SUSTAINABLE AND SMART UNIVERSITY CAMPUSES; STRATEGIC APPROACH TO SUSTAINABILITY AND BUILDING INTELLIGENCE FOR UNIVERSITY CAMPUSES

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Summary

The role of universities in addressing climate change is to provide a vanguard of thought leadership and demonstrate practical solutions to the problem. Intelligent buildings are often more energy efficient and more comfortable because of systems that make it possible to finely regulate heating, air conditioning, lighting and other environmental variables. Engaging staff, faculty and students is also crucial.

Keywords: sustainability strategy; smart buildings; occupant engagement

1 Sustainability for Campuses

Thought leadership can translate into research and teaching of climate science and policy, development of carbon capture technologies and cutting edge sustainable design in buildings, vehicles, products and industrial processes. The American College & University Presidents' Climate Commitment[1] (ACUPCC) recognizes the unique responsibility that institutions of higher education have in training those who will develop social, economic and technological solutions to reverse global warming.

The second form of leadership is to take steps towards climate neutrality on the campus. Anthony D. Cortese, co-director of the ACUPCC[2] believes that colleges and universities are arguably the most important institutions to address climate disruption because they can model climate neutrality on their campuses, and teach their students the skills and knowledge they need to address the climate crisis. In Aristotelian tradition, this means not only talking the talk but also "walking the talk".

There are already many recognized best practices that will help to reduce and eventually eliminate greenhouse gas emissions on campuses. They include establishing energy efficiency and conservation goals in master planning, implementing these in new construction and in retrofits of existing buildings, establishing energy efficient building operations and developing a culture that supports occupant sustainability practices.

The challenge is in the implementation. It is one thing to know what to do. Actually doing it is something else. Colleges and universities embarking on the path towards being

[1] See http://www.presidentsclimatecommitment.org/
[2] Climate Neutrality with Honors, Universities Join UN-led Initiative to Combat Climate Change http://www.unep.org/Documents.Multilingual/Default.Print.asp?DocumentID=593&ArticleID=6255&l=en

carbon neutral and environmentally sustainable need a roadmap that is streamlined, practical and budget-sensitive. Simply put, the process involves the following steps:

- Step 1 Achieve "top down meets bottoms up" organizational support
- Step 2 Establish a baseline assessment of performance, features and operations
- Step 3 Establish goals, objectives, performance indicators and targets
- Step 4 Develop strategies and action plans. Identify funding
- Step 5 Implement the Plan
- Step 6 Monitor results

A campus benchmarking system should use a "top down meets bottom up" approach aimed at driving continuous improvement – rather than "command and control" with the aim of obtaining a certification label. Whereas clear direction and organizational push must be provided from the top (i.e. senior management), particularly to get things rolling, a green campus culture will only be truly sustainable in the long term based on a "bottom up" growing grass-roots movement by facilities administration, faculty and students.

Baselining current performance constitutes a foundation stone of the action planning process. A campus benchmarking system consists of two categories of issues: those that involve the entire campus, and those that are specific to individual buildings.

Examples of issues in a campus-wide assessment are university policies, targets, monitoring and communications related to energy, water, waste, resource use, purchasing and transportation. Other campus-wide issues are those that relate to the overall campus operations. These include regular and preventive maintenance and record keeping, site management including landscaping, use of fleet vehicles, and in some cases, remote sensing and control of multiple buildings. Campus-wide administrative functions include environmental budgets and training and communications with staff, faculty and students.

The second category of issues is those that need to be reviewed for each individual building. Here the criteria may vary depending on the functional requirements and features of different types of buildings, for example, residences, classrooms, administrative buildings, lab buildings and sports facilities. Individual buildings are assessed to see whether they have features to support energy efficiency and renewable energy, water conservation, reduced emissions, effluents and pollution, a good indoor environment. In addition, certain performance measures are taken for each building, including energy and water consumption, carbon emissions and waste diversion.

An analysis of utility bills and a Level 1 Energy Audit should be done for each building to evaluate major energy consuming systems and greenhouse gas emissions, and to highlight specific areas that could benefit from an additional, more detailed investment grade energy audit. The energy assessment should show energy consumption by major end users, define a season-correlated baseline. Based on a target for energy use developed through the detailed analysis of utility data and trend graphs, and by applying current construction and equipment costs, preliminary estimates of overall project retrofit cost and simple payback period are developed. Where capital improvements appear necessary, an investment grade audit is recommended for specific systems that will provide definitive values for cost, savings and return on investment.

2 Building Intelligence for Campuses

Some measures may increase "building intelligence", providing the operator and occupant with an environment which is flexible, effective, comfortable and secure through the use of integrated and detailed sensing, monitoring and controls. Intelligent buildings are often more energy efficient and more comfortable because of systems that make it possible to finely regulate heating, air conditioning, lighting and other environmental variables. For example, a smart building network of sensors and controls can help to deliver just enough heat, air, or cooling exactly when and where it's needed. Smart building sensors can also monitor the amount of sunlight coming into a room and adjust indoor lighting accordingly. Based on key-swipe technology from the security system, a smart building can sense who is in the building after hours and turn on the appropriate lights, equipment, and environmental controls. Efficiencies can also be achieved through consolidated and centralized monitoring capability, which make it possible to control many buildings from one site, maximizing efficient operation while streamline staffing. As smart building systems effectively address energy and other resource and operational efficiencies, they are emerging as a key factor that differentiates high performing buildings in the marketplace.

3 Engaging Administration, Faculty and Students

In addition to establishing high performance, intelligent base buildings, there are issues that should be addressed that are directly within the sphere of influence of the administration, faculty and students who occupy campus buildings. Examples include policies such as turning off lights, not leaving taps running and printing on two sides conserves resources.

By showing leadership in terms of eco-purchasing, selecting locally grown foods and implementing an environmental waste management program, colleges and universities can influence a generation that considers the life cycle environmental impact of every product they purchase along with the environmental impact associated with disposal. The green steps that are taken embody the kind of thought leadership that will influence tomorrow's decision-makers, help to redefine such traditional concepts as "quality of life" and "economic growth", and culminate in a powerful movement which can literally help to save the planet.

3.1 Pulling it together

The Action Plan is developed from a preliminary analysis of the data and a list of observed "areas of concern". For example it might be noted that: campus residences have high energy intensity values, windows are often open in the winter of some buildings, there is lack of lighting controls for some areas in certain academic buildings; certain buildings are producing an excessive amount of solid waste that appears to be due to some specific activities, a large number of classrooms are often empty but are still being heated and lighted, some buildings appear to be heating and cooling at the same time, a large amount of water is being used for irrigation, and so on.

In consultation with the facilities management administrators, the probable root causes of each issue need to be identified as well as any threads that may link them together. As the observations and problem statements are categorized, the Steering Committee will gradually distil the list to primary, secondary and tertiary priorities that

will become the basis for the Strategic Action Plan, which will in turn, inform specific targeted activities.

A critical component of a successful campus sustainability program is documenting what has been done. What projects have been completed and what has been accomplished? How much energy has been saved and how many energy dollars? How much fossil fuel energy has been replaced by clean green power? What are the environmental benefits in terms of reduced air pollution and greenhouse gas emissions? How much has solid waste tonnage been reduced and how much has the recycling rate improved?

To be truly sustainable, a community such as a campus needs an environmental management system that is flexible rather than rigid, provides a supportive rather than a prescriptive framework – and allows the community to develop and take ownership of solutions. It should also support universally accepted key performance indicators, while recognizing that there may be scenarios where certain operational criteria or features are "not applicable". A well designed benchmarking framework will avoid the tendency to go "point-chasing" and instead, take a more holistic approach with a true commitment to reducing carbon and environmental footprints.

4 Conclusions

There are many direct benefits for universities and colleges that work to achieve sustainability. At the operational level, addressing energy sustainability and climate change can help colleges and universities operate more efficiently and gain competitive advantage over institutions that choose to wait. Strategic planning can also help stabilize long-term operating costs, increase capacity for long-range planning, and put postsecondary institutions ahead of the regulatory curve by anticipating governmental energy and carbon mandates.

References

[1] http://www.presidentsclimatecommitment.org/

[2] Climate Neutrality with Honors, Universities Join UN-led Initiative to Combat Climate Change
http://www.unep.org/Documents.Multilingual/Default.Print.asp?DocumentID=593&ArticleID=6255&l=en