GreenTools Government Confluence:
THE "UNCONFERENCE" FOR IMPLEMENTING CHANGE IN YOUR JURISDICTION.
CO-HOSTED BY CASCADIA REGION GREEN BUILDING COUNCIL

Session:
Fiscally Responsible CIPs: Return on Investment for Sustainable Buildings and Infrastructure Projects

Presenters:
Richard Gelb, King County
Stephane Larocque and Jeannie Renne-Malone, HDR
Steve Clem, Skanska

Date:
May 5, 2010

King County GreenTools Powered by the Solid Waste Division

CASCADIA REGION GREEN BUILDING COUNCIL

Assessing functional performance of infrastructure project alternatives – A challenging step on the road to fiscally responsible municipal capital project development

Richard Gelb, Performance Management Lead
King County Department of Natural Resources and Parks

King County GreenTools Powered by the Solid Waste Division

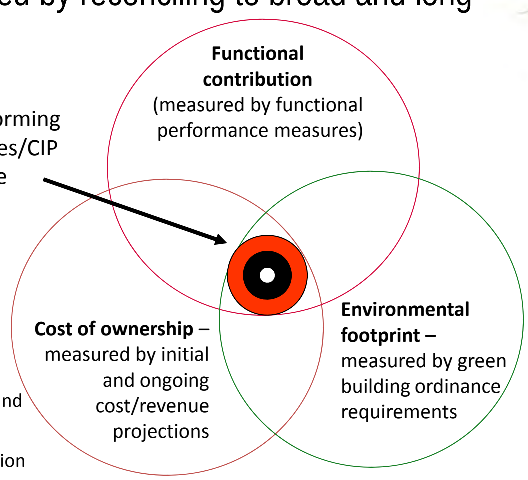
CASCADIA REGION GREEN BUILDING COUNCIL

Why is 'functional performance' important for infrastructure, but not (so much) for building projects?

- Buildings typically have a 'generic' function
- Infrastructure has 'specific' functions:
  - Conveying, storing, and/or treating stormwater, wastewater, floodwaters
  - Moving vehicles, goods, people, bicyclists, strollers
  - Receiving and disposing of solid/hazardous waste
  - Provision of habitat/ecosystem process support
- Credible infrastructure cost/benefit comparisons require an understanding of normalized functional performance
- Individual projects are often pieces of complex systems, not stand alone

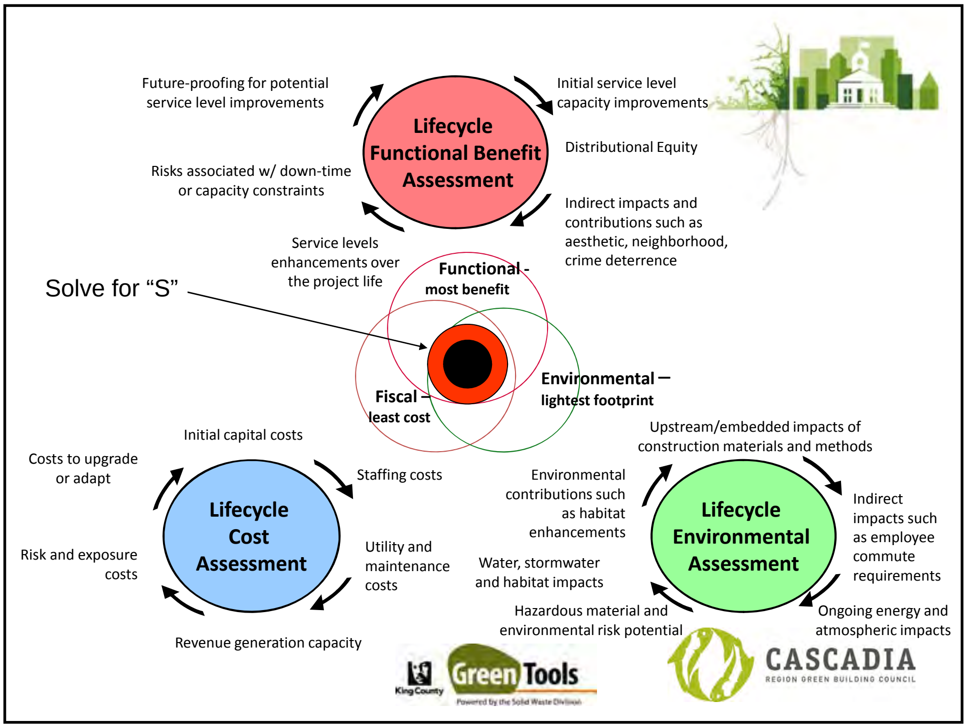
Highest-performing capital programs and projects are developed by reconciling to broad and long objectives:

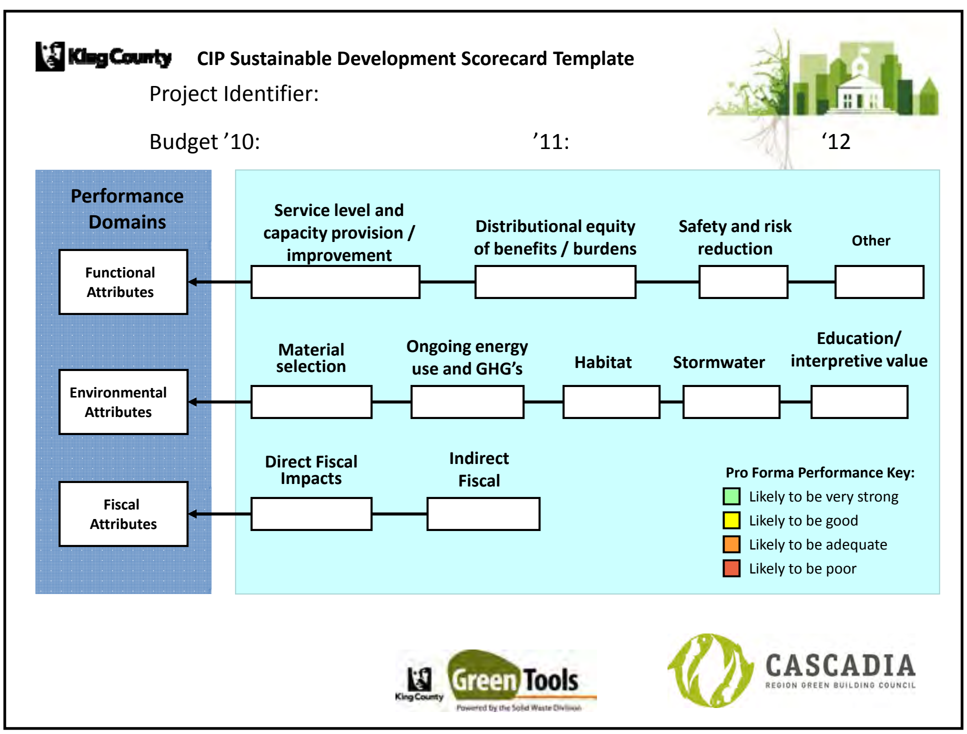
Highest performing infrastructures/CIP are here

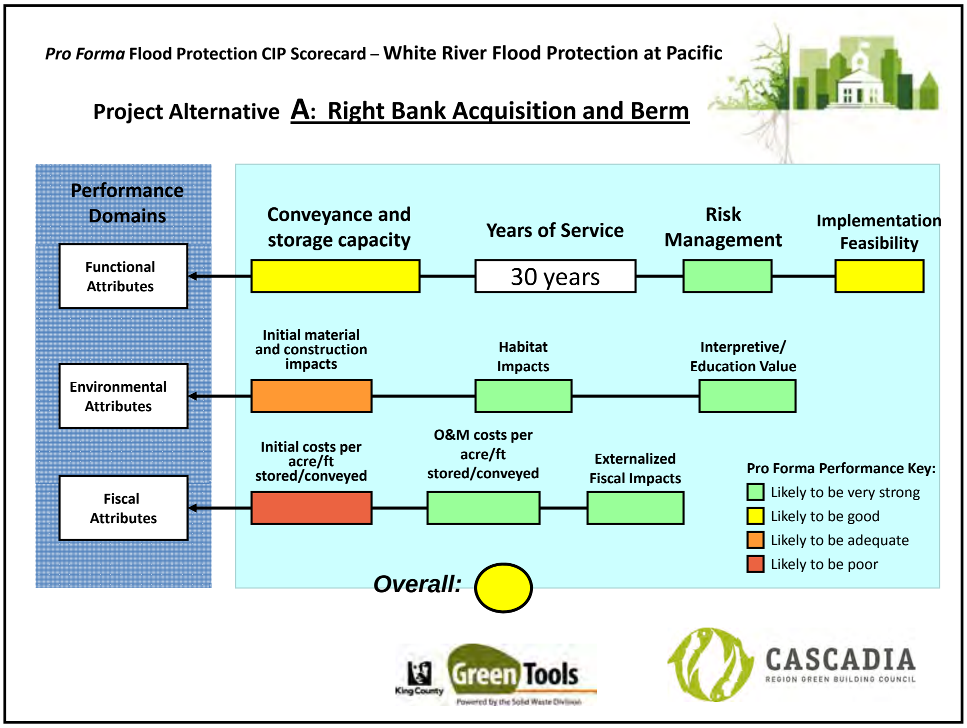


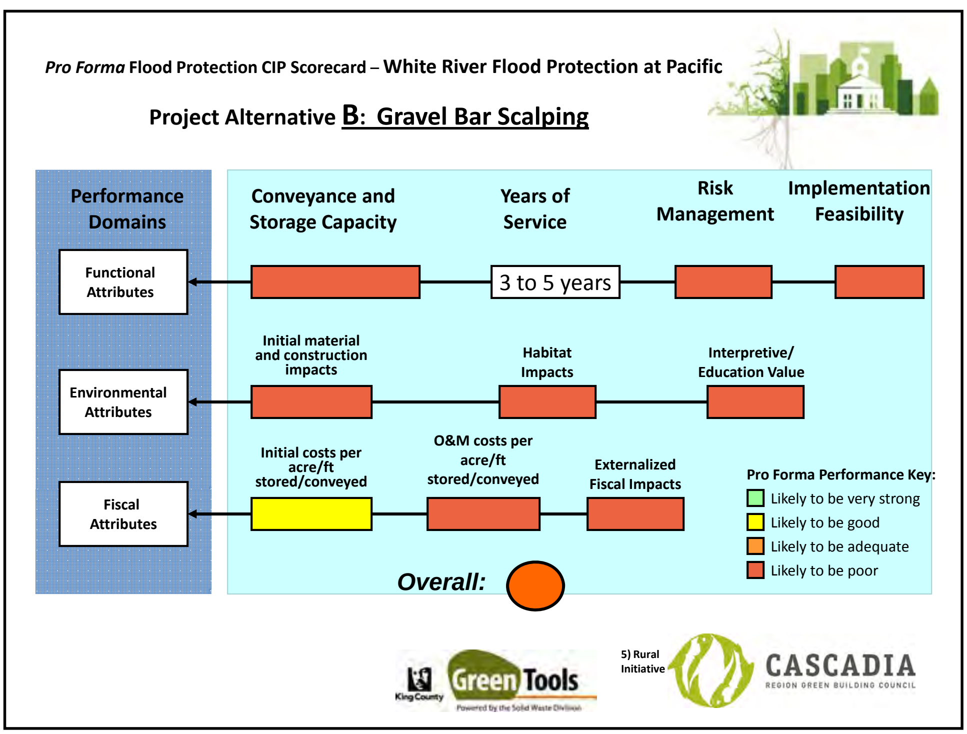
- Cost of project development
- Cost to operate and maintain
- Revenue generation capacities

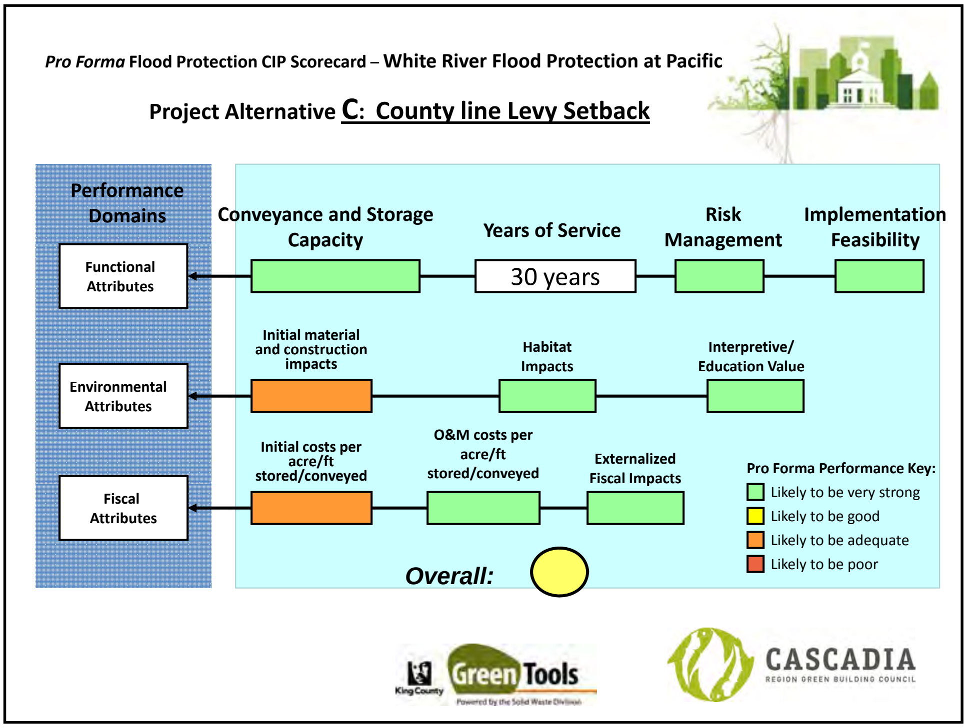
- GHG reductions
- Renewable energy / energy efficiency
- Green materials
- Renewable resources
- Habitat value
- Interpretive value

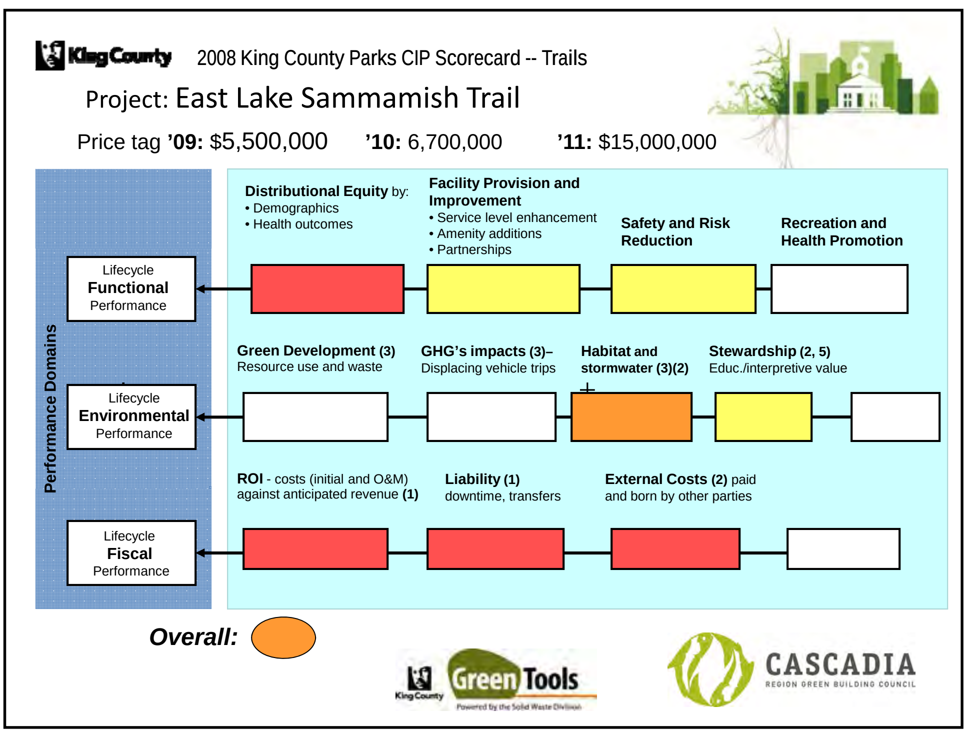

Future-proofing for potential service level improvements
Initial service level capacity improvements
Lifecycle Functional Benefit Assessment
Distributional Equity
Risks associated w/ down-time or capacity constraints
Indirect impacts and contributions such as aesthetic, neighborhood, crime deterrence
Service levels enhancements over the project life
Functional - most benefit
Solve for "S"
Environmental – lightest footprint
Fiscal – least cost
Initial capital costs
Upstream/embedded impacts of construction materials and methods
Costs to upgrade or adapt
Staffing costs
Environmental contributions such as habitat enhancements
Lifecycle Cost Assessment
Lifecycle Environmental Assessment
Indirect impacts such as employee commute requirements
Risk and exposure costs
Utility and maintenance costs
Water, stormwater and habitat impacts
Hazardous material and environmental risk potential
Ongoing energy and atmospheric impacts
Revenue generation capacity
King County
Green Tools
CASCADIA
REGION GREEN BUILDING COUNCIL

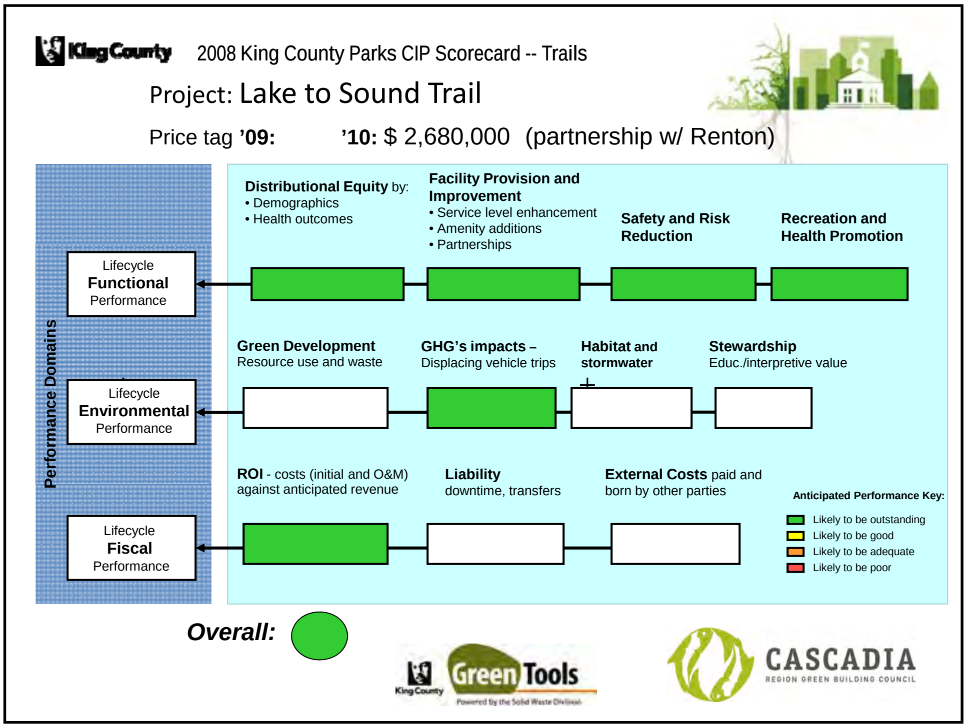

King County
CIP Sustainable Development Scorecard Template
Project Identifier:
Budget '10:
'11:
'12
Performance Domains
Functional Attributes
Environmental Attributes
Fiscal Attributes
Service level and capacity provision / improvement
Distributional equity of benefits / burdens
Safety and risk reduction
Other
Material selection
Ongoing energy use and GHG's
Habitat
Stormwater
Education/ interpretive value
Direct Fiscal Impacts
Indirect Fiscal
Pro Forma Performance Key:
Likely to be very strong
Likely to be good
Likely to be adequate
Likely to be poor
Green Tools
CASCADIA
REGION GREEN BUILDING COUNCIL

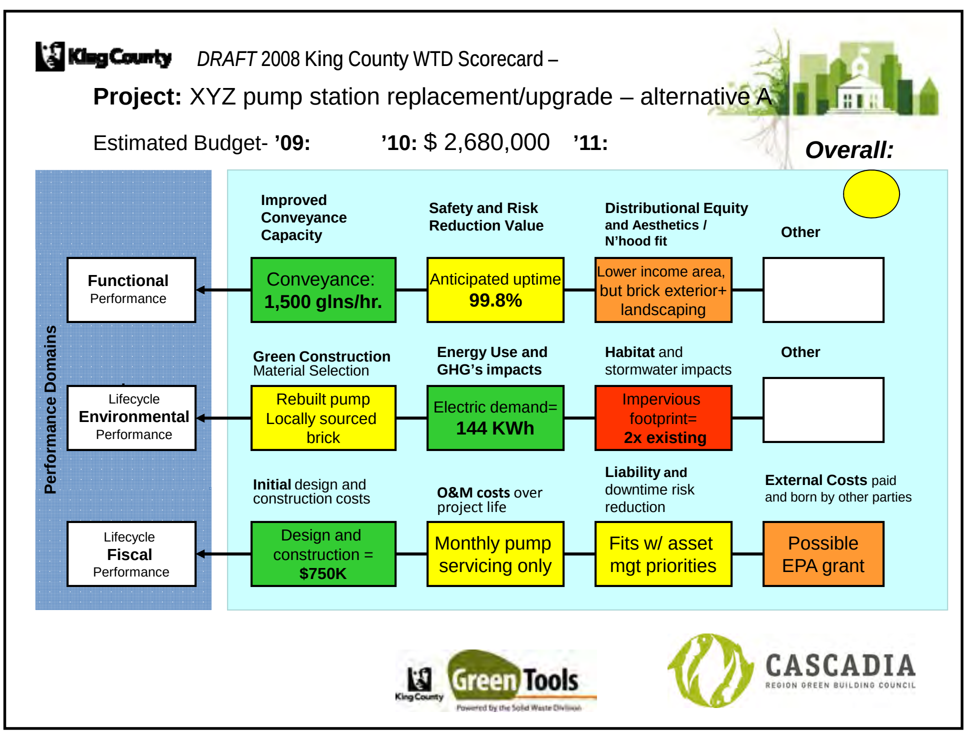

Pro Forma Flood Protection CIP Scorecard – White River Flood Protection at Pacific
Project Alternative A: Right Bank Acquisition and Berm
Performance Domains
Functional Attributes
Environmental Attributes
Fiscal Attributes
Conveyance and storage capacity
Years of Service
30 years
Risk Management
Implementation Feasibility
Initial material and construction impacts
Habitat Impacts
Interpretive/ Education Value
Initial costs per acre/ft stored/conveyed
O&M costs per acre/ft stored/conveyed
Externalized Fiscal Impacts
Pro Forma Performance Key:
Likely to be very strong
Likely to be good
Likely to be adequate
Likely to be poor
Overall:
King County
Green Tools
CASCADIA
REGION GREEN BUILDING COUNCIL


Pro Forma Flood Protection CIP Scorecard – White River Flood Protection at Pacific
Project Alternative B: Gravel Bar Scalping
Performance Domains
Functional Attributes
Environmental Attributes
Fiscal Attributes
Conveyance and Storage Capacity
Years of Service
3 to 5 years
Risk Management
Implementation Feasibility
Initial material and construction impacts
Habitat Impacts
Interpretive/ Education Value
Initial costs per acre/ft stored/conveyed
O&M costs per acre/ft stored/conveyed
Externalized Fiscal Impacts
Pro Forma Performance Key:
Likely to be very strong
Likely to be good
Likely to be adequate
Likely to be poor
Overall:
5) Rural Initiative
King County
Green Tools
CASCADIA
REGION GREEN BUILDING COUNCIL


Pro Forma Flood Protection CIP Scorecard – White River Flood Protection at Pacific
Project Alternative C: County line Levy Setback
Performance Domains
Functional Attributes
Conveyance and Storage Capacity
Years of Service
30 years
Risk Management
Implementation Feasibility
Environmental Attributes
Initial material and construction impacts
Habitat Impacts
Interpretive/ Education Value
Fiscal Attributes
Initial costs per acre/ft stored/conveyed
O&M costs per acre/ft stored/conveyed
Externalized Fiscal Impacts
Pro Forma Performance Key:
Likely to be very strong
Likely to be good
Likely to be adequate
Likely to be poor
Overall:
Green Tools
Powered by the Solid Waste Division
CASCADIA
REGION GREEN BUILDING COUNCIL


King County
2008 King County Parks CIP Scorecard -- Trails
Project: East Lake Sammamish Trail
Price tag '09: $5,500,000 '10: 6,700,000 '11: $15,000,000
Performance Domains
Lifecycle Functional Performance
Distributional Equity by:
• Demographics
• Health outcomes
Facility Provision and Improvement
• Service level enhancement
• Amenity additions
• Partnerships
Safety and Risk Reduction
Recreation and Health Promotion
Lifecycle Environmental Performance
Green Development (3)
Resource use and waste
GHG's impacts (3)–
Displacing vehicle trips
Habitat and stormwater (3)(2)
Stewardship (2, 5)
Educ./interpretive value
Lifecycle Fiscal Performance
ROI - costs (initial and O&M) against anticipated revenue (1)
Liability (1)
downtime, transfers
External Costs (2) paid and born by other parties
Overall:
Green Tools
Powered by the Solid Waste Division
CASCADIA
REGION GREEN BUILDING COUNCIL


King County
2008 King County Parks CIP Scorecard -- Trails
Project: Lake to Sound Trail
Price tag '09: '10: $ 2,680,000 (partnership w/ Renton)
Performance Domains
Lifecycle Functional Performance
Distributional Equity by:
• Demographics
• Health outcomes
Facility Provision and Improvement
• Service level enhancement
• Amenity additions
• Partnerships
Safety and Risk Reduction
Recreation and Health Promotion
Lifecycle Environmental Performance
Green Development
Resource use and waste
GHG's impacts –
Displacing vehicle trips
Habitat and stormwater
Stewardship
Educ./interpretive value
Lifecycle Fiscal Performance
ROI - costs (initial and O&M) against anticipated revenue
Liability
downtime, transfers
External Costs paid and born by other parties
Anticipated Performance Key:
Likely to be outstanding
Likely to be good
Likely to be adequate
Likely to be poor
Overall:
Green Tools
CASCADIA
REGION GREEN BUILDING COUNCIL


King County
DRAFT 2008 King County WTD Scorecard –
Project: XYZ pump station replacement/upgrade – alternative A
Estimated Budget- '09: '10: $ 2,680,000 '11:
Overall:
Performance Domains
Functional Performance
Improved Conveyance Capacity
Conveyance: 1,500 glns/hr.
Safety and Risk Reduction Value
Anticipated uptime 99.8%
Distributional Equity and Aesthetics / N'hood fit
Lower income area, but brick exterior+ landscaping
Other
Lifecycle Environmental Performance
Green Construction Material Selection
Rebuilt pump Locally sourced brick
Energy Use and GHG's impacts
Electric demand= 144 KWh
Habitat and stormwater impacts
Impervious footprint= 2x existing
Other
Lifecycle Fiscal Performance
Initial design and construction costs
Design and construction = $750K
O&M costs over project life
Monthly pump servicing only
Liability and downtime risk reduction
Fits w/ asset mgt priorities
External Costs paid and born by other parties
Possible EPA grant
Green Tools
CASCADIA
REGION GREEN BUILDING COUNCIL

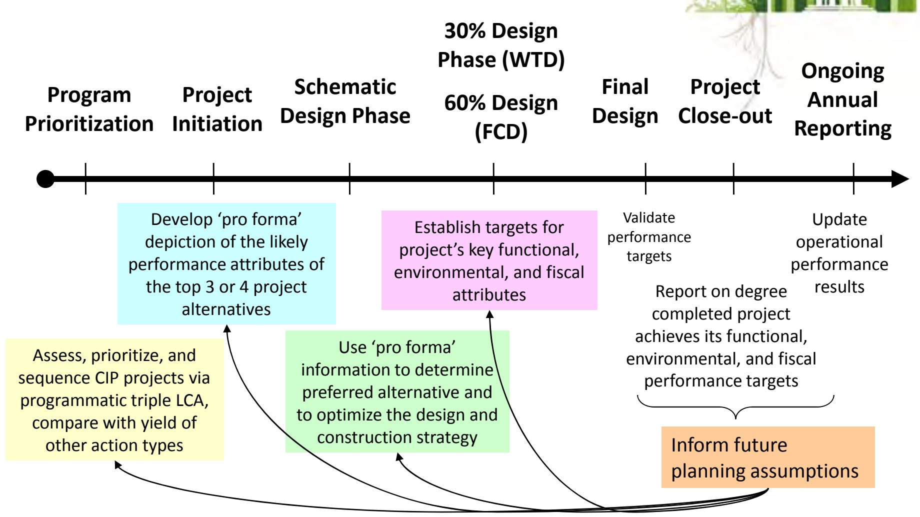
Functional Performance Taxonomy for Wastewater Treatment Division

- Major Capital Projects:
  - Treatment
    - Capacity increase
    - Effluent quality improvement
  - Conveyance
    - Pump station capacity increase
    - Pipeline capacity increase
    - Storage capacity increase
- Asset Management Projects
  - Extend pipe life – reline/replace/coat
  - Process improvements (treatment capacity, effluent quality, reliability)
- Resource Recovery Projects:
  - Reclaimed water volume increase
  - Biosolids production increase
  - Biogas utilization increase

King County GreenTools Powered by the Solid Waste Division

CASCADIA REGION GREEN BUILDING COUNCIL

CIP performance management flowchart



King County GreenTools Powered by the Solid Waste Division

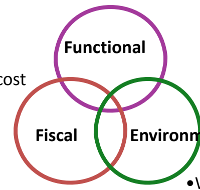
CASCADIA REGION GREEN BUILDING COUNCIL

Aligning CIP goals/measures to organizational goals/measures

- Capacity to convey, store flood, storm, & wastewater
- Capacity to treat stormwater and wastewater
- Capacity to safely transfer and dispose of solid waste
- Service level provision: trails, parks, facilities, haz-waste management

→

- Convey, store floodwater, stormwater, wastewater
- Treat stormwater and wastewater
- Trail, park and recreation facility provision
- Safe transfer and disposal of solid waste
- Foster stewardship in households and businesses



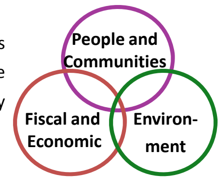
- Initial project cost
- Cost of O&M
- Revenue contributions
- Cost to others

- Energy
- GHGs
- Green materials

- Waste avoidance
- Habitat
- Water quality

CIP performance measures

→



- Rate and fees
- Revenue
- Efficiency

- Energy
- GHGs
- Green materials
- Waste avoidance
- Habitat
- Water quality

DNRP goals and performance measures

Thank you !

King County Green Building and Sustainable Development **Ordinance Requirements**

- LEED Gold for eligible buildings
- Non-LEED eligible buildings and infrastructure projects will optimize functional, fiscal and environmental attributes
- For projects over $750K, use sustainable development scorecard to:
  - consider alternatives
  - establish performance targets, and
  - account for results

Definitions in Ordinance

- Sustainable infrastructures are designed, constructed and operated to optimize fiscal, environmental, and functional performance for the lifecycle of the facility.

- Sustainability performance of infrastructure will be determined through an integrated assessment – one that accounts for fiscal, environmental, and functional costs and benefits, over the life of the facility.

SROI
Sustainable Return on Investment

Evaluating Projects Considering the Complete Triple-Bottom Line

Jeannie Renne-Malone, LEED AP– Nat'l Director, Climate/GHG, HDR Inc.

Stephane Larocque – Principal Economist, HDR Inc.

Green Tools Government Confluence

May 5, 2010

HDR

Presentation Topics

- Transformative Steps
- Planning to Maximize Benefits
- Measuring Green Costs and Benefits with SROI
- Transparency and Making a Green Business Case

2

HDR

About HDR

- **Architecture**
- **Engineering**
  - Transportation
  - Water/Wastewater
  - Power & Environmental

- Headquarters: Omaha, NE
- 174 Offices Worldwide
- >8000 Employees
- >300 Staff in Colorado

"Shaping the future through creative solutions and visionary leadership."

HDR

HDR Sustainability, Climate Change & GHG Management Services

Planning and Strategy

- **Sustainability Planning**
- **Climate Action Planning**
- **Climate Legislation Analysis**
- Carbon Trading Strategies
- Energy Management Planning
- Climate Adaptation Planning
- Flood Protection
- Long-range Impact Planning
- Energy Audits

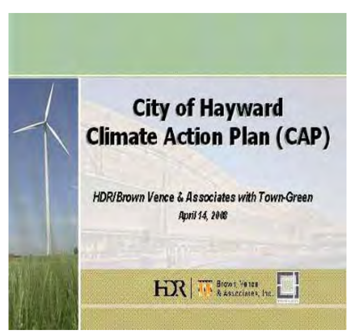
Tools and Management

- Organizational and Community Climate Awareness Tools
- **Greenhouse Gas (GHG) Monitoring, Accounting & Management**
- Carbon Assessment Planning Tool (CAPT) for Solid Waste Systems
- Addressing Climate Impacts in NEPA
- Voluntary Carbon Market Assistance
- Renewable Energy Projects
- Alternative Fuels Analysis
- Green Jobs Calculator

Return on Investment

Shades Of Green Risk Benefit Analysis

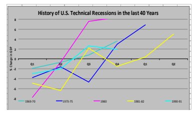
Sustainable Return on Investment



HDR

Sustainability – The Triple Bottom Line

1. **Does the Project Make Economic Sense?**



Economic Environment

2. **Does the Project Provide Social Benefit?**

Social Environment

3. **Does the Project Protect or Enhance the Environment?**

Natural Environment

HDR

Key Drivers to Assessing the Triple Bottom Line

Risks/Benefits

- Cost savings
  - Energy efficiency
- Social Responsibility
  - Corporate values and responsibility
  - Stakeholder expectations
- Reputation
  - Stakeholder expectations
  - Risk avoidance
  - Leadership rewards
  - Enhanced ability to foresee and influence future regulation

Policy and Funding Incentives

- American Recovery and Reinvestment Act (ARRA)
  - Energy Efficiency & Conservation Block Grant (EECBG) Program
  - Renewable Energy Incentives/ Tax Credits
- Regulated and Voluntary Carbon Markets
  - $126 billion in 2008; $150+ billion in 2009; $1.2T by 2020
- Regional Carbon Trading Programs & Registries
  - Western Climate Initiative
  - Regional Greenhouse Gas Initiative
  - Midwestern Regional GHG Reduction Accord
  - Climate Action Reserve
  - Chicago Climate Exchange

HDR

Examples of Legislation and Initiatives

Focused on Monitoring, Reducing and Reporting Sustainability Metrics

Federal

- EPA Mandatory GHG Reporting Rule
- American Clean Energy & Security Act of 2009 (House Version)
- Clean Energy Jobs and American Power Act (Senate Version)
- US Mayors Climate Initiative
- Executive Order 13514

State of Washington

- WA Proposed GHG Reporting Rule
- Climate Change Framework (e.g. VMT Reduction Targets)
- Reducing GHG Pollution in Buildings
- Clan Energy Leadership Initiatives
- Enhancing Energy Efficiency
- Reducing Climate Pollution through Land-Use Planning
- Green Jobs and Climate Acton
- Climate Change Mitigation Act
- Energy Independence Act

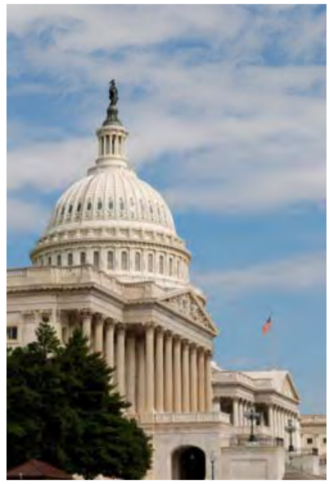
7

Executive Order 13514 - Federal Leadership in Environmental, Energy, and Economic Performance

- **Requires Federal agencies to set a 2020 GHG emissions reduction target within 90 days and addresses:**
  - 30% reduction in vehicle fleet petroleum use by 2020;
  - 26% improvement in water efficiency by 2020;
  - 50% recycling and waste diversion by 2015;
  - 95% of all applicable contracts will meet sustainability requirements;
  - Implementation of the 2030 net-zero-energy building requirement
- **Requires integrated Strategic Sustainability Performance Plan**
  - Prioritizes actions based on lifecycle return on investments
  - Annual performance evaluation
- **Requires a methodology to measure effectiveness of projects and programs**

8

Increasing Emphasis on Leverage and Legacy Outcomes



Desire to Stretch Federal Dollars

Attract Additional Funding

- Federal
- State
- Local
- Private Capital

Future Funding Driven by <u>Results</u>

9

HDR

Measuring Green Costs & Benefits with SROI

HDR

Making Sustainable Decisions

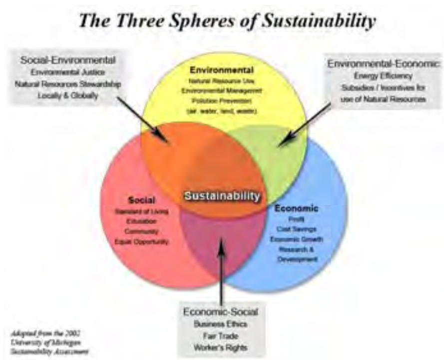
Definition of Sustainability:

"Development that meets the needs of the present without compromising the ability of future generations to meet their own needs"

The World Commission on Environment and Development, 1987 (Brundtland Commission)

Traditional models such as Life-Cycle Cost Analysis (LCCA) often fall short:

- Only consider cash impacts
- Lack transparency
- Do not account for uncertainty



11

Life-Cycle Cost Analysis (LCCA)

Life-Cycle Cost Analysis involves the analysis of the costs of a system or a component over its entire life span

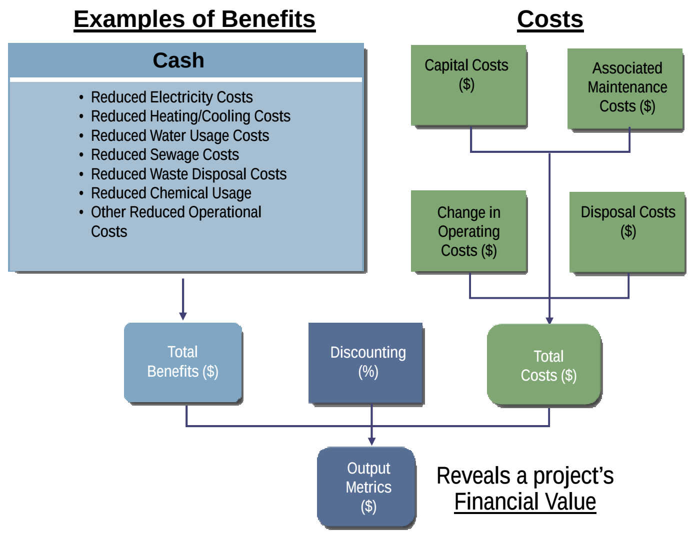
- The Three Main Components Include:
  1. Acquisition Costs
  2. Operations & Maintenance Costs
     - Cost of Failure
     - Cost of Repair
     - Cost for Spare
     - Downtime Cost
     - Loss of Production
  3. Disposal Costs

The Life-Cycle Cost (LCC) of an asset is defined as:

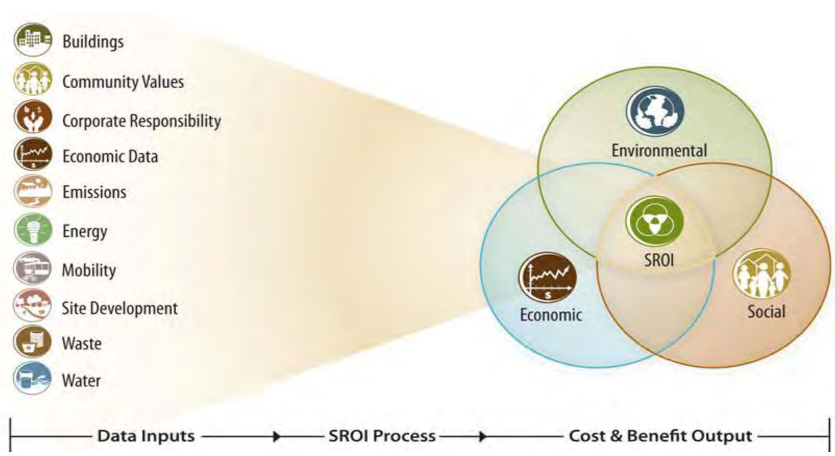
" the total cost throughout its life including planning, design, acquisition and support costs and any other costs directly attributable to owning or using the asset"

12

Traditional LCCA Flow Diagram



SROI = Calculating The Triple Bottom Line



What is The SROI Process?

It's a comprehensive Cost-Benefit Analysis study over a project's entire life-cycle

Augmented by:

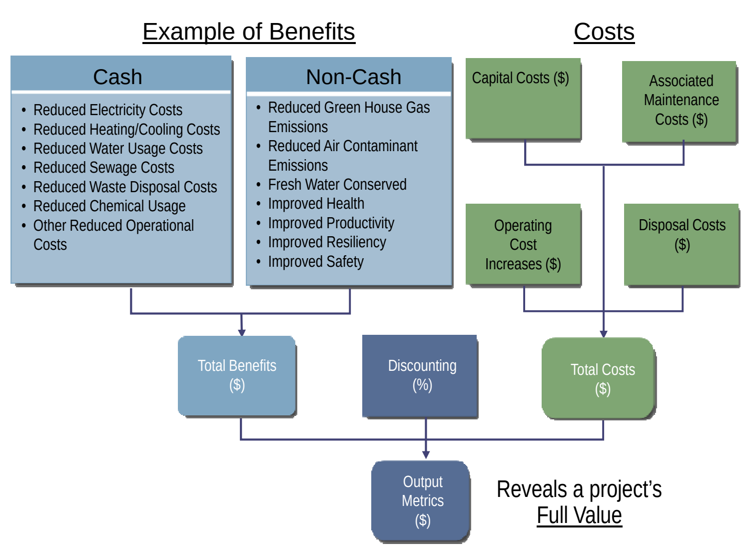
- Accounting for uncertainty using state-of-the-art risk analysis techniques
- Engaging stakeholders directly in the process and generating transparency and consensus
- The SROI process can also incorporate Economic Impact Assessment to calculate jobs created, tax impacts, etc.

Facilitates decision making by answering questions like:

- What is the full true value of each alternative?
- Which alternatives are viable or have the best payoff?
- What's the probability of achieving a positive payoff?

15

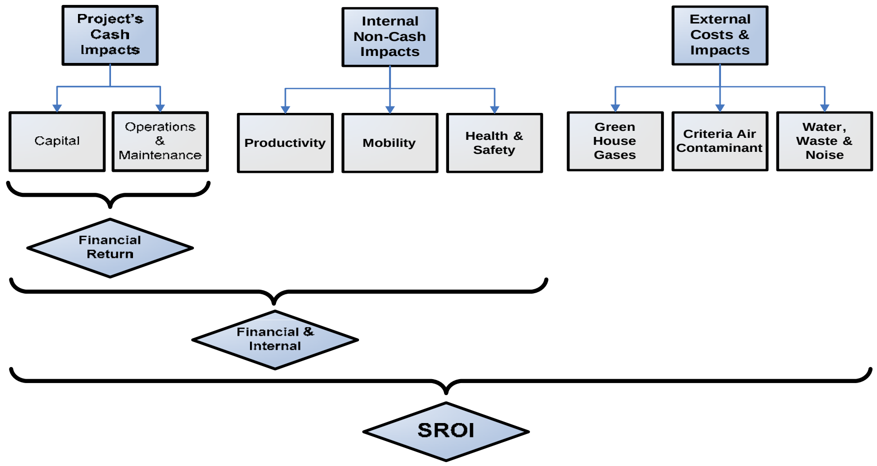
SROI Flow Diagram



16

Sustainable Return on Investment

•SROI adds to traditional financial analysis the monetized value of non-cash benefits and externalities



17

Decision Metrics

From Both a Financial & SROI Perspective

Net Present Value (NPV): The net value of an investment, calculated as benefits less costs, with both expressed in present-value monetary terms (PV of Benefits – PV Costs)

Return on Investment (ROI): The arithmetic average rate of return per year on capital invested

Discounted Payback Period (DPP): The period of time required for the discounted return on an investment to recover the sum of the original investment

Internal Rate of Return (IRR): The discount rate at which the net present value of a project would be zero

Benefit to Cost Ratio (BCR): The overall "value for money" of a project, expressed as the ratio of the benefits of a project relative to its costs, with both expressed in present-value monetary terms (PV Benefits / PV Costs)

18

SROI Methodology

A Four Step Process

"**SROI** reveals the **hidden value** in projects."

David Lewis, PhD
HDR National Director, Economics & Finance

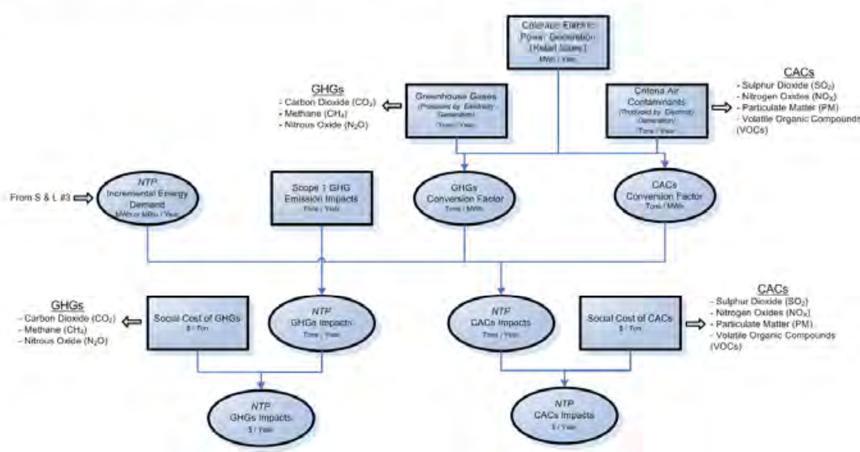
HDR

19

SROI Methodology – Step 1

Structure and Logic Diagrams

S&L #4: Social Value of Greenhouse Gases (GHGs) & Criteria Air Contaminants (CACs) Impacts



HDR

20

SROI Methodology – Step 2

Quantify Input Data Assumptions

Quantify Input Data Distributions

Data Sources

- Architects & Engineers
- Meta-analysis of third party research & data
- Financial & insurance markets
- Contingent valuation i.e. willingness to pay surveys
- Bayesian analysis/expert opinion

Colorado Electric Power Generation (Year 2005) -- Total (All Plants)			
Category	**Metrics**	**Median**	**Comment**
Plant annual net generation	MWh	49,632,186	EPA: eGRID2007 Version 1.0 Plant File (Year 2005 Data)
Plant annual total nonrenewable net generation	MWh	47,528,394	EPA: eGRID2007 Version 1.0 Plant File (Year 2005 Data)
Plant annual total renewable net generation	MWh	2,103,792	EPA: eGRID2007 Version 1.0 Plant File (Year 2005 Data)
Plant annual hydro net generation	MWh	1,293,231	EPA: eGRID2007 Version 1.0 Plant File (Year 2005 Data)
Plant annual biomass net generation	MWh	34,327	EPA: eGRID2007 Version 1.0 Plant File (Year 2005 Data)
Plant annual wind net generation	MWh	776,234	EPA: eGRID2007 Version 1.0 Plant File (Year 2005 Data)
Plant annual solar net generation	MWh	0	EPA: eGRID2007 Version 1.0 Plant File (Year 2005 Data)
Plant annual geothermal net generation	MWh	0	EPA: eGRID2007 Version 1.0 Plant File (Year 2005 Data)
Total Retail Sales	MWh	48,353,236	Energy Information Administration (Year 2005)
Exported	MWh	1,198,342	Implied
Direct Use	MWh	80,608	Direct Use is commercial or industrial use of electricity that 1)
Plant annual net generation less Direct Use	MWh	49,551,578	Implied
Colorado Electric Power Generation - GHG and CAC --Total (All Plants) 2005			
Category	**Metrics**	**Median**	**Comment**
Plant annual NOx emissions	Tons	72,523	EPA: eGRID2007 Version 1.0 Plant File (Year 2005 Data)
Plant annual SO2 emissions	Tons	62,898	EPA: eGRID2007 Version 1.0 Plant File (Year 2005 Data)
Plant annual CO2 emissions	Tons	46,988,461	EPA: eGRID2007 Version 1.0 Plant File (Year 2005 Data)
Plant annual CH4 emissions	Tons	583	EPA: eGRID2007 Version 1.0 Plant File (Year 2005 Data)
Plant annual N2O emissions	Tons	726	EPA: eGRID2007 Version 1.0 Plant File (Year 2005 Data)
Plant annual PM2.5 emissions	Tons	5,441	EPA 2005 National Emissions Inventory. Tier Summaries.
Plant annual PM10 emissions	Tons	7,391	EPA 2005 National Emissions Inventory. Tier Summaries.
Plant annual VOC emissions	Tons	887	EPA 2005 National Emissions Inventory. Tier Summaries.

21

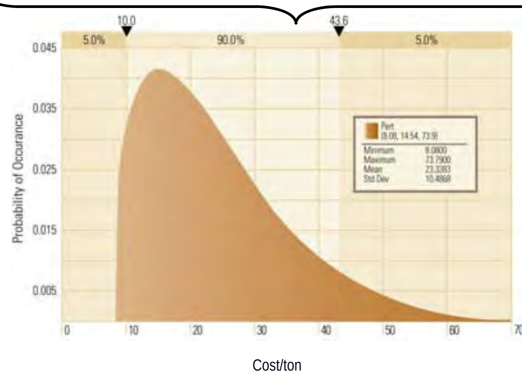
SROI Methodology – Step 2

Quantify Input Data Assumptions

Quantify Input Data Distributions

Example: Cost of CO_2 per Ton ($)

Median	Lower Limit	Upper Limit
$19.86	$8.08	$73.79



22

SROI Methodology – Step 2

Quantify Input Data Assumptions

Quantify Input Data Distributions

Example: Range of Values for CO2

- Median Value: We used the current market price as quoted on the European Climate Exchange based on the Cap and Trade system they have in place in Europe.
  - **As 17 Apr 2009 = $18.94 USD/ton**
- Low Value: We used **$8.08** USD/ton as calculated by William Nordhaus in his book A Question of Balance: Weighing the Options on Global Warming Policies, 2008
- High Value: We used **$73.79** USD/ton as calculated by Nicholas Stern in his book The Economics of Climate Change: The Stern Review, 2006

HDR

23

SROI Methodology – Step 3

Risk Analysis Process (RAP) Session

Sample Participants

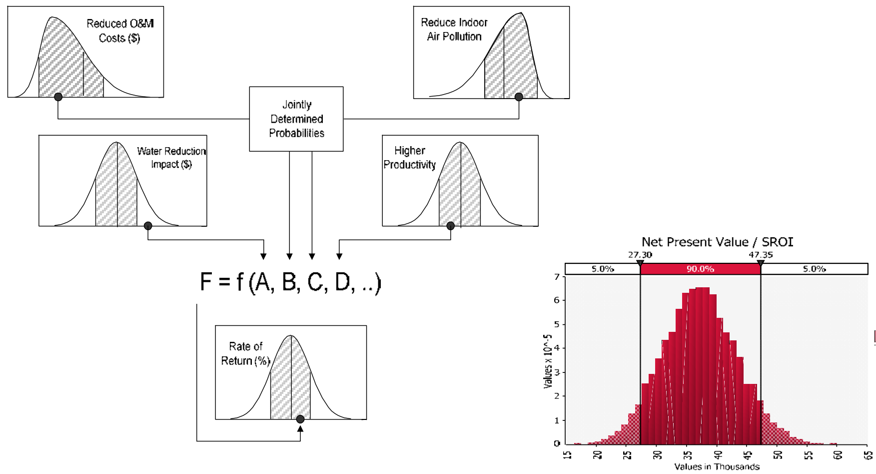
- Client:
  - Project team
  - Technical specialists
  - Financial experts
- HDR:
  - Facilitator
  - Economists
  - Technical specialists
- Outside Experts:
  - Costing Experts
  - Energy Modelers
  - Architects & Engineers
- Public Agencies & Officials

HDR

24

SROI Methodology – Step 4

Run the Model and Produce Results



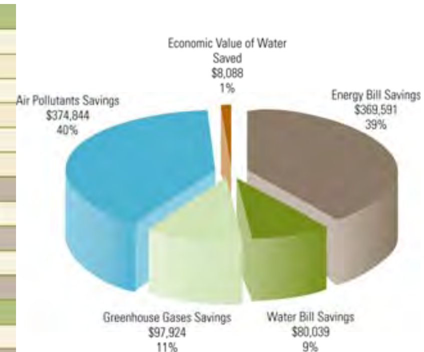
HDR

25

Examples of SROI Results

Fort Belvoir Community Hospital, Virginia - US Army

SROI	Alternative	Notes
Annual Value of Benefits	$930,485	Total value of benefits in one year
Energy Bill Reduction	*369,591*	Cash Benefit
Water Bill Reduction	*80,039*	Cash Benefit
Greenhouse Gases Savings	*97,924*	Non-cash Benefit
Air Pollutants Savings	*374,844*	Non-cash Benefit
Savings from Reduced Water Use	*8,088*	Non-cash Benefit
Net Present Value	$10,194	PV Benefits / PV All Costs
Return on Investment	27%	Average Rate of Return on Capital Investment
Discounted Payback Period	6	Time in years to + discounted cash flow
Internal Rate of Return (%)	23%	Discount rate making NPV = 0
Benefit to Cost Ratio	3.3	PV Benefits / PV Costs
FROI	**Alternative**	**Notes**
Annual Value of Benefits	$449,537	Total value of benefits in first year
Net Present Value	$2,660	PV Benefits / PV All Costs
Return on Investment	12%	Average Rate of Return on Capital Investment
Discounted Payback Period	12	Time in years to + discounted cash flow
Internal Rate of Return (%)	11%	Discount rate making NPV = 0
Benefit to Cost Ratio	1.6	PV Benefits / PV Costs



HDR

26

Examples of SROI Results

Tehachapi Trade Corridor, California – BNSF Railroad

Discounted Value of Net Benefits – Through 2038 (California Only)

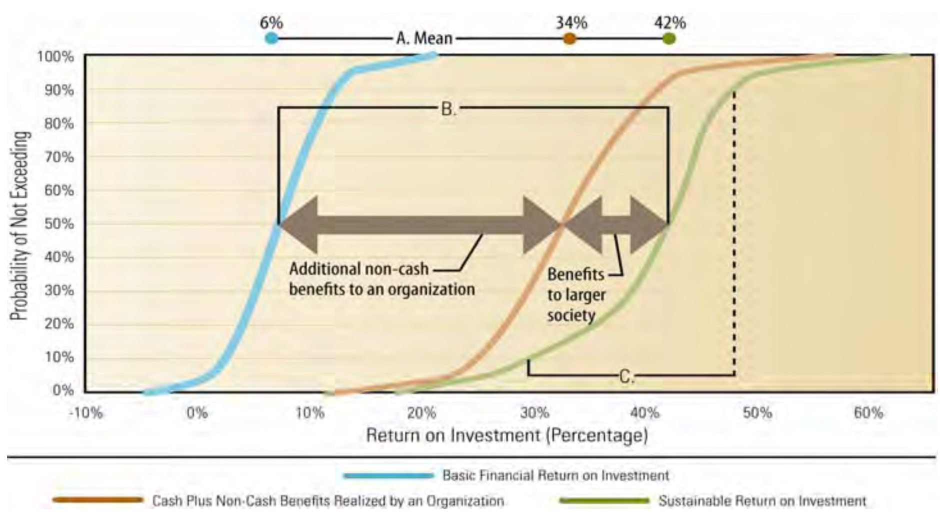
Net Benefit #	Net Benefit Name	Net Benefit Category	Total Discounted Value (2007 US$ M)		
			Mean	Probability of Exceeding	
				90%	10%
1	Reduced Cost of Train Delay at Current Capacity	Transportation System Savings	$11	$7.2	$14.7
2	Reduced Transportation Costs from Displacing Heavy Truck Travel	Transportation System Savings	$580	$324	$847
3	Change in Inventory Costs from Displacing Heavy Truck Travel	Transportation System Savings	-$48	-$65	-$33
4	Change in Inventory Costs from Reduced Train Delay	Transportation System Savings	$6.6	$4.2	$9.4
5	Savings From Reduced Highway Congestion	Transportation System Savings	$16.4	$12.1	$21.0
6	Reduction in Maintenance Costs from Displacing Heavy Truck Travel	Transportation System Maintenance	$85	$47	$127
7	Environmental Savings from Displacing Heavy Truck Travel	Environmental Improvements	$31	$16	$48
8	Environmental Savings from Reduced Train Delay (Idling)	Environmental Improvements	$.2	$0.1	$0.4
9	Reduced Accident Costs from Displacing Heavy Truck Travel	Transportation Safety	$96	$63	$130
10	Aid in Case of Massive Natural Disaster Relief / Terrorist Attack	Emergency Relief	$4.1	$1.0	$8.1
Total Discounted Value of Net Benefits (Note: Separate calculations, may not add)			**$782**	**$507**	**$1,071**

HDR

27

Examples of SROI Results

Explanation of the S-Curve Diagram

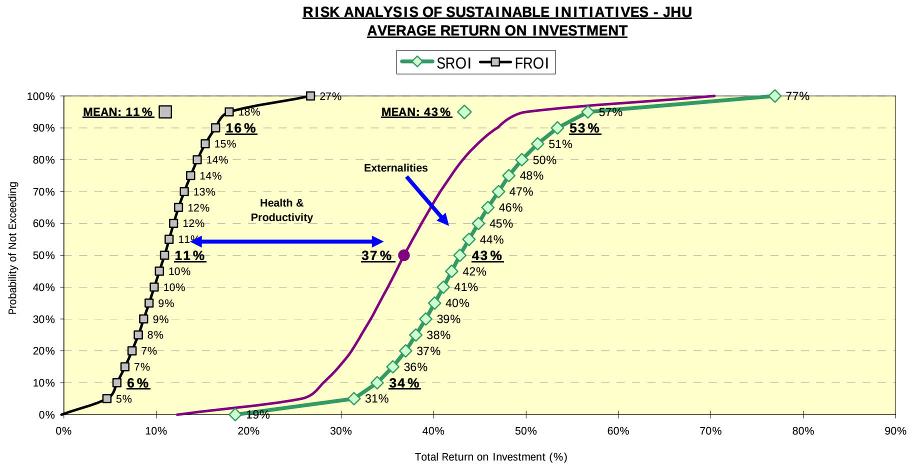


HDR

28

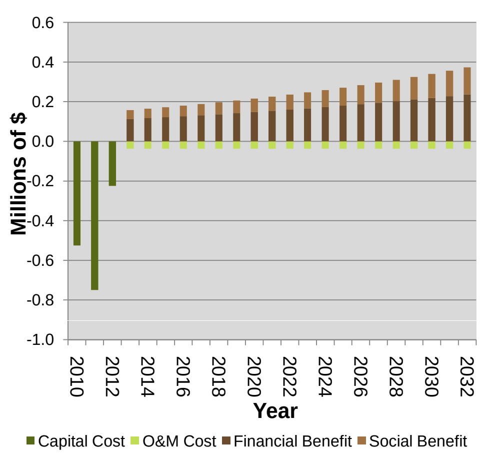
Examples of SROI Results

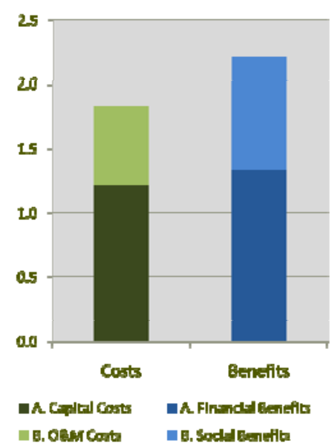
Campus Sustainability Initiative, Baltimore - John Hopkins University



29

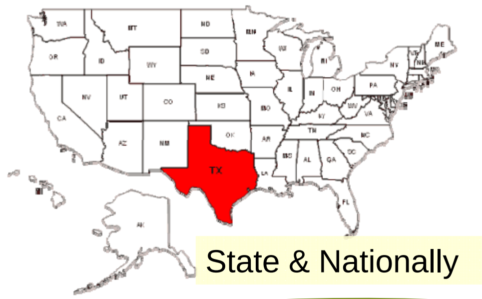
Example Distribution of Costs and Benefits





30

Scale of Application



HDR

31

Examples of Recent SROI Projects

Client	Project
Army	SROI business case for the Fort Belvoir Community Hospital, currently working on USAG Humphreys in Korea
BNSF & UP Railroads	Proved the public benefit of three new infrastructure projects resulting in $200M in grants from TCIF
Boston Redevelopment Authority	Performing SROI analysis on the city of Boston's portfolio of ARRA funding projects
Denver Metro Wastewater Reclamation District	Using SROI to make design & construction decisions on Denver's proposed new wastewater treatment facility
Johns Hopkins University	Provided SROI analysis of JHU's Campus Sustainability Initiative project in order to secure LEED certification
Marine Corps	SROI is being used in Iwakuni, Japan to assist with evaluating sustainable solutions at the base
National Park Service	Working with the Park Service to use SROI to help make sustainable transportation planning decisions

HDR

32

So Why Use SROI?

- ✓ It's a proven Cost-Benefit Analysis based approach to making planning & budgeting decisions
- ✓ It fully incorporates non-cash benefits and externalities into the decision making process
- ✓ It provides a full range of possible outcomes using state-of-the-art risk analysis techniques
- ✓ It helps generate consensus by being both interactive and transparent
- ✓ It is an invaluable tool to help projects secure internal approval, public support, funding, etc.

33

Questions?

SROI@hdrinc.com

"Doing the right thing is good. Doing the right thing for the right reason and with the right intention is even better."

34

Contact Information

Steph Larocque

- Email: Stephane.Larocque@hdrinc.com
- Tel: 613.234.8764

Jeannie Renne-Malone

- Email: Jeannie.Renne-Malone@hdrinc.com
- Tel: 303.812.1090

www.hdrgreen.com

www.hdr-sroi.com

35

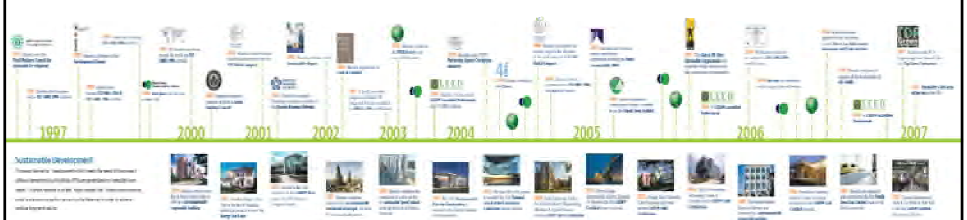
SKANSKA

OPPORTUNITY

DEEP GREEN

SKANSKA

OVER A DECADE OF "GREEN" COMMITTMENT



- All Operations ISO 14001 Certified
- 120+ LEED Registered and Certified Buildings
- 475+ LEED APs in the US
- 34 LEED APs in the Nordics
- One of the Top 3 Green Builders per ENR

SKANSKA

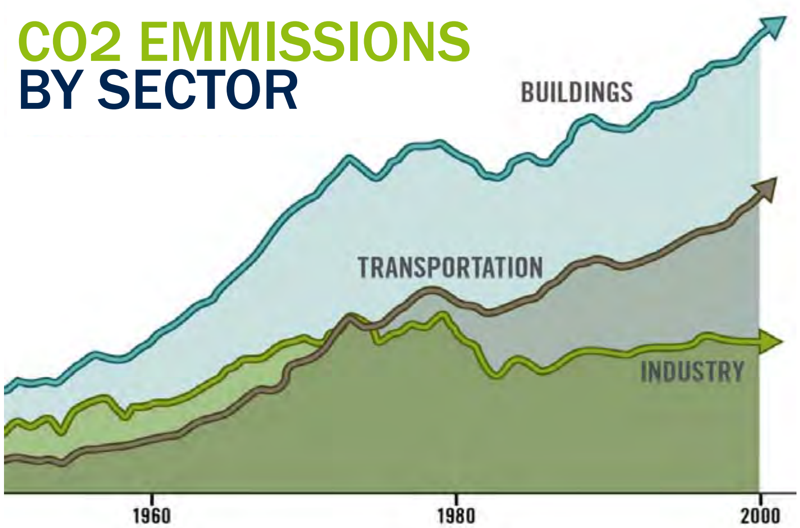
WHY BUILD GREEN?

www.architecture2030.org

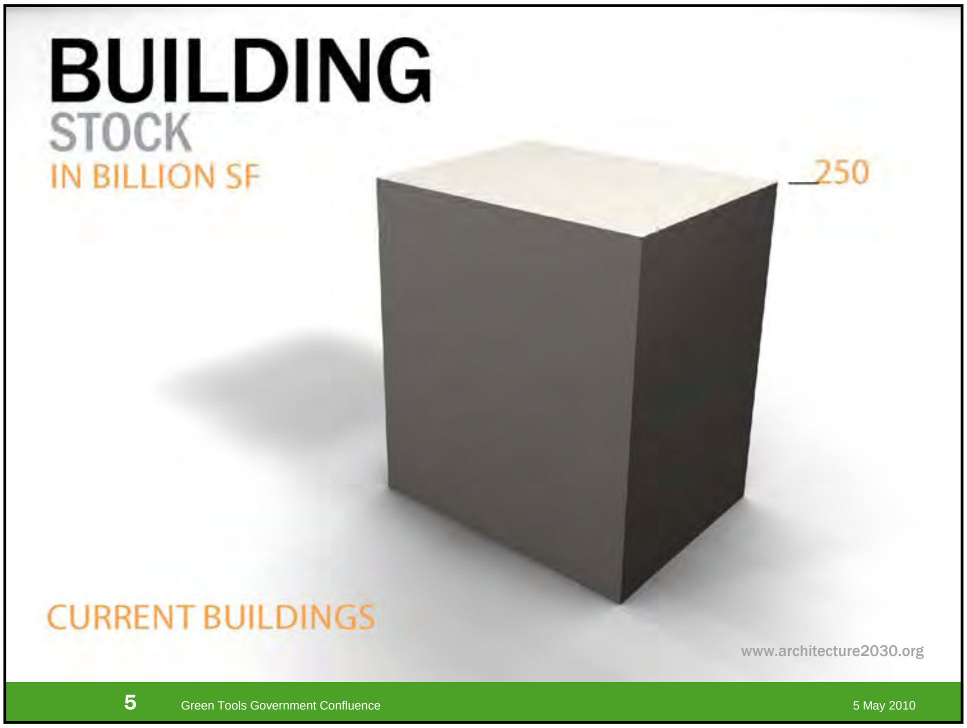
3 Green Tools Government Confluence 5 May 2010

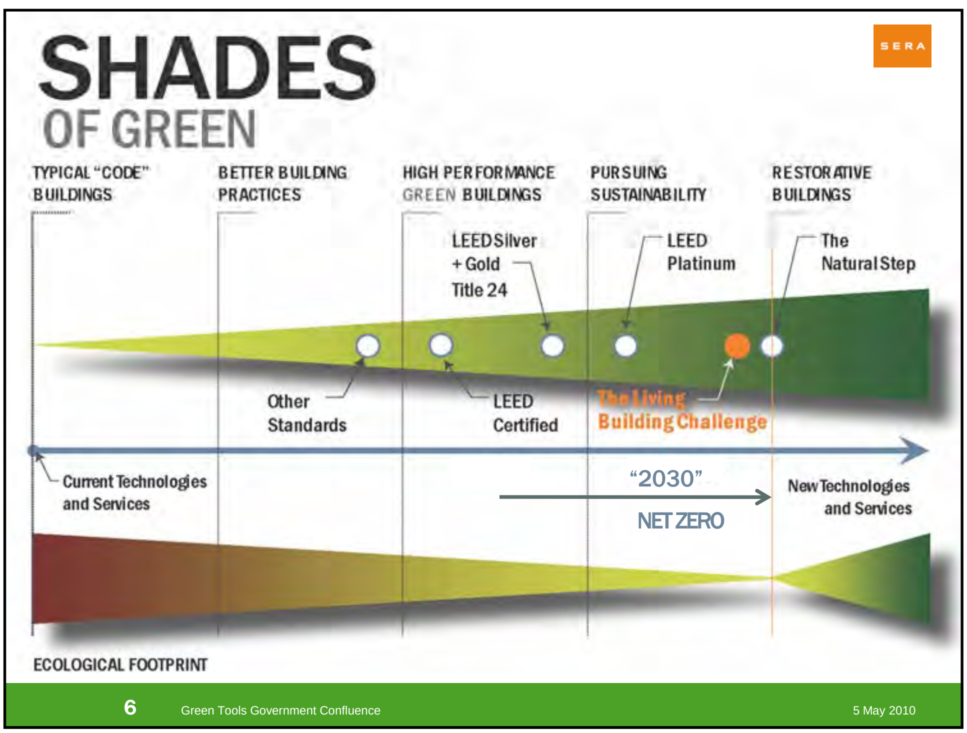
SKANSKA

CO2 EMMISSIONS BY SECTOR



4 Green Tools Government Confluence 5 May 2010


BUILDING
STOCK
IN BILLION SF
250
CURRENT BUILDINGS
www.architecture2030.org
5
Green Tools Government Confluence
5 May 2010


SHADES
OF GREEN
SERA
TYPICAL "CODE" BUILDINGS
BETTER BUILDING PRACTICES
HIGH PERFORMANCE GREEN BUILDINGS
PURSUING SUSTAINABILITY
RESTORATIVE BUILDINGS
LEED Silver + Gold Title 24
LEED Platinum
The Natural Step
Other Standards
LEED Certified
The Living Building Challenge
Current Technologies and Services
"2030"
NET ZERO
New Technologies and Services
ECOLOGICAL FOOTPRINT
6
Green Tools Government Confluence
5 May 2010

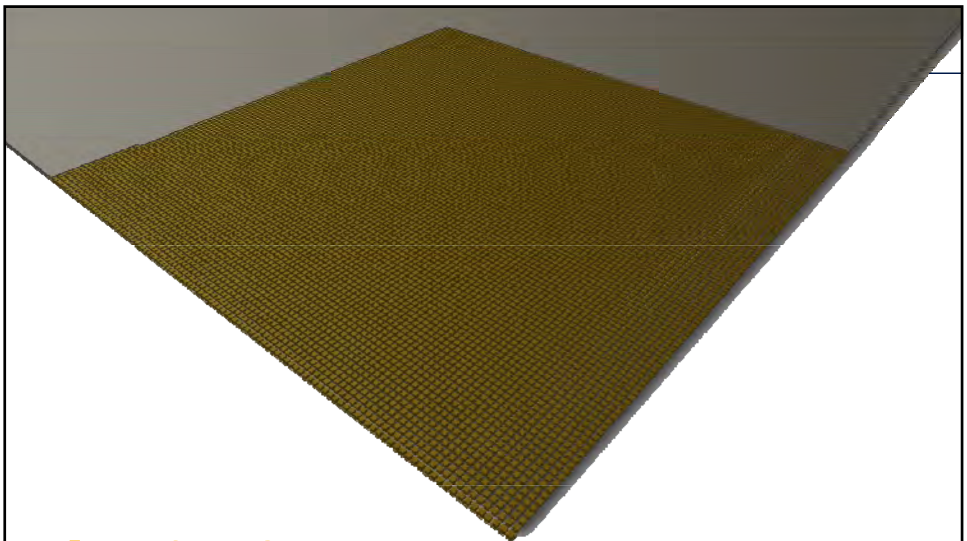
SKANSKA

NET-ZERO BUILDINGS
IN CONTEXT

Information courtesy of New Buildings Institute

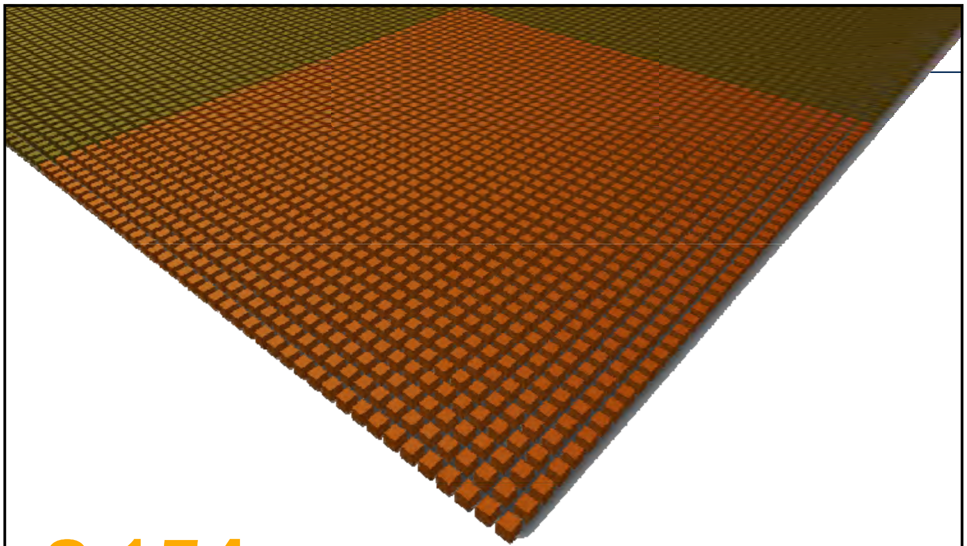
100,000
BUILDINGS BUILT ANNUALLY

7 Green Tools Government Confluence 5 May 2010

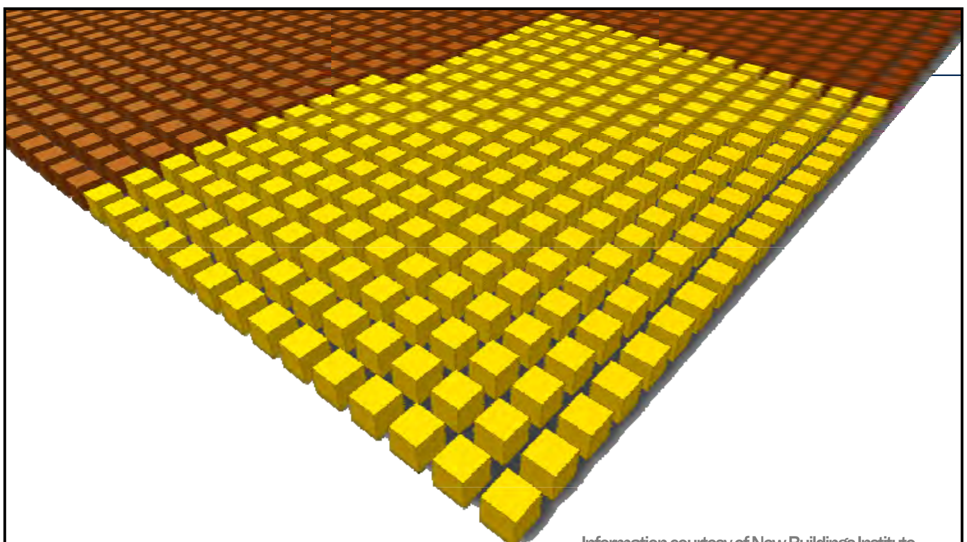


47,059
LEED REGISTERED

8 Green Tools Government Confluence 5 May 2010

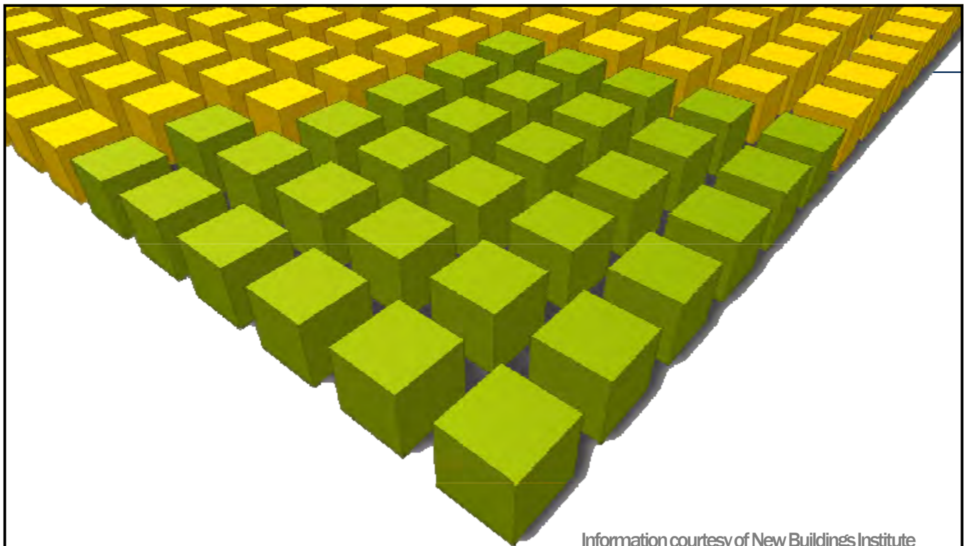


8,154
LEED CERTIFIED



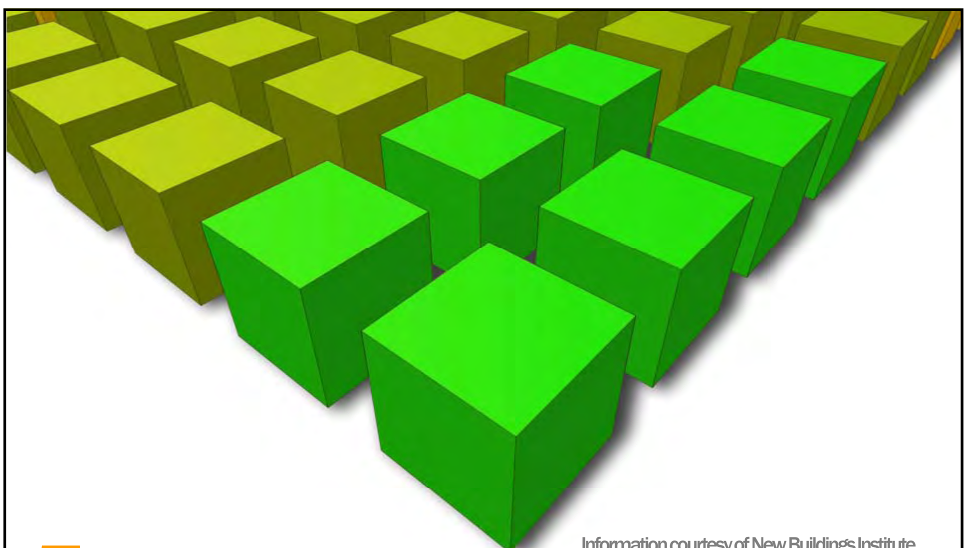
Information courtesy of New Buildings Institute

200 to 250
BUILDINGS WHICH MEET 2030 C



Information courtesy of New Buildings Institute

30 to 50
NET-ZERO BUILDINGS IN DESIGN

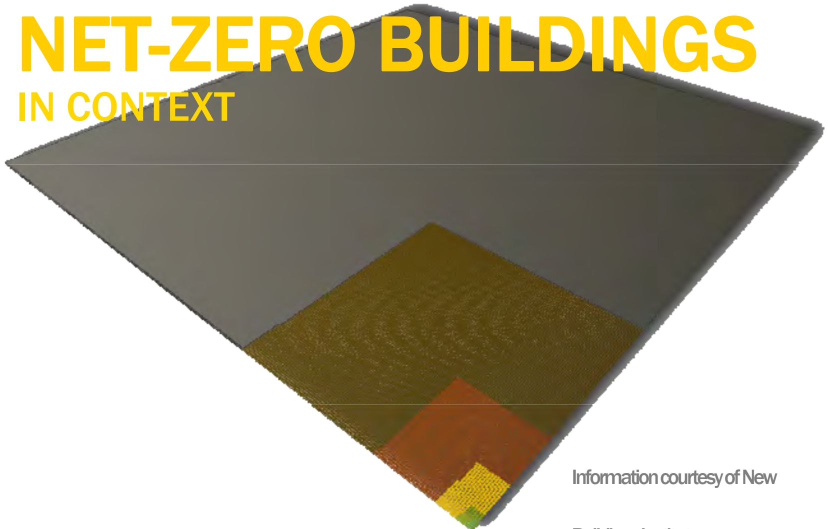


Information courtesy of New Buildings Institute

7
NET-ZERO BUILDINGS BUILT

SERA SKANSKA

NET-ZERO BUILDINGS
IN CONTEXT



Information courtesy of New Buildings Institute

SKANSKA

LIVING BUILDING
CHALLENGE

The Rules

- 7 “Petals”
- Only Prerequisites, no points
- Temporary exceptions exist
- Projects must be operational

It’s about what you do, not what you say you’ll do”

http://www.cascadiagbc.org/lbc

FINANCIAL
STUDY

SERA Architects

SKANSKA USA Building

NEW BUILDINGS Institute

INTERFACE Engineering

GERDING EDLEN

SERA SKANSKA

LB FINANCIAL STUDY BUILDING TYPES

UNIVERSITY CLASSROOM
LEED Score: 41 (NC)

MID RISE OFFICE
LEED Score: 36 (CS)

MULTI FAMILY RESIDENTIAL
LEED Score: 41 (NC)

SCHOOL K-8
LEED Score: 47 (NC)

MIXED USE RENNOVATION
LEED Score: 60 (NC)

HIGH RISE MIXED USE
LEED Score: 56 (NC)

LOW RISE OFFICE
LEED Score: 36 (CS)

SINGLE FAMILY RESIDENTIAL
LEED Score: N/A

HOSPITAL
LEED Score: 30 (CS)

SERA SKANSKA

LB FINANCIAL STUDY

CLIMATE ZONES

SKANSKA

CONSTRUCTION COSTS

BUILDING TYPE: **HOSPITAL**
BUILDING LOCATION: **BOSTON, MA**

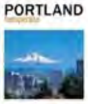
	Division Premium (%)	Building Premium (%)	LEED™ Gold Baseline Total	LEED™ Gold Baseline Cost/SF	Living Building Total	Living Building Cost/SF
B Shell	**2.1%**	**0.5%**	**$14,789,139**	**$82.06**	**$15,102,359**	**$83.79**
Baseline Building			$14,789,139	$82.06	$14,789,139	$82.06
Replace Roofing with Glazed Skylight					$15,000	$0.08
Improved Glazing (reduce solar heat gain at vision only)					$16,000	$0.09
Exterior Horizontal Shading Devices					$87,600	$0.49
Interior Light Shelf					$58,400	$0.32
Vertical Shading Fins (west end)					$26,900	$0.15
New Light Shafts to Nurse Stations					$387,000	$2.15
Infill Spandrel Panel with Framing and Insulation (replace glazed area)					$22,320	$0.12
Reduce Mechanical Rooftop Screen					($300,000)	($1.66)

SERA SKANSKA

LB FINANCIAL STUDY KEY FINDINGS

LIVING BUILDING FINANCIAL STUDY

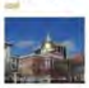
PORTLAND



ATLANTA

PHOENIX

BOSTON



temperate: This climate is milder with less extremes. Rainfall varies across the region depending on location.

hot-humid: This climate is characterized by hot humid days especially in the summer. Rainfall varies across the region depending on location.

hot-arid: This climate is characterized by hot dry days and cooler nights, although cold days are possible in the winter months. The average rainfall is very low.

cool: This climate typically has cold winter days, possible hot/ humid summer evenings. Rainfall varies across the region depending on location, with snow fall adding to total precipitation.

BUILDING TYPES

- University Classroom
- School K-8
- Low Rise Office
- Mid Rise Office
- Mixed Use Renovation
- Single Family Residential
- Multi Family Residential
- High Rise Mixed Use
- Hospital

KEY VARIABLES

PHOTOVOLTAIC CAPACITY

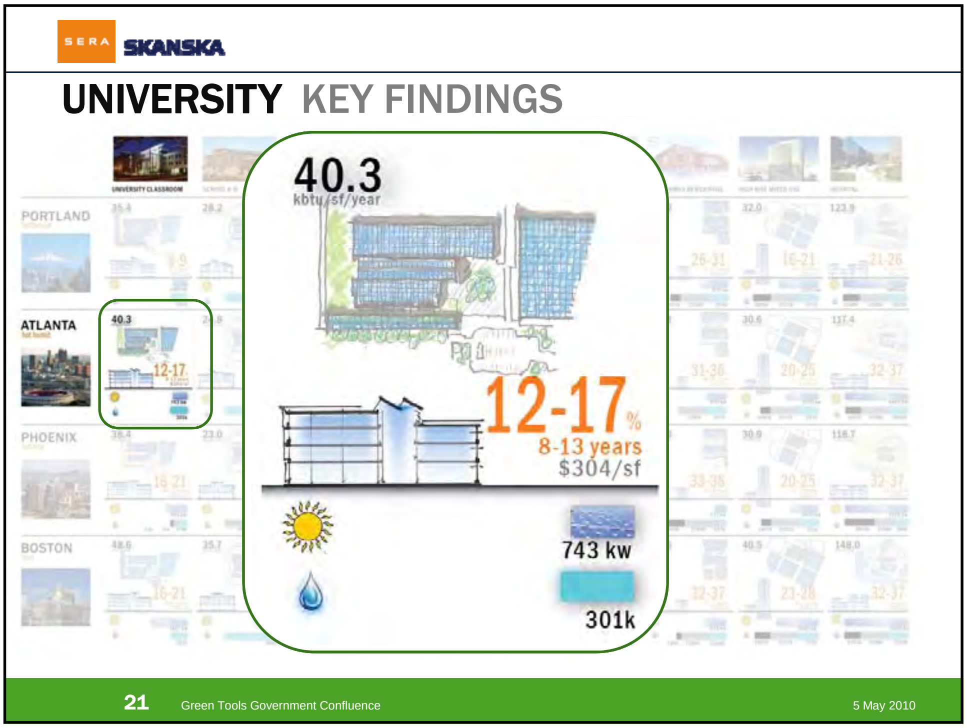
TOTAL WATER USE

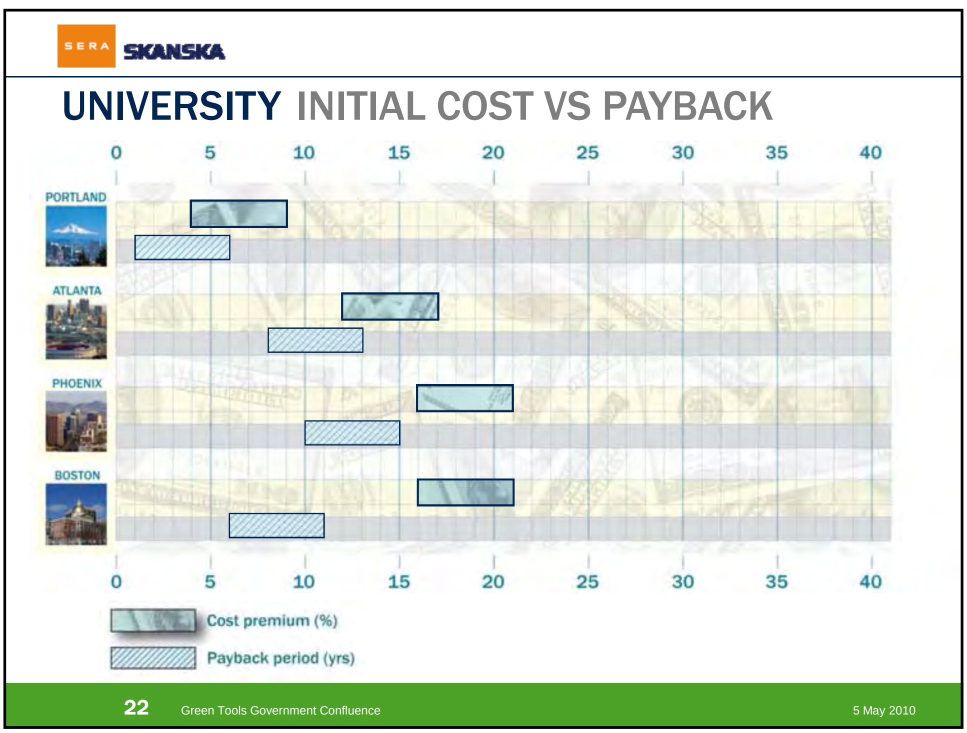
36.8 kbtu/sf/year — ENERGY USE INTENSITY

15-20 — COST PREMIUM (%)

$146/sf — DIRECT CONSTRUCTION COST

15-20 years — PAYBACK PERIOD


SERA
SKANSKA
UNIVERSITY KEY FINDINGS
PORTLAND
ATLANTA
PHOENIX
BOSTON
40.3
kbtu/sf/year
12-17 %
8-13 years
$304/sf
743 kw
301k
21
Green Tools Government Confluence
5 May 2010


SERA
SKANSKA
UNIVERSITY INITIAL COST VS PAYBACK
0 5 10 15 20 25 30 35 40
PORTLAND
ATLANTA
PHOENIX
BOSTON
Cost premium (%)
Payback period (yrs)
22
Green Tools Government Confluence
5 May 2010

SERA SKANSKA

LB FINANCIAL STUDY KEY FINDINGS

WHAT MATTERS:

Client type

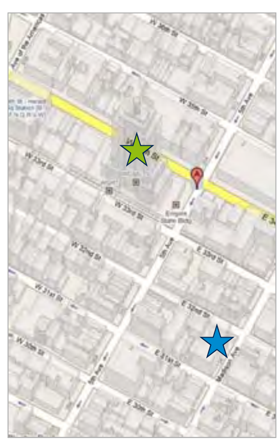
Energy Cost

Water Cost

Financial Horizon

SKANSKA

HIGH PERFORMANCE GREEN BUILDING- CASE STUDY



New Site

Old Site

THE MISSION

- LEED PLATINUM SPACE FOR A CLASS 'A' OFFICE BUDGET
- COMFORTABLE WORK ENVIRONMENT
- MODERN AND FLEXIBLE WORKSPACE
- MODEL PROJECT TO PROMOTE SUSTAINABILITY

CHOOSING THE RIGHT TEAM

- SKANSKA
- EMPIRE STATE BUILDING
- COOK + FOX ARCHITECTS

  SWANKE HAYDEN CONNELL ARCHITECTS

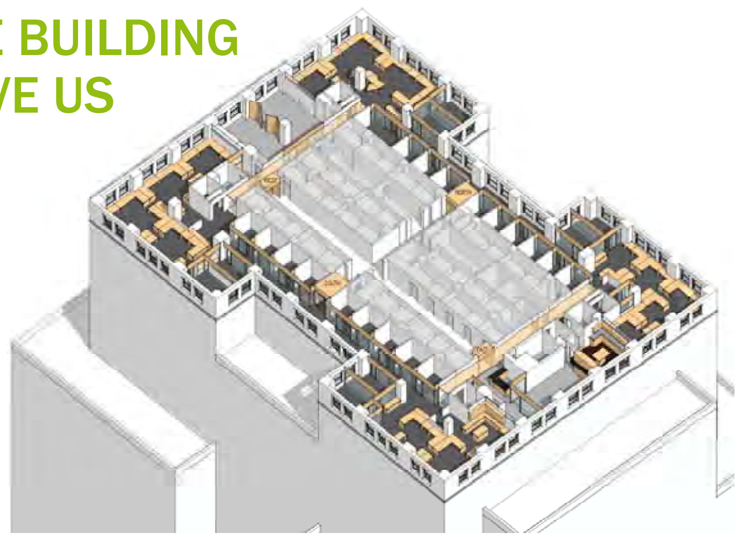
  COSENTINI ASSOCIATES

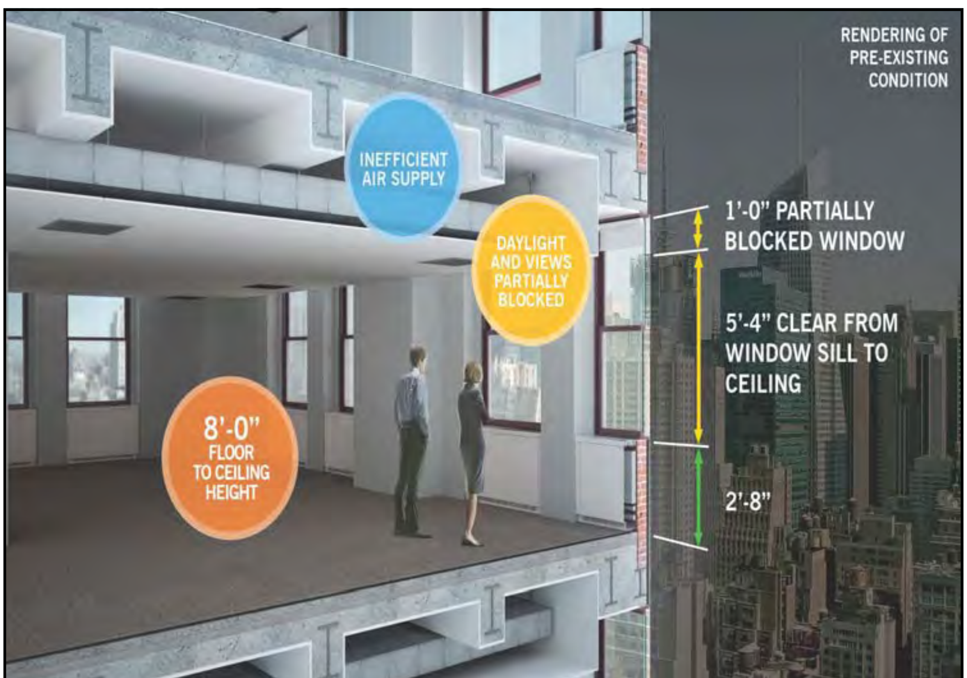
  ARUP

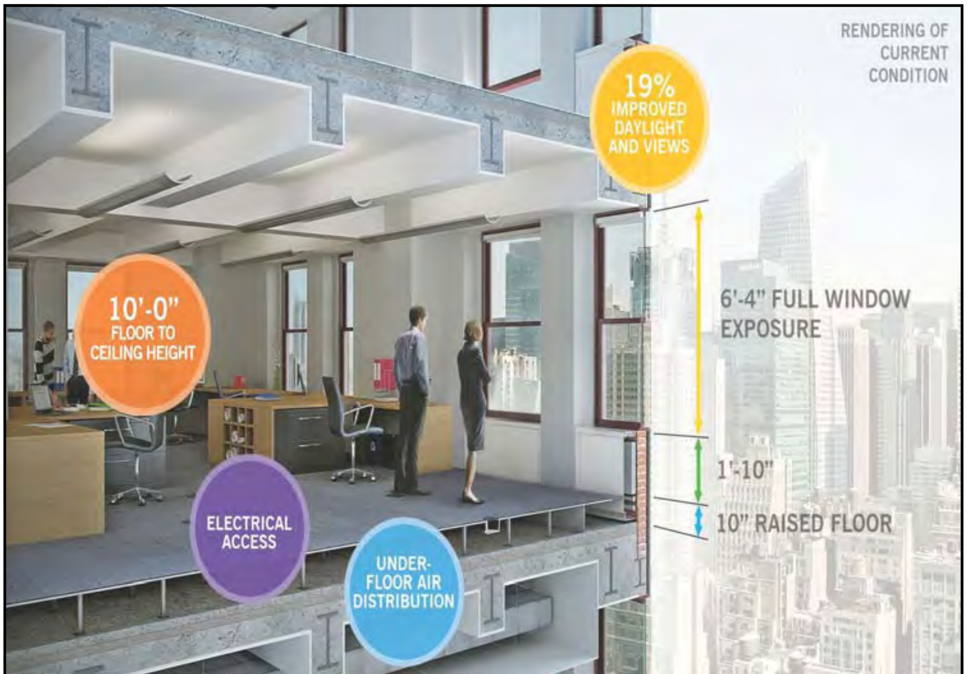
  TERRAPIN BRIGHT GREEN

SKANSKA

USING WHAT THE BUILDING GAVE US







Green Facts

Skanska's Flagship Office
New York, NY

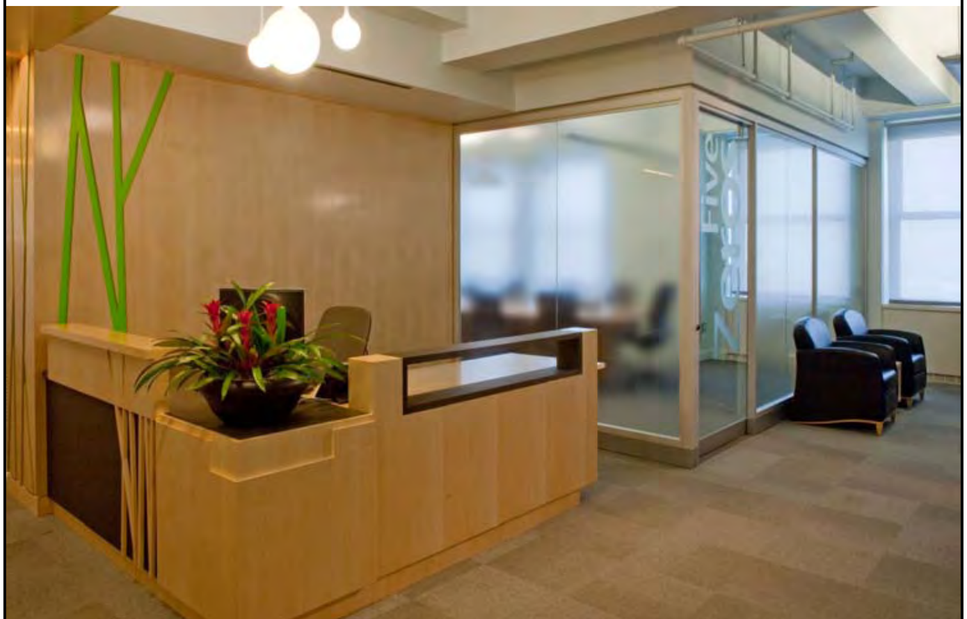
LEED® Commercial Interiors	
Platinum	44
Sustainable Site	6
Water Efficiency	2
Energy & Atmosphere	12
Materials & Resources	8
Indoor Environmental Quality	16
Innovation & Design	5

USGBC LEED-CI rated 44 out of 57 points

MAKING LEED HAPPEN

- 80% CONSTRUCTION WASTE RECYCLED
- 40% INTERIORS MAINTAINED
- 90% NATURAL DAYLIGHT
- 99% OF OCCUPANTS HAVE VIEWS
- 89% FSC CERTIFIED WOOD
- 28% MATERIALS WITHIN 500 MILES
- 40% WATER USE REDUCTION
- 35% LESS LIGHTING POWER DENSITY

SKANSKA



31 Green Tools Government Confluence 5 May 2010

SKANSKA

32 Green Tools Government Confluence 5 May 2010

SKANSKA

57% ENERGY SAVINGS

ENERGY STUDY

Utility Consumption Comparison

136 Madison (Class "A" Office)

	2008 JAN Actual	2008 FEB Actual	2008 MAR Actual	TOTAL ANNUAL Actual	COMPARISON ANNUAL Adjusted*
Cost	$3,677	$3,921	$4,209	$57,506	$85,039
Consumption (KWH)	13,760	15,520	17,920	220,853	326,595
Avg. Cost per KWH	0.27	0.25	0.23	0.26	0.26
Energy Cost per Rentable SF	0.22	0.24	0.26	2.36	3.49

*adjust Class "A" office to the same RSF as ESB

ESB, 32nd Floor (LEED Platinum)

	2009 JAN Actual	2009 FEB Actual	2009 MAR Actual	TOTAL ANNUAL Projected	ESB LEED OFFICE ANNUAL Adjusted**
Cost	$ 1,989	$ 1,987	$ 2,500	$ 34,358	$ 45,718
Consumption (KWH)	10,516	10,506	11,686	173,996	173,996
Avg. Cost per KWH	0.19	0.19	0.21	0.19	0.26
Energy Cost per Rentable SF	0.08	0.08	0.10	1.41	1.87

**Madison rate utilized

SKANSKA

ROI IN LESS THAN 5 YEARS

LIFE CYCLE COST ANALYSIS

No.	Year	Projected Cost Per Year: ESB LEED	Projected Cost Per Year: ESB Class "A"	Savings
1	2009	$36,760	$85,039	$48,279
2	2010	$38,965	$90,142	$51,176
3	2011	$41,303	$95,550	$54,247
4	2012	$43,781	$101,283	$57,502
5	2013	$46,408	$107,360	$60,952
6	2014	$49,193	$113,802	$64,609
7	2015	$52,144	$120,630	$68,485
8	2016	$55,273	$127,867	$72,594
9	2017	$58,589	$135,540	$76,950
10	2018	$62,105	$143,672	$81,567
11	2019	$65,831	$152,292	$86,461
12	2020	$69,781	$161,430	$91,649
13	2021	$73,968	$171,116	$97,148
14	2022	$78,406	$181,382	$102,977
15	2023	$83,110	$192,265	$109,155
Total		$855,618	$1,979,369	$1,123,751

Subtotal = $272,155.84 (ROI in less than 5 years)

Electricity Use Reduction 57%

Net Present Value Energy Savings** $683,200

*Assuming annual Con Ed increase of 6%
**PV Savings assuming 6% annual discount rate

SKANSKA

11% TOTAL SAVINGS

COST ANALYSIS SUMMARY

	Total Project Cost	Total Cost ($/rsf)	Construction Cost ($/rsf)
Class 'A' Office Budget	$4,413,404	$180.88	$121.45
Actual Costs	$4,624,262	$189.52	$132.95
LEED Premium*	$210,858	**$8.64**	**$11.50**
*Total LEED Premium - 4.7%			
Energy Saving (NPV for 15 Yrs)	$683,200		
NYSERDA Grant (Approx.)	$20,527		
Net Positive**	$492,869		
**Total Savings - 11%			

SKANSKA

79.64 TONS/YEAR CARBON FOOTPRINT REDUCTION

CARBON FOOTPRINT

Annual KWH (Class A Office)	326,595
Annual KWH (ESB, 32nd Floor)	(141,383)
Annual KWH Saved	185,212
NYC CO2 Footprint for Electricity	.86 lbs/KWH
Carbon Footprint Reduction	159,282 lbs/year or 79.64 tons/year

SKANSKA

BERTSCHI SCHOOL

SKANSKA

PRODUCTIVITY
BIGGEST SAVINGS OPPORTUNITY

SKANSKA

PARTING SHOTS

- Plan "green" from the beginning-Cultural Change
- Take advantage of fee-bates & incentives
- Huge opportunity to "green" existing buildings
- Change the cost argument to life cycle value
- Conserve and then Conserve more before adressing renewables
- Right-size your program to support your business