Putting the 'Action' into Climate Action Planning

Mike Walters and Jeannette LeBoyer, Affiliated Engineers, Inc.

ABSTRACT

Over the past 3 years, nearly 600 universities and colleges have signed the American College and University Presidential Climate Commitment (ACUPCC) to reach campus carbon neutrality. This paper examines how climate action plans are the necessary first step in reducing campus energy and associated carbon emissions, while noting that following up on the plan through implementation often poses a more substantial challenge in realizing tangible results. The higher education sector encounters many challenges, both financial and political, in crossing over from planning to action. With the recent submittals of Climate Action Plans by the first rounds of signatories of the ACUPCC, a database of best practices and carbon management can now be used to examine the current applications and potential for energy efficiency. Using two universities as case studies of publicly available Climate Action Plans, we explore the challenges and benefits of working on a campus level to achieve maximum sustainability, emphasizing the goal of "action" in Climate Action Plans. The climate action planning process can be replicated to other types of campuses, from businesses to small communities, each with similar sets of roadblocks to overcome.

Climate Action Planning for Achievable Implementation

The higher education campus is a complex and dynamic community. Administrators must balance the needs of diverse campus populations of faculty, researchers, students and staff, providing academic training along with sufficient energy, food and transportation. The building stock is varied; most colleges and universities have grown over time, making them a patchwork of building age, size and usage. Building type often ranges from low energy- expending offices and residence halls to high-energy laboratories. Moreover, higher educational institutions have to achieve research and educational goals. Within these complex communities, universities consume a significant amount of energy and resources. According to the Energy Information Administration, the education sector consumed the third most energy in the United States, approximately 820 trillion BTUs, behind offices and mercantile space (EIA, 2008). In response to climate change impacts related to their resource consumption, many higher education communities have begun to examine their environmental and energy effects (Mueller and Rhyne, 2009).

The ACUPCC was formed as a collective agreement to reduce carbon emissions from campus related activities. As stated in the ACUPCC charter, the higher education sector has the responsibility to "show leadership in their communities and throughout society by modeling ways to eliminate global warming emissions and by providing the knowledge and the educated graduates to achieve climate neutrality" (ACUPCC, 2010). This two-fold vision is one that over 600 colleges and universities have declared their own.

While the ultimate goal is to reach carbon neutrality, there are many stepping stones in reaching that final point. One of the difficult first steps involves developing a Climate Action Plan (CAP) that will lay out the path to reach carbon neutrality. In preparation for CAP development, institutions are required to develop their baseline of emissions through a greenhouse gas (GHG) inventory. The process can be similarly seen in other pledges to carbon neutrality, such as in the ICLEI (Local Governments for Sustainability's Cities for Climate Protection), Sierra Club's Cool Cities and US Conference of Mayor's Climate Protection Agreement, which all focus on municipalities (Wheeler, 2008). The EPA Climate Leaders program targets the private sector with similar carbon reduction goals. (EPA, 2010)

While all commitments are non-binding, these public declarations provide an effective motivation to take the first steps in creating a plan of action towards carbon neutrality. With these commitments comes an external force, albeit voluntary, that drives the process of CAP creation. Climate action plans not only can show the commitment to reducing carbon emissions but also allow the higher education sector to examine their current policies and practices and take the first steps towards a more efficient and strategic campus. Without a plan, taking any action to reduce carbon impacts may be so daunting as to inhibit any substantive changes.

Because each school is unique, every CAP outlines a slightly different path towards carbon neutrality. However, to ensure that the CAP is implemented, the CAP needs to be based upon sound technical and financial analysis and accepted by university administrators.

This paper will first examine our process of developing a CAP, focusing on the technical scope needed to facilitate campus sustainability and move universities towards reducing their carbon impact. The challenges and possibilities for improvement will be examined in light of two schools' experiences, Cornell University and The Ohio State University. While both schools developed CAPs, the differences in process reflect the challenges inherent in creating a complex plan towards carbon neutrality.

CAP Process

Table 1: CAP Development Phases

Phase Name	Action
Discovery	**Profile the Situation** - Carbon Inventory - Calculate Risk Exposure - Forecast model - Initial stakeholder engagement
Ideation	**Solicit Ideas** - Working groups formed - Idea generation - Qualitative screening
Analysis	**Screen Ideas** - Technical Analysis - Internal/External Expert Involvement - Quantitative Screening - Viability Considerations - Stakeholder Review
Plan Creation	**Endorse Actions** - Portfolio Analysis - Stakeholder review - Draft Plan - Decision Support - Public Education Sessions - Board Review

We organize the CAP development process into discrete sections, understanding that each component of the process needs to be tailored to the institution. With any plan there is the fear that once it is completed, it will simply gather dust on the shelf; with this CAP development process, the argument should become compelling enough and the analysis strong enough, that they catalyze action. The components are outlined in Table 1 above. We begin with a big picture view of the situation and narrow down the potential actions to make the tasks manageable.

Discovery Phase

The Discovery Phase is a total inventory of information, processes, policies and goals, ensuring that everyone shares an understanding of the contextual starting point. The GHG Inventory – which defines the baseline of carbon emissions – is developed at this point. Emissions are calculated on an institutional level to encompass Scope 1 emissions (on-campus stationary combustion, fleet fuel, and refrigerants), Scope 2 emissions (purchased electricity, chilled water or steam) and Scope 3 emissions (campus-related travel and commuting, waste removal). The inventory becomes the foundation upon which future actions are measured. While the GHG inventory can be a large task unto itself, it is only mentioned briefly in this paper.

The financial, technical and social metrics are outlined that will enable objective assessment of the economic feasibility, carbon mitigation potential, and costs of each project. Such criteria include: standard life-cycle and abatement cost metrics, financial and qualitative feasibility, and institutional, environmental, social, and economic measures. Because any reduction in an institution's carbon emissions relies on the cooperation of varied campus stakeholders, it becomes important the criteria be well-defined and mutually accepted. Some institutions find the Triple Bottom Line as a useful concept upon which to base institutional decisions (Elkington, 1997). This step should also include the organization of a decision-making team who will advise the entire CAP process to optimize university representation.

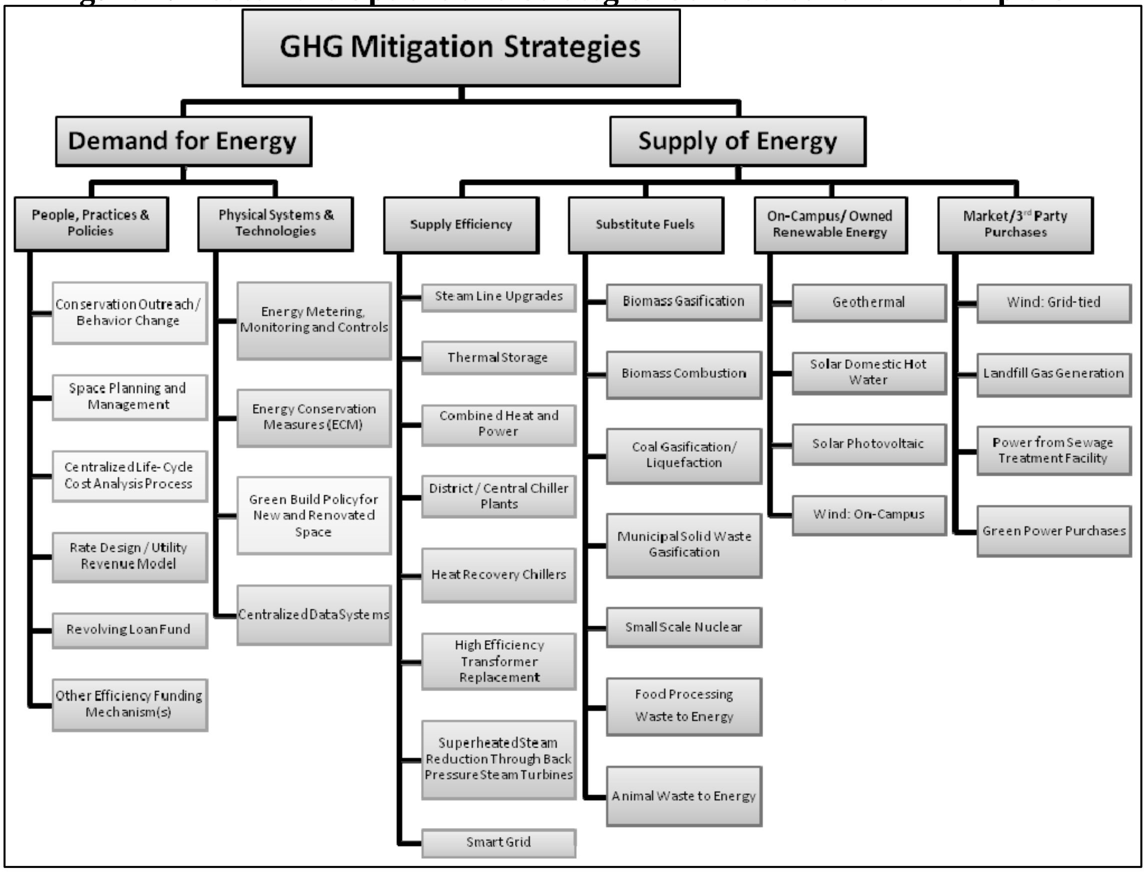
The CAP, by nature, should be a participatory process. If possible, the process should provide a campus-wide open forum for discussion of the potential options, thereby helping to ensure plan execution.

Ideation Phase

During Ideation, brainstorming with stakeholders helps conceive the list of alternatives appropriate to meet the objectives of the planning work. For organizational purposes, we structure our ideas using "wedge" categories as an organizing tool to develop and screen a list of potential projects and measures the institution can employ to reduce its GHG emissions. The concept of wedges, first originated by Pacala and Socolow, breaks down an intimidating task into more manageable pieces, or wedges (Pacala and Socolow, 2004).

A flow chart of abatement options and strategies is provided in Figure 1. Using an abatement hierarchy that focuses first on avoiding future carbon emissions, reducing current emissions next, and replacing carbon intensive fuel sources third, an appropriate focus is placed on absolute reduction of energy use – an outcome with both environmental and financial benefits.

Figure 1: Abatement Options and Strategies Considered for an Example CAP



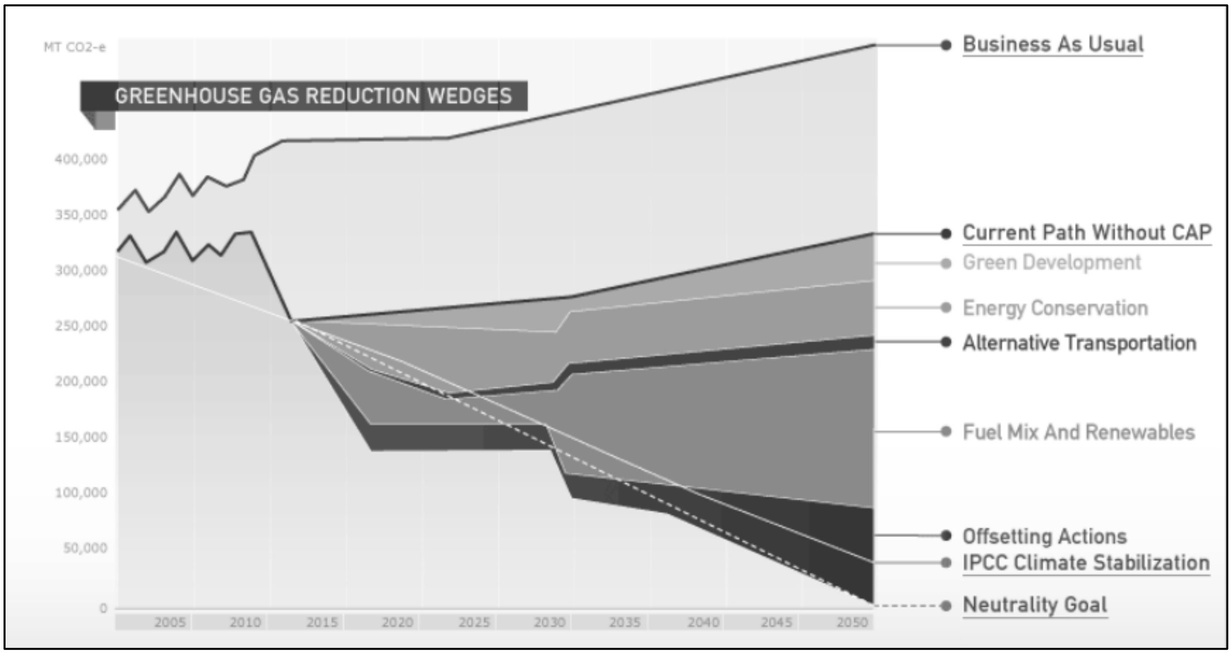
Analysis Phase

The Analysis Phase tests the GHG emission mitigation strategies recommended by the Ideation Phase. At this point, the details become more fine-tuned as technical and financial analysis provides an understanding of potential energy, carbon and dollar savings as well as the capital investment, operations and maintenance implications, and any required policy or procedural adjustments. Through technical memos, the key CAP options and measures for implementation are documented and assumptions used in the modeling are confirmed with university stakeholders. These assumptions are used as the inputs into the quantitative assessments and analysis. The evaluation of economic and GHG emission performance of each alternative project is evaluated and measured against the base case scenario. At this point, the Triple Bottom Line or other criteria is considered and applied to the technical analysis.

Plan Creation

With an in-depth understanding of the costs and benefits of each abatement measure, a plan can be created that incorporates all financial, technical and political metrics defined by the institution. The recommended actions that have been endorsed by the stakeholders for further analysis will be compiled into alternative portfolios. For example, one portfolio may reflect constraints on capital availability. Another may reflect accelerated carbon neutrality and a third may reflect a particular area of research. The portfolios will be evaluated and compared, applying the financial and other metrics adopted by the institution. The objective is not only to select a recommended portfolio of actions for the CAP, but to understand how the portfolio might change to the extent future conditions and key assumptions, such as energy commodity and carbon prices, vary.

Figure 2: Cornell University Wedge Diagram (Cornell, 2009)



Tale of Two Schools

Examining the experiences of Cornell University and The Ohio State University (OSU) help illuminate the challenges found in the CAP development process. Cornell, a part-endowed/part-state-funded mid-sized school, completed their CAP in September of 2009. OSU is one of the largest publicly-supported universities and will complete their CAP by mid 2010 as part of a campus master planning effort that includes an Energy and Infrastructure Plan. OSU's CAP will be a third deliverable produced as part of a Sustainability Plan.

The following tables provide an overview of the stages of CAP development for each school, highlighting the process.

Table 2: Cornell University CAP Process

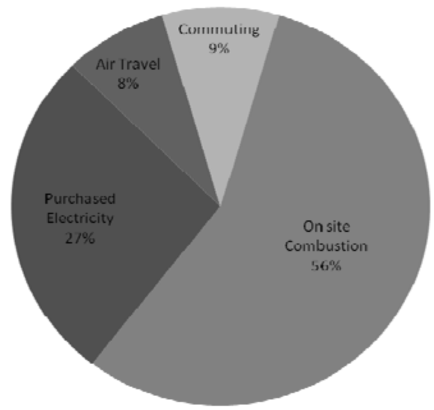
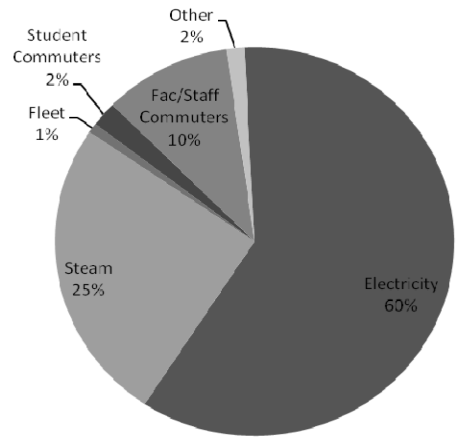
• Charter Signatory of ACUPCC • Before ACUPCC, university committed to adhering to the Kyoto Protocol goals. (Dullea, 2001) • The CAP development process became an integrated resource plan.	
Discovery Phase	The CAP was part of a larger strategic sustainability initiative that provided the framework upon which the CAP was begun. The Advancing Sustainability Action Plan outlined the vision of sustainability at Cornell, which then became a reference from which the CAP could be developed. Baseline Footprint: • Gross MTCO2e: 319,000 • Scope 1 MTCO2e: 176,000 • Scope 2 MTCO2e: 87,000 • Scope 3 MTCO2e: 56,000 • Offsets from land owned by Cornell: 11,000 MTCO2e 
Ideation Phase	Opened up the ideation to the entire school population through use of web tools with 706 ideas generated Seven Wedge Working Groups defined to lead idea generation: Green Development, Energy Conservation, Fuel Mix and Renewables, Transportation, Offsetting Actions, Sustainable Decisions, and Forecast
Analysis Phase	114 themes explored; the themes were divided among working groups to provide assumptions for the analysis used. Assumptions of future projections were agreed upon in the working groups to ensure acceptance.
Plan Creation	Final plan includes many large-scale actions, like enhanced geothermal system and a bioenergy initiative along with smaller building efficiency measures, such as HVAC and lighting upgrades, fume hood reductions and steam line upgrades. Reflects both the research interests of faculty and the campus population. Policy measures include a space planning management policy and green building standard which requires new buildings to have a minimum energy use intensity (Labs= 170 kBtu/SF and Offices/Academic Buildings= 53 kBtu/ SF) **<u>Cornell Carbon Abatement Options</u>** Green development: 12% Energy Conservation : 16% Fuel Mix & Renewables: 42% Transportation: 4% Carbon Offsetting: 27%

Table 3: The Ohio State University CAP Process

• Became signatory of ACUPCC in 2008. • Ohio State House Bill 251 requires a 20% reduction in University energy use by 2014 as compared to 2004 levels, making energy conservation mandatory. • The CAP development process became a strategic energy plan.	
Discovery Phase	Undergoing a Framework Plan, a 2-year master planning process. Framework Plan includes two supporting plans: Energy and Infrastructure Plan and Sustainability Plan. Major components of the CAP are completed through the Energy and Infrastructure Plan but the CAP is formally part of the Sustainability Plan. Baseline Footprint: • Gross MTCO2e: 649,051 • Scope 1 MTCO2e: 390,119 • Scope 2 MTCO2e: 169,093 • Scope 3 MTCO2e: 89,839 • Offsets MTCO2e: 1,850 
Ideation Phase	Opened up the brainstorming to various groups including: President's Council on Sustainability, Energy Services and Sustainability, Facility Operations and Development, and Researchers. Included four subcommittees: Energy Transportation and Green Buildings, Water Resources and Ecological Systems, Material Flows, Research, Education, and Community Engagement. Audited 11 buildings for sampling of energy conservation potential.
Analysis Phase	Focused on campus infrastructure such as major production equipment projects (e.g. chiller plants, combined heat and power, geothermal), building metering, retrofits and deferred maintenance. Provided policy recommendations such as a revolving loan fund for energy conservation work and green building standards.
Plan Creation	At the time of the authors' writing, OSU is currently undergoing its final determinations on its CAP. The final CAP will likely be a part of a strategic master plan that includes central plant upgrades, building conservation, geoexchange systems and campus infrastructure improvements to inform future energy conservation measures.

Overarching Themes and Challenges to Making an Effective CAP

Getting Stakeholders Onboard

Having individuals involved in the process with a vested interest in the outcome is important to ensure that the CAP proceeds to implementation. The stakeholder engagement should be taken seriously at each step of the process. However, getting an effective group of stakeholders together can be a difficult task of itself. Even if a consultant team is hired to assist the university, a great deal of time will still be required by university staff, researchers, and administration to generate and document base case information and operational assumptions, provide abatement ideas, review analysis, and communicate with the university community.

For Cornell University, the planning process was divided into the wedge categories, and each working group was comprised of 10-15 people. This allowed for a range of experience and interest in the CAP. To provide one example, the driving force behind investigating enhanced geothermal systems (EGS) was Jeff Tester, a professor in the Fuel Mix and Renewables working group. This particular resource option, which takes the heat from “deep hot rocks” to provide space heating, has not been commercially implemented. With the expertise and collaboration from within the working group, this potential resource option was fully vetted and determined to be a strong possibility in the long-term time frame and a strategic link to the academic and research community of the university (Cornell, 2009). Other strategic university partnerships were with Utilities and Energy Management of Cornell, the organization responsible for the many building retrofits and operations upgrades necessary to achieve near-term carbon reduction goals.

The Ohio State University’s stakeholder engagement process involved the President’s Council on Sustainability, Energy Service and Sustainability, Facility Operations and Development, Business and Finance, and Researchers. The process was led by the Director of Energy Services and Sustainability and utilized four subcommittees: Energy Transportation and Green Buildings, Water Resources and Ecological Systems, Material Flows, and Research, Education, and Community Engagement. Development of the CAP coincided with the OSU’s campus master planning effort. This coincidence provided opportunities for reporting out to the larger campus community at regular intervals in town hall-like events.

Organizing Institutional Data

As outlined above, institutional data becomes the backbone of understanding how to reduce carbon emissions. While every higher education institution needs to provide energy and maintenance to its buildings, pay its energy bills and ensure a reliable network of facilities for the campus population, the way that data is organized ranges from institution to institution. Examining a campus from the carbon perspective is a different task than simply ensuring that the energy budget breaks even at the end of the year. Even the development of a greenhouse gas inventory, the first step in the CAP process, can pose significant challenges for an institution whose data is housed in different formats all across campus.

Cornell University has a strong foundation of institutional data. Every building has system submeters with online access to building-level energy consumption data. This data not only provided the basis for the school’s overall GHG inventory, but also allows for a higher degree of control in energy management and application of energy conservation measures. It also allows for the capabilities of internal benchmarking of energy use intensities and verification of energy efficiency systems. For example, the current Energy Conservation Initiative (ECI) will be continued and expanded to significantly increase conservation-focused maintenance and double capital investment in conservation projects, resulting in 13,500 tons of average annual abatement. Other building conservation measure will include lighting retrofits, weatherization and fume hood reductions, which will achieve approximately 50,000 metric tons of carbon abatement from existing buildings alone. Without specific building data, it is difficult, if not impossible, to verify energy performance of efficiency measures.

While OSU has quality data for the overall energy consumption of its operations, they had significant gaps in building level energy consumption data. A study of metered buildings showed that a majority of buildings do not have submetered steam or chilled water usage. The incomplete data posed a challenge in developing accurate energy conservation potential for individual buildings. Twelve building audits were performed to provide a basis for understanding on potential energy efficiency mechanisms; however without data on a building level, it is difficult to extrapolate to a campus level. One recommendation was to invest in building energy monitoring to further monitor potential building performance optimization.

Energy consumption information is only one metric in the list of required information that is critical to the long term success of a CAP. Additionally, building function, campus square footage, space allocation, operating budgets, capital constraints, potential funding mechanisms, and university bandwidth – in terms of quantity and capacity of staff – are all necessary to understand.

Making the Business Case

The business case for climate neutrality – and sustainability broadly – has historically been difficult to articulate. In the end, institutional decisions are often made through the spectrum of financial metrics. While the Triple Bottom Line can provide guidance to the CAP process, large capital projects and energy investments are driven by a sound business model. The CAP needs to show financial viability along with the social and institutional goals.

One way to evaluate financial viability is to compare current costs with future potential costs associated with climate legislation. While carbon dioxide emissions are currently not regulated federally, there has been recent activity to put a price on carbon. The institution should consider the full array of carbon risk exposures to the institution, e.g. strategic, operating, compliance, direct financial, reputational, and technology-related. This analysis establishes a financial cost exposure, expressed as the net present value (NPV) of annual, economy-wide compliance cost a university may face in complying with federal climate regulations under different policy and emissions allowance price scenarios. This kind of financial risk exposure analysis to emerging GHG legislation will establish the business case for taking action sooner rather later.

While placing a value on carbon is one mechanism to address risk exposure and create a CAP business case the proactive institution will consider enterprise risk management in is broadest sense a prudent step in the CAP planning process as well as in their internal policies. Employing conventional risk management approaches during the development of a CAP results in a more robust plan that is sensitive to the strategic objectives of the university. Comprehensive CAPs will include risk management consideration of commodity fuel costs, institutional reputation, deferred maintenance, access to funding, “optionality” (or the opportunity to pursue a different option at some point in the future) and appropriate investments in research and academics. These financial metrics, when provided in context of other monetary priorities, are often compelling enough for financial administrators or boards of trustees to act upon them.

Looking Into the Crystal Ball

One of the more difficult challenges that any institution faces is the tension between wanting to plan out decades into the future and the realization that such planning is fraught with assumptions and uncertainties. There is uncertainty around carbon risk, institutional support, available financing and technological advances. There are relatively certain trajectories that can be projected into the near-term, but beyond 10 years into the future, these trajectories become ambiguous.

To overcome this challenge, it is important to create stepping stones along the path to carbon neutrality. The NREL Climate Neutral Research Campus Initiative recommends making interim carbon reduction targets to ensure easier management of the CAP. The interim targets allow for evaluation of the process and if necessary, a re-working of the strategies to accommodate new circumstances in the future. These uncertainties also strengthen the case for an institution to act sooner rather than waiting for the unknown problems to come to fruition.

Applying CAPs to the Community Planning Sector

Many of the reasons to undertake a CAP on a municipal and private sector are similar to those of the higher education sector: reduced energy costs, mitigate risks of rising energy costs and carbon legislation, desire to reduce negative environmental impact, etc. Likewise, many of the challenges of creating an effective CAP hold true for other community planning efforts. As stated above, there are a number of other organizations that target community level carbon planning, such as on the municipal level (such as through ICLEI) or on a private sector level (through the EPA's Climate Leaders program). Some financial metrics or organizational boundaries will differ from CAPs in the higher education sector, but the essential process remains the same.

Municipal CAPs must take into consideration the taxpayer input and the CAP should reflect not only an economically viable set of solutions but also one that can address societal issues such as job creation and economic development. A report analyzing the lessons learned from the Chicago Climate Action Plan includes a table of co-benefits to climate action which reveals some of the other motives behind strong planning for climate action, shown in Table 5 (Parzan, 2009). The DOE recently published a report outlining its recommended strategies for making a strategy energy plan, many of which reflect the CAP process outlined in this paper (DOE, 2010).

Figure 3: Co-benefits of Climate Action Planning (Parzan, 2009)

Strategy	Co-Benefits						
	Reduced energy costs	Jobs	Economic develop-ment	Improved air quality and health	Water quality	More Appealing Communities	A More Resilient City
Energy efficient buildings	✔	✔	✔	✔	✔	✔	✔
Clean & renew-able energy sources		✔	✔	✔			✔
Improved trans-portation options	✔	✔	✔	✔		✔	✔
Reduced waste & industry pollution	✔	✔	✔	✔	✔	✔	✔
Adaptation to climate change	✔	✔	✔	✔	✔	✔	✔

For the private sector, CAPs offer a way to quantify the risks associated with rising energy costs and potential carbon emissions. For some private institutions, such as those with energy–intensive manufacturing or a complex transportation network, the financial effects of rising energy costs or carbon costs will have a strong negative consequence. Other private institutions have a campus of buildings not unlike higher education campuses. Building energy efficiency may have a high rate of return and be worth the added investment.

Conclusion

While a daunting process, CAPs provide an institution with the opportunity to examine how their policies and processes affect their impact on global carbon emissions. In doing so, a university can assess overall efficiency of its energy systems and develop ways to reduce dependence on costly fossil fuels. Reaching carbon neutrality should be seen as an added benefit to streamlining energy systems, managing risk and achieving university academic goals. CAPs should not be seen as a one-time document or a report generated by a solitary group on campus; rather, a CAP should be examined through a holistic lens with as many institutional stakeholders that can bring the words on paper to life. Given sufficient institutional support, the right financial metrics and a realistic timeframe, a CAP can be an essential tool to bring carbon reduction concepts into action.

References

[ACUPCC] American Colleges and Universities Presidential Climate Commitment. 2008. *Charter Signatories.* http://www2.presidentsclimatecommitment.org/html/chartersignatories.php Boston, Massachusetts: Second Nature.

[ACUPCC] American Colleges and Universities Presidential Climate Commitment. 2010. *Commitment Text.* http://www.presidentsclimatecommitment.org/about/commitment Boston, Massachusetts: Second Nature.

Cornell University. 2009. **Cornell Climate Action Plan**. http://www.sustainablecampus.cornell.edu/climate/index.cfm Ithaca, New York: Cornell University.

[EIA] Energy Information Administration. 2008. Overview of Commercial Buildings 2003. http://www.eia.doe.gov/emeu/cbecs/cbecs2003/overview3.html. Washington, DC: Energy Information Administration.

[DOE] Department of Energy. 2010. **Community Greening: How to Develop a Strategic Energy Plan.** Washington, D.C.: Department of Energy: Energy Efficiency and Renewable Energy. GO-102010-2826

Dullea, H. 2001. "**Cornell Administration Reaches Agreement with Cornell Kyoto Now! Students**." *Cornell News.* April 17.

Elkington, J. 1998**. Cannibals with Forks: The Triple Bottom Line of 21st Century Business** Gabriola Island, Canada: New Society Publishers.

[NREL] National Renewable Energy Laboratory. 2009. http://www.nrel.gov/applying_technologies/climate_neutral/measure.html *Carbon Neutral Research Campuses.* Golden, Colorado: National Renewable Energy Laboratory.

Pacala S and R Socolow. 2004. "**Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies**." *Science* 305 (5686): 968-972.

Parzan, 2009. **Lessons Learned: Creating the Chicago Climate Action Plan**. Chicago, Ill: City of Chicago Department of Environment.

Wheeler, S.M. 2008. "**State and Municipal Climate Change Plans**." *Journal of the American Planning Association* 74 (4): 481- 496.