



Montgomery County Planning Board 2009 Growing Smarter Speaker Series

Thursday, February 12th, 2009

Green Building: Today's Practices Tomorrow's Challenges

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Principal

Director of Sustainable Design

QUINN EVANS | ARCHITECTS





Outline

- **Who I am**
- Today's Green Building Marketplace
- Current Green Building Practice
- Emerging Green Technologies
- Facing the Carbon Challenge





Renewing Legacy



Ocean Hall



Peabody Institute

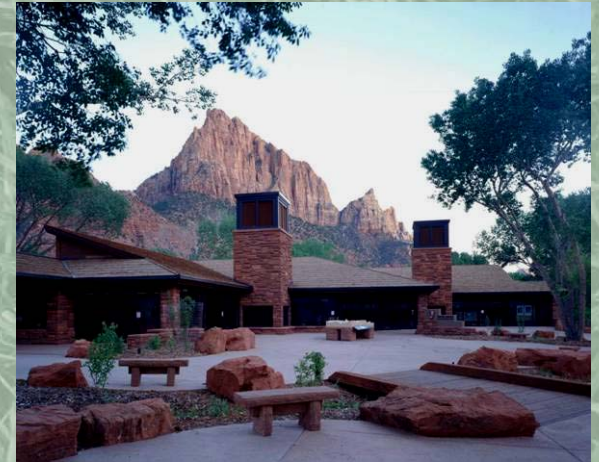


Dana Building





The *Greenest* Building is ...





... One That is *Already* Built.





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- Who I am
- **Today's Green Building
"Marketplace"**
- Current Green Building Practice
- Emerging Green Technologies
- Facing the Carbon Challenge





Green Building Rating Systems

LEED



USGBC

United States Green Building Council

LEED

Leadership in Energy and Environmental Design





Green Building Rating Systems

LEED

SS Sustainable Sites

WE Water Efficiency

EA Energy & Atmosphere

MR Materials & Resources

EQ Environmental Quality

ID Innovation & Design

42		27 Total Project Score		Possible Points 69			
Sustainable Sites		Possible Points 14		Materials & Resources		Possible Points 13	
Y	SS001	1	1	Y	MR001	1	1
Y	SS002	1	1	Y	MR002	1	1
Y	SS003	1	1	Y	MR003	1	1
Y	SS004	1	1	Y	MR004	1	1
Y	SS005	1	1	Y	MR005	1	1
Y	SS006	1	1	Y	MR006	1	1
Y	SS007	1	1	Y	MR007	1	1
Y	SS008	1	1	Y	MR008	1	1
Y	SS009	1	1	Y	MR009	1	1
Y	SS010	1	1	Y	MR010	1	1
Y	SS011	1	1	Y	MR011	1	1
Y	SS012	1	1	Y	MR012	1	1
Y	SS013	1	1	Y	MR013	1	1
Y	SS014	1	1	Y	MR014	1	1
Y	SS015	1	1	Y	MR015	1	1
Y	SS016	1	1	Y	MR016	1	1
Y	SS017	1	1	Y	MR017	1	1
Y	SS018	1	1	Y	MR018	1	1
Y	SS019	1	1	Y	MR019	1	1
Y	SS020	1	1	Y	MR020	1	1
Y	SS021	1	1	Y	MR021	1	1
Y	SS022	1	1	Y	MR022	1	1
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Y	SS024	1	1	Y	MR024	1	1
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Y	SS077	1	1	Y	MR077	1	1
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Y	SS091	1	1	Y	MR091	1	1
Y	SS092	1	1	Y	MR092	1	1
Y	SS093	1	1	Y	MR093	1	1
Y	SS094	1	1	Y	MR094	1	1
Y	SS095	1	1	Y	MR095	1	1
Y	SS096	1	1	Y	MR096	1	1
Y	SS097	1	1	Y	MR097	1	1
Y	SS098	1	1	Y	MR098	1	1
Y	SS099	1	1	Y	MR099	1	1
Y	SS100	1	1	Y	MR100	1	1





Green Building Rating Systems

LEED

LEED NC v2.2 Scoring

69 total points

Platinum

52 + points

Gold

39 – 51 points

Silver

33 – 38 points

Certified

26 – 32 points





Green Building Rating Systems

LEED

Building For Sustainability: Sustainability Matrix

Building Form

Energy, Pollution and External Cost to Society

Schedules

Short and Long Term Costs

● = 5 Households
 ● = Energy Consumed by the Building
 ● = Energy Generated by the Building

Width of Bar = Amount of Energy Required
 Height of Bar = % of Energy Obtained from the Grid

■ = Carbon Dioxide (tons) - Global Warming
 ■ = Sulfur Dioxide (lbs.) - Acid Rain
 ■ = Nitrogen Dioxide (lbs.) - Smog
 ■ = Particulate Matter < 10 Microns (lbs.) - Air Quality

■ = Additional Research
 ■ = Design
 ■ = Construction

All of these figures are based on cost estimates created for each conceptual building model. All costs shown have been adjusted from actual cost estimates to reflect a \$10 million Market Building as a baseline. The Net Present Values indicated represent 30-, 60- and 100-year cost models that are based on 5% cost of capital, 1-1/2% inflation rate and 5% annual increase in energy costs.

Living Building	Plan	Wall Section	Energy to Operate Building	Grid Reliance	Pollution from Building Operation (20 yr)	External Cost to Society (20 yr)	Schedule	Construction Cost	Furniture, Fixtures and Equipment	Design and Management Fees	Net Present Value	Living Building
LEED™ Platinum 100 Year Building 45 Wings Solar Orientation Natural Daylighting Natural Ventilation Living Machine*			89			\$0		\$12.9 m	\$1.7 m	\$2.0 m	\$18.7 m (30 Year Model) \$19.6 m (60 Year Model) \$20.8 m (100 Year Model)	LEED™ Platinum
LEED™ Gold 100 Year Building 45 Wings Solar Orientation Natural Daylighting Natural Ventilation			89			\$0.7 m		\$12.1 m	\$1.6 m	\$1.7 m	\$18.3 m (30 Year Model) \$23.7 m (60 Year Model) \$62.2 m (100 Year Model)	LEED™ Gold
LEED™ Silver 80 Year Building 45 Wings Solar Orientation Natural Daylighting			150			\$1.3 m		\$11.5 m	\$1.6 m	\$1.5 m	\$18.5 m (30 Year Model) \$27.8 m (60 Year Model) \$95.8 m (100 Year Model)	LEED™ Silver
LEED™ Certified 60 Year Building 90 Wings Natural Daylighting			208			\$2.0 m		\$11.3 m	\$1.5 m	\$1.5 m	\$19.7 m (30 Year Model) \$36.7 m (60 Year Model) \$166.9 m (100 Year Model)	LEED™ Certified
Market 40 Year Building 120 Wings Big Box			250			\$2.5 m		\$10.1 m	\$1.4 m	\$1.3 m	\$19.6 m (30 Year Model) \$45.3 m (60 Year Model) \$218.4 m (100 Year Model)	Market
Market 40 Year Building 120 Wings Big Box			461			\$3.2 m		\$10.0 m	\$1.3 m	\$1.3 m	\$22.7 m (30 Year Model) \$62.9 m (60 Year Model) \$348.9 m (100 Year Model)	Market

The David and Lucile Packard Foundation Los Altos Project

www.packard.org





Green Building Regulation **Maryland**

High-Performance Buildings Act

LEED Silver Rating / Green Globes 2 Globes
7,500 SF

Green Buildings Tax Credits

8% Construction, 30% Fuel Cells,
25% PV's, 20% BIPV's, 25% Wind

Energy Administration Incentives

Bio-Fuel Tax Credits, Renewable Energy Grants,
Geothermal Grants, Wind Power Grants





Green Building Regulation **Montgomery County**

Green Buildings Law

LEED Certification over 10,000 SF

LEED Silver Rating for Public Buildings

Clean Energy Rewards

Clean Energy Purchase Tax Credits

Solar Tax Credits

50% Tax Credits on Solar Technologies





Green Building Standards

Federal

ASHRAE

Advanced Energy Design Guides

90.1-2004 30% better than 90.1-1999

Net-Zero Goal

US DOE

Energy Efficiency & Renewable Energy

Building Energy Codes

US EPA

Energy Star





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- Who I am
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- **Current Green Building Practice**
- Emerging Green Technologies
- Facing the Carbon Challenge





Current Green Building Practice

No-Cost Green

Best-Practice Green

Maximum Benefit Green





No-Cost Green

Shielded Lighting Fixtures

Water-efficient Plumbing Fixtures

Occupancy & Proximity Sensors

Green Materials

Green Cleaning





No-Cost Green

Transit-oriented Development

Compact Mixed-use Development

Climate-responsive Design

Daylighting

Operable Windows





Best-Practice Green

LID Stormwater Management

Rainwater Harvesting

High-performance HVAC Systems

Energy-efficient Lighting Technologies

High-performance Building Envelopes

Commissioning





Greening Case Study

HD Cooke





Greening Case Study

HD Cooke





Greening Case Study

HD Cooke





Greening Case Study

HD Cooke





Greening Case Study

HD Cooke

Sustainable Sites

- Dense urban site
- Access to transit
- Alternative transportation
- Contamination-Free site
- Storm water quantity and quality
- New roofs limit heat-island effect
- Joint use of facilities

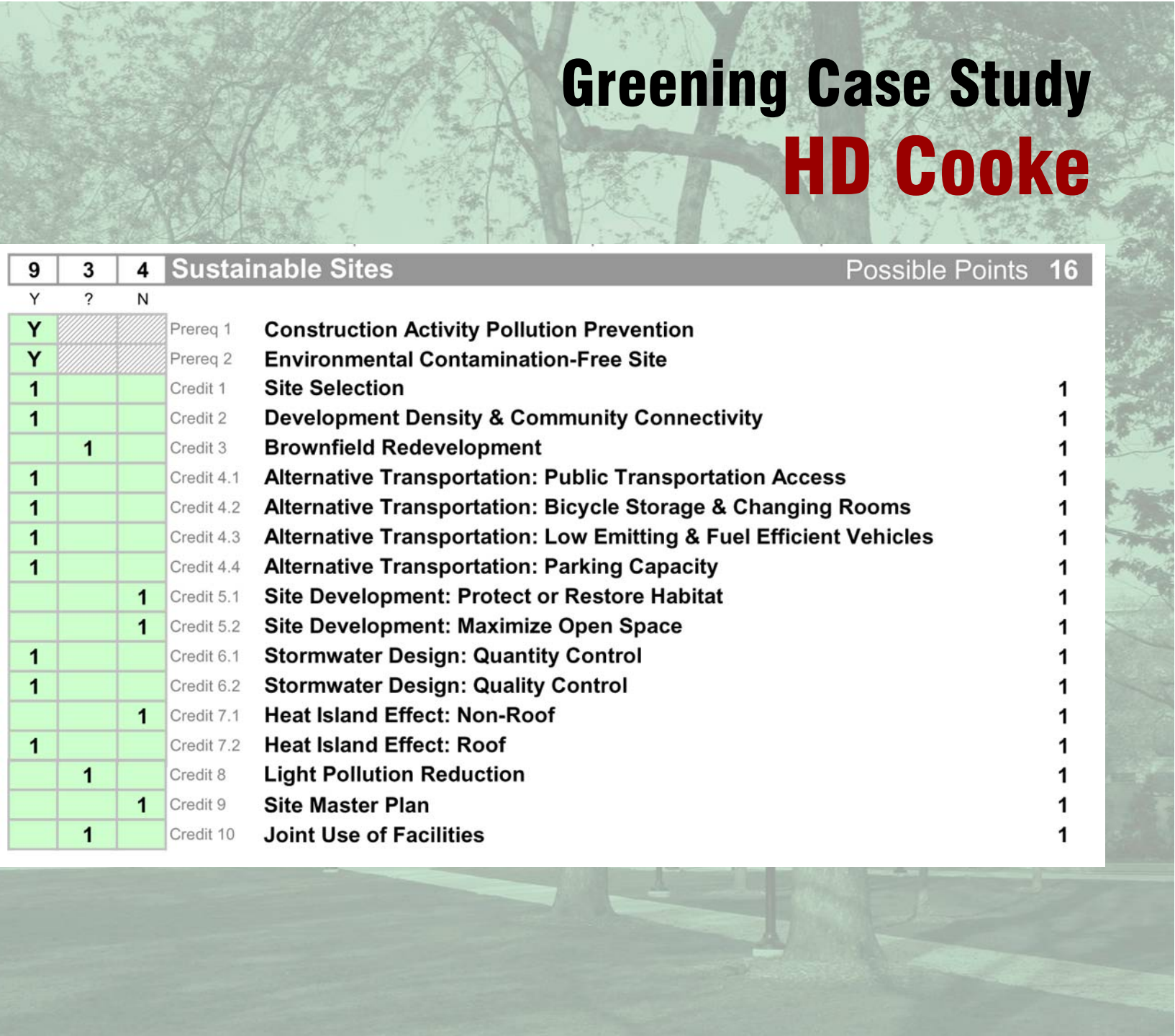




Greening Case Study

HD Cooke

9	3	4	Sustainable Sites		Possible Points	16
Y	?	N				
Y			Prereq 1	Construction Activity Pollution Prevention		
Y			Prereq 2	Environmental Contamination-Free Site		
1			Credit 1	Site Selection		1
1			Credit 2	Development Density & Community Connectivity		1
	1		Credit 3	Brownfield Redevelopment		1
1			Credit 4.1	Alternative Transportation: Public Transportation Access		1
1			Credit 4.2	Alternative Transportation: Bicycle Storage & Changing Rooms		1
1			Credit 4.3	Alternative Transportation: Low Emitting & Fuel Efficient Vehicles		1
1			Credit 4.4	Alternative Transportation: Parking Capacity		1
		1	Credit 5.1	Site Development: Protect or Restore Habitat		1
		1	Credit 5.2	Site Development: Maximize Open Space		1
1			Credit 6.1	Stormwater Design: Quantity Control		1
1			Credit 6.2	Stormwater Design: Quality Control		1
		1	Credit 7.1	Heat Island Effect: Non-Roof		1
1			Credit 7.2	Heat Island Effect: Roof		1
	1		Credit 8	Light Pollution Reduction		1
		1	Credit 9	Site Master Plan		1
	1		Credit 10	Joint Use of Facilities		1





Greening Case Study

HD Cooke

Water Efficiency

- Water efficient landscaping w/o irrigation
- Water use 30% below the baseline

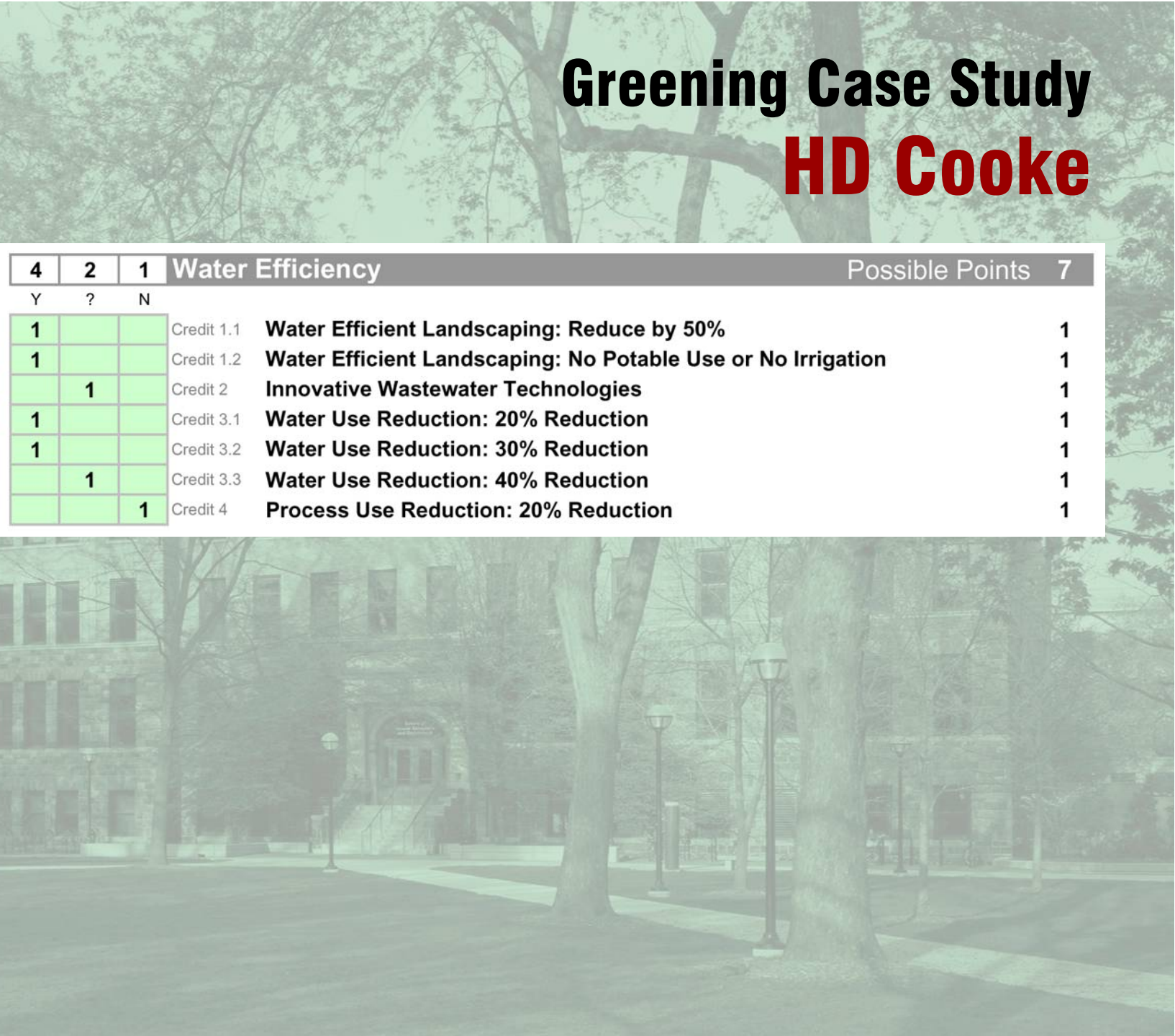




Greening Case Study

HD Cooke

4	2	1	Water Efficiency	Possible Points	7
Y	?	N			
1			Credit 1.1 Water Efficient Landscaping: Reduce by 50%		1
1			Credit 1.2 Water Efficient Landscaping: No Potable Use or No Irrigation		1
	1		Credit 2 Innovative Wastewater Technologies		1
1			Credit 3.1 Water Use Reduction: 20% Reduction		1
1			Credit 3.2 Water Use Reduction: 30% Reduction		1
	1		Credit 3.3 Water Use Reduction: 40% Reduction		1
		1	Credit 4 Process Use Reduction: 20% Reduction		1





Greening Case Study

HD Cooke

Energy & Atmosphere

- Fundamental & enhanced commissioning
- Energy use 17.5% below baseline





Greening Case Study

HD Cooke

4	3	10	Energy & Atmosphere		Possible Points
Y	?	N			17
Y			Prereq 1	Fundamental Commissioning of the Building Energy Systems	
Y			Prereq 2	Minimum Energy Performance	
Y			Prereq 3	CFC Reduction in HVAC&R Equipment	
1			Credit 1.1	Optimize Energy Performance: 10.5% New / 3.5% Existing	1
1			Credit 1.1	Optimize Energy Performance: 14% New / 7% Existing	1
1			Credit 1.2	Optimize Energy Performance: 17.5% New / 10.5% Existing	1
	1		Credit 1.2	Optimize Energy Performance: 21% New / 14% Existing	1
		1	Credit 1.3	Optimize Energy Performance: 24.5% New / 17.5% Existing	1
		1	Credit 1.3	Optimize Energy Performance: 28% New / 21% Existing	1
		1	Credit 1.3	Optimize Energy Performance: 31.5% New / 24.5% Existing	1
		1	Credit 1.4	Optimize Energy Performance: 35% New / 28% Existing	1
		1	Credit 1.4	Optimize Energy Performance: 38.5% New / 31.5% Existing	1
		1	Credit 1.5	Optimize Energy Performance: 42% New / 35% Existing	1
		1	Credit 2.1	On-Site Renewable Energy: 2.5%	1
		1	Credit 2.2	On-Site Renewable Energy: 7.5%	1
		1	Credit 2.3	On-Site Renewable Energy: 12.5%	1
1			Credit 3	Enhanced Commissioning	1
	1		Credit 4	Enhanced Refrigerant Management	1





Greening Case Study

HD Cooke

Materials & Resources

- Storage and collection of recyclables
- 75% retention of the existing structure
- 50% construction waste diverted
- 10% new recycled materials
- 10% new regional materials

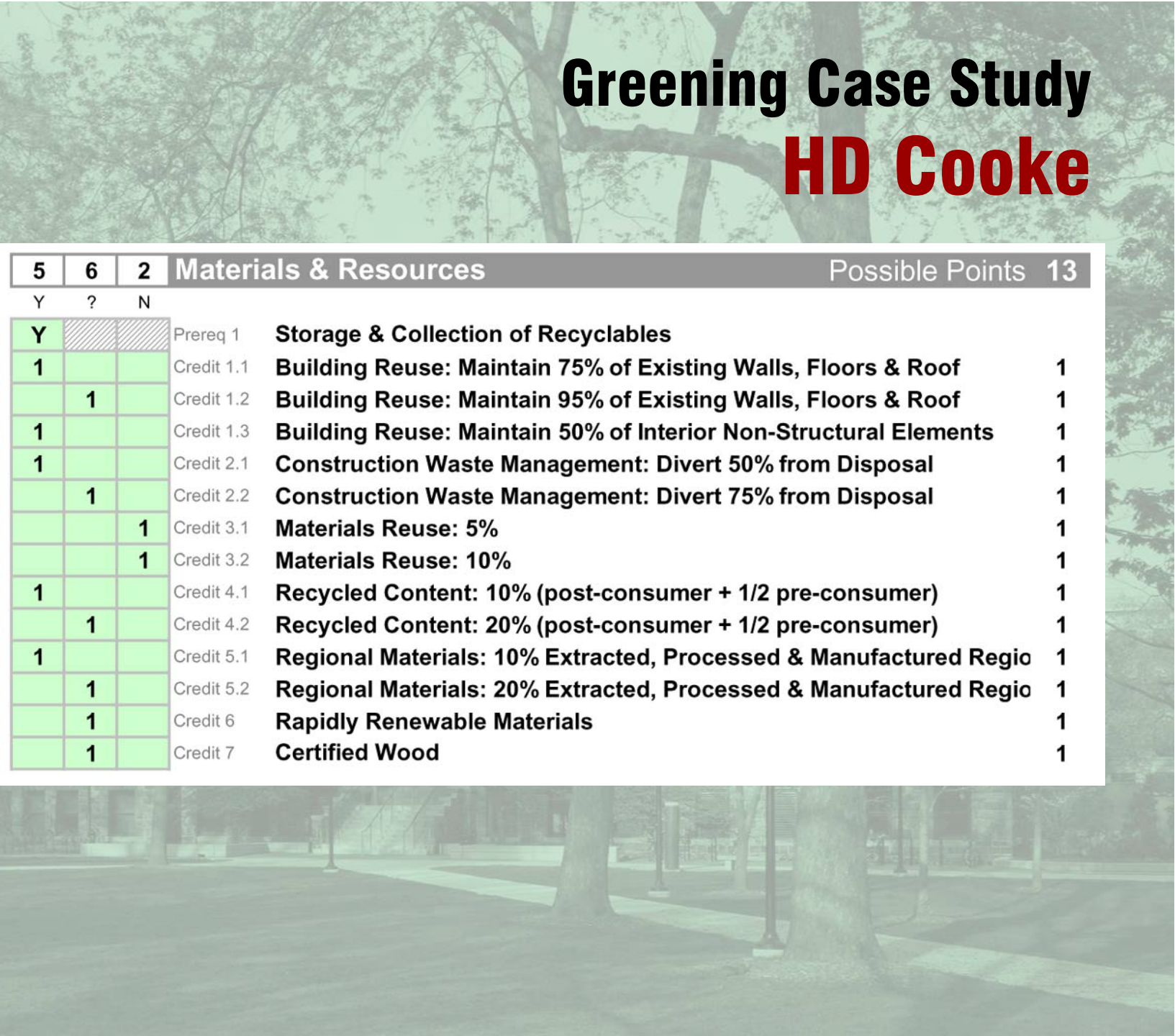




Greening Case Study

HD Cooke

5	6	2	Materials & Resources		Possible Points	13
Y	?	N				
Y			Prereq 1	Storage & Collection of Recyclables		
1			Credit 1.1	Building Reuse: Maintain 75% of Existing Walls, Floors & Roof		1
	1		Credit 1.2	Building Reuse: Maintain 95% of Existing Walls, Floors & Roof		1
1			Credit 1.3	Building Reuse: Maintain 50% of Interior Non-Structural Elements		1
1			Credit 2.1	Construction Waste Management: Divert 50% from Disposal		1
	1		Credit 2.2	Construction Waste Management: Divert 75% from Disposal		1
		1	Credit 3.1	Materials Reuse: 5%		1
		1	Credit 3.2	Materials Reuse: 10%		1
1			Credit 4.1	Recycled Content: 10% (post-consumer + 1/2 pre-consumer)		1
	1		Credit 4.2	Recycled Content: 20% (post-consumer + 1/2 pre-consumer)		1
1			Credit 5.1	Regional Materials: 10% Extracted, Processed & Manufactured Regio		1
	1		Credit 5.2	Regional Materials: 20% Extracted, Processed & Manufactured Regio		1
	1		Credit 6	Rapidly Renewable Materials		1
	1		Credit 7	Certified Wood		1





Greening Case Study

HD Cooke

Environmental Quality

- Outdoor air monitoring & increased ventilation
- Construction IAQ
- Low-emitting materials & pollutant source control
- Advanced lighting control
- Advanced thermal control
- Daylight & views
- Acoustic performance





15	3	2	Indoor Environmental Quality	Possible Points 20
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Y	?	N		
Y			Prereq 1	Minimum IAQ Performance
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control
Y			Prereq 3	Minimum Acoustical Performance
1			Credit 1	Outdoor Air Delivery Monitoring 1
1			Credit 2	Increased Ventilation 1
1			Credit 3.1	Construction IAQ Management Plan: During Construction 1
1			Credit 3.2	Construction IAQ Management Plan: Before Occupancy 1
1			Credit 4.1	Low-Emitting Materials: Adhesives & Sealants 1
1			Credit 4.2	Low-Emitting Materials: Paints 1
1			Credit 4.3	Low-Emitting Materials: Carpet 1
1			Credit 4.4	Low-Emitting Materials: Composite Wood & Agrifiber Products 1
		1	Credit 4.5	Low-Emitting Materials: Furniture and Furnishings 1
1			Credit 4.6	Low-Emitting Materials: Ceiling and Wall Systems 1
1			Credit 5	Indoor Chemical & Pollutant Source Control 1
1			Credit 6.1	Controllability of Systems: Lighting 1
1			Credit 6.2	Controllability of Systems: Thermal Comfort 1
1			Credit 7.1	Thermal Comfort: Design 1
1			Credit 7.2	Thermal Comfort: Verification 1
	1		Credit 8.1	Daylight & Views: Daylight 75% of Spaces 1
		1	Credit 8.1	Daylight & Views: Views for 90% of Spaces 1
			Credit 8.1	Daylight & Views: Daylight 75% of Other Spaces 1
			Credit 8.2	Daylight & Views 1
	1		Credit 9	Enhanced Acoustical Performance 1
	1		Credit 9	Enhanced Acoustical Performance (Enhanced) 1
1			Credit 10	Mold Prevention 1





Greening Case Study

HD Cooke

Innovation & Design

- Green Cleaning
- Green Arts and Crafts
- School as teaching tool
- Exceptional performance:
regional materials
- Exceptional performance:
green power

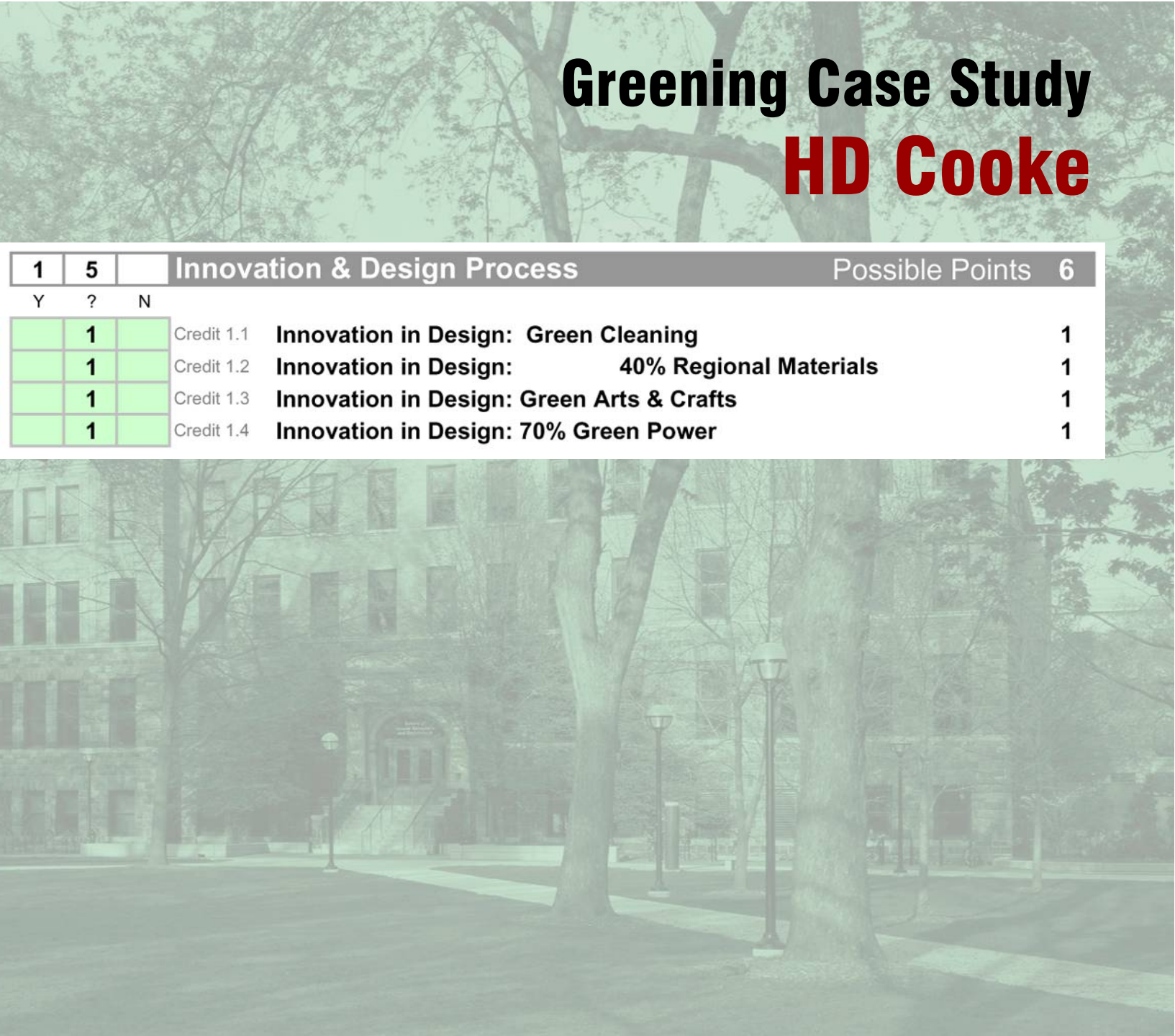




Greening Case Study

HD Cooke

1	5		Innovation & Design Process	Possible Points	6
Y	?	N			
	1		Credit 1.1 Innovation in Design: Green Cleaning		1
	1		Credit 1.2 Innovation in Design: 40% Regional Materials		1
	1		Credit 1.3 Innovation in Design: Green Arts & Crafts		1
	1		Credit 1.4 Innovation in Design: 70% Green Power		1





LEED® Credit Scorecard

LEED-S Green Building Rating System, First Edition 2007

HD Cooke Elementary School

Quinn Evans Architects



January 7, 2008

38 22 19 Total Project Score Possible Points 79

Certified 29 to 36 points Silver 37 to 43 points Gold 44 to 57 points Platinum 58 or more points

9 3 4 Sustainable Sites Possible Points 16				
Y	?	N		
Y			Prereq 1 Construction Activity Pollution Prevention	1
Y			Prereq 2 Environmental Contamination-Free Site	1
1			Credit 1 Site Selection	1
1			Credit 2 Development Density & Community Connectivity	1
		1	Credit 3 Brownfield Redevelopment	1
1			Credit 4.1 Alternative Transportation: Public Transportation Access	1
1			Credit 4.2 Alternative Transportation: Bicycle Storage & Changing Rooms	1
1			Credit 4.3 Alternative Transportation: Low Emitting & Fuel Efficient Vehicles	1
1			Credit 4.4 Alternative Transportation: Parking Capacity	1
		1	Credit 5.1 Site Development: Protect or Restore Habitat	1
		1	Credit 5.2 Site Development: Maximize Open Space	1
1			Credit 6.1 Stormwater Design: Quantity Control	1
1			Credit 6.2 Stormwater Design: Quality Control	1
		1	Credit 7.1 Heat Island Effect: Non-Roof	1
1			Credit 7.2 Heat Island Effect: Roof	1
		1	Credit 8 Light Pollution Reduction	1
		1	Credit 9 Site Master Plan	1
1			Credit 10 Joint Use of Facilities	1

4 2 1 Water Efficiency Possible Points 7				
Y	?	N		
1			Credit 1.1 Water Efficient Landscaping: Reduce by 50%	1
1			Credit 1.2 Water Efficient Landscaping: No Potable Use or No Irrigation	1
		1	Credit 2 Innovative Wastewater Technologies	1
1			Credit 3.1 Water Use Reduction: 20% Reduction	1
1			Credit 3.2 Water Use Reduction: 30% Reduction	1
		1	Credit 3.3 Water Use Reduction: 40% Reduction	1
		1	Credit 4 Process Use Reduction: 20% Reduction	1

4 3 10 Energy & Atmosphere Possible Points 17				
Y	?	N		
Y			Prereq 1 Fundamental Commissioning of the Building Energy Systems	1
Y			Prereq 2 Minimum Energy Performance	1
Y			Prereq 3 CFC Reduction in HVAC&R Equipment	1
1			Credit 1.1 Optimize Energy Performance: 10.5% New / 3.5% Existing	1
1			Credit 1.1 Optimize Energy Performance: 14% New / 7% Existing	1
1			Credit 1.2 Optimize Energy Performance: 17.5% New / 10.5% Existing	1
		1	Credit 1.2 Optimize Energy Performance: 21% New / 14% Existing	1
		1	Credit 1.3 Optimize Energy Performance: 24.5% New / 17.5% Existing	1
		1	Credit 1.3 Optimize Energy Performance: 28% New / 21% Existing	1
		1	Credit 1.3 Optimize Energy Performance: 31.5% New / 24.5% Existing	1
		1	Credit 1.4 Optimize Energy Performance: 35% New / 28% Existing	1
		1	Credit 1.4 Optimize Energy Performance: 38.5% New / 31.5% Existing	1
		1	Credit 1.5 Optimize Energy Performance: 42% New / 35% Existing	1
		1	Credit 2.1 On-Site Renewable Energy: 2.5%	1
		1	Credit 2.2 On-Site Renewable Energy: 7.5%	1
		1	Credit 2.3 On-Site Renewable Energy: 12.5%	1
1			Credit 3 Enhanced Commissioning	1
		1	Credit 4 Enhanced Refrigerant Management	1

5 6 2 Materials & Resources Possible Points 13				
Y	?	N		
Y			Prereq 1 Storage & Collection of Recyclables	1
1			Credit 1.1 Building Reuse: Maintain 75% of Existing Walls, Floors & Roof	1
		1	Credit 1.2 Building Reuse: Maintain 95% of Existing Walls, Floors & Roof	1
1			Credit 1.3 Building Reuse: Maintain 50% of Interior Non-Structural Elements	1
		1	Credit 2.1 Construction Waste Management: Divert 50% from Disposal	1
		1	Credit 2.2 Construction Waste Management: Divert 75% from Disposal	1
		1	Credit 3.1 Materials Reuse: 5%	1
		1	Credit 3.2 Materials Reuse: 10%	1
1			Credit 4.1 Recycled Content: 10% (post-consumer + 1/2 pre-consumer)	1
		1	Credit 4.2 Recycled Content: 20% (post-consumer + 1/2 pre-consumer)	1
1			Credit 5.1 Regional Materials: 10% Extracted, Processed & Manufactured Region	1
		1	Credit 5.2 Regional Materials: 20% Extracted, Processed & Manufactured Region	1
		1	Credit 6 Rapidly Renewable Materials	1
		1	Credit 7 Certified Wood	1

15 3 2 Indoor Environmental Quality Possible Points 20				
Y	?	N		
Y			Prereq 1 Minimum IAQ Performance	1
Y			Prereq 2 Environmental Tobacco Smoke (ETS) Control	1
Y			Prereq 3 Minimum Acoustical Performance	1
1			Credit 1 Outdoor Air Delivery Monitoring	1
1			Credit 2 Increased Ventilation	1
1			Credit 3.1 Construction IAQ Management Plan: During Construction	1
1			Credit 3.2 Construction IAQ Management Plan: Before Occupancy	1
1			Credit 4.1 Low-Emitting Materials: Adhesives & Sealants	1
1			Credit 4.2 Low-Emitting Materials: Paints	1
1			Credit 4.3 Low-Emitting Materials: Carpet	1
1			Credit 4.4 Low-Emitting Materials: Composite Wood & Agrifiber Products	1
		1	Credit 4.5 Low-Emitting Materials: Furniture and Furnishings	1
1			Credit 4.6 Low-Emitting Materials: Ceiling and Wall Systems	1
1			Credit 5 Indoor Chemical & Pollutant Source Control	1
1			Credit 6.1 Controllability of Systems: Lighting	1
1			Credit 6.2 Controllability of Systems: Thermal Comfort	1
1			Credit 7.1 Thermal Comfort: Design	1
1			Credit 7.2 Thermal Comfort: Verification	1
		1	Credit 8.1 Daylight & Views: Daylight 75% of Spaces	1
		1	Credit 8.1 Daylight & Views: Views for 90% of Spaces	1
		1	Credit 8.1 Daylight & Views: Daylight 75% of Other Spaces	1
		1	Credit 8.2 Daylight & Views	1
		1	Credit 9 Enhanced Acoustical Performance	1
		1	Credit 9 Enhanced Acoustical Performance (Enhanced)	1
1			Credit 10 Mold Prevention	1

1 5 Innovation & Design Process Possible Points 6				
Y	?	N		
		1	Credit 1.1 Innovation in Design: Green Cleaning	1
		1	Credit 1.2 Innovation in Design: 40% Regional Materials	1
		1	Credit 1.3 Innovation in Design: Green Arts & Crafts	1
		1	Credit 1.4 Innovation in Design: 70% Green Power	1





Outline

- Who I am
- Today's Green Building "Marketplace"
- Current Green Building Practice
- **Emerging Green Technologies**
- Facing the Carbon Challenge





Maximum Benefit Green

Green Roofs

Geothermal Heating & Cooling

Solar Technologies





Maximum Benefit Green Green Roofs





Maximum Benefit Green Green Roofs

Costs

- Extensive (shallow) Vegetated Roofs
 - 30 \$/SF
 - 30 #/SF
- Intensive (deep) Vegetated Roofs
 - 100 \$/SF
 - 100 #/SF
- 60-70% reduced run-off
- +/- R10 insulation





Maximum Benefit Green Geothermal





Maximum Benefit Green Geothermal

Costs

- save 40% energy over conventional heat pump systems
- save 70% energy over electric heating and cooling systems
- 1/2 ton heating/cooling per 250 ft well
- 2,500 \$/ton heating/cooling (about 2x conventional heat pump system)





Maximum Benefit Green Solar





Maximum Benefit Green Solar

Costs – HD Cooke Array

- 100+ panels on Gym Roof
- 20+ kW maximum output
- \$ 200,000 estimated installed cost
- \$ 3,500 estimated annual energy cost savings





Outline

- Who I am
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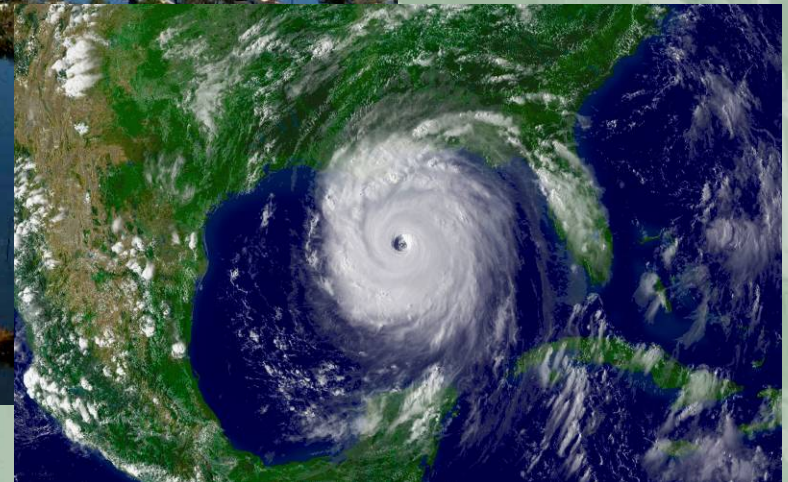




The Climate Change Imperative



Hurricane Katrina

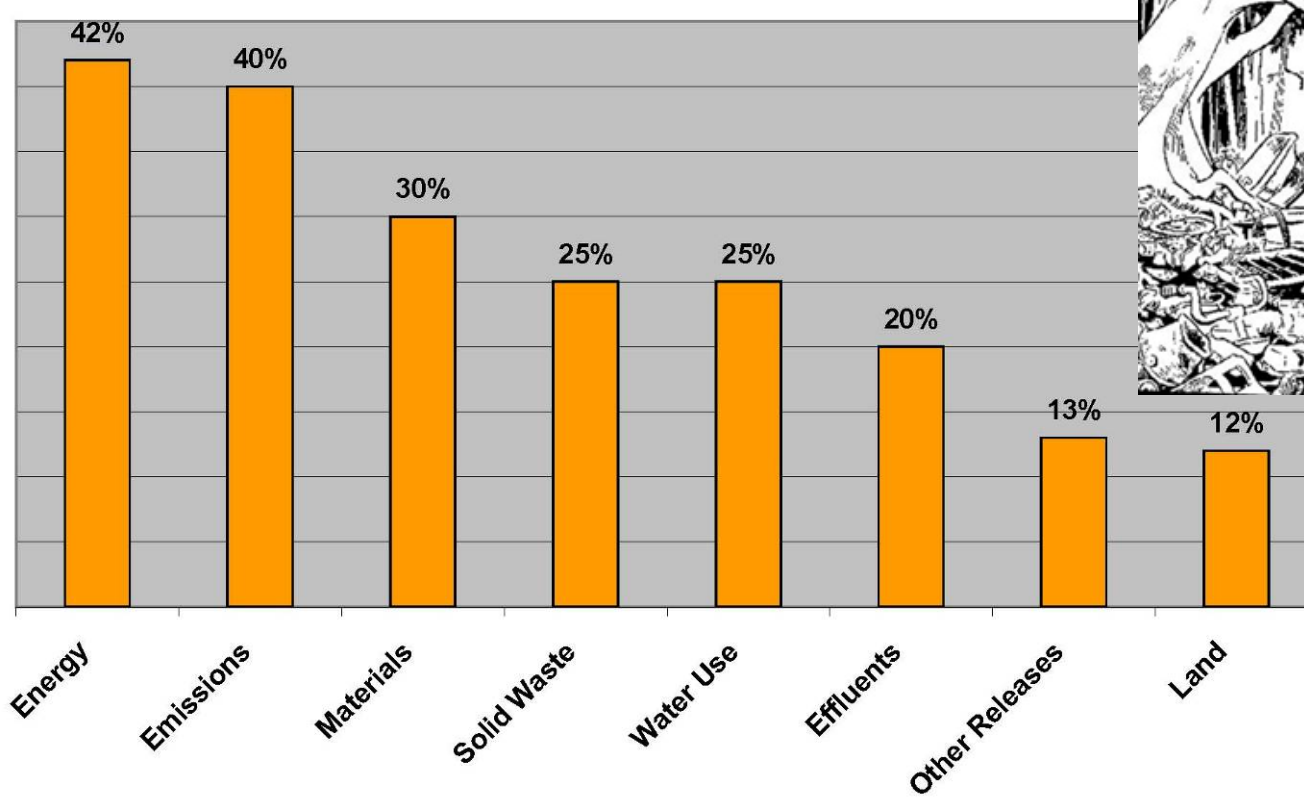




Building Impacts



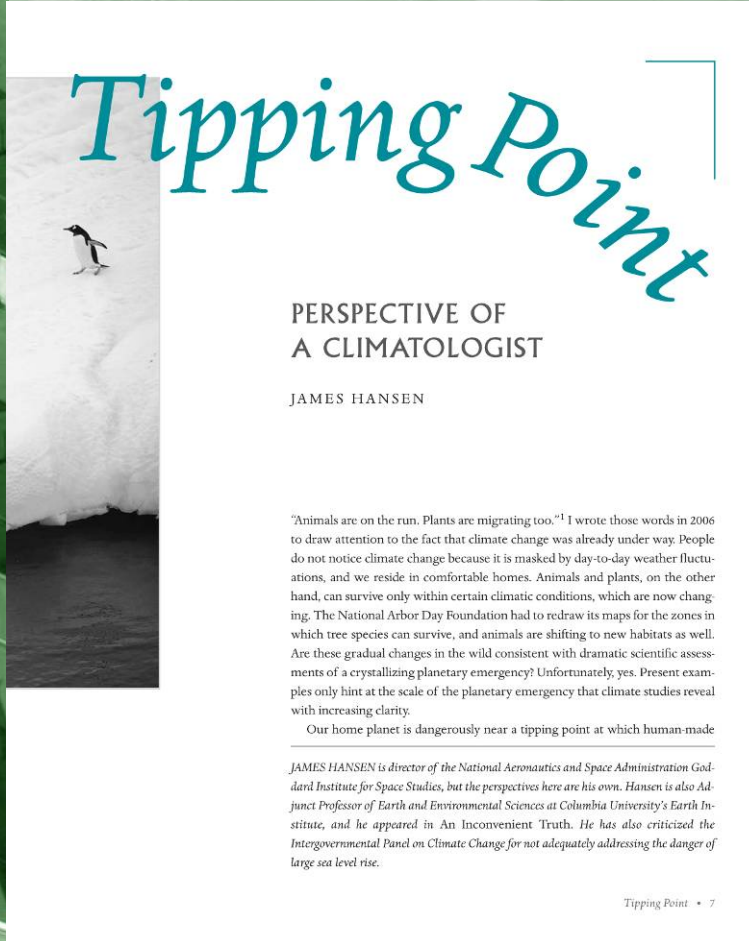
Pogo
Earth Day 1971
Walt Kelly



Sustainable Buildings Industry Council



Climate “Tipping Point”



“Our home planet is dangerously near a tipping point at which human-made greenhouse gases reach a level where major climate changes can proceed mostly under their own momentum.”

Tipping Point - Perspective of a Climatologist
James Hansen





The Tipping Point **CO₂ Levels**

Pre-industrial level	280 ppm
2007 measured level	383 ppm
Tipping point	450 ppm
Delta	067 ppm
Current annual increase	002 ppm
Years to tipping point	$67/2 = $ 34





Climate Change Response Policy

**IPCC / ICLEI / US Conference of
Mayors**

Architecture 2030 Challenge

**Montgomery County Sustainability
Working Group (SWG)**

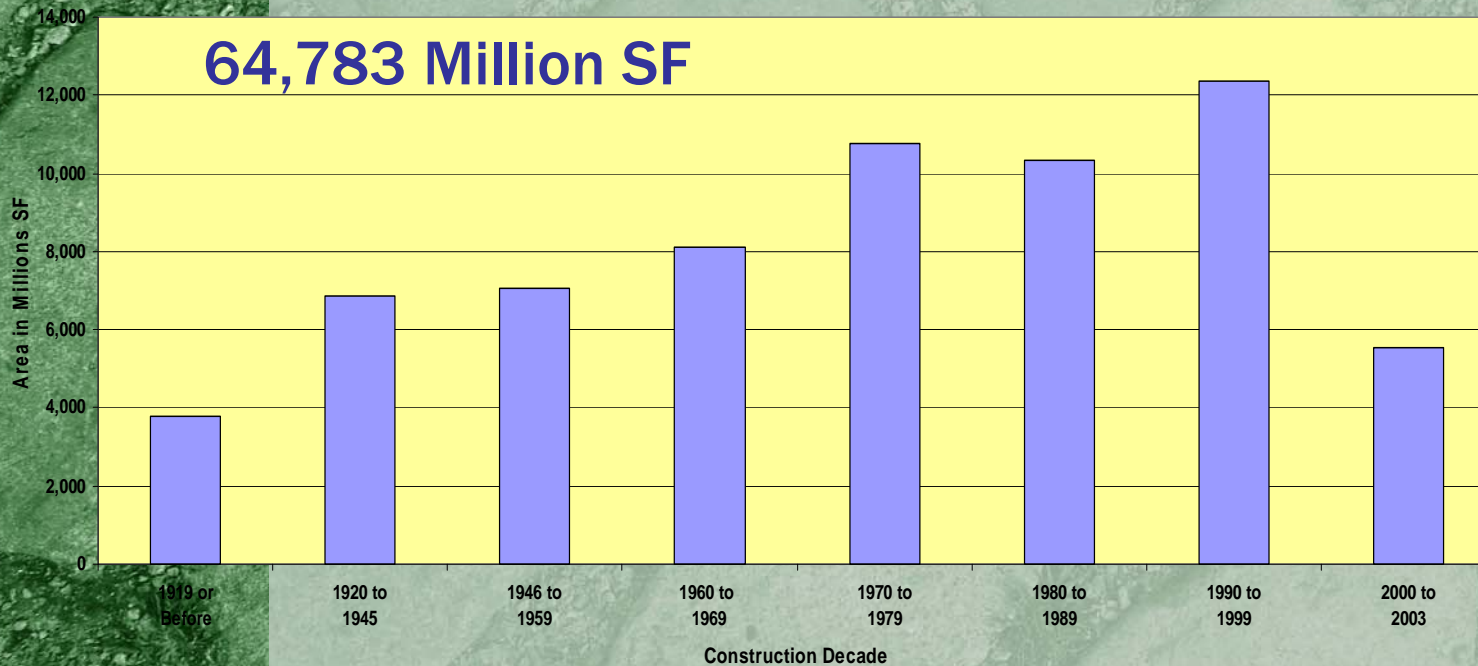




Building Stock Statistics

Existing Stock by Decade Constructed

AREA: Non-Residential Buildings



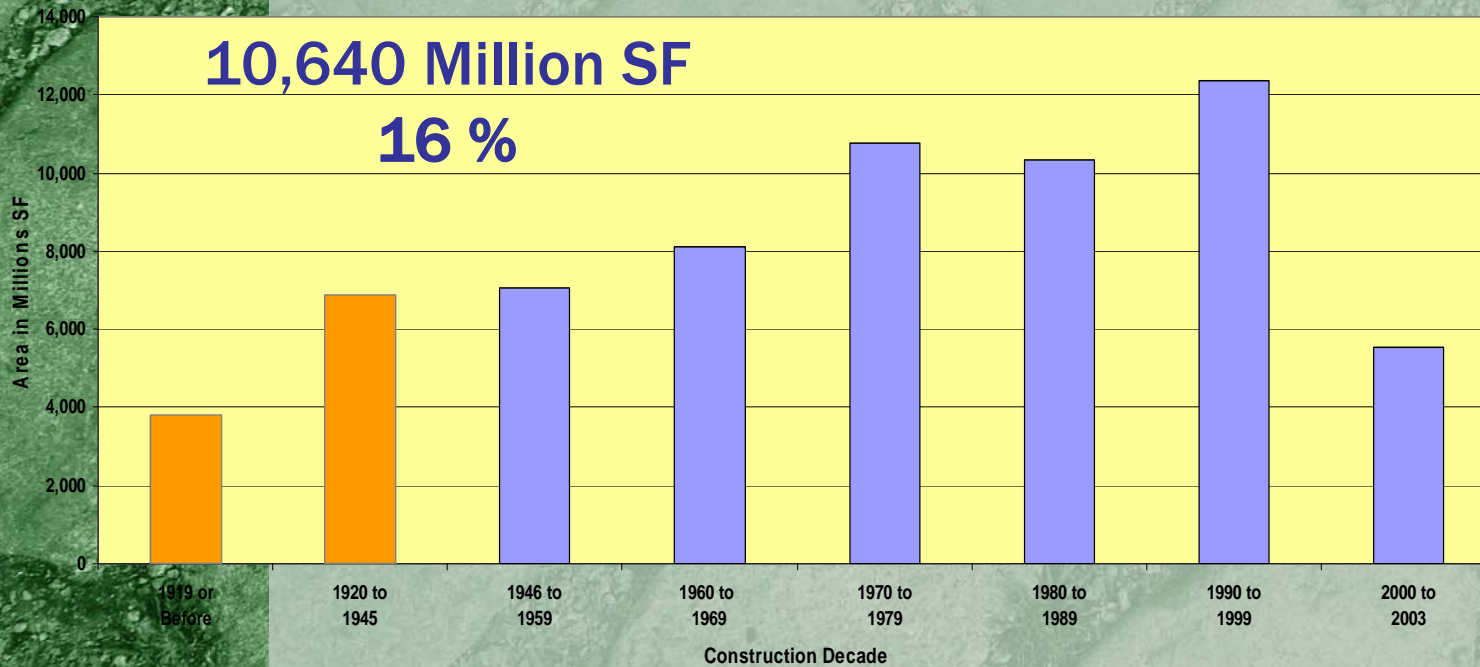
2003 Commercial Building Energy Consumption Survey
U.S. Department of Energy





Building Stock Statistics Traditional & Historic Buildings

AREA: Non-Residential Buildings



2003 Commercial Building Energy Consumption Survey
U.S. Department of Energy

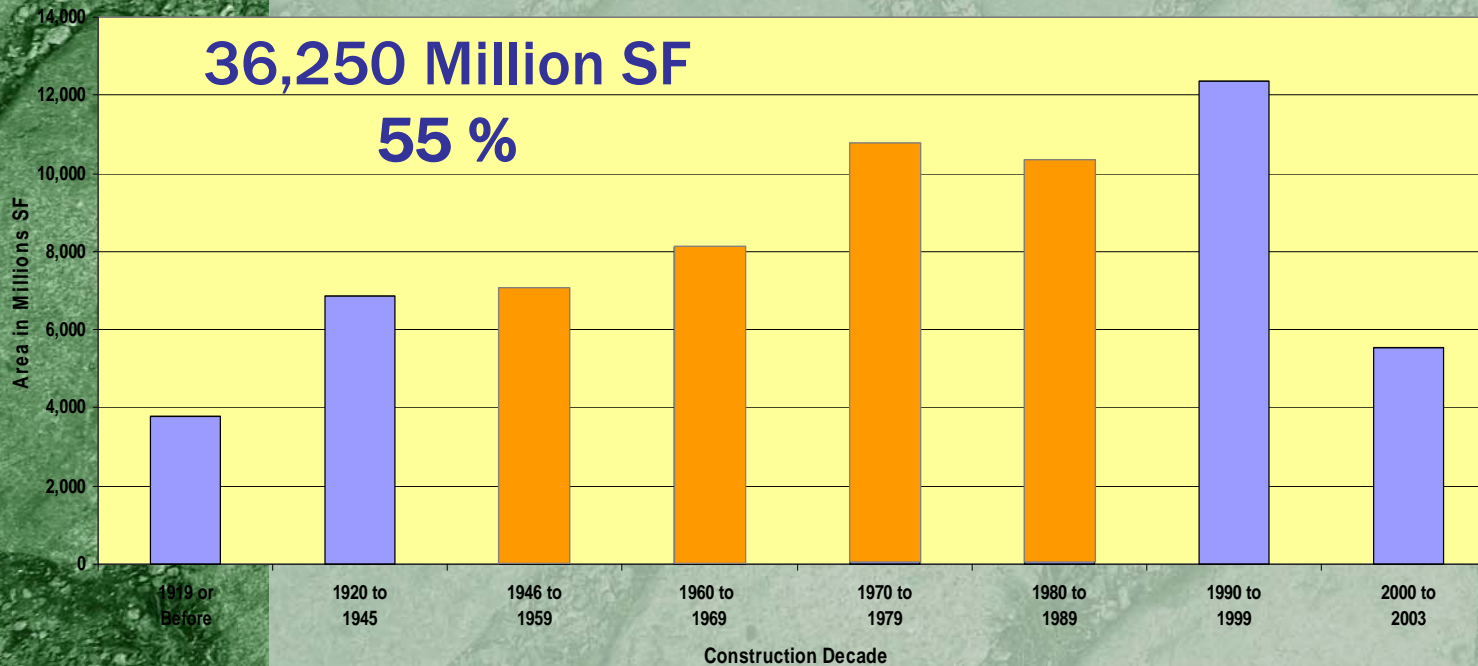




Building Stock Statistics

Modern-Era Buildings

AREA: Non-Residential Buildings



2003 Commercial Building Energy Consumption Survey
U.S. Department of Energy

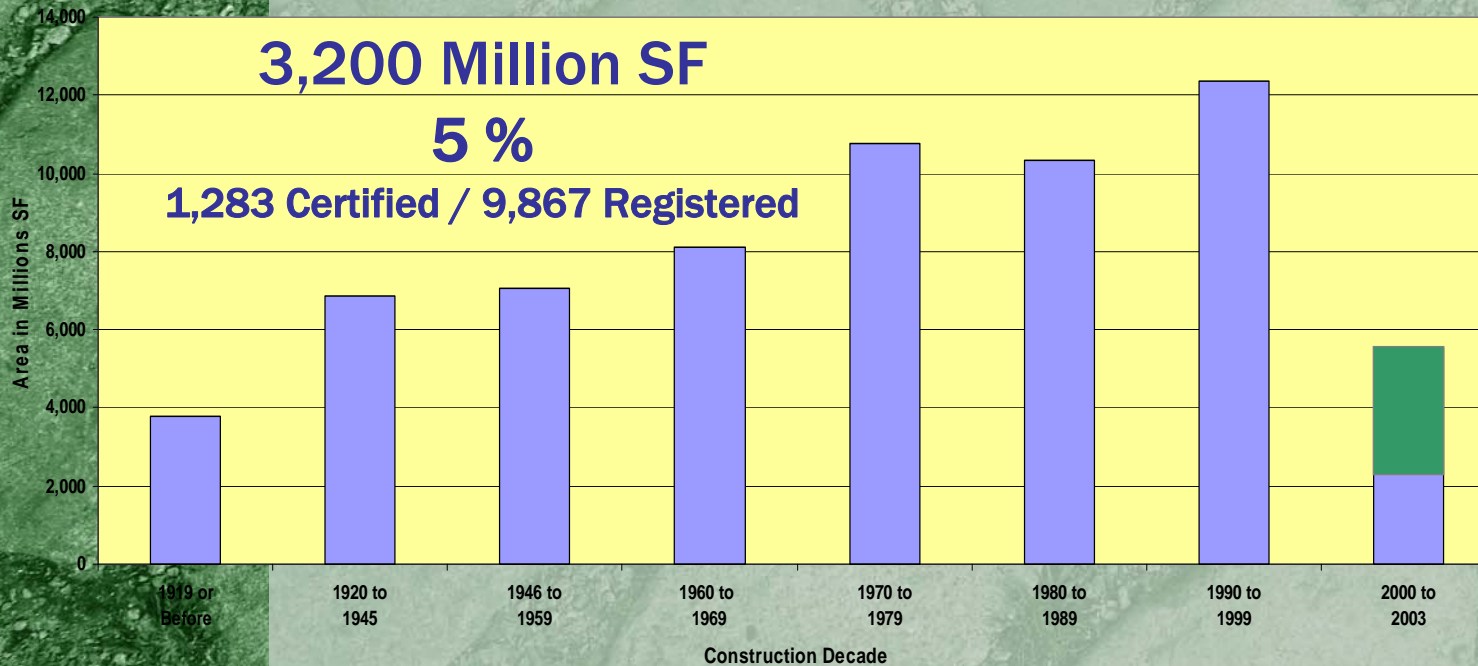




Building Stock Statistics

LEED Buildings

AREA: Non-Residential Buildings



2003 Commercial Building Energy Consumption Survey
U.S. Department of Energy

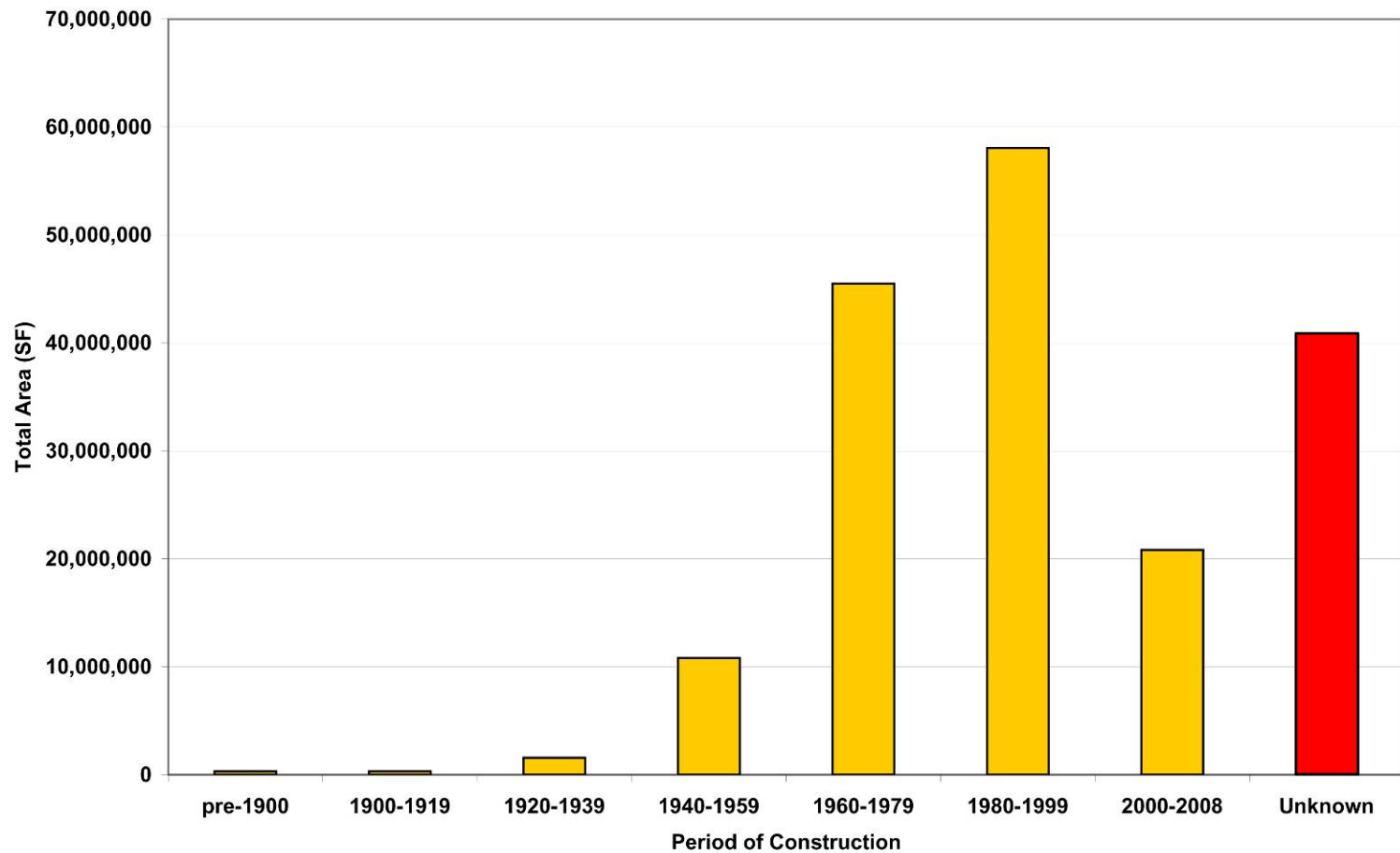




Montgomery County

Existing Stock by Period Constructed

Montgomery County, Maryland, Non-Residential Buildings

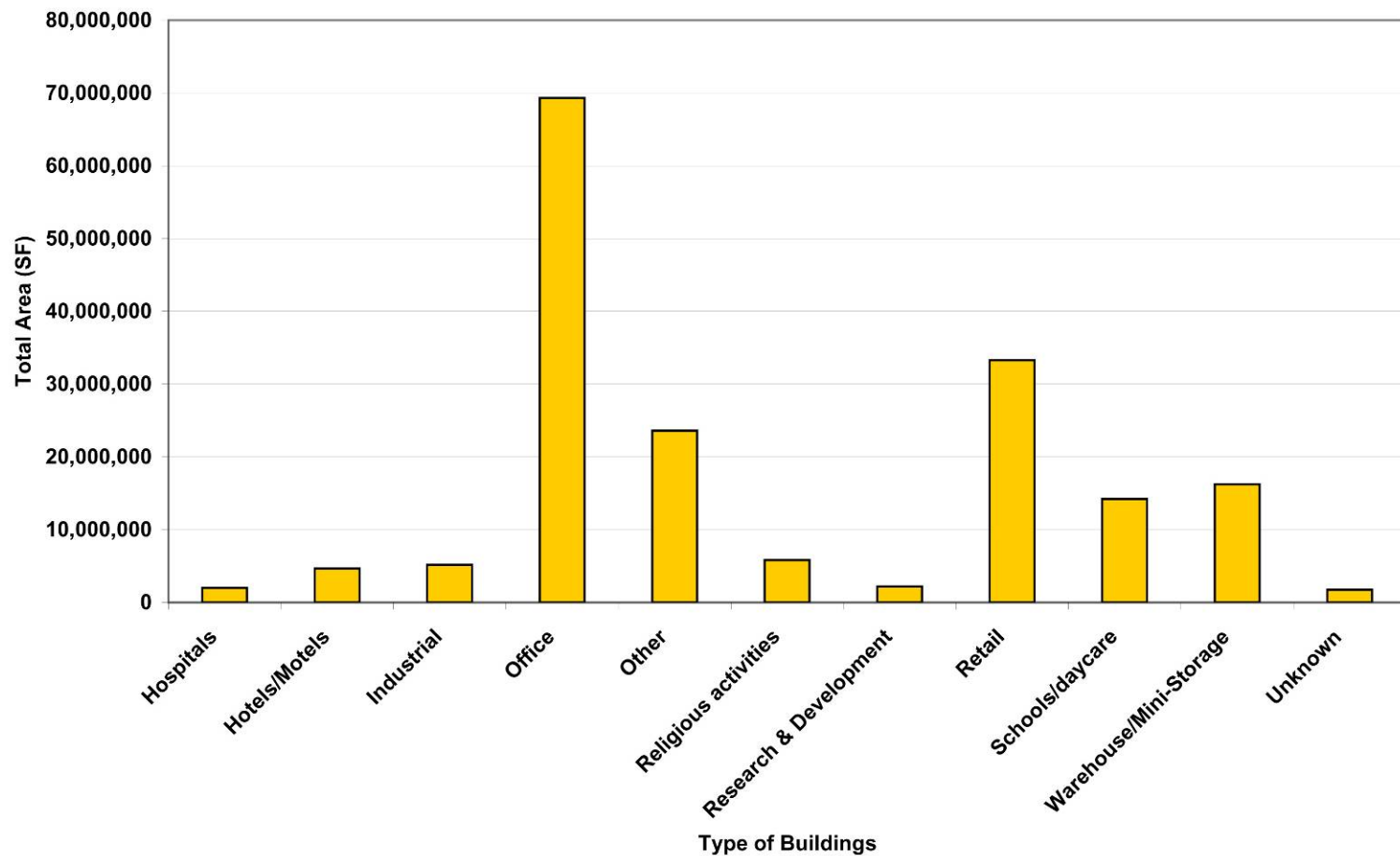




Montgomery County

Existing Stock by Type

Montgomery County, Maryland, Non-Residential Buildings by Type

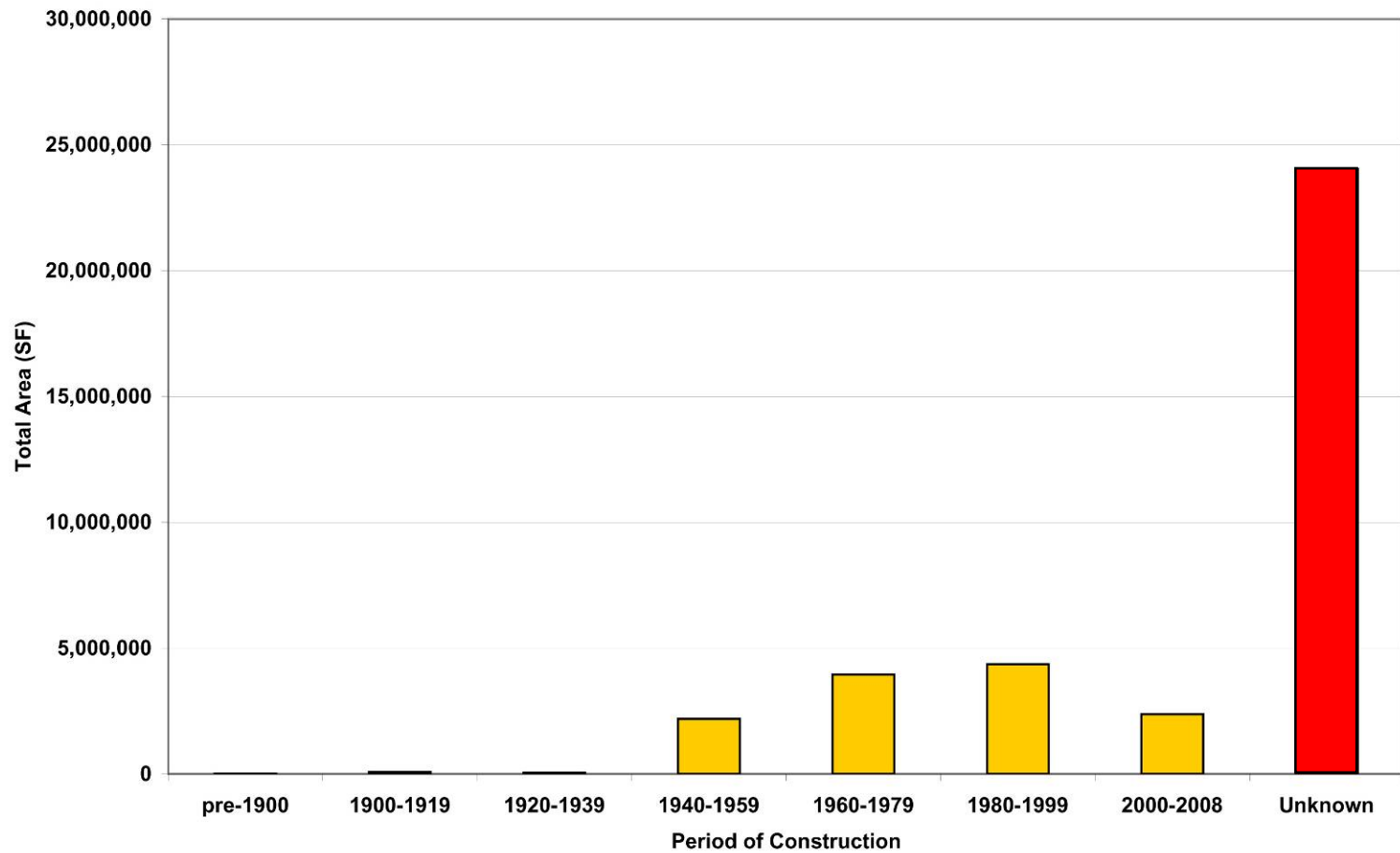




Montgomery County

Public Stock by Decade Constructed

Montgomery County, Maryland, Public Buildings

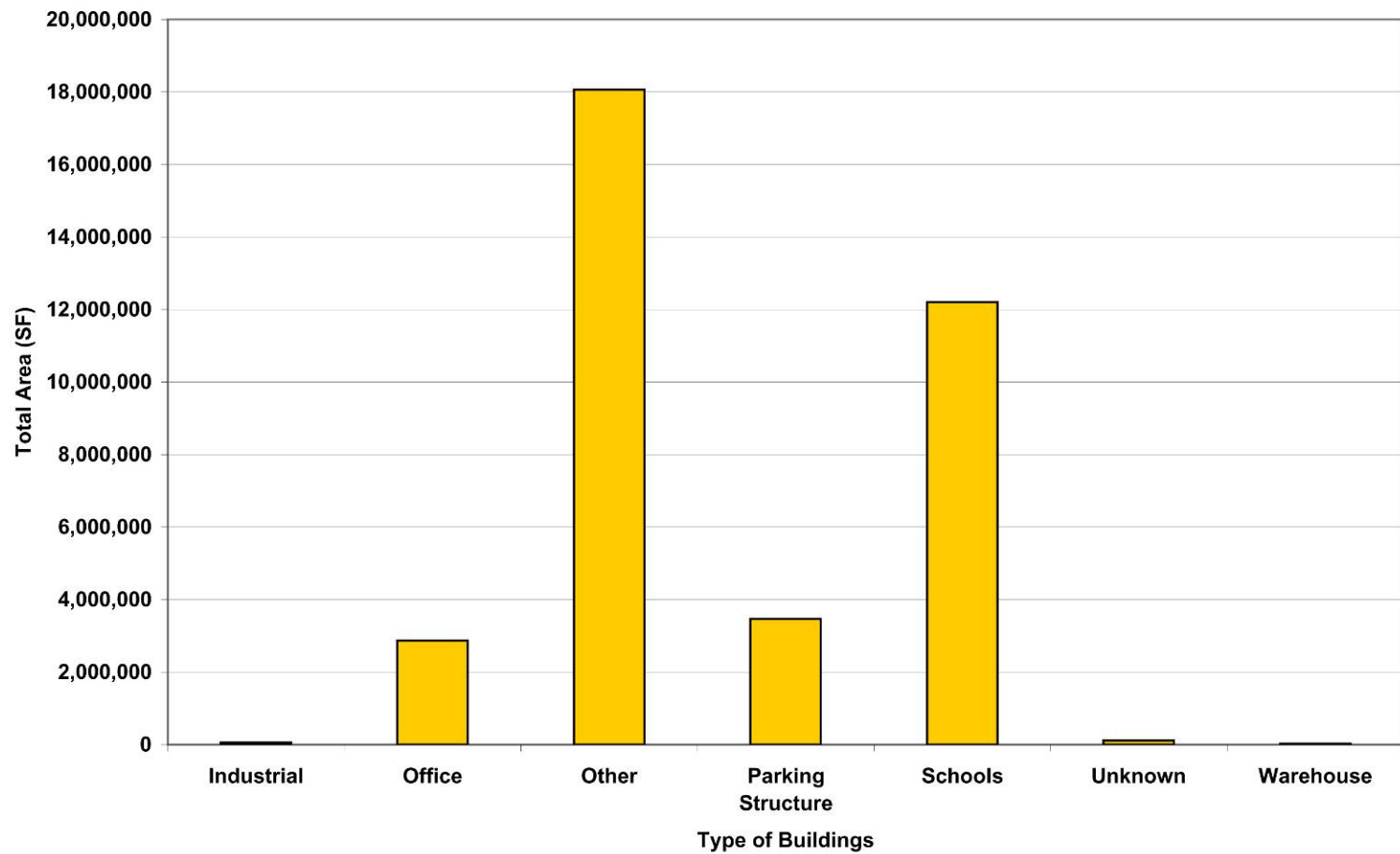




Montgomery County

Public Stock by Type

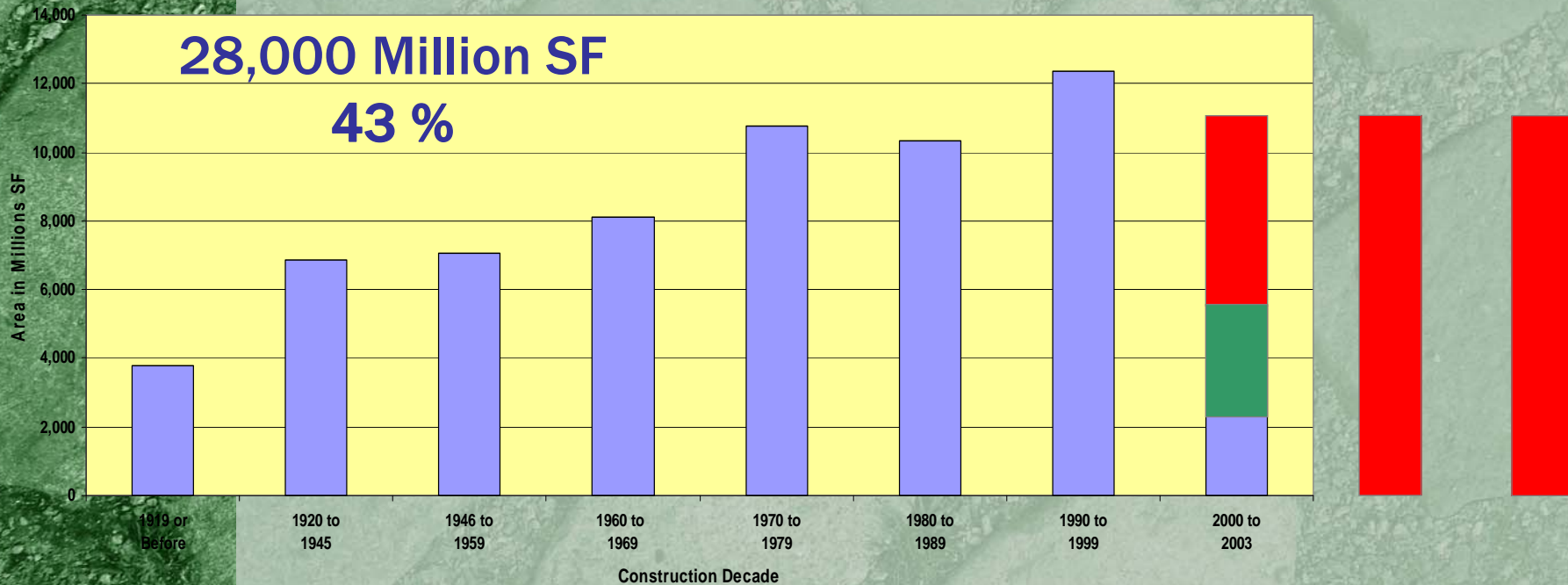
Montgomery County, Maryland, Public Buildings by Type





Projected Growth to 2030 New Building Construction

AREA: Non-Residential Buildings



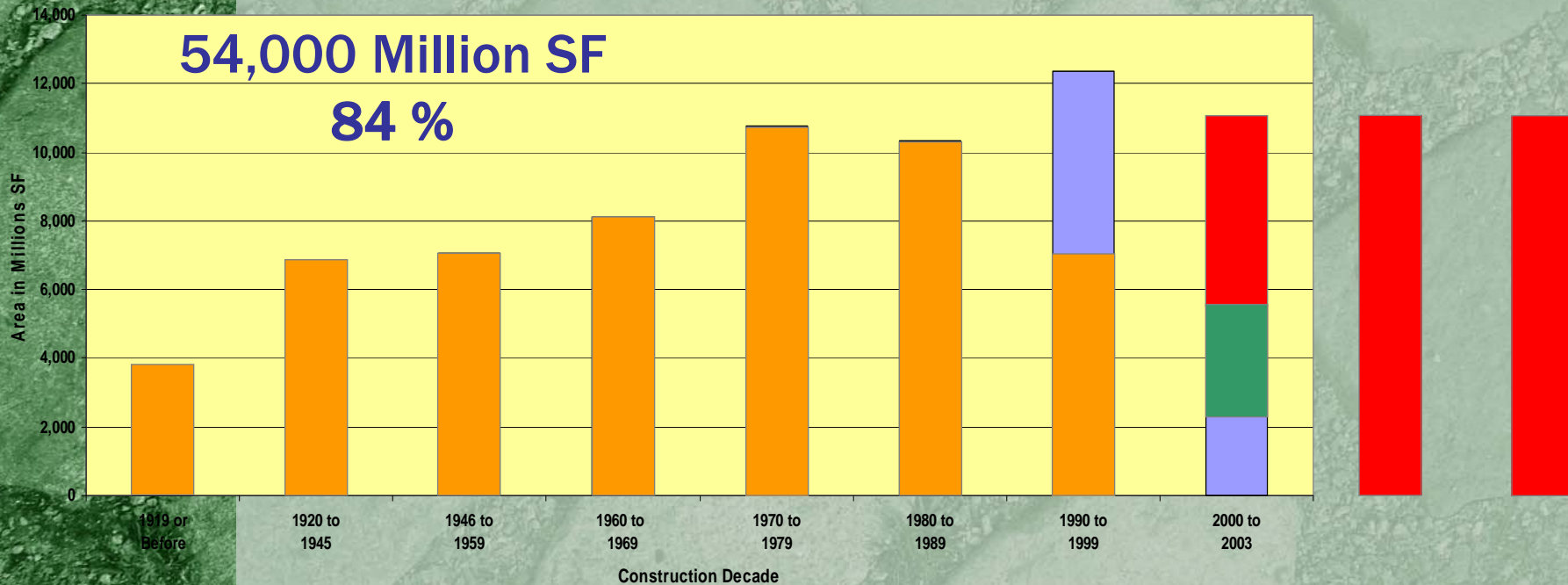
The Boom To Come – America Circa 2030
Architect Magazine, October 2006





Projected Growth to 2030 Renovation

AREA: Non-Residential Buildings



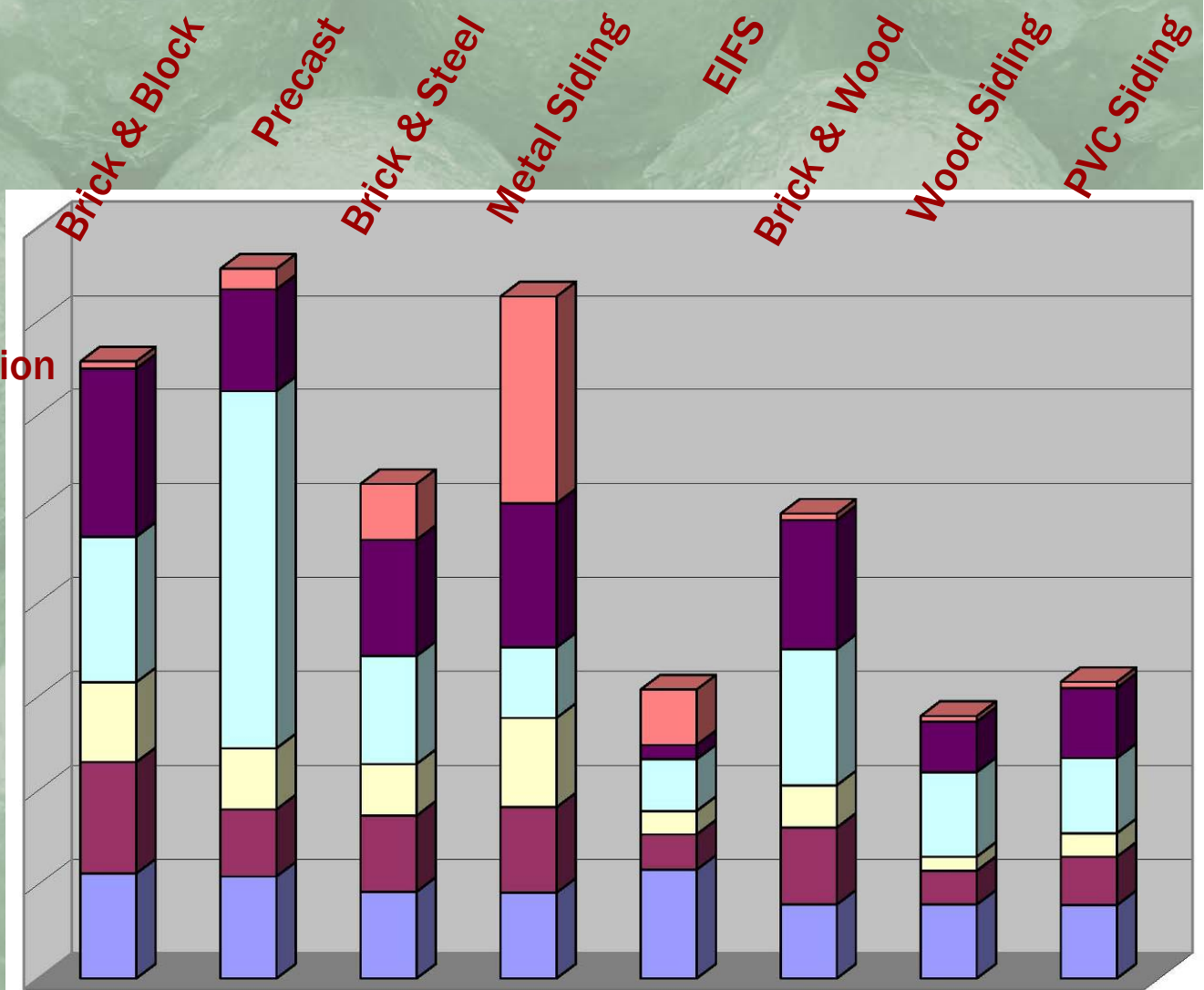
The Boom To Come – America Circa 2030
Architect Magazine, October 2006





Life Cycle Analysis

Environmental Impacts of Wall Assemblies



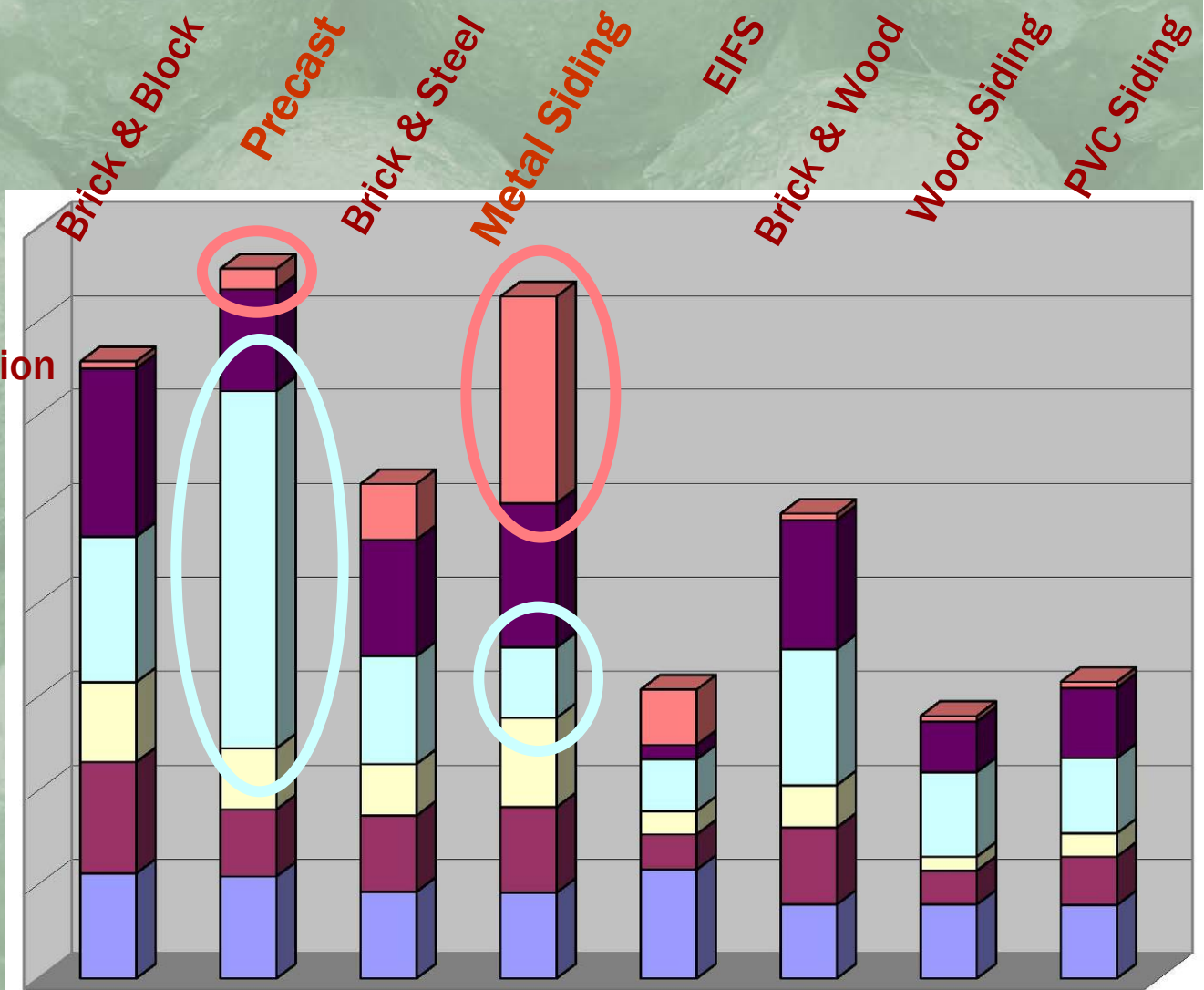
- Water Pollution
- Air Pollution
- Resources
- Climate
- Energy
- R Value





Life Cycle Analysis

Environmental Impacts of Wall Assemblies



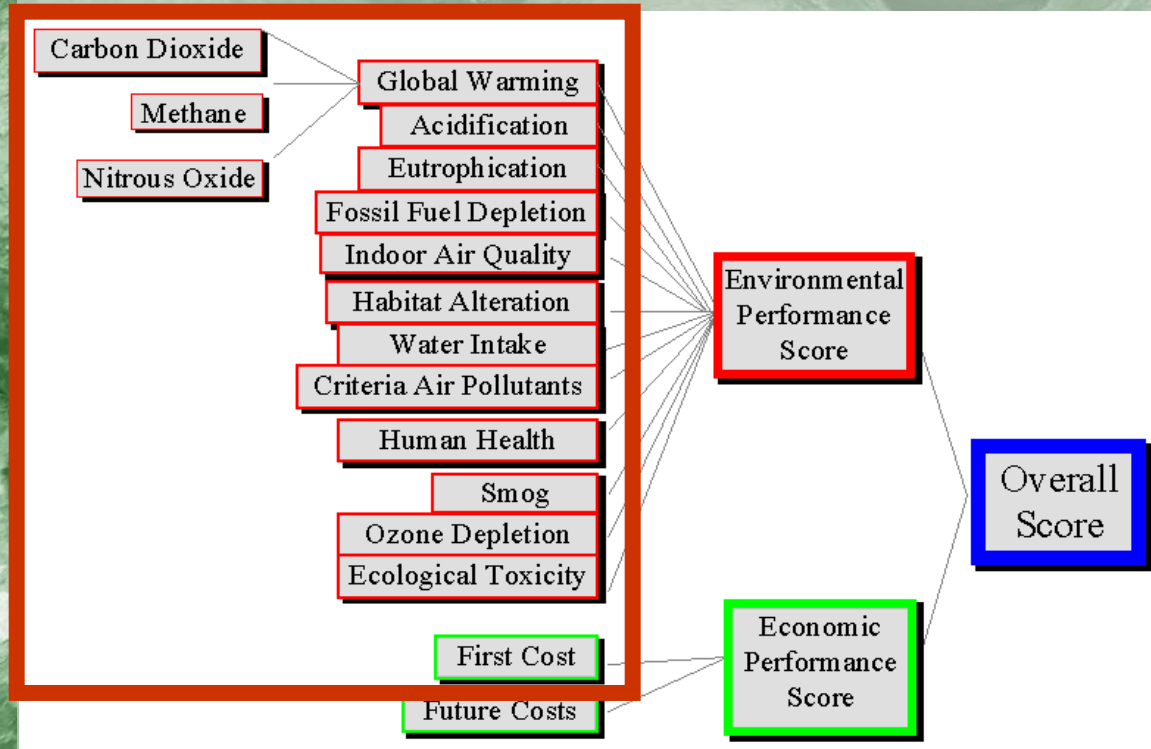
- Water Pollution
- Air Pollution
- Resources
- Climate
- Energy
- R Value





Life Cycle Analysis U.S. EPA & NIST BEES

Building for Economic and Environmental Sustainability



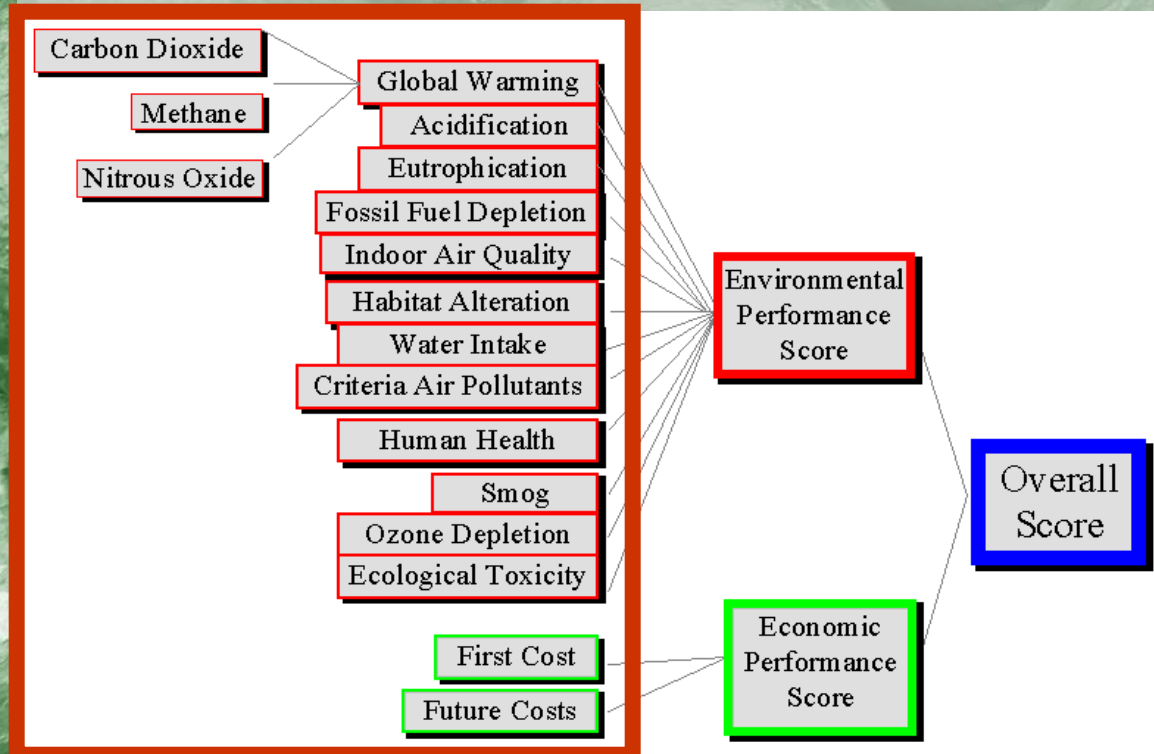
BEFORE USE
Extraction
Manufacture
Fabrication
Transportation
Construction





Life Cycle Analysis U.S. EPA & NIST BEES

Building for Economic and Environmental Sustainability



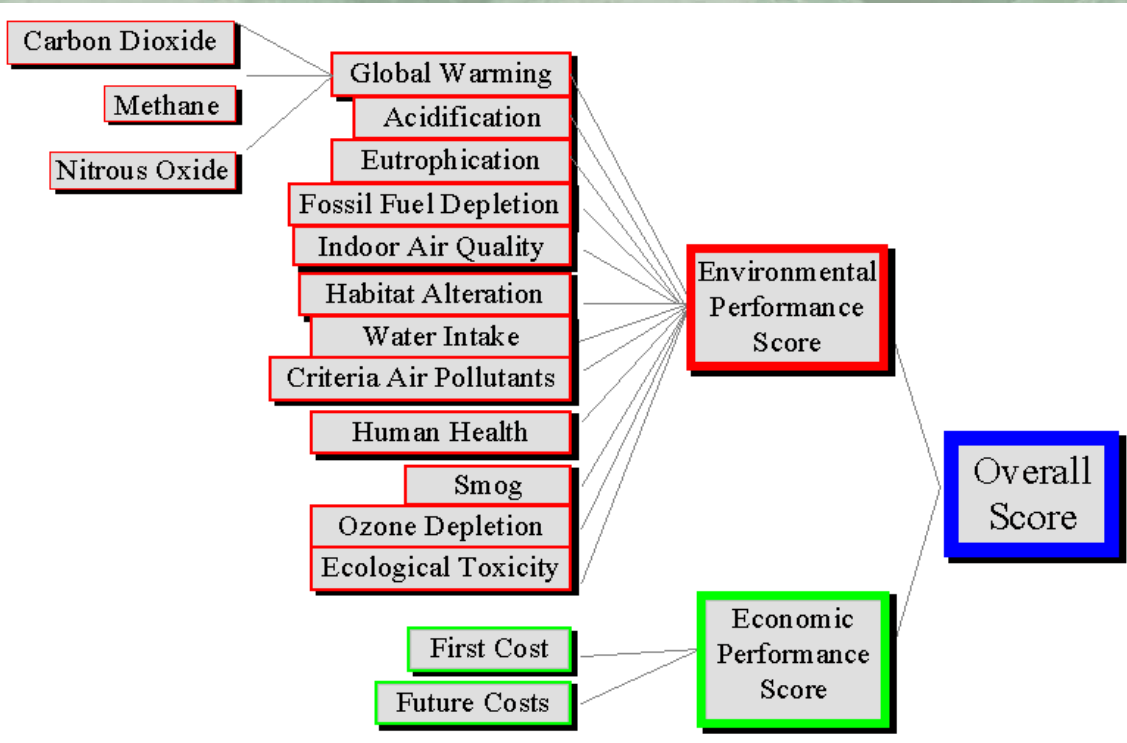
DURING USE
Operation
Maintenance





Life Cycle Analysis U.S. EPA & NIST BEES

Building for Economic and Environmental Sustainability



AFTER USE
Renewal
Removal
Re-use
Disposal





Life Cycle Impacts

Recapturing Environmental Impacts

Through Improved Performance





Life Cycle Impacts

Recapturing Environmental Impacts Through Improved Performance



Recaptures Energy in
3.5 years





Life Cycle Impacts

Recapturing Environmental Impacts Through Improved Performance

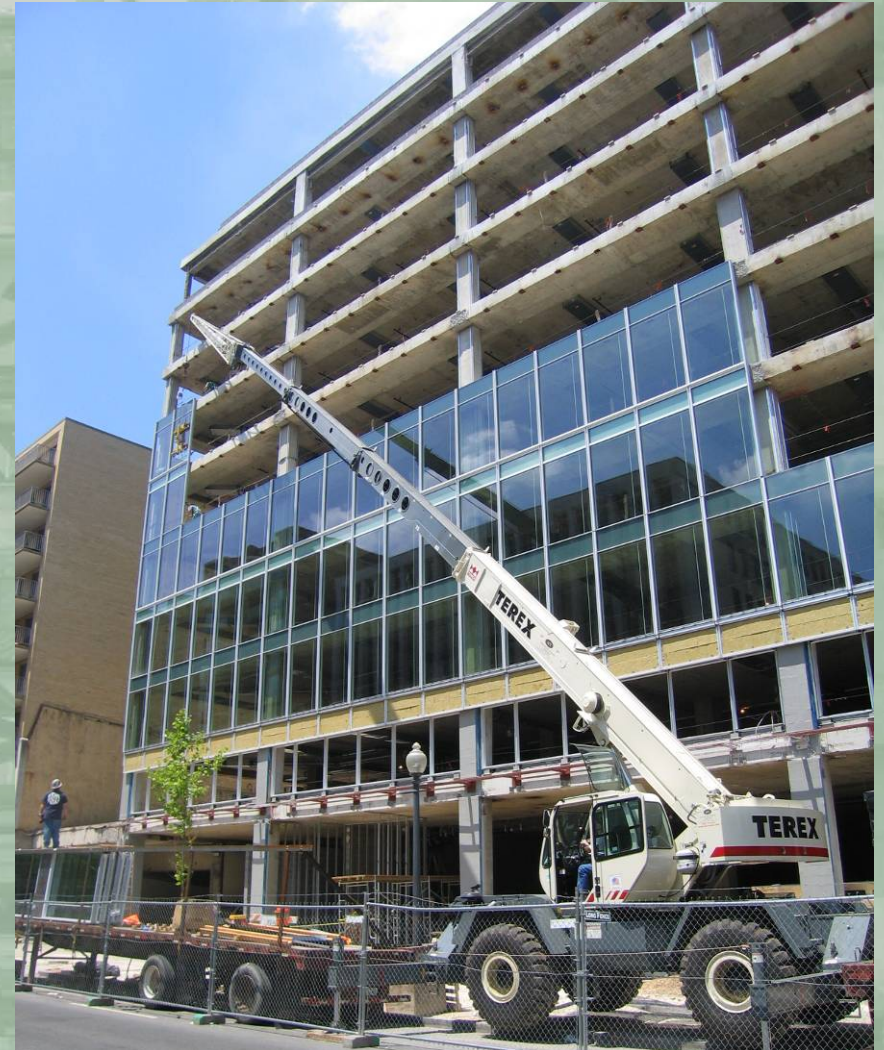


Recaptures Toxic Emissions in
22 years



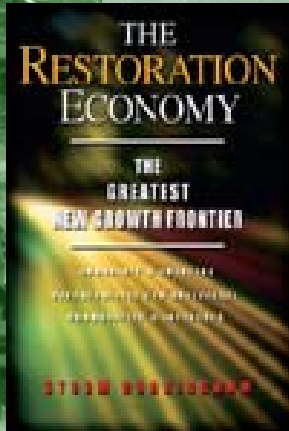


E-Valuating Existing Buildings





E-Valuating Existing Buildings Preservation Economics



Re-investment Driven
over \$1 trillion annually
over \$100 trillion inventory

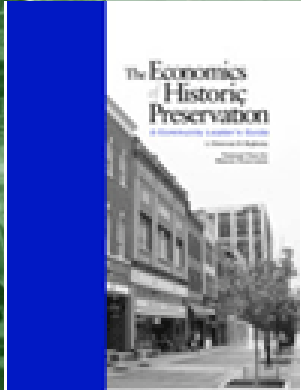
The Restoration Economy
The Greatest New Growth Frontier
Storm Cunningham
www.restorationeconomy.com





E-Valuating Existing Buildings

Preservation Economics



Minimal Material Expenditure

Minimal Energy Expenditure

Skill and Craft Intensive

Creates Good Jobs

Cycles Money Through Local Economy

The Economics of Historic Preservation

A Community Leaders Guide

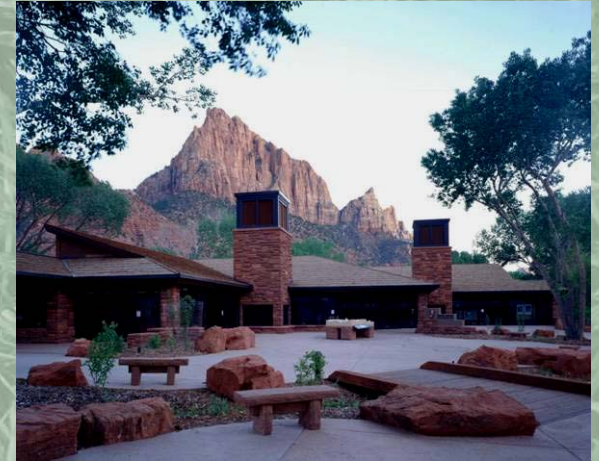
Donovan Rypkema

www.preservationbooks.org





The *Greenest* Building is ...





... One That is *Already* Built.

