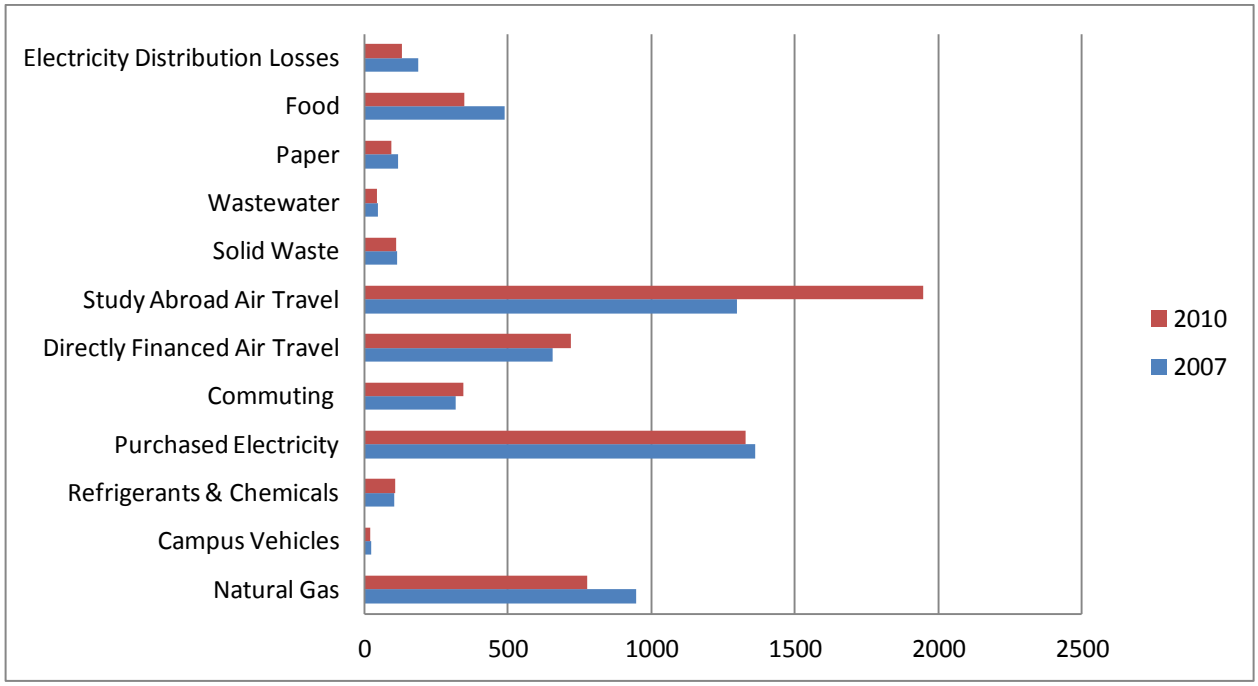
	Annual Emissions					
	Pitzer College					
Select Year -->	**2010**	**Energy Consumption**	**CO2**	**CH4**	**N2O**	**eCO2**
		MMBtu	kg	kg	kg	Metric Tonnes
Scope 1	Natural Gas	14,681.8	774,977.1	77.6	1.6	777.4
	Direct Transportation	292.9	20,538.9	4.1	1.4	21.1
	Refrigerants & Chemicals	-	-	-	-	106.1
	Agriculture	-	-	-	-	-
Scope 2	Purchased Electricity	43,964.6	1,326,620.8	23.0	8.7	1,329.8
Scope 3	Faculty / Staff Commuting	3,356.9	235,387.0	47.1	16.2	241.4
	Student Commuting	1,104.1	77,417.7	15.5	5.3	170.0
	Directly Financed Air Travel	3,656.3	717,871.9	7.1	8.1	720.5
	Study Abroad Air Travel	9,888.6	1,941,505.1	19.1	22.0	1,948.5
	Solid Waste	-	-	4,497.8	-	112.4
	Wastewater	-	-	-	14.6	4.3
	Paper	-	-	-	-	114.4
	Food					350.0
	Electricity Distribution Losses	4,348.1	131,204.3	2.3	0.9	131.5
Offsets	Additional					-
	Non-Additional					-

Totals	Scope 1	14,974.7	795,516.1	81.7	3.0	904.6
	Scope 2	43,964.6	1,326,620.8	23.0	8.7	1,329.8
	Scope 3	22,354.0	3,103,385.9	4,588.8	67.1	3,793.1
	All Scopes	81,293.4	5,225,522.7	4,693.5	78.7	6,027.5
	All Offsets					-
					Net Emissions:	**6,027.5**

Change from previous report

Energy and Transportation continue to account for a majority of campus emissions. Over the last four years, the Study Abroad programs have grown significantly. In 2007-8, 134 students participated in the program; in 2010-11, that number rose to 214. Travel between home and Campus is not required to be reported under ACUPCC, however, Pitzer will continue to measure this element as a component of total emissions.

Figure 1: Emissions Comparison 2007-2010 Metric Tonnes eCO2



Source: 2011-2012 Pitzer College CAP (Wolfsen, Coughlin, Fine, Grady-Benson, & Shubin, 2012).

Educational Offerings in the Environmental Sustainability and Responsibility Category:

With CEC, the Environmental Analysis internship network, and the Ontario Program, many internship opportunities at the college involve environmental issues. Below is a sample list of projects:

- Prototypes Women Center in Pomona: Students have worked with women recovering from substance abuse and their children to create and tend to a community garden (CEC)
- Amy's Farm: Students provide assistance with organic vegetable gardens, animal ranch, memorial and educational gardens, CSA, and farmer's markets harvest and distribution. (CEC)
- California Wilderness Coalition: Students work to help protect natural landscapes and biodiversity on a statewide level by raising awareness and conducting projects. (EA)
- Energy Service Corps: As a joint project with CalPIRG and AmeriCorps, students work with the Claremont College chapter to focus on education and outreach into the local community through energy efficiency projects and programs. (EA)
- Uncommon Good: Students work with the local organization to empower underserved families through education, medicine, and the environment. Currently students are also working to help construct the first-ever super adobe office building in the United States for the organization. (EA)
- CCAEJ: The Center for Community Action and Environmental Justice is a progressive, base-building non-profit that brings people together to find opportunities for improving their social and natural environment. Using the lens of environmental health to achieve social change, CCAEJ develops indigenous leadership, community organizing through strategic campaigns and building a base of community power in order to create safer, healthier, toxic free places to live, work, learn and play. (EA)
- The Garden Club engages the community in similar ways by inviting the community to work in the garden and learn sustainable agriculture techniques. (Student-run)
- Linda Vista Community Garden: Linda Vista is located on the site of a former elementary school, adjacent to a children's health clinic and a faith-based community services center. Initiated by Pitzer students in 2010, this community garden allows students to participate in gardening, community outreach, and forging coalitions between local stakeholders. (Ontario)
- The Wheelhouse Bike Co-Op: The Wheelhouse is a volunteer and student run bike cooperative based out of Pitzer's Ontario House, approximately six miles from campus. The Wheelhouse promotes biking locally by offering free maintenance, coordinating community rides, and encouraging riders to learn about servicing and maintaining their bikes. (Ontario)
- Harvest and Deliver: Students work with other volunteers to pick fruit and fresh produce to deliver to local food banks and kitchens that feed the homeless. (Ontario)

Source: 2011-2012 Pitzer College CAP

Pitzer Student Activities

Eco Center: Promotes environmental awareness on campus, runs a yearly Energy Challenge, brings keynote speakers to Pitzer, hosts a variety of events including clothing swaps and movie screenings.

Garden Club: Manages the Pitzer garden and chickens, and holds the annual "Zest Fest" citrus festival.

Pitzer Outdoor Adventure: POA Encourages outdoor adventure by sponsoring student trips to go hiking, climbing, skiing, etc.

Food Not Bombs: Raises awareness about food justice issues and collects and serves food to local areas of need.

Students for the Bernard Field Station: Supports the protection and maintenance of the Robert J. Bernard Field Station so that it can continue to be an educational resource and ecological preserve of California sage scrub species.

Slow Food Campus Chapter: A new club that will focus on food justice issues and the importance of sustainability in food production. This club hopes to work with the dining service and student cafes to increase sustainability and awareness about current food debates.

Composting Club: The Composting Club is a student-run initiative to reduce Pitzer's solid waste by composting food wastes from the dining hall and dorms.

5C Environmental Council: The 5CEC works to join and collaborate efforts of the varied environmentally focused clubs at the Claremont Colleges to coordinate and support environmental efforts such as the annual 5C Environmental Conference.

Green Bike Program: The GBP is a community bike co-op that teaches students how to repair their bicycles, auctions off used bikes for students, and is an on-campus resource for anything bike-related. They promote the bicycle culture of alternative, healthy, and environmentally friendly transportation.

Bee Keeping Club: The newly formed Bee Keeping Club with raise awareness of the critical importance of bees and pollination issues that are threatening colonies and thereby human food supply internationally, while giving students an actual opportunity to tend to and safe-guard bee hives on campus.

Emission Reductions Plan in the Area of Transportation

The following are examples of the programs that may be considered for around campus:[43]

- Evaluate requiring individual carbon offset purchases for vehicle.
- Implement an on-line rideshare program such as iCarpool for facilitating carpool and van connections.
- Daily Rideshare Incentive: Pitzer College will pay $3/per day for each day an employee rideshares to work.
- Public Transportation Incentive: Pitzer College will reimburse up to $250 towards the purchase of monthly Metro and/or Bus pass that is used as their primary mode of transportation to work.
- Bike Incentive: Pitzer College will reimburse up to $200 towards the purchase of a bicycle that will be used as their primary mode of transportation to work.
- Carpool/Hybrid Parking: Pitzer College will provide a minimum of five Carpool/Hybrid spaces in each parking lot. Employee must request a permit from the Human Resources office to be able to use the designated spaces.
- 10,000 Steps Program: Employees may participate in the 10,000 Step Program when their primary form of commute is walking. Pitzer will provide interested employees a pedometer to track their steps on a daily basis. Employees who accomplish the daily goal will receive a $2/per day incentive.
- Parking Fee: Levying a higher fee for on-campus student parking permits per semester to de-incentivize students having cars on-campus
- Vehicle Justification Form: Short application for why students need to have on-campus cars (i.e. internship in LA, lives in the area, ect.). This approach would need to be accompanied by a significant expansion of the on-campus Pitzer vehicle fleet, as well as allowing their use for non-academic purposes.

To reduce the environmental impacts of the study abroad program, Pitzer should make the following changes:

- Create a program for carbon offsets purchasing to mitigate the emissions from air travel. This program should support local companies working in renewable energy. This offset should eventually become mandatory or worked into the total cost of the program.
- Offer grants to students dedicating their classroom and independent study to environmental analysis-related topics while abroad. These grants could either cover part of the cost of study abroad, or help fund a research project in the country of study.
- Provide tips for sustainable traveling on the study abroad website and in orientation meetings.
- Provide sustainability information and training for program directors abroad.
- Encourage students to connect in global environmental action abroad

[43] Drafted in collaboration with Maricela Rios in Human Resources; includes contributions from myself (Lindon Pronto)

- Connect the study abroad program with international initiatives addressing climate change, for example, 350.org ; 350 Study Abroad http://www.350.org/en/studyabroad
- Increase opportunities abroad for internships and independent studies focused in environmentally related topics.
- Develop programs that bring sustainability expertise and technology to the communities in which students are staying in.

A combination of these measures is expected to further reduce emissions related to commuting by an additional 20% by 2020.

Emissions Reduction Plan in the Area of Food Services

Throughout current and future plans, our goal is to make the following standards a priority:

1. Support the local economy by purchasing from small-scale local food producers.
2. Food producers should meet the following standards: humane practices for meat, dairy and egg production, fair employment, no chemical or synthetic inputs, water and soil conservation practices, and minimal input of fossil fuels.
3. Continue a philosophy of pursuing new and innovative ideas to reduce waste and emissions.

Area of Change	Future Plans + Initiatives	Impact of Improvement
Food Transportation	▪ Long-term goal of 80% locally sourced foods ▪ Provide more food storage space within the kitchen so that food deliveries may be less frequent.	▪ Reduce overall food emissions from 4% to ~ 1%
Food Production	▪ Increase organic / sustainable foods ▪ Reduce purchases of animal products, especially beef. Possible plans: weekly day of reduced meat, daily meal with no meat, increase meatless meals over time. ▪ Reduce purchases of processed foods: Substitute processed cereals for more sustainable brands: ex: Nature's Path, Three Sisters (which carries their own more sustainable versions of cinnamon toast crunch, lucky charms, and frosted mini wheat). Use local sources of gluten free products ex: Sugar Beets Gluten Free Bakery in Chino - look into ingredient sourcing comparative analysis	The average serving of meat accounts for the equivalent 16 lbs of CO_2 emissions. On average the dining hall serves 11,000 meals each week. If each student ate one serving of meat per meal, that would equate to 176,000 lbs of CO_2 emissions per week. If one meal per week was meat-free, that would reduce weekly emissions by 88,000 lbs of CO_2. (double check math)

Waste	▪ Purchase composting machines capable of composting all food waste, including animal products. ▪ Further reduce the use of disposable utensils and cups by establishing a charge	▪ Currently, roughly the dining hall creates 100 tons of waste annually (check data). This composting capability would reduce this waste by at least ~50%.
Energy	▪ Reduce amount of processed frozen foods ex: foods used at the grill including French fries, onion rings, chicken tenders etc.	▪ Emissions reduction from less refrigeration / freezers
Education	▪ Increase education about the importance of sustainably produced food. Include this in the Sustainable Living Orientation. Also increase education of kitchen staff on food sustainability. ▪ Improve labeling of foods including ingredients, distance traveled, organic or non-organic. ▪ Perform a faculty and student survey on their daily diet	▪ Contribute to behavioral changes favoring environmentally conscious diets

Source: 2011-2012 Pitzer College CAP (Wolfsen, Coughlin, Fine, Grady-Benson, & Shubin, 2012).

Appendix D

Environmental Responsibility Educational Objective Requirement

2012A

Draft originated on: 02/2/12

Last significant revision on: 03/24/12

Author: Lindon Pronto (Environmental Senator)

Approved by Student Senate on 02/12/12

Approved by Academic Planning Committee on 03/03/12

Approved by Faculty Executive Committee on _____

Approved by College Council on_____

ISSUES

Whereas issues of environmental concern are critical ones facing humanity, educational institutions have a responsibility to educate today's students so as to prepare them for solving tomorrows problems;

Whereas Pitzer College prides itself in its commitment to preserving the natural environment by approaching issues like landscaping or new construction with notable strides in sustainable practices and applications;

Whereas Pitzer's Board of Trustees adopted a mission statement that opens with this sentence: "Pitzer College produces engaged, socially responsible citizens of the world through an academically rigorous, interdisciplinary liberal arts education emphasizing social justice, intercultural understanding and environmental sensitivity," and whereas the mission statement highlights the intersection of social and environmental justice, acknowledging that one cannot sufficiently occur without the other;

Whereas Environmental Sustainability is identified as one of Pitzer's five core values that distinguishes our approach to education, and whereas this core value is highlighted in the following statement: "Sensitivity for and preservation of the environment is a key value of Pitzer College. Campus landscaping utilizes drought-resistant, native plants and the College is proud of its many LEED-certified sustainable buildings. Students shape their daily activities, programming and studies to ensure they leave the environment and the world stronger than how they found it. Students interested in environmental issues will find Pitzer an exciting living and learning laboratory";

Whereas Pitzer College has a "Statement of Environmental Policies and Principles, which reads in part, "Pitzer College strives to incorporate socially and environmentally sound practices into the operations of the College and the education of our students…";

Whereas Pitzer College publicizes its commitment to the environment through venues such as the college website or tours for prospective students;

Whereas Goal 5 Objective C. of the 2011-2016 Tactical Plan of Pitzer College is to "create and implement an environmental sustainability action plan for the College campus and community" by 1) funding a Pitzer post-graduate Environmental Fellow, 2) increase funding for existing student-run environmental organizations and initiatives, and 3) to follow through on the ACUPCC;

Whereas Pitzer College may attract a higher ratio of students with interests in environmental concerns due to College attributes, but has no framework to guarantee that Environmental Sustainability is a widespread topic of engagement for students during their enrollment at Pitzer;

Whereas Social Responsibility is also a core value at Pitzer College, and has a supporting educational objective requirement of social responsibility;

THEREFORE BE IT RESOLVED

The members of [Pitzer College Student Senate] support the addition of an Educational Objective requirement of Environmental Responsibility to augment Pitzer's newest core value. This addition will work to ensure that future student engagement and the "Pitzer experience" is more holistically representative of the College's core values, particularly with regard to environmental sustainability. Furthermore, as Pitzer has signed on to the American College and University Presidents' Climate Commitment in an effort to become carbon neutral, it is of utmost importance that Environmental Sustainability is a value that is mirrored in the curriculum and Pitzer experience. Student behavior and level of environmental awareness is a critical component of the equation in a quest for long-term carbon neutrality.

***

IMPLEMENTATION (and Handbook/Catalog language)

Educational Objectives of Pitzer College

7. **Environmental Responsibility and the Means for a Sustainable Lifestyle**

By developing a nuanced understanding for the environments students come from and live in, and by becoming more informed on contemporary environmental issues, students will be at the forefront of a global trend recognizing the imperative of co-

inhabiting this planet. This Objective is a reflection of the core values of Pitzer, among them, producing students that possess an understanding of the local and global environmental implications of their individual actions. Through a fulfillment of this Objective, students will explore innovative and practical approaches that seek to engage them in more meaningful ways and prepare them for brighter prospects for the interactions of humans and nature.

***

Environmental Responsibility and the Means for a Sustainable Lifestyle

Working closely with their advisers to plan their studies, students will meet this Objective in one or more of the following ways:

Options with Academic Credit

1. One full-credit course that involves either environmentally-themed community service, environmental-based fieldwork, or an environmental-based internship (for courses that fulfill this requirement, see your adviser or the Registrar's office);
2. An environmentally focused independent study with a project and/or engagement component; see the Guidelines for Internship and Community Service Independent Study (available at the Registrar's Office, at Career Services, or in the Course Catalog) for instructions on how to design an independent study.
3. A course that has been approved in the [proposed] Environmental Responsibility Guideline (ERG) as meeting the criteria for fulfilling this Objective.

Non-Credit Options

1. Involvement in a single semester (or equivalent) of 45 hours (e.g., 15 weeks x 3 hours per week) of volunteer or environmentally-themed community service while enrolled at Pitzer. Normally, an involvement that includes pay is not acceptable.
2. One semester (or equivalent) of service to the Pitzer community that focuses on issues of environmental concern and actively engages the student in relevant and important projects or initiatives (for example, serving in a leadership role in environmental affairs at the college governance level or in student-run programs such as the Ecology Center, the Green Bike Program or the Pitzer Garden).

Students must discuss either of these non-credit options with their faculty advisers to determine if the placement is appropriate for the Environmental Responsibility Objective. Students must complete an "Environmental Responsibility (Non-Credit Option) Verification Form" (to be available at the Registrar's Office) and write a 3-5 page report summarizing their activities and evaluating their experiences. This report is due to the faculty adviser and the verification form to the Office of the Registrar prior to graduation.

Additional examples for what might constitute valid means of fulfilling this requirement

This Objective could be fulfilled through successful completion of an appropriate single credit course (or 2 half credit courses), or an approved internship or independent study. Some of these options include:

f. Service and community engagement activities/projects with an environmental focus.
g. Courses to be defined and that are identified as satisfactory under the proposed Environmental Responsibility Guideline (ERG).
h. New course offerings that might develop in areas such as urban planning, sustainable design, sustainable agriculture, etc. (see course offerings indicated under the new EA track of Sustainability in the Build Environment) and also [to be] defined in the ERG.
i. Prior approved internships through credit or non-credit options.
e. Special courses that feature experts that pick a sustainability orientated issue outlined in the College's Climate Action Plan that the students address/solve/plan/design during the semester, as opposed to hiring outside help or authorities. ***This idea is too short-term for this proposal; for more information see Oberlin College.**

A selection of currently offered opportunities for students to fulfill this new Educational Objective:

A sample of internship offerings

- Prototypes Women Center in Pomona: Students work with women recovering from substance abuse and their children to create and tend to a community garden
- Amy's Farm: Students provide assistance with organic gardening, tending to livestock, and farmers' markets harvesting and distribution.
- The Bernard Field Station in Claremont: Students work to provide education and restoration to a local academic resource consisting of 75 acres of native plants. The Bernard Field Station is used by neighboring schools and the Claremont College Keck Science Center to teach environmental and biological sciences.
- California Wilderness Coalition: Students work to help protect natural landscapes and biodiversity on a statewide level by raising awareness and conducting projects.
- Energy Service Corps: As a joint project with CalPIRG and Americorps, students work with the Claremont College chapter to focus on education and outreach into the local community through energy efficiency projects and programs.
- Harvest and Deliver Internship Program: Students work with other volunteers to pick fruit and fresh produce to deliver to local food banks and kitchens that feed the homeless.
- Uncommon Good: Students work with the local organization to empower underserved families through education, medicine, and the environment. Currently students are also working to help construct the first-ever super adobe office building in LA County for the organization.

- Student interns who, every two years will have the opportunity to update the Pitzer College Climate Action Plan.

Environmental Internship Guidelines

***The following proposed guidelines are taken from the language that already exists in the Course Catalog for the EA major, the following language however, has been adjusted to be more pertinent to fulfilling the proposed Objective; this language is intended to loosen the extant "Internship Guidelines" to make it a more appropriate option for the whole student body.**

All students seeking to fulfill the proposed Objective through the internship option, must engage in one semester's worth of intensive (between 5 and 10 hours per week) internship work with a local organization. Options for completing this requirement are as follows:

a. This requirement may be fulfilled through any environmental course that offers an internship component.
b. Under special circumstances, students may be allowed to fulfill the internship requirements as an independent study, to be arranged with an appropriate professor.
c. A student may petition to have work abroad in the Costa Rica program or another study abroad site count toward the requirement. Students must furnish proof of hours and submit the final product (DISP, field notes, final paper, etc.) to a field group for approval.
d. Students may complete their internships through the Ontario program. Internships and final papers must explicitly revolve around environmental issues. Students work with an advisor from Environmental Analysis to ensure that their Ontario work is appropriate for fulfilling the proposed requirement.
e. A student may add hours to a class that is already approved under [the proposed] ERG as acceptable fulfillment of the [proposed] Objective; the addition of hours would take the form of a community-based component and would augment the students experience in fulfilling the Objective. Similarly, students can propose to add an internship to a class that does not currently have a community-based component. In both cases, the student must have the professor's prior written approval and written agreement from the host organization. CEC staff will request time sheets from the organization to insure that a prior-agreed-upon time commitment is met.

*** The above outlined Internship Guidelines (in terms of hours per week) may be relaxed when fulfilled by options "a." and "e." in accordance with and approval of the student's guiding/advising professor(s).**

A sample of student leadership opportunities

- Leadership position (elected or appointed) in the following student organizations:
    - Student Senate (Environmental Senator)

    - Green Bike Program (Coordinator)
    - Pitzer Garden (Manager)
    - EcoCenter
    - Garden Club
    - Bee Keeping Club
- Other 5C environmental groups with open membership:
    - PEAR (PO)
    - SPEAR (CMC)
    - CMC Garden Club (CMC)
    - Scripps Environmental Club (SC)
    - ESW/MOSS (HMC)
    - Pomona Farm (PO)
    - Ralf Cornell Society (PO)
    - 5C Environmental Council
    - Students for the Bernard Field Station

A sample of current course offerings

- Leadership in Environmental Education Partnership (LEEP): Students teach local elementary school children about ecology and environmental education outdoors in the Bernard Biological Field Station.
- 46. Environmental Awareness and Responsible Action. This course examines lifestyle choices and campus policies in relation to waste management, water usage, energy conservation, and plant and animal habitats.
- 86. Environmental Justice. This course actively teaches students to analyze environmental issues using an environmental justice lens, evaluate the race and equity implications of environmental harms, and be inspired to do something about environmental injustice.
- 101. Environmental Internships. The Environmental Internships course engages students in real-world environmental challenges. Students work with local nonprofit, for-profit, governmental, or non-governmental organizations, contributing to efforts in environmental justice, conservation, green architecture and planning, agroecology, public policy, and education.
- 104. Doing Natural History. The interdisciplinary field of Natural History links the natural sciences to the humanities and social sciences by combining ecological field studies with drawing and painting, cultural history, and social analysis.
- 131. Restoring Nature: The Pitzer Outback. This course focuses on designing and implementing a restoration plan for the Pitzer Outback as a resource and develops a restoration strategy and management plan.
- EA 132/Art 132. Practicum in Exhibiting Nature: The Pitzer Outback. The course focuses on designing and implementing an exhibition plan for the Pitzer Outback. Students will assess the Outback as a resource and develop an exhibit strategy and management plan.

- 146. Theory and Practice in Environmental Education. Students are trained in principles of environmental education, and serve as instructors to children from elementary schools in Pomona and Claremont. Participants work in teams to develop and teach effective environmental curricula at the Bernard Biological Field Station.
- Any introductory Environmental Analysis course that addresses a full range of global environmental issues in a broad and comprehensive manner (to be indicated in the ERG).

Additional Considerations

- The Consortium has sufficient current course offerings, sufficient department expertise to guide independent studies, leadership opportunities within environmental student organizations, and well-established connections to nearby resources such as environmental NGOs, to be able to facilitate all Pitzer students' achievement of this new Objective.
- Dependent upon the presently upcoming (and budgeted) Environmental Fellow position, this position could be modified to include some of the organizational aspects of ensuring specifications for meeting the proposed Objective, perhaps with particular attention towards the parameters of fulfilling the proposed Objective through student organization leadership positions.
- Perhaps the EA Department in concourse with Curriculum Committee could be responsible for deciding the parameters for what courses, internships, and independent studies may satisfy this Objective.
- Once the respective and appropriate committees establish a written Environmental Responsibility Educational Objective Guideline, this will serve as a reference for advising faculty members (especially non-EA) to have the proper understanding of how the Objective can be satisfied in an interdisciplinary format. This guideline for Environmental Responsibility could be a modeled after the Social Responsibility guideline and parameters. Just as not all faculty members are specialists on social responsibility, not all faculty and advisors will have a trained eye for appropriate student actions aligned with the value of Environmental Responsibility. This necessitates a clear guideline for fulfilling this Objective.
- Just as Pitzer recognizes Environmental and Social Responsibility as two separate core values, the curricular requirements and learning Objectives should reflect this sentiment. It is not too much to ask of Pitzer students that, out of a minimum of 32 classes taken during their 4 years, one is focused on the environment, and one on social responsibility. Furthermore, if a student encounters a class that addresses both Environmental AND Social Responsibility learning Objectives (for example LEEP or Ontario Program), it is not unreasonable to require the student to indicate which of the two Objectives they would like that class to count for, one or the other.
- Due to the current and proposed vast array of options for reaching the proposed learning objective, and bearing in mind that a great many more options will soon be available under the current expansion of the 5C EA Department, the upcoming new EA

track of Sustainability in the Built Environment (and a little further along the Redford Center for Sustainability), no student should ever need to take the same class or internship [twice] in order to separately address the learning Objectives of Environmental Responsibility and Social Responsibility.

- Double-dipping: This is an issue that still needs some envisioning on how exactly it can work in a way that counting two learning Objectives under one class or experience can be done without taking any value away from either. One possible distinction would be that no double counting is permitted between the 7 Educational Objectives, but that, Objectives can be fulfilled through classes that are required for any given students major (is this not how it currently works?). Another route would be to formally distinguish guidelines of what specific Objectives it would be permissible to double count for. In my personal estimation, I think this route (although slightly more involved) would be the most effective for identifying more possible options for students to fulfill the proposed Objective and possibly an existing one as well, while still maintaining educational and experiential integrity and purpose for both (and all) Objectives.

Version 2012B

[Weak Version]

(With handbook language changes)

--PROPOSAL--

Proposed New Title: Social/Environmental Responsibility and the Ethical Implications of Knowledge and Action

New language for objective [adapted from existing catalogue language; additions **bolded**]**:**

By undertaking social**/environmental** responsibility and by examining the ethical implications of knowledge, students learn to evaluate the effects of actions and social policies and to take responsibility for making the world we live in a better place. Pitzer College encourages students to pursue these educational objectives during their undergraduate years and beyond.

Working closely with their advisers to plan their **programs**, students will meet this objective in one of the following ways:

Options with Academic Credit

1. One full-credit course that involves **socially and/or environmentally themed** community service, community-based fieldwork, or a community-based internship (for courses that fulfill this requirement, see your adviser or the Registrar's office).

2. A directed independent study with a **socially and/or environmentally themed** community-based experiential component; see the Guidelines for Internship and

Community Service Independent Study (available at the Registrar's Office, at Career Services and on p. 308) for instructions on how to design the independent study.

3. Participation in apposite Study Abroad programs (those involving a **socially and/or environmentally themed** community- based internship or community service).

Non-Credit Options

Involvement in a single semester (or equivalent) of 45 hours (e.g., 15 weeks × 3 hours per week) of **socially and/or environmentally themed** volunteer or community service while at Pitzer. Normally, an involvement that includes pay is not acceptable.

1. One semester (or equivalent) of service to **socially and/or environmentally themed** the Pitzer community (for example, as a participant in College governance, the Ecology Center, or as a Resident Assistant).

2. Students must discuss either of these non-credit options with their faculty advisers to determine if the placement is appropriate for the Social/**Environmental** Responsibility Objective. Students must complete a "Social/**Environmental** Responsibility (Non-Credit Option) Verification Form" (available at the Registrar's Office) and write a 3–5 page report summarizing their activities and evaluating their experiences. This report is due to the major adviser and the verification form to the office of the Registrar prior to graduation.

Rationale:

This slightly revised objective makes visible links between social and environmental issues, and allows more students to engage with these issues in overlapping, mutually enhancing ways. Through this requirement, students engage in disciplinary and interdisciplinary work, both on campus and off, that prepares them to be socially and environmentally responsible stewards of our globe. Adding environmental concerns to the social responsibility requirement strengthens Pitzer's core commitments to social responsibility, student engagement, and environmental sustainability.

This objective recognizes existing pathways in which topics of environmental and social responsibility overlap without disrupting the structure of the existing social responsibility mechanisms. By presenting the two objectives together, we emphasize interconnections between social and environmental concerns. Our goal is, through appropriate curricular and community-based partnerships, to continue to increase the mechanisms through which students are participating in both simultaneously, rather than viewing them as an either/or.