The Harvard Green Campus Initiative: Business Development & Organizational Transformation for Campus Sustainability

Leith Sharp

Founding Director, Harvard Green Campus Initiative

Harvard Green Campus Initiative: Organizational Chart 2000

Co-Chair
Faculty, Harvard School of Public Health
Prof. Jack Spengler

Director,
Leith Sharp

Co-Chair
Assoc. VP, Facilities & Environmental Services
Tom Vautin

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19 Full-time Staff
40 Part-time students

High Performance Building Service
- ✓2 Managers
- ✓6 Coordinators

Campus Energy Reduction Programs - Labs
- ✓1 Manager, Medical and Public Health Schools
- ✓1 Coordinator, Faculty of Arts and Science
- ✓1 Assistant

Residential Green Living Programs
- ✓1 Manager, Undergraduate Program
- ✓1 Coordinator, Graduate Program
- ✓40 part-time student employees

HGCI Base Program Staff
- ✓1 Manager, Business Organization and Communications
- ✓2 Web staff
- ✓2 Special Projects Assistant

HGCI Courses at Harvard Extension School
- •Sustainability – The Challenge of Changing Our Institutions
- •Green Building Design, Construction and Operations

♦ FY07Operating Cost = $1.6million ♦ Annual Savings = $6+ million & 90+ million pounds of CO2
➢**30% Office of President and Provost & central administration sources.**
➢**70% from fee for service partnerships funded on the basis of extensive savings**

Started Small and Grew As the Savings Grew

	Base Program Funding		Total HGCI Full Time Staff	Annual University Savings
FY01	$ 80,000		1	
FY02	$264,000		4	$400,000
FY03	$648,000		8	$700,000
FY04	$890,000		11	$1.5 million
FY05	$857,000		11	$3 million
FY06	$1,155,000		16	$5 million
FY07	$2,264,000		16	$6+million
FY08-FY10	$2,300,000		21	$7+million

7 Elements of Organizational Change

7 Elements of Organizational Change

1. Change Attitudes and Assumptions
2. Engage People and Foster New Capacities
3. Pilot and Expand New Practices
4. Process Quality Control
5. Leverage Leadership
6. Adopt Accountability Frameworks
7. Institutionalize Continuous Improvement

1. Change Attitudes and Assumptions

There's no problem because….the planet is an infinite source of resources with an infinite capacity to absorb our pollution

↓

There is a problem but I'm not involved because…..What I do has little impact on the planet

↓

There is a problem, I am involved but I can't change anything or anyone because…..I am unable to influence anybody

↓

There is a problem, I am involved, I could do something except it's just too expensive because……green products cost more, green Building design is expensive and sustainability threatens economic well being

↓

There is a problem and I am working on my part of the solution in every way possible!

2. Engage People and Foster New Capacities

Green Skillet

Residential Green Living Programs

Green Labs Programs

Social Marketing Campaigns

Peer to Peer Facilities
Training Staff Programs

3. Pilot and Expand New Practices

Biodiesel in University Shuttles

Occupancy sensor driven temperature Setbacks

Ground Source Heat Pumps

Green Cleaning

4. Process Quality Control

Do we need some in time research?

Do we need more management support?

Has it fallen off the agenda due to other priorities?

Is the bigger picture still being addressed?

Does something have to be done and no else knows how to do it?

Are we missing someone important at the table?

Did someone leave and momentum lost?

Is there some unfounded perception of risk or misunderstanding preventing engagement?

Did we consider life cycle costs, rebates, grants, integrated design related savings etc?

Does anyone have the time to project manage this properly?

Are we re-inventing the wheel instead of using what's been done already?

Continuously Diagnose & Address the Weakest Links in Every Process

5. Leverage Different Leadership Contributions

Grass Roots → **CONFIDENCE & CAPACITY**
Building Managers, facilities staff, project managers, custodial, transport & procurement staff
- •Evidence
- •Confidence
- •Business base for green campus organization

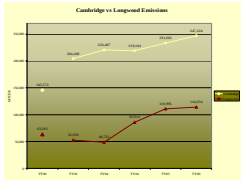
↓

Top Level Leadership → **AUTHORITY**
President, Provost, Deans, VP's
- •Legitimacy
- •Priority
- •Mood/culture
- •Goals

↓

Upper Middle Management → **SYSTEMS INTEGRATION**
2nd Level Deans, Associate VP's, Chief Financial Officers (Finance, Treasury & Accounts) Chief Operating Officers - Planning
- •Capital Approvals Systems
- •Finance & Accounting
- •University Contracts

6. Adopt Accountability Frameworks



GHG Reduction Targets

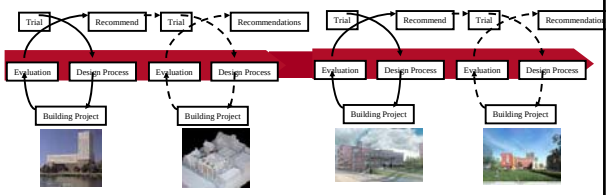
Life Cycle Costing

Finance and Accounting Frameworks

LEED
LEADERSHIP IN ENERGY & ENVIRONMENTAL DESIGN

Green Building Standards

7. Institutionalize Continuous Improvement



Case Study 1 - Green Buildings @ Harvard:

Organizational Change via a Grassroots Approach

The Evolution of Green Building @ Harvard

Registered LEED Projects	3	4	5	12	16	21
	2002	2003	2004	2005	2006	2007

The Evolution of Green Building @ Harvard

Registered LEED Projects	3	4	5	12	16	21
	2002	2003	2004	2005	2006	2007

Change Attitudes → **Engage & Develop Capacities** → **Provide process quality control** → **Leverage Leadership** → Adopt Accountability → **Continuous Improvement**

Pilot & Expand

ONE WESTERN AVENUE, LEED-NC SILVER

New Construction

Completion Date: August 2003

Address: One Western Avenue, Allston

Department: HRES

Building Type: Dormitory

Size: 229,000 square feet

Major Features:

- 1.5 acres of open space created
- 19 Electric recharging stations in the garage for more than 3% of the parking capacity
- Energy Star roof
- Heat recovery for exhaust systems
- Low-emitting adhesives and sealants

MATHER DUNSTER KITCHEN, LEED-CI SILVER

Renovation

Completion Date: August 2005

Address: Memorial Drive & Flagg Street

Department: Harvard University Dining Services

Building Type: Kitchen

Size: 7,480 square feet

Major Features:

- First LEED kitchen in the nation
- Range Hood controls adjust variable speed drive exhaust fans according to actual conditions
- Reduced expected occupant water usage by 32%
- Diverted over 95% of construction waste from landfills
- 240,000 pounds of organic waste composted each year
- Frontline International Waste Oil Tank: a 150 gallon stainless steel storage tank for waste vegetable oil. The kitchen's fryers are directly plumbed to the tank so waste vegetable oil can be filtered and collected without risk of spill

ALLSTON SCIENCE CENTER, LEED-NC GOLD PENDING

New Construction

In Design

Address: Western Avenue, Allston

Department: HSCI, HIBIE, HSBI, HCBI, HIIC

Building Type: Science Complex

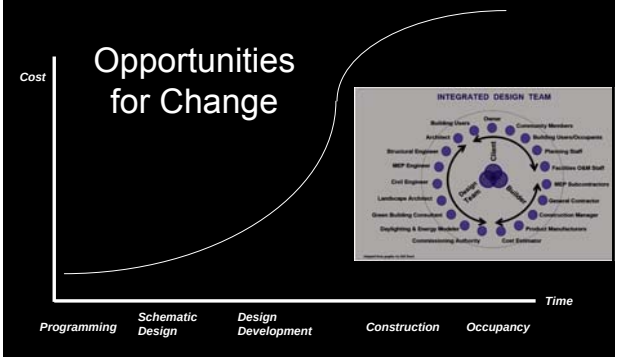
Size: 695,000 sq. ft.

Major Features:

- Passive heating and cooling
- Natural drainage
- Renewable Energy
- Reuse of stormwater and greywater
- Environmentally responsible materials
- Energy efficient laboratories

Harvard Green Campus Services

HGCI Service: Establish Project Team Commitment

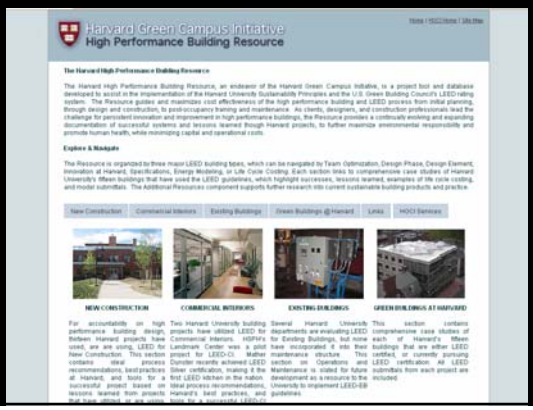


HGCI Service: Owner's Sustainability Representative

HGCI Service: Sustainable Design Consulting

HGCI Service: LEED Certification Project Management

HGCI Service: Best Practices & Lessons Learned



46 BLACKSTONE, LEED-NC PLATINUM

Renovation

Completion Date: May 2006

Address: 46 Blackstone Street, Cambridge

Department: Harvard Business School

Building Type: Office

Size: 40,000 square feet

Major Features:

- Ground source heat pumps for cooling
- Valence units for heating and cooling distribution
- Enthalpy wheel for latent and sensible heat recovery
- Extensive daylight and views
- Native plants and bio-retention pond
- Occupant water use reduced by 43%
- 99.5% of construction waste diverted from landfills
- Environmentally responsible materials – recycled content, local, certified wood, rapidly renewable

- Highest rating of any renovation in USA
- 3rd highest rating of all USA projects
- NO ADDED CAPITAL COST

Bioswale treats all water from 25,000 s.f. parking lot

A serious commitment to construction waste management

99% waste diversion through reuse and recycling

Daylight and Views

- Daylight access to over 75% of spaces
- View access to over 90% of spaces

Plumbing

43% reduction in water use from EPAct Standards

Energy Use

Designed to be 40 % more energy efficient than ASHRAE 90.1

Mechanical Systems

- **Cooling: ground-source heat pumps**
- **Heating: hot water from steam**
- **DDC controls:**
  - Outside air reset
  - Occupancy sensors
  - CO2 monitors
  - Variable air volume

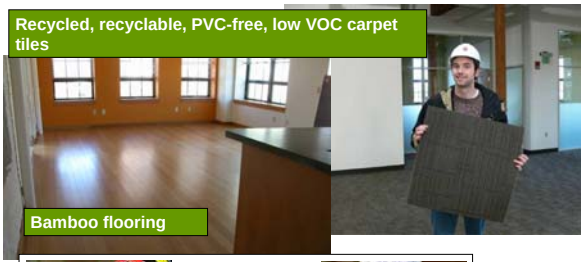
Air Handler/Heat Recovery System

•Enthaply energy recovery system is 80% efficient
• Ventilation is demand **controlled with occupancy and CO2 sensors**

Sustainable and Renewable Materials

Sustainable Carpeting Materials

Recycled, recyclable, PVC-free, low VOC carpet tiles

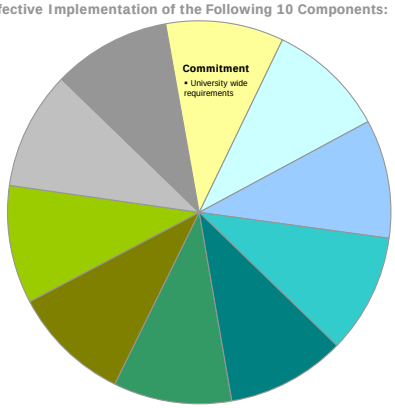


Low VOC adhesives and sealants

And now…

Institutionalizing An Accountability Framework that Drives Harvard towards Cost Effective Green Building Design

A Comprehensive Strategy for Cost Effective Green Building Design Requires Effective Implementation of the Following 10 Components:



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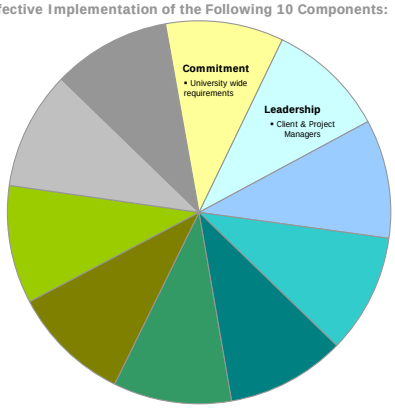

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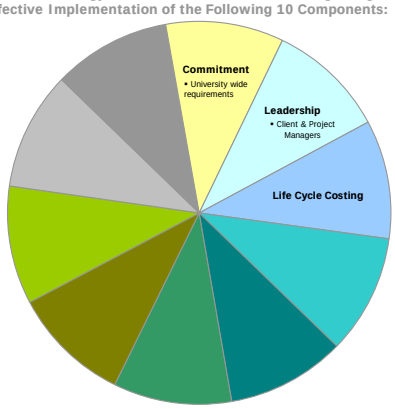

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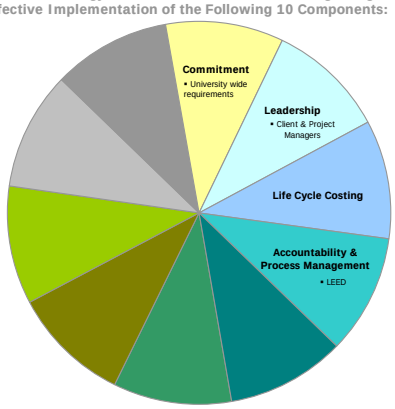

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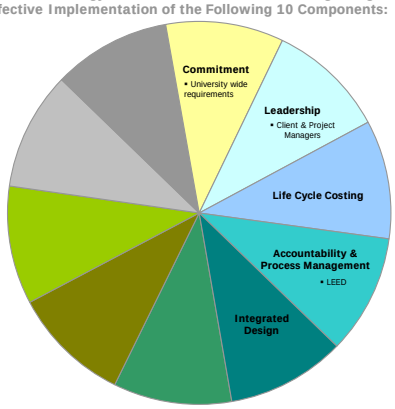

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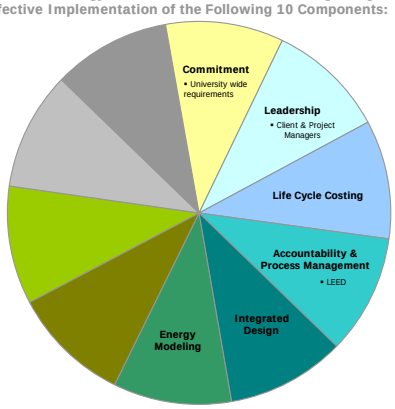

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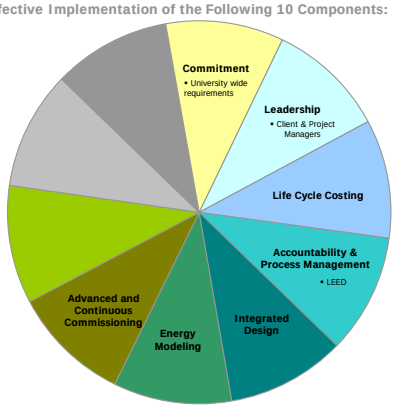

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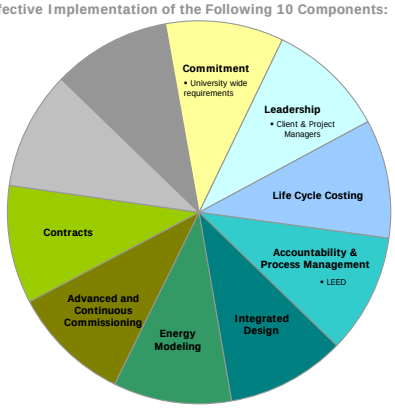

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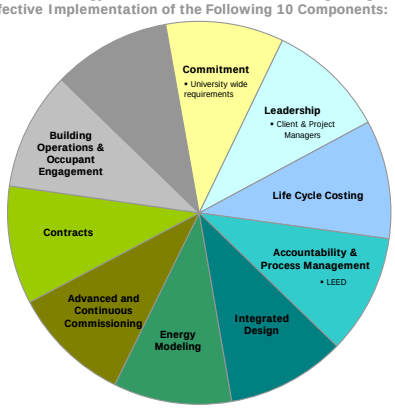

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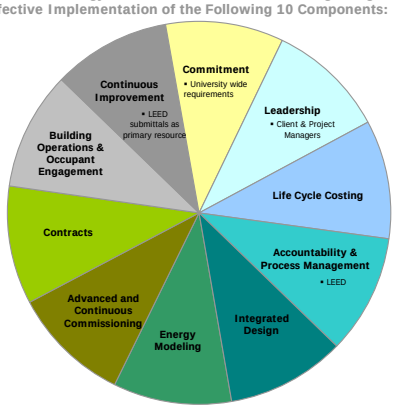


Institutionalizing a Direction for Cost Effective Green Building at Harvard University

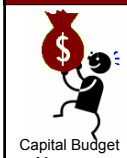
Guidelines Need to Address:

- ✓RFP language
- ✓Energy Efficiency Requirements
- ✓Energy Modeling
- ✓LEED Certification
- ✓Integrated Design
- ✓Life Cycle Costing
- ✓Continuous Commissioning

Case Study 2 – Finance and Accounting for Sustainability:

Organizational Change via a Grassroots Approach

Accounting Structures Are Getting in the Way of Best Financial Practice



Capital Budget Managers

Utility Budget Managers

Barrier: Accounting structures are driving inefficient design and operations by separating the appropriate movement of investments and savings

Maintenance Budget Managers

Human Resources Managers

Harvard Green Campus's Revolving Loan Fund

Green Campus Loan Fund

$12 Million Fund - interest free capital for high performance projects

Existing Buildings

5 Year Payback Maximum

Full project funded

Can bundle projects

Simple payback used

New Construction

10 Year payback maximum

Cost premium of high performance option funded

Life Cycle Costing used

Loan Fund Performance

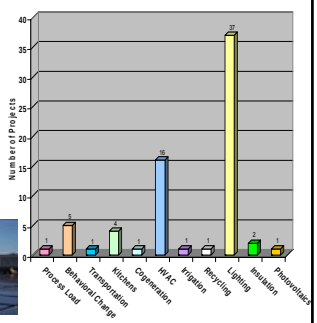
Over $8+ million invested in 140+ projects

Average Simple Payback ~ **3 years**

Average Return on Investment – **35%**

Annual Environmental Impacts

- 80,000,000+ pounds of CO2 equivalent
- 8,600,000 gallons of water
- 200,000 pounds of waste diverted



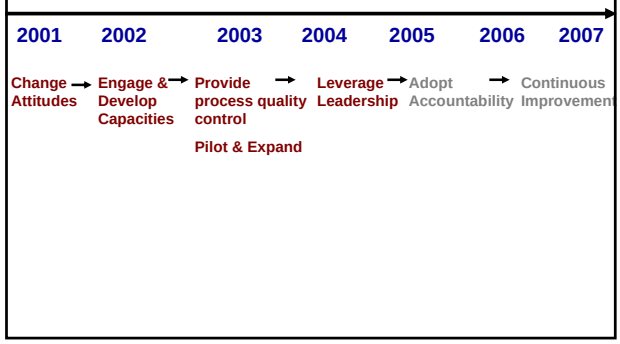
Provide Financial Access to the Champions

NEXT: Instituting Life Cycle Costing

A **method of project evaluation in which all costs** arising from owning, operating, maintaining and ultimately disposing of a project **are financially evaluated in the decision making process**.

- ► New Construction
- ► Major Renovations
- ► Capital Projects
- ► Routine Replacements or Upgrades

The Evolution of Finance & Accounting for Sustainability



Case Study 3 – Master Planning for Sustainability:

Organizational Change via a Top Down Approach

Harvard as Landowner

- 657 acres of campus land area
  - 219 acres in Cambridge
  - 22 acres in Longwood
  - **250 acres in Allston**
  - 137 acres in Southborough
  - 29 acres in Watertown
- 4,100 acres of research land area

Proposed Program

	PHASE I: 20 YEARS	PHASE II: 30 YEARS
Science	1.5M SF	2M SF
GSE	300K SF	-
SPH	575K SF	-
Undergraduate Houses	800K SF (4 houses)	400K SF + 400K SF renovate
Student Center	(50K SF renovate)	-
Graduate Housing	350K SF (590 beds)	-
Performing Arts	75K SF	-
Museums	240K SF	-
Retail	60K SF	50K SF
Academic	-	1.7M SF
HBS Academic & Housing	500K SF	-
Administrative Support Space	100K SF	100K SF
Conference Center	220K SF (70K + 250 rooms)	-
Athletics (150K replace)	50K SF	-
Totals: (all numbers are rounded)	4-5M SF Phase I Total	4-5M SF Phase II Total

TOTAL: 9 – 10M SF

Allston Development Group February 22, 2007

Master Plan Theme – Sustainability

Campus-Wide Sustainability Principles

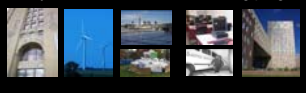
Harvard's Sustainability Principles

Harvard University is committed to continuous improvement in:

- **Demonstrating institutional practices that promote sustainability.**
- **Promoting health, productivity and safety** through better building design and campus planning.
- **Enhancing the health of campus ecosystems** & increasing the diversity of native species.
- **Developing planning tools to support triple bottom line decision-making.**
- **Encouraging environmental inquiry and institutional learning** throughout the University.
- **Establishing indicators for sustainability** for monitoring, reporting & continuous improvement.

Implementation Commitments

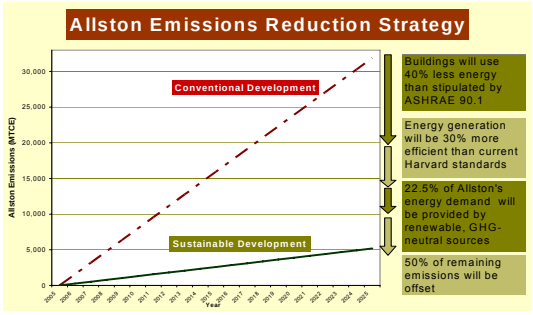
- Integrate sustainability requirements into Harvard's Capital Approvals process.
- Integrate sustainability into annual financial reporting processes.
- Establish a set of university wide indicators for monitoring progress.



Allston's Sustainable Design Guidelines

Greenhouse Gas Reduction Strategy

The Allston Sustainability Guidelines chart a course for Harvard to reduce the emissions of its new campus in Allston by over 80% compared to a conventional campus.



Allston's Sustainable Design Guidelines

Building Green in Allston

Harvard is considering committing to a LEED Gold standard for all buildings in Allston. The LEED process ensures accountability and supports continuous improvement.

LEED United States Green Building Council (USGBC)

Harvard has over 21 building projects that are LEED registered or certified.

Harvard can achieve LEED Gold and beyond with minimal additional cost and significant operating savings.

TOP DOWN STRATEGY for Ensuring Sustainability Remains a Priority in Planning for the New Allston Campus

- Establish GOALS – set expectations early
- Set performance and design TARGETS
- Design team develops and tests STRATEGIES
- Select TECHNOLOGIES to support strategies
- Monitor progress against BENCHMARKS

The Evolution of Master Planning for Sustainability

To Learn More About The Harvard Green Campus Initiative:

Visit our website
www.greencampus.harvard.edu

Subscribe to our newsletter –
Spring 2007 soon available

Enroll in our Distance learning course through Harvard Extension School:
ENVR –E117 Sustainability – The Challenge of Changing Our Institutions
Note: Next enrollment period is in January 2007
http://courses.dce.harvard.edu/~envre117/