Articulating a Sustainable Vision for Higher Education in Campus Development

Richard A. Miller Esq.  Gregory Mella  R. Umashankar (Uma)
Agenda

- Organizing for Sustainability
- Overview of UConn Sustainability Initiatives
- Benchmarking
- Sustainable Design Guidelines
- The Road Ahead
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• Organizing for Sustainability
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Motivation

• Philosophical
• Cultural
• Economic
• Community Interest
• Compliance
Where We Are Today

- Significant Focus on Environmental Priorities

- Sustainable Campus Initiatives
  - Campus Development; Green Buildings
  - Energy Conservation
  - Conservation/Sustainable Master Plans
  - Sustainable Design Guidelines
  - Procurement/Purchasing
  - Dining Services
  - Recycling Programs

- New Leadership Roles
  - Sustainability Directors/Planners/Coordinators
  - Energy Managers
  - Environmental Policy Directors
Sustainability Leadership

• Diversity of Backgrounds and Roles
  o Academia
  o Senior Administration
  o Environmental Health and Safety
  o Facilities and Operations
  o Design and Engineering

• Leadership Active in Organizing Itself:
  o ULSF and NWF Campus Ecology Program have gained significant recognition
  o EFS West is developing a national list
  o Regional Coalitions
A Snapshot

- University of Pennsylvania obtains 10% of its energy from renewable sources
- University of British Columbia will surpass the Kyoto Protocol requirements by 25% in 2012
- More institutions are adopting comprehensive sustainability initiatives
- Green buildings may be the single largest trend in campus development
- 8% of all LEED™ projects are in higher education
- Clemson University system requires all of its buildings to be certified LEED™ Silver
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• Organizing for Sustainability

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• Benchmarking

• Sustainable Design Guidelines

• The Road Ahead
University of Connecticut

- Established in 1881
- Over 4,000 Acres
- Main Campus Located at Storrs
- Law School at Hartford
- Health Center at Farmington
- Five Regional Campuses
- Over 11 Million GSF of Real Estate
- Enrollment of 27,600
UConn 2000 Program Highlights

$2.3 Billion to Capital Improvements Program to Renew, Rebuild and Enhance Campus


- Over 80 projects completed
- 1.4 million GSF of new construction
- Enrollment Increased from 22,000 to 27,600
UConn 2000: Campus Master Plan
$2.3 Billion to Capital Improvements Program to Renew, Rebuild and Enhance Campus

- Over 50 Projects above $2 Million
- 1.5 Million GSF of new construction
- Over 600,000 GSF of renovation
- Will reduce faculty-student ratio to 1:15
21st Century UConn: Master Plan Update
UConn’s Path to Sustainable Development

- $2.3 billion capital improvement program reflects institutional goals for excellence
- Need for improvement in environmental performance
- Rural setting of main campus
- Well-informed, environmentally-aware community & public officials
- Environmental sustainability a focus area of New Academic Plan (2003-04)
- Consistent with Institutional Values
Environmental Policy Organization

EPAC Subcommittees & Workgroups

Environmental Policy Advisory Council (EPAC)

EcoHusky Student Group

Compliance & Best Practices
C&BP Subcommittee

- Greenhouse Gas Reduction
  GHG Workgroup
- Biodiesel Team
- Water Conservation
  Workgroup
- Waste Paper Reduction
  Workgroup

Land Use & Sustainable Development
LUSD Subcommittee

- Landfill Eco-Demonstration
  Workgroup
- Integrated Pest Management
  IPM Workgroup
- Green Building/Low Impact Design
  Workgroup
- Campus Bicycle Plan Team
  ITE/EcoHusky

Outreach Subcommittee

- Recycling Workgroup
- Environmental Literacy
  Workgroup
Performance: The University will institutionalize best practices and continually monitor, report on and improve its environmental performance.

Responsible management and growth: The University will design, construct and maintain its buildings, infrastructure and grounds in a manner that ensures environmental sustainability and protects public health and safety.

Outreach: The University will promote environmental stewardship in Connecticut and embrace environmental initiatives in partnership with its surrounding communities.

Academics: The University will advance understanding of the environment through its curriculum, research and other academic programs, and will employ an ethic of environmental stewardship in all intellectual pursuits.

Conservation: The University will conserve natural resources, increase its use of environmentally sustainable products, materials and services, including renewable resources, and prevent pollution and minimize wastes through reduction, reuse and recycling.

Teamwork: The University will encourage teamwork and provide groups and individuals with support, guidance and recognition for achieving shared environmental goals.
2004-05 EPAC Initiatives

- Sustainable Design Guidelines
- Climate Change - GHG Emissions Reductions
  - Alternative Fuels
  - Energy Conservation
- Water Conservation
- Waste Paper Reduction
- Environmental Education & Literacy
- Environmental Outreach
  - EcoHusky
  - Recycling
  - Conservation
2004-05 EPAC Initiatives
Compliance and Best Practice: Water Conservation

• Develop robust water use monitoring data

• Meet with “owners” - apply best practices and increase water conservation outreach

• Measure results against benchmark data
2004-05 EPAC Initiatives
Climate Change: Green House Gas Emissions Reduction

- 96 diesel vehicles, 16 diesel shuttle buses
- Fleet vehicles ~5% GHG emissions on-campus
- 4,000 gal/yr waste cooking oil from dining halls = 20,000 gal/yr B20
- 20,000 gal B20 can power 6 buses year round or 16 buses for 4.5 months
- Result ➔ 7.95 tons eCO2 emissions reduction/yr
Student Involvement is Essential

- Internships
- EPAC Subcommittees
- Class Projects
- Research Projects
- Events & Activities
- Outreach
2003-04 East Campus Master Plan

- Prior master plan (2000) reflected Ag Campus development opportunities

- Conservation goals implied but not affirmed

- Natural resources & historical attributes were secondary
2000 East Campus Master Plan
Addressing Concerns of Rapid Growth
2003-04 East Campus Master Plan
Creating a New Framework

Legend
- Direct Recharge Area
- Fenton Forest Tract
- Special Forest Areas
- CT DEP Wet Soil
- UConn Well Fields
- Historic District (Natl. Register)
- Historic Site (Natl. Register)
2003-04 East Campus Master Plan
Master Plan for Conservation and Development

Legend
- Preservation
- Conservation
- Education & Research
SDGs: A Major Breakthrough

• Technical & Process Guidance specific to UConn
  o Consistent with:
    o Regulatory climate
    o Natural resources and conditions on campus
    o Integrated into UConn construction process

• Sustainability baseline for all projects
  o UConn 2000/21st Century UConn
  o Deferred Maintenance/Renovation
  o Low Impact Design
First Step: Stormwater “Rain Gardens”

Low Impact Design Projects
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The Tailloires Declaration

Composed in 1990 at an international conference in Talloires, France, this is the first official statement made by university administrators of a commitment to environmental sustainability in higher education.
The Tailloires Declaration

1. Increase awareness of environmentally sustainable development
2. Create an institutional culture of sustainability
3. Educate for environmentally responsible citizenship
4. Foster environmental literacy for all

5. **Practice institutional ecology**
   Set an example of environmental responsibility by establishing institutional ecology policies and practices of resource conservation, recycling, waste reduction, and environmentally sound operations.

6. Involve all stakeholders
7. Collaborate for interdisciplinary approaches
8. Enhance capacity of primary and secondary schools
9. Broaden service and outreach nationally and internationally
10. Maintain the movement
5. Practice institutional ecology

Set an example of environmental responsibility by establishing institutional ecology policies and practices of resource conservation, recycling, waste reduction, and environmentally sound operations.

Set an example of environmental responsibility by **establishing guidelines** of resource conservation, recycling, waste reduction, and environmentally sound operations practices for future campus development.
LEED as a Guideline for Campus Dev.

LEED focuses on:

- Sustainable Site Design
- Water Efficiency
- Energy and Atmosphere
- Materials and Resources
- Indoor Environmental Quality

LEED does not address:

- Local environmental priorities
- Decision making process
- Campus waste management strategy
- Campus transportation strategy
- Energy Plant, metering and monitoring
- Purchasing and policy
LEED Campus Application Guide

• Applying LEED-NC to campus buildings
  o A reinterpretation of LEED credits for campus applications
  o No new credits
  o Can apply to one or more buildings

• Sharing common infrastructure
  o Central heating/chiller plants
  o Central stormwater treatment
  o Lighting
  o Parking

• Suggestions for innovation credits
  o Campus-wide Landscape Management
  o Campus-wide Solid Waste Management
  o Campus-wide centralized monitoring
  o Cogeneration
  o Wildlife Corridor Protection
Benchmarking Guidelines

Blueprint for a Green Campus:

The Campus Earth Summit Initiatives for Higher Education

Stanford University
Agenda

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- **Sustainable Design Guidelines**
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Environmental Policy Statement

Performance: The University will institutionalize best practices and continually monitor, report on and improve its environmental performance.

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Importance of Assessment

- Learn about campus culture & critical issues
- Evaluate past performance of built projects
- Evaluate which strategies are applicable
- Understand campus energy distribution methods
- Identify local and regional environmental issues
- Identify typical palette of materials used on campus
- Understand typical project delivery process
LEED Audit

• Surveyed a diverse group of four recently completed project

• Basis for Audit:
  o Tour of each building
  o Review of construction drawings and specification
  o Review of building cost breakout
  o Discussion with facilities staff

• Standard for Audit: LEED™ Version 2.1
# LEED Audit

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<th>School of Business</th>
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<td>Materials and Resources</td>
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<td>3</td>
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<tr>
<td>Indoor Environmental Quality</td>
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<td><strong>TOTAL</strong></td>
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September 23, 2003
Tailoring Goals to Regional Issues
SDG Structure and Scope

• Technical Guidelines
  o Planning Sustainable Sites
  o Safeguarding Water
  o Conserving Materials and Resources
  o Improving Energy Efficiency
  o Enhancing Indoor Environmental Quality
Goal: Safeguarding Water

Goal:
Reduce potable water consumption associated with landscape irrigation.

Strategies:
Currently, most campus landscape areas are not irrigated. For prominent areas which are thought to require irrigation, consider the following strategies:

- In lieu of providing irrigation, consider specifying drought tolerant landscape features, include drought tolerant turf mixes where turf grass is a landscape requirement.
- Consider alternative landscapes to turf grass lawn. Native vegetation beds and meadows require no irrigation and do not require fossil fuel expenditure from mowing.
- If irrigation systems are to be incorporated into a project, consider using non-potable sources, such as adjacent ponds, or collected rainwater.
- For shrub and groundcover beds, consider using high-efficiency drip irrigation in lieu of conventional irrigation systems.
- Design irrigation system to be water efficient, using moisture sensors, and drip irrigation as appropriate and as justified by a Life-Cycle Cost Assessment.
Goal: Reducing Energy Impacts

Goal:
Reduce the total energy consumption of buildings.

Strategies:
Increase Operational Efficiency:
- Use campus central plant for steam and chilled water needs within buildings.
- Require all projects to comply with ASHRAE Standard 90.1-1999.
- New equipment, transformers, and residential kitchen appliances to comply with the EPA’s Energy Star program.
- Use energy efficient equipment, premium efficiency motors, variable speed drives.
- Use high-efficiency lighting. Consider using electronic ballasts.
- Avoid over-sizing equipment.
- Consider a demand controlled ventilation strategy.
- Use heat recovery systems that capture waste heat to reduce heating energy consumption. Consider total energy recovery systems that capture both latent & sensible heat, to reduce both heating energy and cooling energy.
- Provide occupancy sensors that control lighting in all spaces not regularly occupied.
Goal: Material Resource Conservation

**Goal:**
When selecting building materials, consider the environmental impacts associated with each product.

**Strategies:**
Expand the evaluation criteria used when selecting building and site materials to include the following criteria:

- **Durable**
- **Local Manufactured**
- **Locally Extracted** - Steel, brick, concrete, and slate
- **Recycled** - Fly-ash Concrete, recycled Acoustical Ceiling Tiles, recycled HDPE toilet partitions, recycled glass ceramic tiles, MDF for millwork substrates, 100% recycled drywall, recycled carpet.
- **Recyclable**
- **Salvaged**
- **Renewable**
- **Favorable Life-Cycle Assessment** - How do materials contribute to acidification, critical air pollution, ecological toxicity, eutrophication, fossil fuel depletion, global warming, habitat alteration, human health concerns, indoor air quality, ozone depletion, smog, and water consumption. Use BEES 3.0
Goal: Creating Healthy Indoor Environments

Goal:
Create healthy interior spaces that are comfortable to users and support learning.

Strategies:

- Consider designing interiors to comply with ASHRAE 55-1992: Thermal Environmental Conditions for Human Occupancy. May require to provide interior humidification.

- Wherever possible, provide ample natural light into interior spaces.
  - Plan for internal shading strategies to reduce glare.

- Wherever possible, provide views to the outside from most interior spaces. Designs should strive to provide a connection to the outdoors.
Goal: Minimizing Site Disturbance

Goal:
Place new buildings on the most suitable site possible, avoiding unnecessary environmental impacts to the existing open space and natural resources of the campus.

Strategies:
- Encourage development on campus consistent with State plans for Conservation and Development
- Encourage development outside of Level A Aquifer Recharge Areas
- Encourage development outside of designated UConn Forest Tracts, consistent with management plans
- Whenever possible, encourage development on previously disturbed sites.
- Encourage development whose elevation is 5’ above the FEMA 100 year floodplain elevation.
- Encourage development that remains at least 100’ from a wetland.
SDG Structure and Scope

• Process Guidelines - Why Discuss Process?
  o Technical guidelines alone are not sufficient
  o Process Guidelines are a critical overlay
  o Promote an integrated and collaborative process
  o Ensure that the resulting project is compatible with the expectations and culture of the University
  o Consultant design team will coordinate the sustainable design process
Process Guidelines

- **Pre-Design**
  - Pre-proposal
  - Project Initiation

- **Design**
  - Schematic Design
  - Design Development
  - Construction Documentation

- **Construction**
  - Bidding and Contract Negotiations
  - Construction

- **Occupancy**
Process Guidelines

• Pre-Design
  o Pre-proposal
  o Project Initiation

• Design
  o Schematic Design
  o Design Development
  o Construction Documentation

• Construction
  o Bidding and Contract Negotiations
  o Construction

• Occupancy

Discuss **broad sustainable approaches**

Ensure a **climate/site analysis** is performed

Hold a **green design workshop**

Identify and prioritize strategies to **address significant utility loads**
Process Guidelines

• Pre-Design
  o Pre-proposal
  o Project Initiation

• Design
  o Schematic Design
  o Design Development
  o Construction Documentation

• Construction
  o Bidding and Contract Negotiations
  o Construction

• Occupancy

Develop Life-Cycle Cost Analyses (LCCA’s) for the primary green strategies being considered in the design

Hold a final sustainability workshop to finalize strategies; update the sustainability matrix

Commissioning agent should review the completed Design Development drawings
## Process Guidelines

### The Sustainable Design Matrix

<table>
<thead>
<tr>
<th>LEED</th>
<th>Credit</th>
<th>Action</th>
<th>Goals</th>
<th>Intent</th>
<th>Criteria and Metrics - Standards</th>
<th>Implementation Strategies</th>
<th>Challenge to Implementation</th>
<th>Response to Challenge</th>
<th>Action Required</th>
<th>Documentation Required</th>
<th>Prime Team Members(s)</th>
<th>LEED Credits Proposed</th>
<th>LEED Credits Possible</th>
<th>LEED Credits Available</th>
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<tr>
<td>SSI</td>
<td>Pre 1</td>
<td>1</td>
<td>Erosion and Sediment Control</td>
<td>Reduce and control erosion and stormwater runoff, and the negative effect that has on water and air quality</td>
<td>Design an erosion control plan that conforms to best management practices in the EPA’s Storm Water Management for Construction Activities. EPA Document No. EPA-833-R-02-001</td>
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<tr>
<td>SSI</td>
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<td>Site Selection</td>
<td>Site Selection</td>
<td>Not suitable land as defined by the Fairland Tract. Land not a habitat for endangered species. Land was not previously a public park.</td>
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<td>SSI</td>
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<td>Alternative Transportation</td>
<td>Proximity to Public Transportation</td>
<td>Reduce pollution and land development impacts from automobile use.</td>
<td>Locate building within 1/2 miles of a commuter rail, light rail or subway station or 1/4 mile of 2 or more bus lines.</td>
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<td>Alternative Transportation</td>
<td>Encourage non-petrol vehicles</td>
<td>Reduce pollution and land development impacts from automobile use.</td>
<td>Provide a suitable means for securing bicycles, with convenient, clear, short-distance facilities for use by cyclists, for 5% or more of building occupants.</td>
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<td>Alternative Transportation</td>
<td>Encourage non-petrol vehicles</td>
<td>Reduce pollution and land development impacts from automobile use.</td>
<td>Provide alternative fuel refueling station(s) for 3% of the total vehicle parking capacity of the site. Light or gasless fueling facilities must be separately ventilated or located outdoors.</td>
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<td>Alternate Transportation</td>
<td>Reduce Parking</td>
<td>Reduce pollution and land development impacts from automobile use.</td>
<td>Limit number of parking spaces not to exceed local zoning AND provide preferred parking for carpools or vanpools capable of serving 5% of the building occupants. OR, add new parking for rehabilitation projects AND provide preferred parking for carpools or vanpools capable of serving 5% of the building occupants.</td>
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<td>Reduced Site Disturbance</td>
<td>Conserve existing natural areas and restore damaged areas to provide habitat and promote biodiversity.</td>
<td>Set limits of disturbance to 0% beyond building perimeter, 10% beyond roadways/walkways, and 25% beyond parking areas.</td>
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<td>SSI</td>
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<td>Reduced Site Disturbance</td>
<td>Conserve existing natural areas and restore damaged areas to provide habitat and promote biodiversity.</td>
<td>Reduce the footprint of the building, roadways, and parking to exceed the total corridor open space requirement for the site by 25%.</td>
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Process Guidelines

- Pre-Design
  - Pre-proposal
  - Project Initiation

- Design
  - Schematic Design
  - Design Development
  - Construction Documentation

- Construction
  - Bidding and Contract Negotiations
  - Construction

- Occupancy

**Work with the contractor** to discuss sustainable strategies

Verify that the necessary considerations for implementing specific sustainable strategies are being [discussed at the appropriate pre-construction meetings](#).

Require [Construction Waste Management Plans](#) and [Construction Indoor Air Quality Management Plans](#).

Provide the commissioning agent with a selective review of [contractor submittals](#).
Why SDG’s

- Single Point of Reference for Sustainable Goals for Campus Development
- Comprehensive Overlay to Existing Campus Design Standards
- Tailored the Best Strategies of Relevance
- Benchmark Other Institutions
- Incorporate Local Specificity and Context
- Address all Development and Reconstruction Projects
- Document a Process
To LEED™ or not to LEED™

- LEED™ establishes a good framework: larger institutions must consider building upon its structure
- LEED™ is general: not specific to institutional needs and priorities
- Not all aspects of LEED™ are either achievable or desired for every project
- LEED™ is applicable only to buildings
- Local environmental priorities are lost in simply pursuing LEED™
- LEED Certification vs. Designing to LEED™
  - Defining the threshold
  - Are we really achieving sustainable design?
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SDGs: Benefits & Lessons Learned

• Integrated Sustainable Design into UConn’s Construction Process
  • Applied to all projects
  • Established sustainability matrix as a tool
  • Changed the paradigm

• Introduced and Promoted “Sustainability,” LEED and Green Building Concepts

• Engaged Administrators, Faculty, Staff and Students in Dialogue

• Acknowledged Prior Successes: Energy & Water Conservation

• Made the Case for Feasibility

• An Evolving Document
Green Building at UConn:

The Pursuit of LEED Certification
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<td>Erosion &amp; Sedimentation Control</td>
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<td>Alternative Transportation, Public Transportation Access</td>
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<td>Alternative Transportation, Bicycle Storage &amp; Changing Rooms</td>
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<td>Alternative Transportation, Alternative Fuel Refueling Stations</td>
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<td>Alternative Transportation, Parking Capacity</td>
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<td>Water Efficient Landscaping, Reduce by 50%</td>
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<td>Fundamental Building Systems Commissioning</td>
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<td>Prereq 2</td>
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<td>CFC Reduction in HVAC&amp;R Equipment</td>
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<td>No</td>
</tr>
<tr>
<td>CATEGORY TOTAL</td>
<td>2</td>
</tr>
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Road Project - Vernal Pool Study
Landfill Remediation Project

- Exploring opportunities for research, demonstration and student projects focusing on invasive species and wildlife habitat

- An opportunity for a trail system and new recreational resource for UConn community
Bike Master Plan

• 2105 Surveys Collected
• Survey Results
  o Develop a bike network of roads paths and lanes (73%)
  o Add bike racks closer to buildings (68%)
  o Add overnight commuter lot storage (64%)
  o Create ‘free bike’ loan programs (62%)
  o Next: “critical mass” bike ride in April
Transforming the Design Profession

Accredited Professionals

Certified Projects
Staying with the Advances

LEED Roll-out Schedule

- 1998 – LEED 1.0 (Pilot)
- 2000 – LEED 2.0
- 2003 – LEED 2.1 (update)
- 2005 – LEED 2.2 (update)
- 2006 – LEED 3.0
The Road Ahead