

An International Exchange of Campus Sustainability Experiences

Summary by Lisa Fernandez

Panelists

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Sustainable campus initiatives must adapt to the institution they strive to change, as well as to the cultural and regulatory context in which they are embedded. At the same time, there are similarities in approaches to advancing sustainability at academic institutions in different countries. Much can be gained from comparing experiences. A case study approach to sustainable campus management, initiated by ‘Novatlantis – Sustainability at the ETH domain’ is discussed and illustrated with experiences from Harvard, Yale, and ETH Zurich. These examples are put into a wider context with an overview of sustainable campus design and education at the University of Tokyo.

DEVELOPING INTERNATIONAL CASE STUDY COMPARISONS

As in any field, national, regional, and institutional backgrounds shape the challenges and opportunities faced with advancing sustainability on campus. Kasemir discussed a program to compare approaches at universities around the globe that lead the change on sustainability. This case study effort was launched in the context of the international Sustainable Campus Network and initiated with an experience exchange between sustainable campus initiatives at Harvard, Yale and ETH Zurich. Topics addressed include:

- Team composition and background;
- financial models employed;
- implications of the institutional framework;
- activities and lessons learned; and
- future challenges.

This is a new effort and more complete data sets as well as resulting recommendations are just emerging. Still, some elements have been identified as essential in shaping similarities and differences between sustainability approaches at the three institutions.

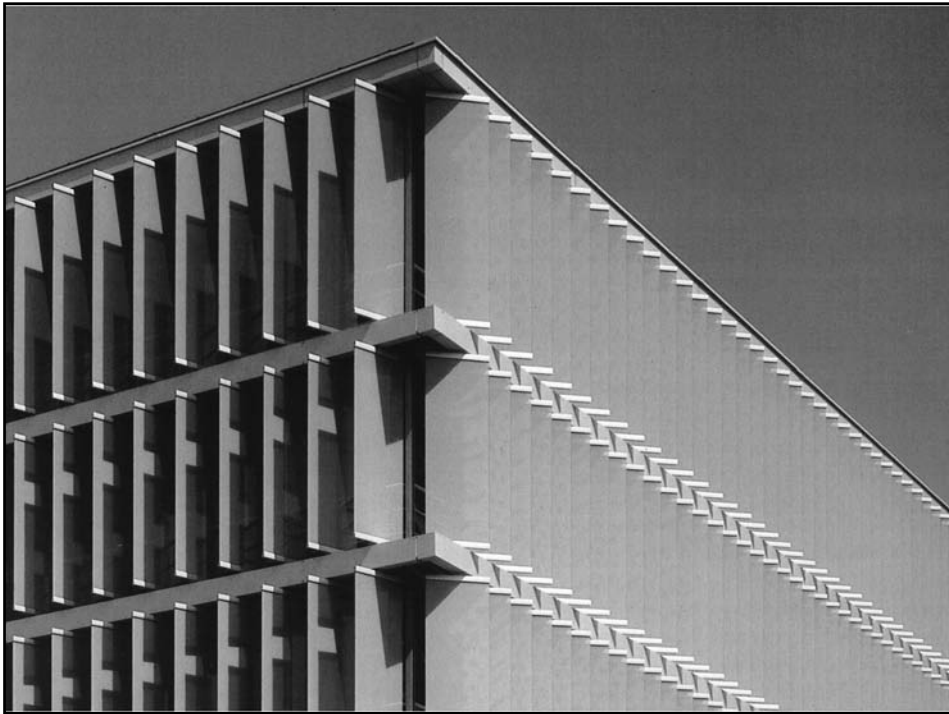
Yale University has a dedicated Office of Sustainability (YOS). The focus has been on developing sustainability metrics, to create benchmarks for progress against goals over time. A “Green Fund” has helped support a variety of sustainability initiatives on campus. Yale University has an overall greenhouse gas goal, committing the institution to reduce its greenhouse gas emissions to 10 percent below 1990 levels by 2020, corresponding to a reduction compared to 2005 levels of 43 percent.

In contrast, Harvard’s Green Campus Initiative takes a more decentralized approach – decisions are made at the school level (e.g., business school). Instead of a grant program, Harvard administers a Green Campus Loan Fund that provides interest-free revolving loans for specific projects, such as a lighting retrofit. These loans can be paid back once the capital expense is recouped from the energy savings realized. Harvard University has committed to a set of Sustainability Principles formally adopted by its president.

At ETH Zurich, facility-related decisions are more centralized, though planning is very participative. In ETH’s new “Science City,” a large remodeling and extension project of a major campus area, sustainable design principles are integrated into the master planning process. Collaborative planning involves members of the ETH community, local residents, authorities, and representatives from politics and business. In addition, an international competition has been launched to solicit further input for sustainable planning at Science City.

In the ETH Domain, of which ETH Zurich is part, the goal of a “2000 Watt society” is pursued that would give all global citizens equitable access to energy while at the same time protecting the climate. A model building of one of the Domain’s institutions, Eawag’s “Forum Chriesbach,” illustrates how this goal is implemented in practice. Through the use of innovative construction and building technologies, the building does not require conventional heating and cooling systems and is essentially carbon neutral. Water use is highly efficient due to several unique systems such as the use of rainwater for toilet flushing and separate collection of urine for nutrient recycling in agriculture.

Figure 1 The ETH Domain's carbon-neutral Forum Chriesbach building



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One goal of the international Sustainable Campus Network's case studies will be to analyze institutional decision-making and its impact on the efficiency and effectiveness of sustainable construction and remodeling programs.

EFFECTIVE GREEN BUILDING DESIGN: LESSONS LEARNED AT HARVARD

There are many aspects of the Harvard Green Campus Initiative (HGCI) worth reviewing, however Sharp focused this discussion on green building design to illustrate HGCI's approach.


Between 2002 and 2006 Harvard built 16 LEED registered or certified buildings. Each building experience informed and refined the next, beginning with the design process, followed by construction, and finally evaluation. HGCI provided sustainable building support services to each project, to varying degrees. HGCI found that establishing as much staff continuity from one project to the next was crucial.

The continuity of staff involvement helped to ensure that needed conversations between different parties to the project occurred at the right times. Much legwork and face-time is required to "get to yes" with the large variety of experts signing off at different phases of a building project, including, to name just a few: consultants on zoning and codes; landscape architects; the project architect; the cost estimator; the

construction manager; as well as people in the fields of planning and permitting, facilities operations, and insurance.

Many detailed tasks must be completed at each stage of the design process. It is important to have a thorough understanding of these tasks and then contribute to managing the team that gets them done.

Figure 2 Opportunities to influence a sustainable project

Budget/Planning Pre-Design Conceptual Design Schematic Design Design Development Construction Documents Bidding/Construction Occupancy			
		<p>Key opportunities to influence a sustainable project during Schematic Design include optimizing the energy model to compare the baseline case with the design case, articulating specific strategies for water use reduction, daylighting, and envelope criteria. Identifying loan fund and rebate opportunities, researching materials, and reviewing life cycle costing, will aid in reducing cost. Page 2-16 of Advanced Building's Reference Guide contains a helpful Schematic Design checklist for energy efficiency.</p>	
Activity	Description	Service Provider	Tools and Resources
Energy Efficiency Strategy: Energy Model Optimization	Undertake energy model optimization by using software such as eQuest. Optimize energy loads by integrating architectural elements and downsizing mechanical systems. Use LCC when identifying potential system alternatives. Investigate various system alternatives, such as geothermal and heat enthalpy wheels. Use integrated design: consider R values of walls, U values of windows, glazing types, window shading, etc. when sizing the mechanical system.	MEP Engineer, HGCI Review	HPBR: EA:1 Model LEED Submittals Advanced Building Benchmark for High Performance Buildings eQuest and ASTM Standard E 917 for Life Cycle Costing
Energy Efficiency Strategy: Development	Discuss passive strategies for load reductions, such as thermal massing, natural ventilation, and building orientation. Envelope: Set target R-values for walls, floors, and roof and U-values for skylights and windows. Use Advanced Buildings Benchmark and LEED for guidelines. Lighting: Design to optimize daylighting to reduce artificial lighting loads. Set lighting power allowances and illuminance targets for buildings zones. See Advanced Building Benchmark and ISNEA's Advanced Lighting for guidelines.	MEP, Architect	Innovation at Harvard: Mechanical, Electrical and Envelope HPBR LEED Requirements: Energy and Atmosphere Advanced Buildings Benchmark
Water-Reduction Strategy: Development	Review water cost savings using EPACT as a baseline. Choose plantings to eliminate the need for a permanent irrigation systems. Consider a cistern, such as the ones used at Zero Arrow Street or 175 N. Harvard Street, to collect rainwater.	Landscape/Civil, MEP, HGCI Review	HPBR: SS and VE Model LEED Submittals Innovation at Harvard: Site
Landscape Design Strategy: Development	Identify opportunities for native, drought tolerant species planting, pervious surface optimization, and stormwater management. Recommend passive building design strategies based on the orientation, daylight, and shading on the site.	Landscape Architect	HPBR: Model LEED Submittals HPBR Innovation at Harvard: Site
Loan Fund and Rebate Opportunity Identification	Identify project elements that are eligible for NSTAR rebates and /or Green Campus Loan Funds.	HGCI or other sustainability consultant	GCLF NSTAR Rebate Program
	Review LEED-specific requirements appropriate for each spec section		HGCI Model

Throughout the design process, every performance goal requires a set of tasks to be completed in the proper sequence by the right members of the team. At each of these points, it is imperative to check that sustainability standards are being met.

High quality defensible energy modeling can influence the design process and is crucial for cost-effective green building design. LEED requirements should be detailed throughout the specifications. Perhaps the most critical ingredient is to ensure that life-cycle costing is used from the beginning when calculating costs. This will prevent the process of ‘value engineering’ (VE) from killing the sustainable aspects of the design.

Keep track of lessons learned. Keep good records of what worked—technologies, design approaches, controls, materials, etc.—in previous projects and roll them into the current one. In this vein of the past informing the future, make all LEED submittals available for future projects to use.

Campus sustainability professionals are in a good position to enhance institutional memory and help campus development to efficiently institutionalize new innovations and commitments. In the Master Plan for Harvard's new Allston Campus, sustainability goals have been integrated throughout. Among other aims, the goal is for LEED gold certification; 22.5 percent renewable energy use; co-generation (combined heat and power); geo-thermal cooling and green roofs; and a design that is pedestrian, transit and bike-friendly.

SUSTAINABILITY IN BUILDING DESIGN AND CURRICULUM CONTENT AT THE UNIVERSITY OF TOKYO

At the University of Tokyo, which has about 28,000 students, the principal challenge is to stabilize energy consumption while at the same time allowing the campus' square footage to grow. Between 2003 and 2005, floor area increased by nine percent, and energy consumption increased by 11 percent. The main campus of Hongo committed to a 1.1 percent reduction in CO₂ emissions by 2009. Several approaches are being taken.

One means is to tighten already stringent controls on car commuting. Another more far-reaching effort is the campaign "Cool Biz and Warm Biz," to moderate the thresholds for heating and cooling to 19 degrees celcius in the winter and 28 degrees in the summer.

Figure 3 Building Envelope showing shading and ventilation for energy savings, Kashiwa Campus, University of Tokyo



The new Kashiwa Campus integrates sustainability principles. The campus is home to the School of Frontier Sciences and several research institutes. The Kashiwa campus is intended to provide a globally competitive research environment for education exchange both domestically and abroad. The goal is to contribute to society through industry-academia collaboration. The development of Kashiwa took place in consultation with local government to create an environmentally-friendly international campus. The building's design reflects its aim to be an incubator of research collaboration. It has an "S" shaped building envelope with shading and ventilation provided by louvers with state-of-the-art indoor heat and air management via a large-scale ventilation chimney.

Figure 4 Building envelope showing the louver design for energy savings – Kashiwa Campus, University of Tokyo



Kashiwa Campus houses the Institute of Environmental Studies, which was launched in 1999 and embraces five departments, 70 faculty members and 600 students. Beginning in 2004, a new degree program leading to the title of "Environmental Planner" became available. Growing out of this, a program focusing specifically on environmental design got underway in 2006. In 2007, a Master's Program in Sustainability Science will be offered for the first time. The new program provides students with a sustainability "tool-box" to help advance sustainability at the local, national, or international level. Theoretical and experiential learning are both integral to the degree.