

MUSCAT GREEN CONFERENCE

Green Building Rating Systems and Achieving Greater Levels of Sustainability in the GCC

5th October 2010

Muscat, Oman.

Mario Seneviratne *FIMechE., PEng., LEED AP (BD+C),
LEED Faculty Member , LEED Mentor*
Managing Director - Green Technologies FZCO

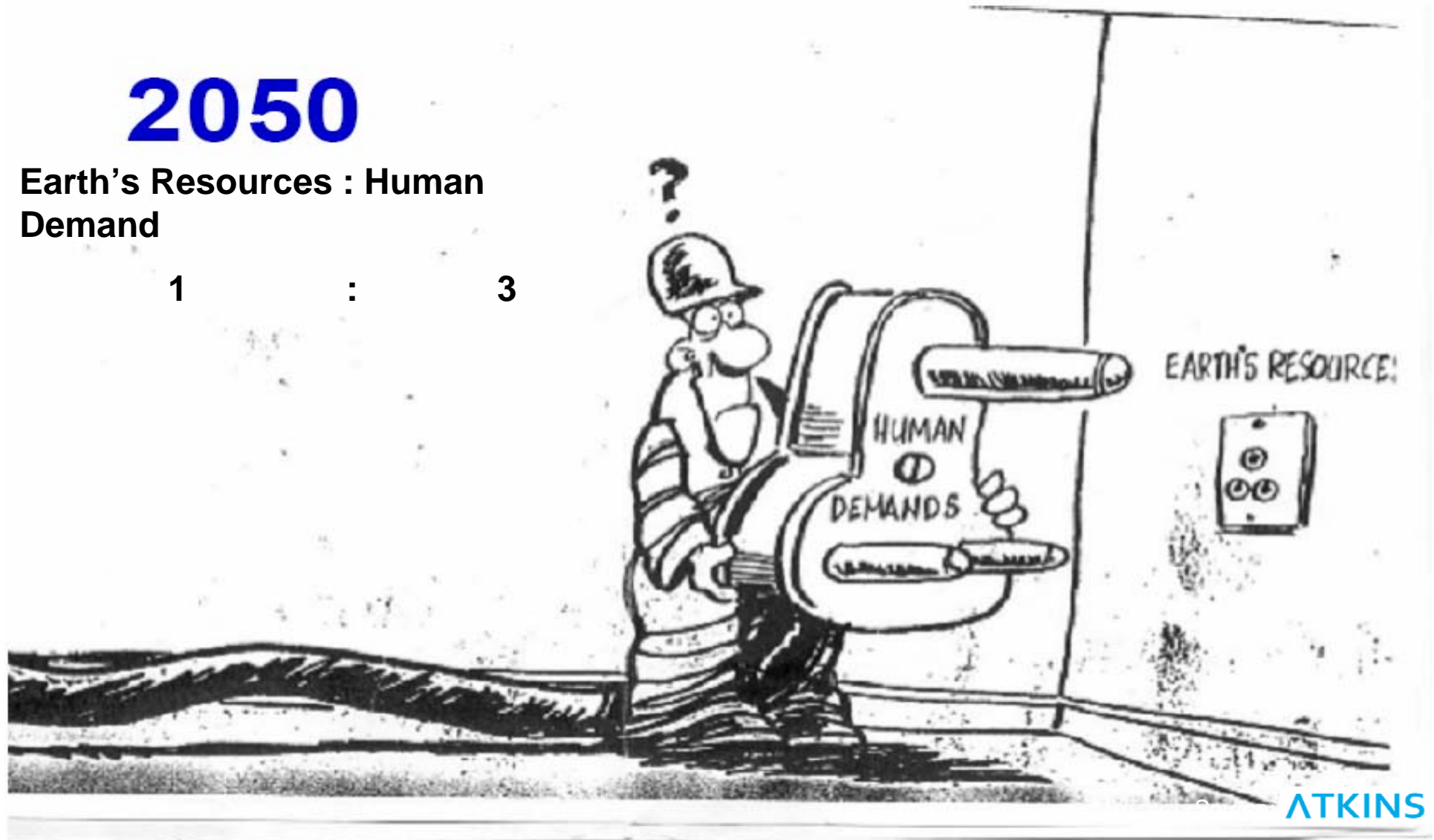


Earth's Resources vs Human Demand

2050

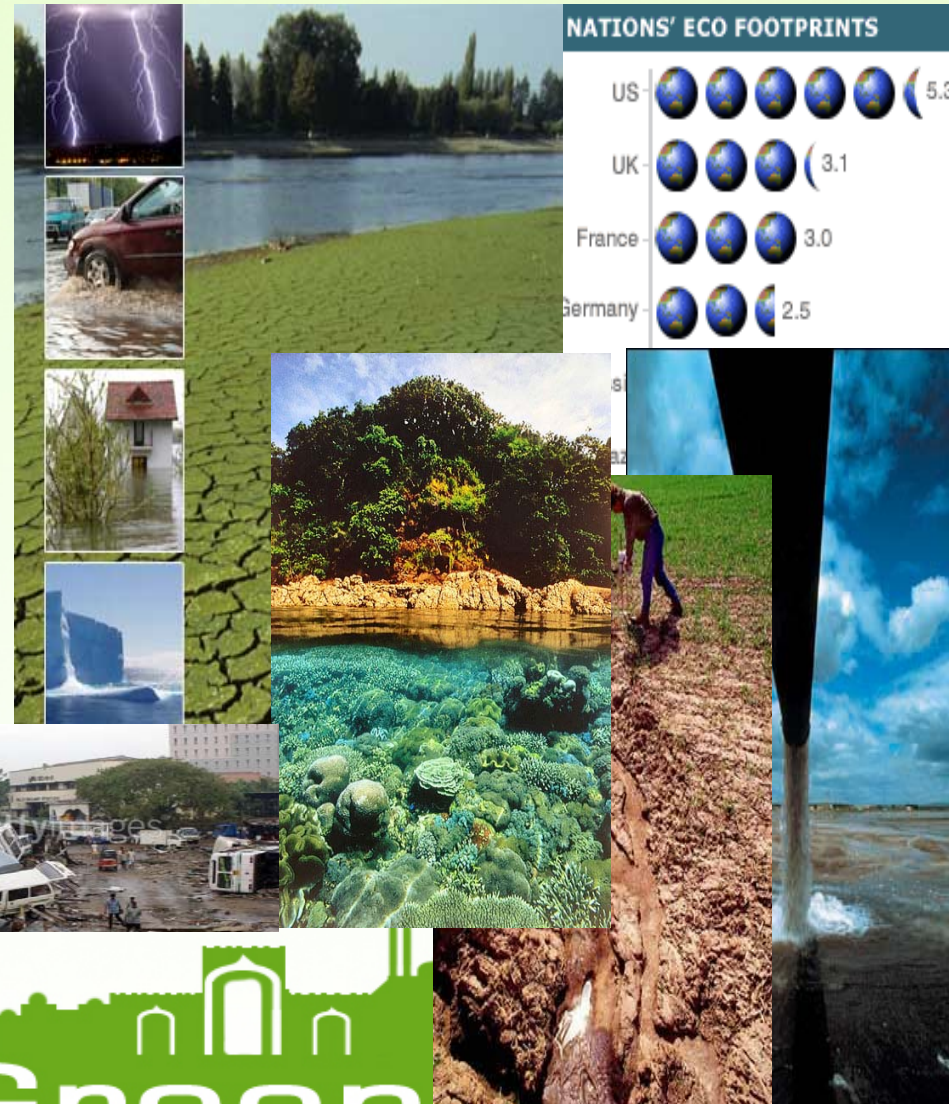
Earth's Resources : Human
Demand

1 : 3



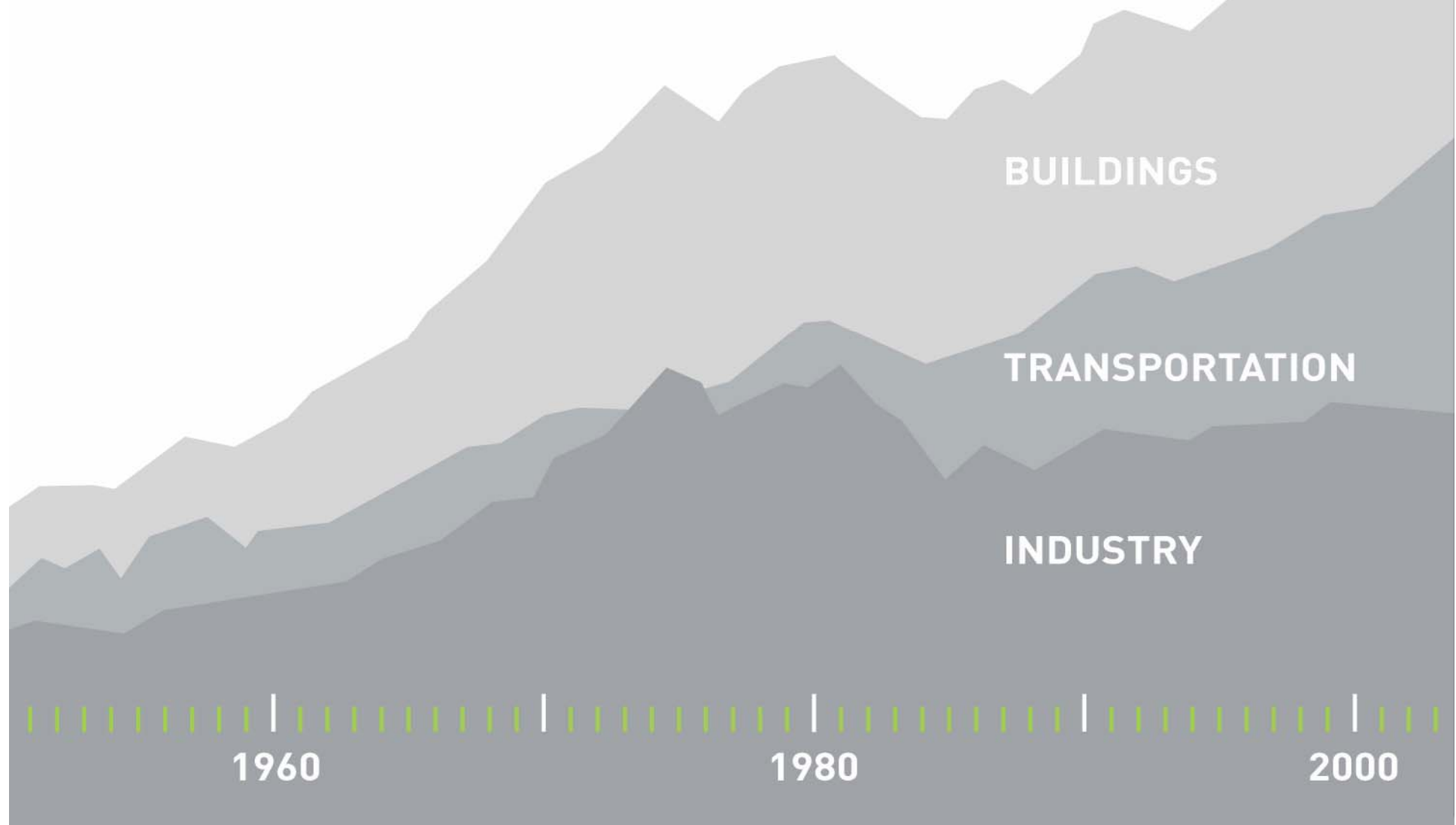
Key Environmental Challenges

- Anomalous Climate Change
- Natural Resource Depletion
- Atmospheric Pollution and Acid Rain
- Contamination of Freshwater Resources
- Soil Erosion and Degradation
- Loss of Biodiversity



CO₂ EMISSIONS BY SECTOR:

Buildings are an important part of the solution to climate change.



Muscat Green Days



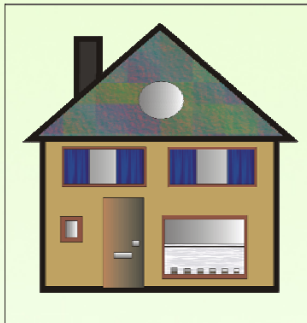
GREEN BUILDING AN IMPORTANT PART OF THE **SOLUTION**



What Is Green Building?



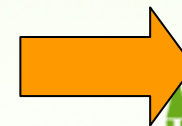
The Solution Benefits



End-users,
Developers,
Constructors



Government,
Infrastructure
Reduction



World,
Environment



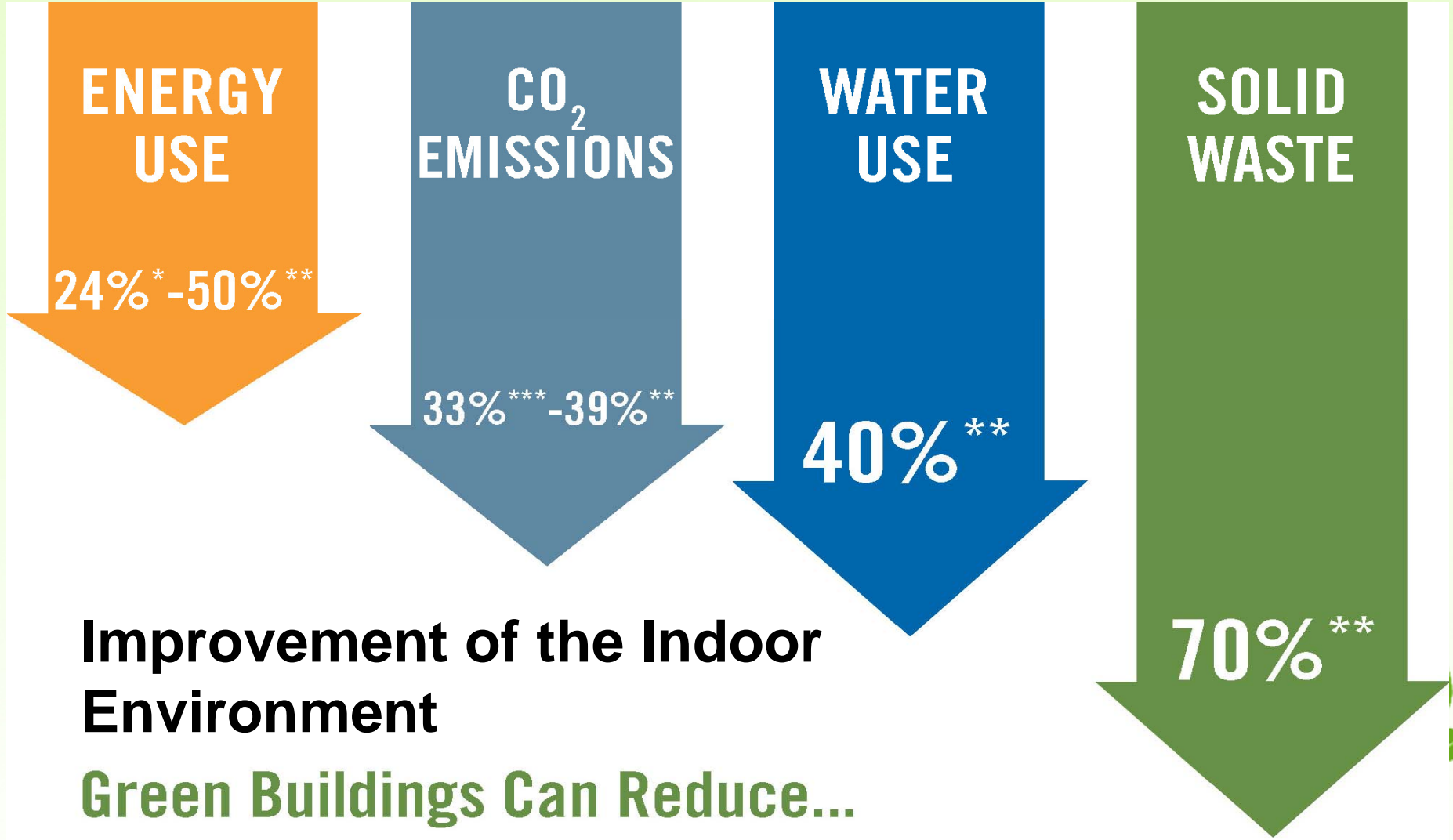
Muscat Green Days

Benefits of Sustainability

- Lowering of Operating Costs
- Better quality of life
 - Improved indoor environment quality
- Lowering infrastructure development cost
 - Energy & water savings up to 40%
- Lowering import dependency
- Indigenous construction practices
 - Usage of regional material
 - Local skill and labor

The logo for 'Muscat Green Days' is positioned at the bottom of the slide. It features a green silhouette of a city skyline with several minarets, and a stylized green plant with three leaves on the right side. The text 'Muscat Green Days' is written in a bold, white, sans-serif font across the bottom of the green background.

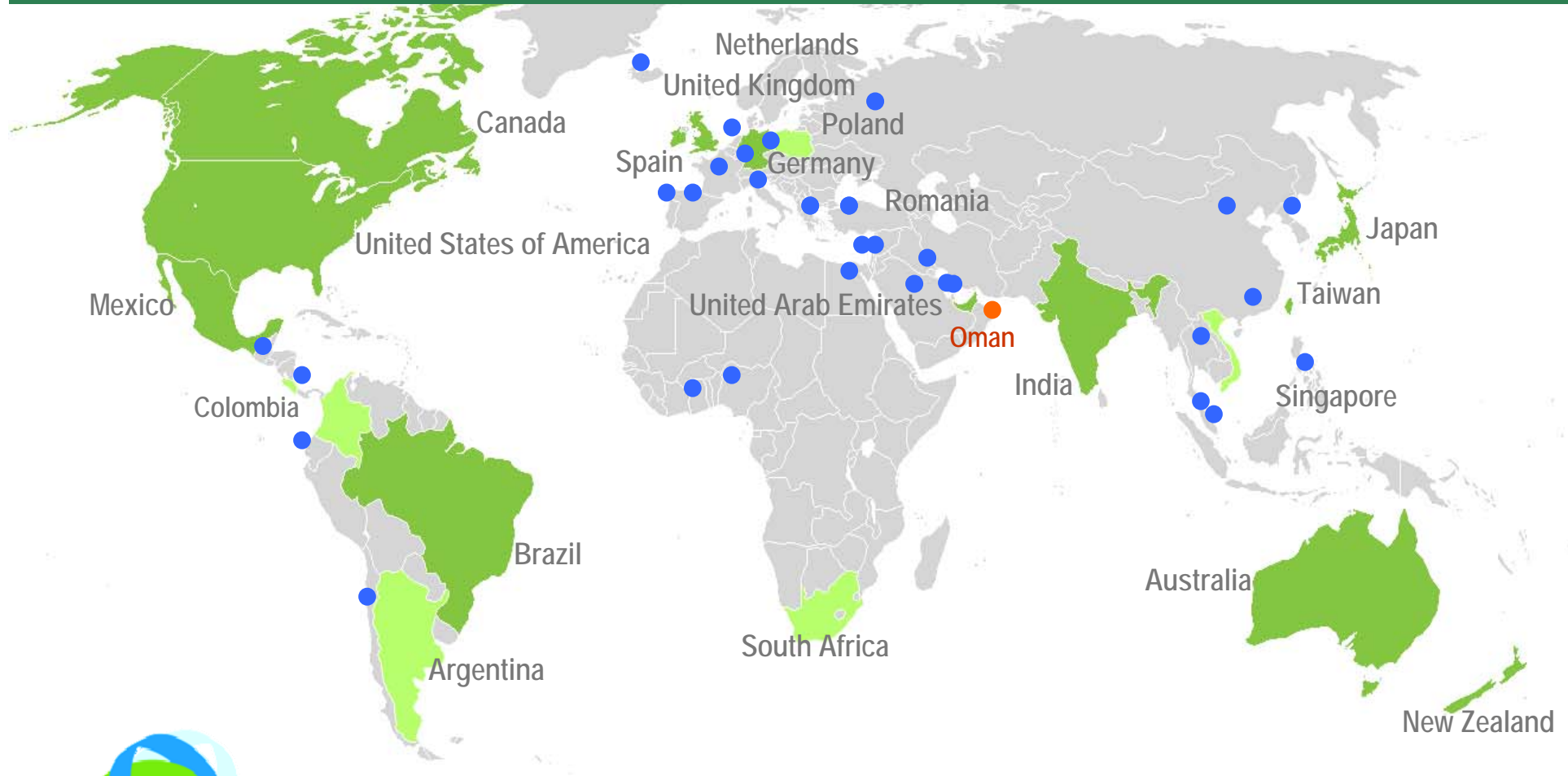
Muscat Green Days



Improvement of the Indoor Environment
Green Buildings Can Reduce...

* Turner, C. & Frankel, M. (2008). Energy performance of LEED for New Construction buildings: Final report.
** Kats, G. (2003). The Costs and Financial Benefits of Green Building: A Report to California's Sustainable Building Task Force.
*** GSA Public Buildings Service (2008). Assessing green building performance: A post occupancy evaluation of 12 GSA buildings.

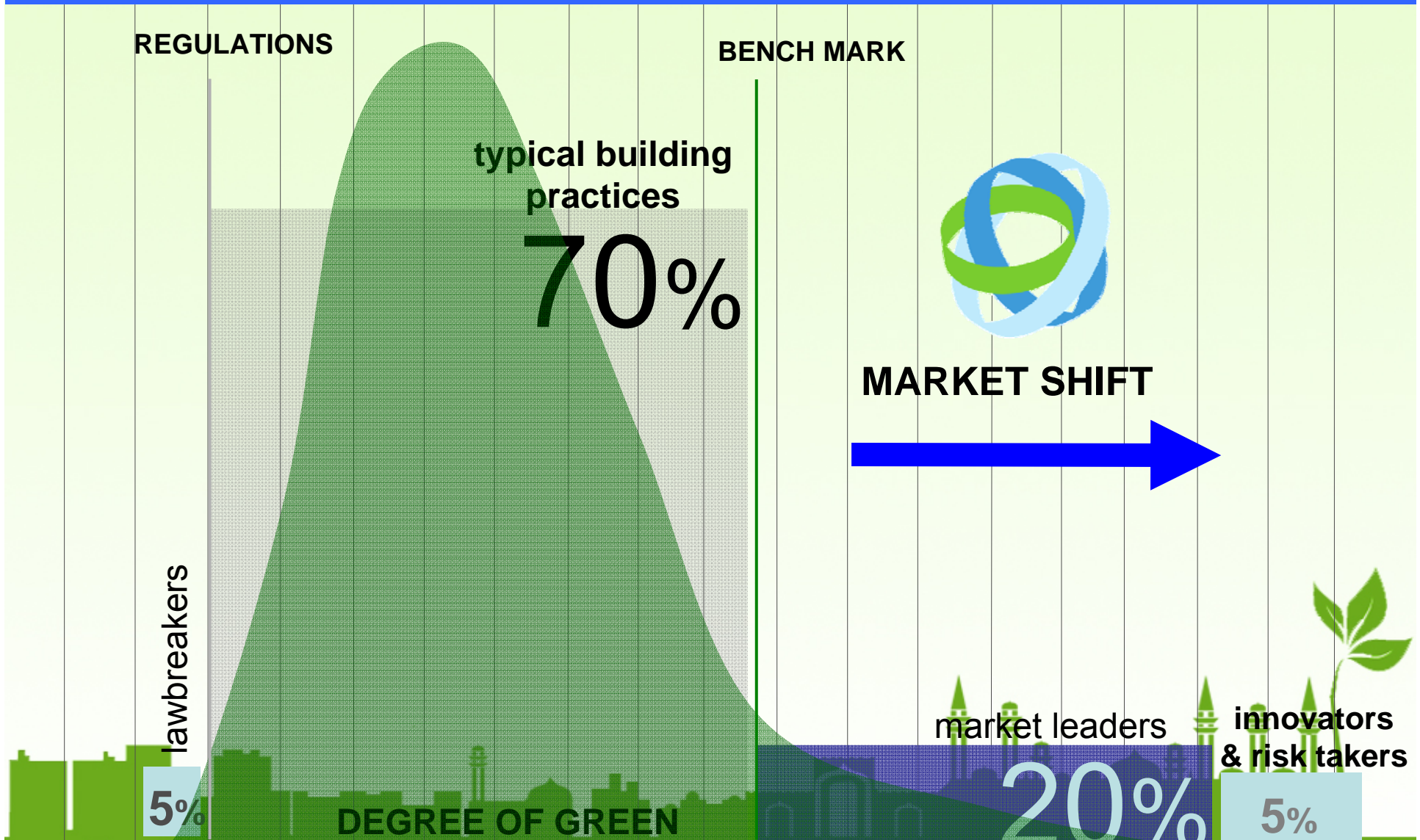
WGBC



20 National Green Building Councils | 3 Emerging Members
Total of 76 Countries and Associated Groups 3

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MARKET SHIFT



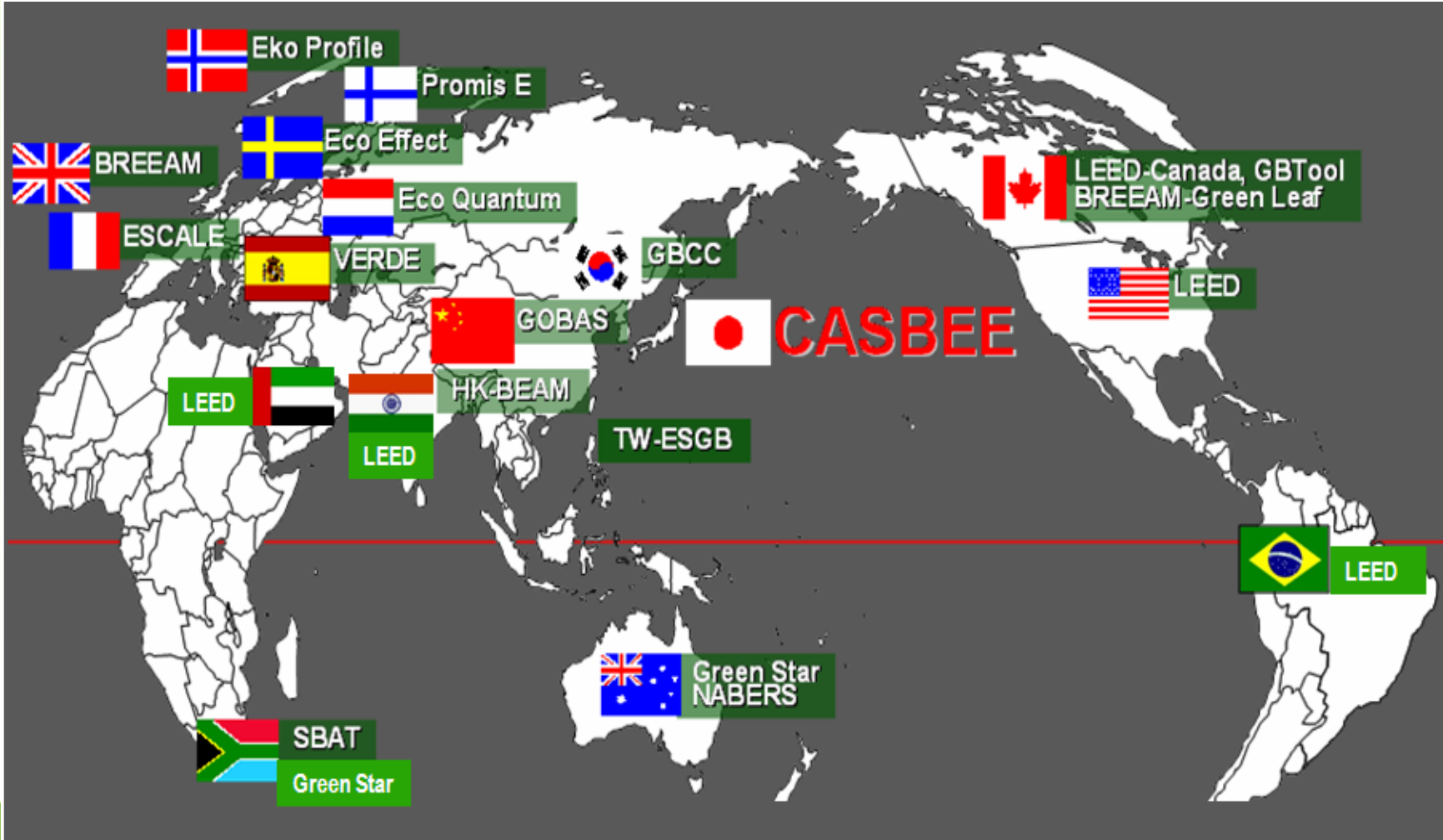
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LEED Commercial + Homes + Schools Project Totals

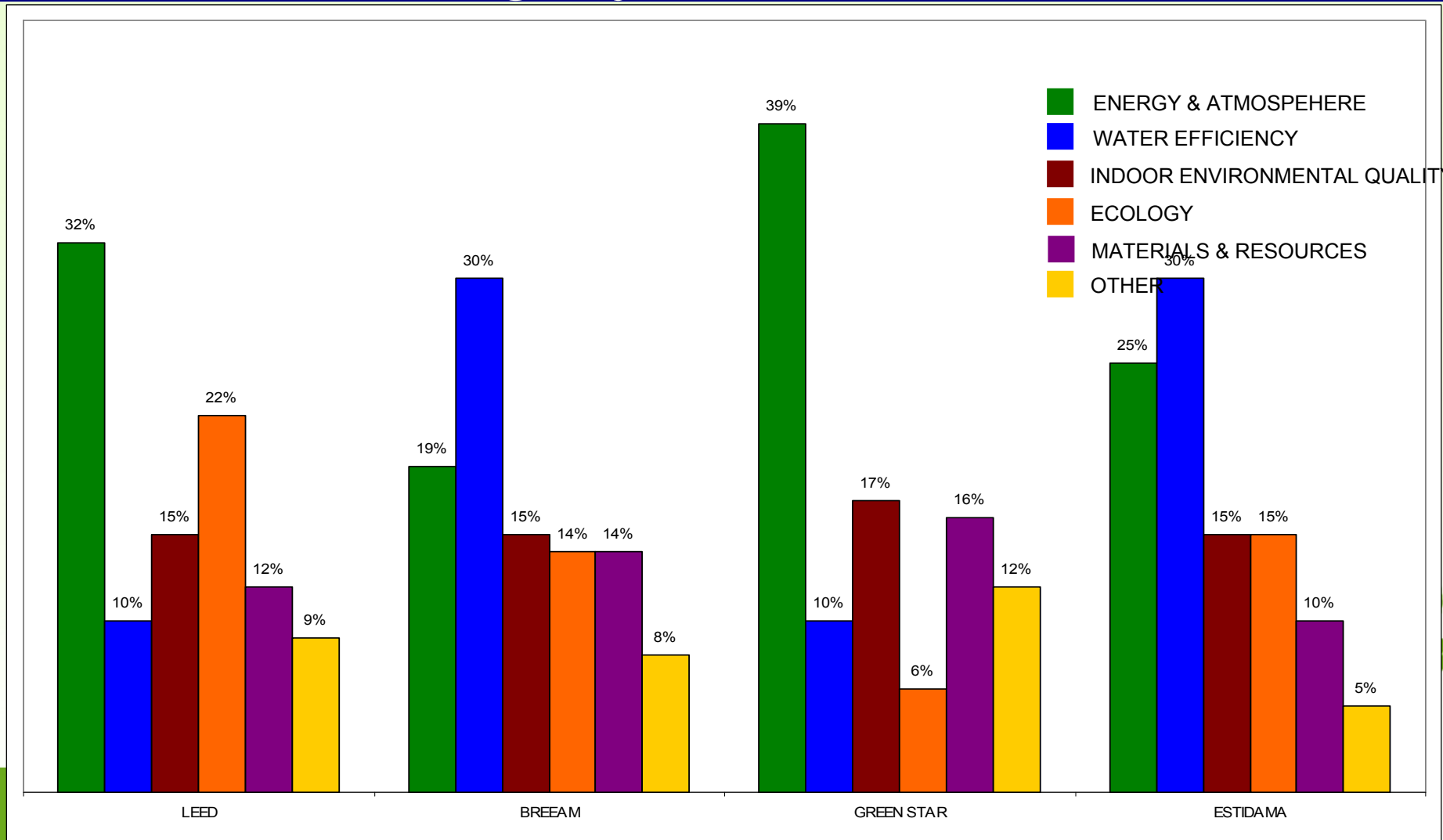
As of September 2010



International Rating Systems- Tools



Tools and Rating Systems- Point Distribution



Lighting Power Density

Lighting Power Density Requirement (watts per sq.ft.)

Building Area Method

Area Served	ASHRAE	Estidama	Dubai Municipality	Energy Codes
	Standard 90.1 - 2007	Pearl Rating System	Green Building Regulation 2010	Standard 189.1 - 2009/LEED
Office	1	1	0.93	0.9
Hotels	1	1	0.93	0.9
Resorts	1	1	0.93	0.9
Restaurants	1.3	1.3	0.93	1.17
Schools/Educational Facilities	1.2	1.2	1.12	1.08
Manufacturing Facility	1.3	1.3	1.21	1.17
Retail Outlets	1.5	1.5	1.30	1.35
Shopping Malls	1.5	1.5	1.30	1.35
Workshops	1.4	1.4	1.30	1.26
Warehouses	0.8	0.8	0.74	0.72

Water Efficiency – LEED, DEWA & Estidama Comparison

Sl. No	Item	LEED v3 Baseline Requirements	DEWA Requirements	Estidama Baseline Requirements
1	Commercial Toilet	1.28 GPF = 4.88 LPF	Dual Flush Toilet (Mandatory) 6 LPF (full) / 3 LPF (part)	Dual Flush Toilet 6 LPF (full) / 4 LPF (low)
2	Commercial Urinals	0.8 GPF = 3.04 LPF	1 LPF / or Waterless Urinal	0.5 LPF
3	Commercial Lavatory (Restroom) Faucet	1.76 GPM (6.68 LPM) @ 60psi for private application 0.4 GPM (1.52 LPM) @ 60psi for other places 0.20 GPS (0.76 LPS) for Metering Faucet	6 LPM	Bathroom Tap: Private 6 LPM @ 60psi Bathroom Tap: Public 1.9 LPM @ 60psi Bidet 6 LPM
4	Kitchen Sink	1.76 GPM (6.68 LPM) @ 60psi	7 LPM	6 LMP @ 60psi
5	Showerhead	2.0 GPM (7.6 LPM) @ 60psi	8 LPM	9.5 LMP @ 80psi

Building Envelope Characteristic Comparison

Non-Residential Application (Climate Zone 1 - A&B)

Building Envelope		ASHRAE Standard 90.1-2007		Estidama		Standard 189.1 - 2009		Dubai Municipality	
		Climate Zone 1(A&B)		Pearl Rating System		Climate Zone 1(A&B)		Green Building Regulation 2010	
		W/sq.m deg.K	BTU/hr / sq.ft. deg.F	W/sq.m deg.K	BTU/hr / sq.ft. deg.F	W/sq.m deg.K	BTU/hr / sq.ft. deg.F	W/sq.m deg.K	BTU/hr / sq.ft. deg.F
Roof	U-Value	0.355	0.063	0.355	0.063	0.27	0.048	0.44	0.078
	Description	Insulation Entirely above Deck		Insulation Entirely above Deck		Insulation Entirely above Deck		no information available	
Wall	U-Value	0.7	0.124	0.7	0.124	0.43	0.077	0.57	0.10
	Description	Steel Framed		Steel Framed		Steel Framed		no information available	
Floors Typical	U-Value	1.97	0.35	1.97	0.35	0.3	0.052	no info available	no info available
	Description	Steel Joist		Steel Joist		Steel Joist		no information available	
Fenestration 10% to 40% of wall	U-Value	6.81	1.2	6.81	1.2	6.81	1.2	3.28	0.58
	SHGC (All)	0.25		0.25		0.25		0.35	
	SC (All)	0.29		0.29		0.29		0.40	
Fenestration 0% to 40% of wall	U-Value	6.81	1.2	6.81	1.2	6.81	1.2	2.10	0.37
	SHGC (All)	0.25		0.25		0.25		0.30	
	SC (All)	0.29		0.29		0.29		0.35	
Skylight w/ curb 0% to 2% of roof (Glass)	U-Value	11.17	1.98	11.17	1.98	4.03	0.71	6.70	1.19
	SHGC	0.36		0.36		0.19		0.22	
	Shading Coefficient	0.41		0.41		0.22		0.25	
Skylight w/ curb 2.1% to 5% of roof (Glass)	U-Value	11.17	1.98	11.17	1.98	4.03	0.71	6.70	1.19
	SHGC	0.19		0.19		0.19		0.11	
	Shading Coefficient	0.22		0.22		0.22		0.13	



USGBC
EDUCATION

V3





Leadership Energy Environmental Design



LEED Affiliations

USGBC Member Company



LEED Accredited Professional

Four Certification Levels



LEED Certified Building



40-49

50-59

60-79

80+ Points

Muscat Green Days



Leadership in Energy and Environmental Design

A leading-edge system
for certifying the
greenest performing
buildings in the world

© U.S. Green Building Council, 2008



LEED Facts	
Building size	12,500 square ft
Type of building	
LEED for Core & Shell Development	
Certification awarded July 27, 2008	
Platinum	49*
Sustainable Sites	13/15
Water Efficiency	5/5
Energy & Atmosphere	12/15
Materials & Resources	6/9
Indoor Environmental Quality	10/13
Innovation & Design	3/5
*Out of a possible 62 points	



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Design Tool
Bench Mark
Measures Performance
Carbon Reduction Tool



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Design and Certification Tools



- Rating systems
- Reference guides
- LEED-Online
- Credit Interpretation Rulings (CIRs)
- www.usgbc.org
- Case studies



U.S. GREEN BUILDING COUNCIL

LEED Education Resources News & Events

Welcome to USGBC

The U.S. Green Building Council is a 501(c)(3) non-profit community of leaders working to make green buildings available to everyone within a generation. This is the place to:

- » [Certify your green building](#)
- » [Join USGBC as an organization](#)
- » [Join a chapter as an individual](#)
- » [Sign up for courses and workshops](#)
- » [Purchase LEED Reference Guides](#)
- » [Register for Greenbuild](#)
- » [Sign up for e-newsletters](#)
- » [Become a LEED AP](#)
- » [Learn about green building](#)

Highlights

USGBC's Strate



Mus

CREDIT CATEGORY SYNERGIES & INTEGRATIVE DESIGN

Sustainable Sites





LEED 2009 for Core and Shell Development

Project Checklist

KAFD: Parce 0.00

20-Nov-09

50	43	17	Certified 40-49 Silver 50-59 Gold 60 -79 Platinum 80+	Possible Points	110
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11	15	2	Sustainable Sites	Possible Points	28	2	3	8	Materials & Resources	Possible Points	13
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Y	?	N				Y	?	N			
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Y			Prereq 1	Erosion & Sedimentation Control		C	Y		Prereq 1	Storage & Collection of Recyclables		D		
1	0	0	Credit 1	Site Selection	1	D	0	0	5	Credit	Building Reuse, Maintain existing floors, walls, roofs	5	C	
5	0	0	Credit 2	Development Density	5	D	1	1	0	Credit 2	Construction Waste Management	2	C	
0	0	1	Credit 3	Redevelopment of Contaminated Sites	1	D	0	0	1	Credit 3	Materials Reuse	1	C	
0	6	0	Credit 4.1	Alternative Transportation, Public Transportation Access	6	D	0	1	1	Credit 4	Recycled Content, Specify 10, 20% (post-consumer + 1/2 pre-consumer)	2	C	
2	0	0	Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	2	D	1	0	1	Credit 5	Regional Materials, 20, 30% Extracted and Manufactured Regionally	2	C	
0	3	0	Credit 4.3	Alternative Transportation, Low Emitting & Fuel Efficient Vehicles	3	D	0	1	0	Credit 6	Certified Wood	1	C	
0	2	0	Credit 4.4	Alternative Transportation, Parking Capacity	2	D								
0	0	1	Credit 5.1	Reduced Site Disturbance, Protect or Restore Open Space	1	C	9	3	0	Indoor Environmental Quality			Possible Points	12
0	1	0	Credit 5.2	Reduced Site Disturbance, Development Footprint	1	D	Y			Prereq 1	Minimum IAQ Performance		D	
0	1	0	Credit 6.1	Stormwater Management, Rate and Quantity	1	D	Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control		D	
0	1	0	Credit 6.2	Stormwater Management, Treatment	1	D	1	0	0	Credit 1	Outdoor Air Delivery Monitoring	1	D	
1	0	0	Credit 7.1	Heat Islands Effect, Non-Roof	1	C	0	1	0	Credit 2	Increased Ventilation	1	D	
1	0	0	Credit 7.2	Heat Islands effect, Roof	1	D	1	0	0	Credit 3.1	Construction IAQ Management Plan, During Construction	1	C	
0	1	0	Credit 8	Light Pollution Reduction	1	D	1	0	0	Credit 4.1	Low-Emitting Materials, Adhesives & Sealants	1	C	
1	0	0	Credit 3	Tenant Design and Construction Guidelines	1	D	1	0	0	Credit 4.2	Low-Emitting Materials, Paints and Coating	1	C	
							1	0	0	Credit 4.3	Low-Emitting Materials, Carpet	1	C	

9	1	0	Water Efficiency	Possible Points	10	1	0	0			
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Y			Prereq 1	Water Use Reduction, 20% Reduction		D	1	0	0	Credit 5	Indoor Chemical & Pollutant Source Control	1	D
4	0	0	Credit 1	Water Efficient Landscaping, Reduce by 50%	4	D	0	1	0	Credit 6	Controllability of Systems, Thermal Comfort	1	D
2	0	0	Credit 2	Innovative Wastewater Technologies	2	D	0	1	0	Credit 7	Thermal Comfort, Design	1	D
3	1	0	Credit 3	Water Use Reduction, 30, 35, 40 Reduction	4	D	1	0	0	Credit 8.1	Daylight & Views, Daylight	1	D
							1	0	0	Credit 8.2	Daylight & Views, Views	1	D

14	16	7	Energy & Atmosphere	Possible Points	37						
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Y			Prereq 1	Fundamental Building Systems Commissioning		C	5	1	0	Innovation & Design Process			Possible Points	6
Y			Prereq 2	Minimum Energy Performance		D	1	0	0	Credit 1.1	Innovation in Design: Green Education	1	C	
Y			Prereq 3	CFC Reduction in HVAC&R Equipment and elimination of Halons		D	1	0	0	Credit 1.2	Innovation in Design: Insert strategy	1	?	
4	14	3	Credit 1	Optimize Energy Performance,	21	D	1	0	0	Credit 1.3	Innovation in Design: Insert strategy	1	?	
4	0	0	Credit 2	On Site Renewable Energy, 1,3,5,7,9,11,13%	4	D	1	0	0	Credit 1.4	Innovation in Design: Insert strategy	1	?	
0	0	2	Credit 3	Enhanced Commissioning	2	C	0	1	0	Credit 1.5	Innovation in Design: Insert strategy	1	?	
0	2	0	Credit 4	Enhanced Refrigeration Management	2	D	1	0	0	Credit 2	LEED Accredited Professional	1	C	
3	0	0	Credit 5.1	Measurement & Verification: Base building	3	C								

3	0	0	Credit 5.2	Measurement & Verification: Tenant Submetering	3	C	0	4	0	Regional Priority			Possible Points	4
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0	0	2	Credit 6	Green Power	2	C	0	1	0	Credit 1	Regional Priority:		1	?
				Site wide application strategy (for some or all of the application requirements)			0	1	0	Credit 2	Regional Priority:		1	?
				Not achievable by any parcel			0	1	0	Credit 3	Regional Priority:		1	?
C	D			refers to Construction or Design level submissions			0	1	0	Credit 4	Regional Priority:		1	?

ENVIRONMENTAL IMPACTS

- CLIMATE CHANGE
- INDOOR ENVIRONMENTAL QUALITY
- RESOURCE DEPLETION
- HUMAN HEALTH CRITERIA
- WATER INTAKE
- HUMAN HEALTH-CANCEROUS
- ECOTOXICITY
- EUTROPHICATION
- HABITAT ALTERATION
- HUMAN HEALTH-NONCANCEROUS
- SMOG FORMATION
- OZONE DEPLETION
- ACIDIFICATION



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- HUMAN HEALTH-NONCANCEROUS
- SMOG FORMATION
- OZONE DEPLETION
- ACIDIFICATION

HOMES

NEIGHBORHOOD DEVELOPMENT

COMMERCIAL INTERIORS

CORE & SHELL

NEW CONSTRUCTION

SCHOOLS, HEALTHCARE, RETAIL

Present in over 115
countries in the world

EXISTING BUILDINGS
OPERATIONS & MAINTENANCE

100% SUSTAINABLE

DESIGN

CONSTRUCTION

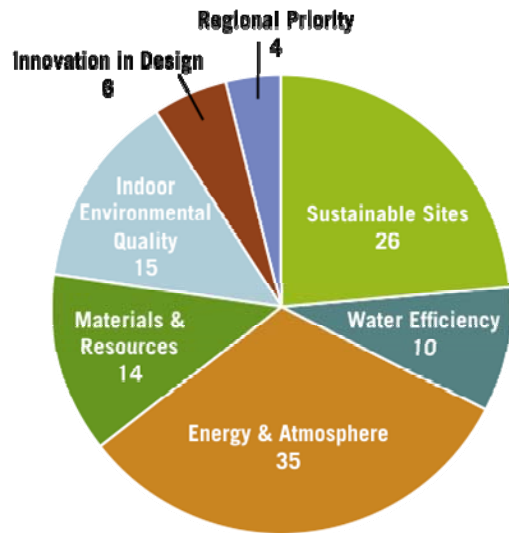
OPERATIONS

100% Green Bay

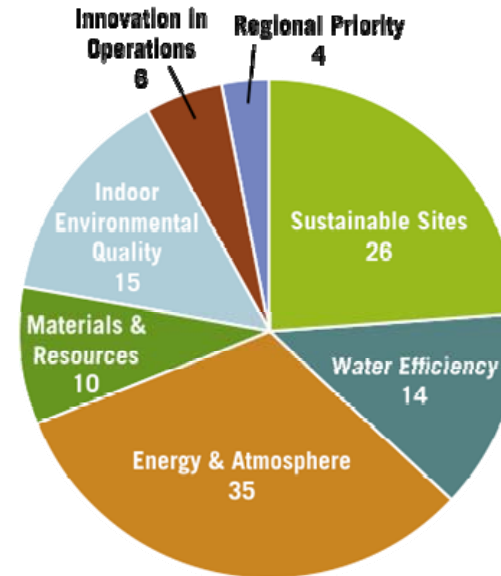
POINT DISTRIBUTIONS



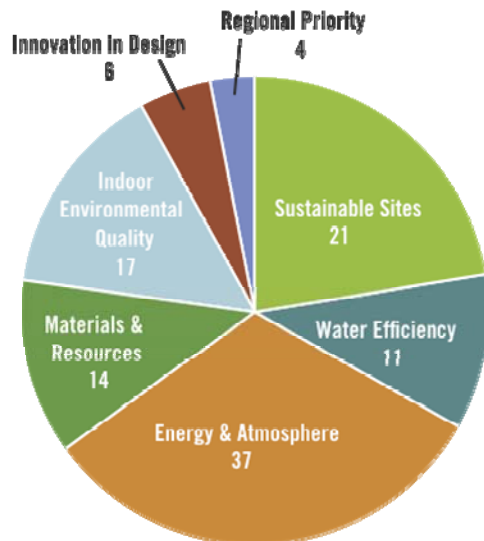
New Construction



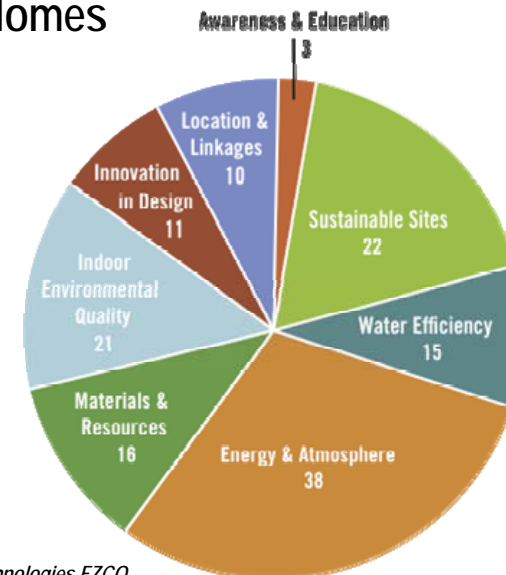
Existing Buildings: Operations & Maintenance



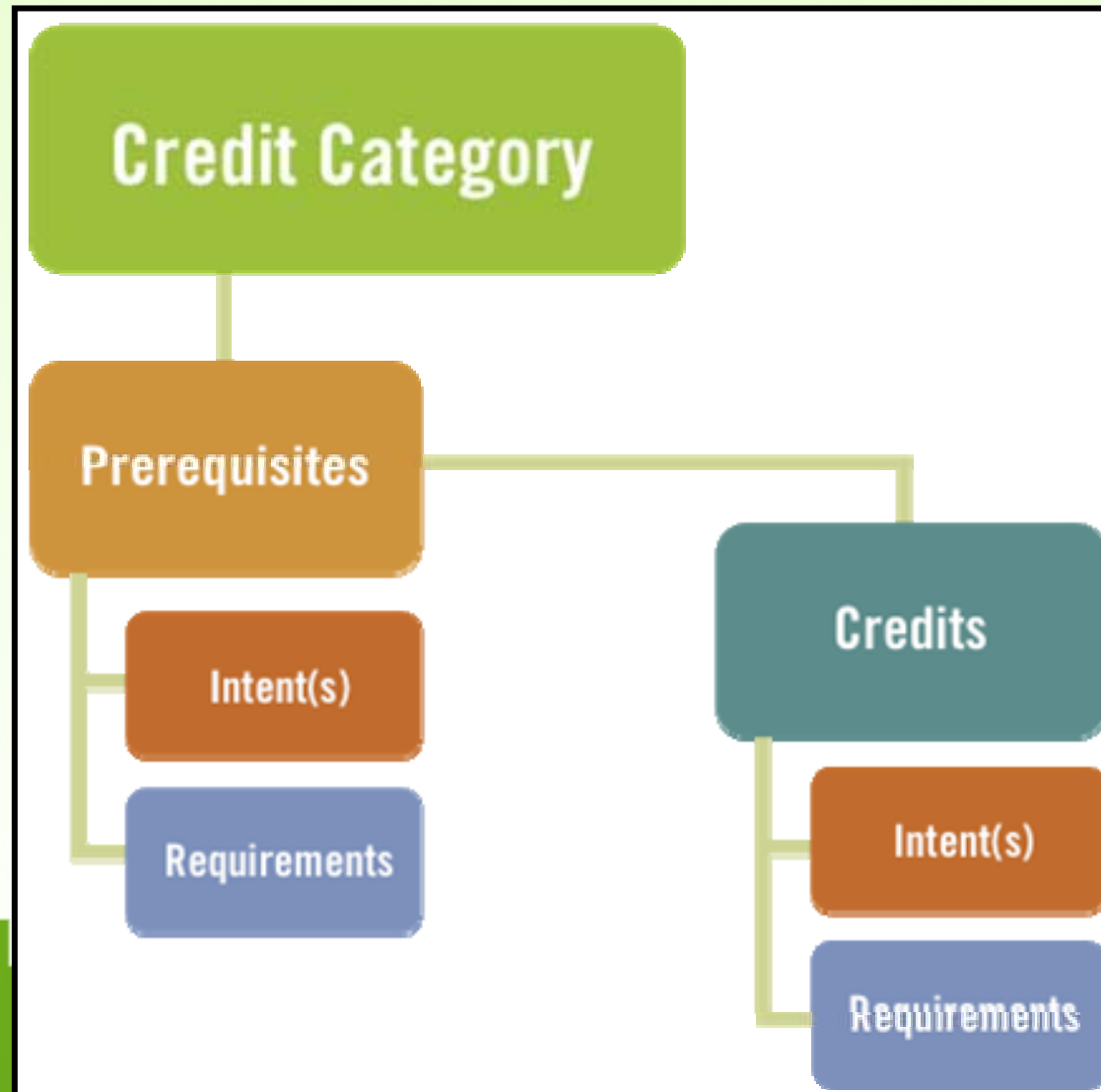
Commercial Interiors



Homes



RATING SYSTEM STRUCTURE



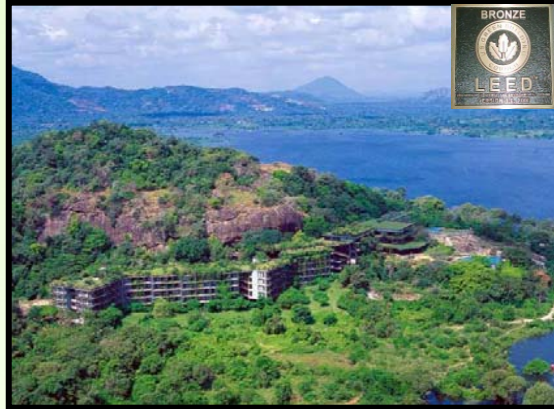


**100 Possible Points + 10 Possible Points
for Innovation / Regional Priority**

- ✓ **Certified** **40 - 49 points**
- ✓ **Silver** **50 - 59 points**
- ✓ **Gold** **60 - 79 points**
- ✓ **Platinum** **80 + points**



LEED for IIESL

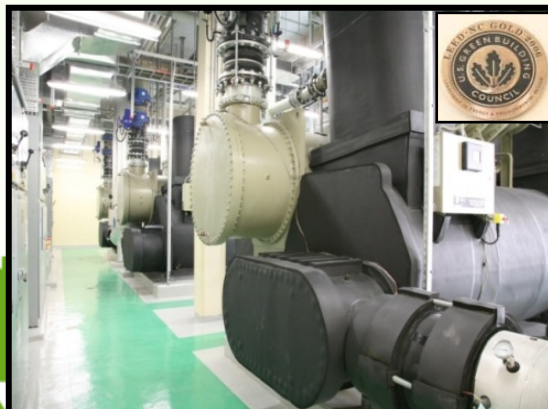


2000 – SRI LANKA

2008 - KUWAIT



2008 - UAE



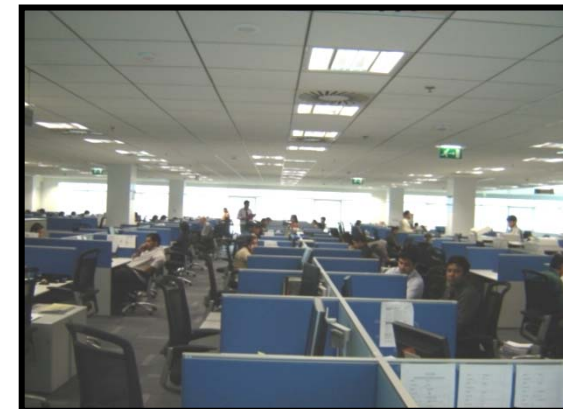
2006 – UAE



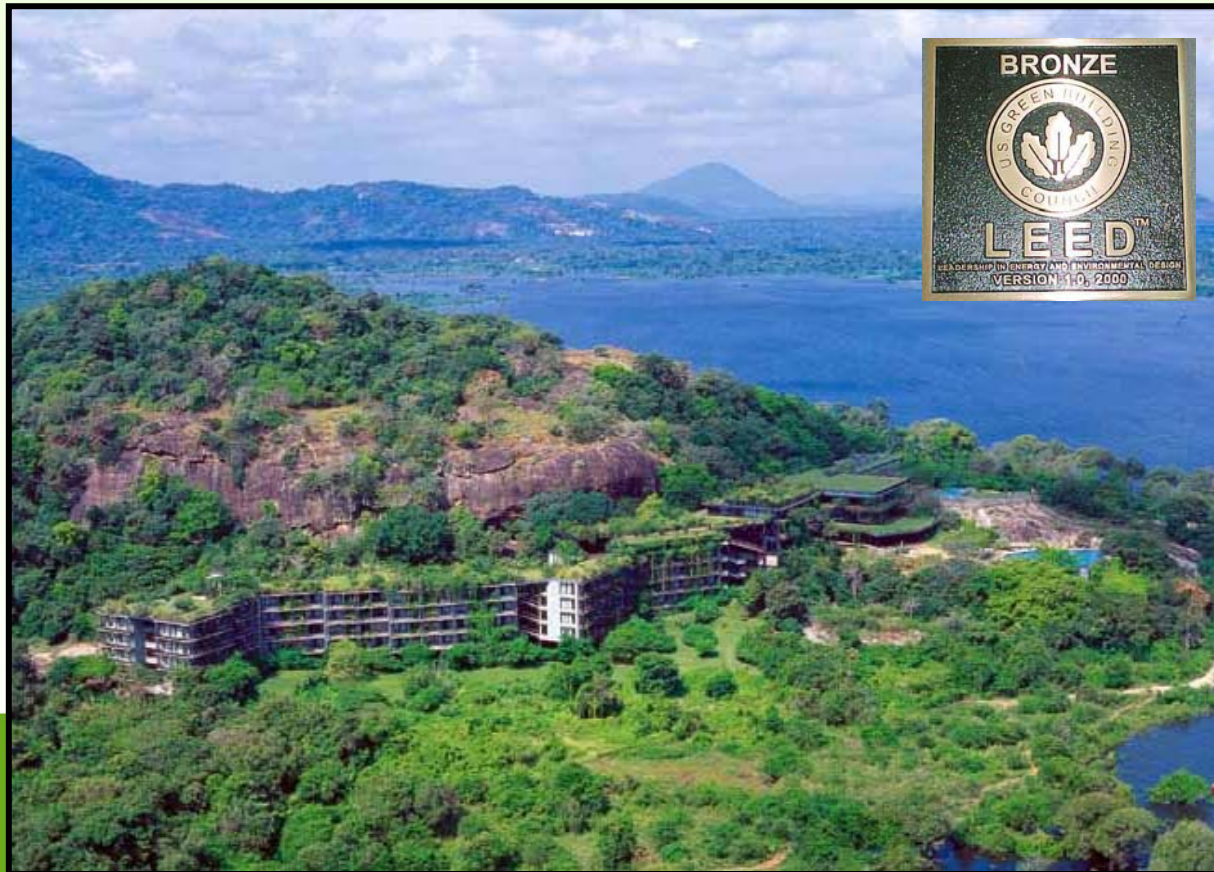
Mustat Green Days



ABN AMRO BANK'S OPERATIONS OFFICES, UAE – LEED Gold; 2008 The First LEED Commercial Interiors & the Largest LEED Project in the Middle East



THE KANDALAMA HOTEL, Dambulla – LEED Bronze; 2000 The First LEED Green Building outside USA & the First LEED Green Hotel in the World



KING ABDULLAH FINANCIAL DISTRICT RIYADH, KINGDOM OF SAUDI ARABIA

Area: 3 million sq.m.

2010



LEED Registered Projects in Oman

Project Name	City	Country	LEED System
1. Jabal Al Akhdar Hotel	Jabal Al Akhdar	OMAN	LEED-NC v2009
2. Khasab Hotel	Khasab	OMAN	LEED-NC v2009
3. MAF Muttrah Ibis and Novotel Hotel	Muscat	OMAN	LEED NC 2.2
4. MAF Sohar City Centre	Sohar	OMAN	LEED NC 2.2
5. MAF Sohar Ibis and Novotel Hotel	Sohar	OMAN	LEED NC 2.2
6. Muscat International Airport	Muscat	OMAN	LEED-NC v2009
7. Muscat International Airport	Muscat	OMAN	LEED NC 2.2
8. Oman Botanic Garden	Muscat	OMAN	LEED NC 2.2
9. Oman Convention and Exhibition Center	Muscat	OMAN	LEED-NC v2009
10. Safana Plaza - Commercial Towers	Muscat	OMAN	LEED CS 2.0
11. Salalah International Airport	Salalah	OMAN	LEED NC 2.2
12. Salalah International Airport	Salalah	OMAN	LEED-NC v2009
13. Sofitel Muscat Beach Hotel	Muscat	OMAN	LEED NC 2.2
14. The Oberoi Resort at Al Khiran	Muscat	OMAN	LEED NC 2.2
15. Aramex Logistic 3PL Warehouse	Muscat	OMAN	LEED-NC v2009

LEED Registered Projects in Oman



Jabal Al Akhdar Hotel
LEED-NC v2009



Khasab Hotel
LEED-NC v2009

LEED Registered Projects in Oman



Oman Botanical Garden

LEED NC 2.2



Oman Exhibition and
Convention Centre

LEED-NC v2009

Muscat Green Days

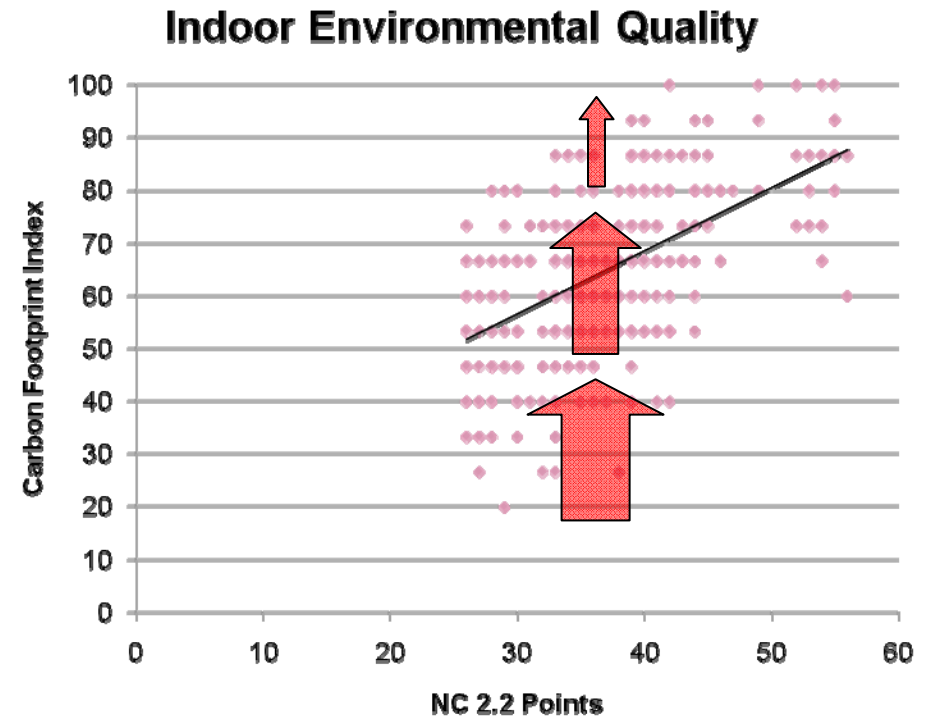
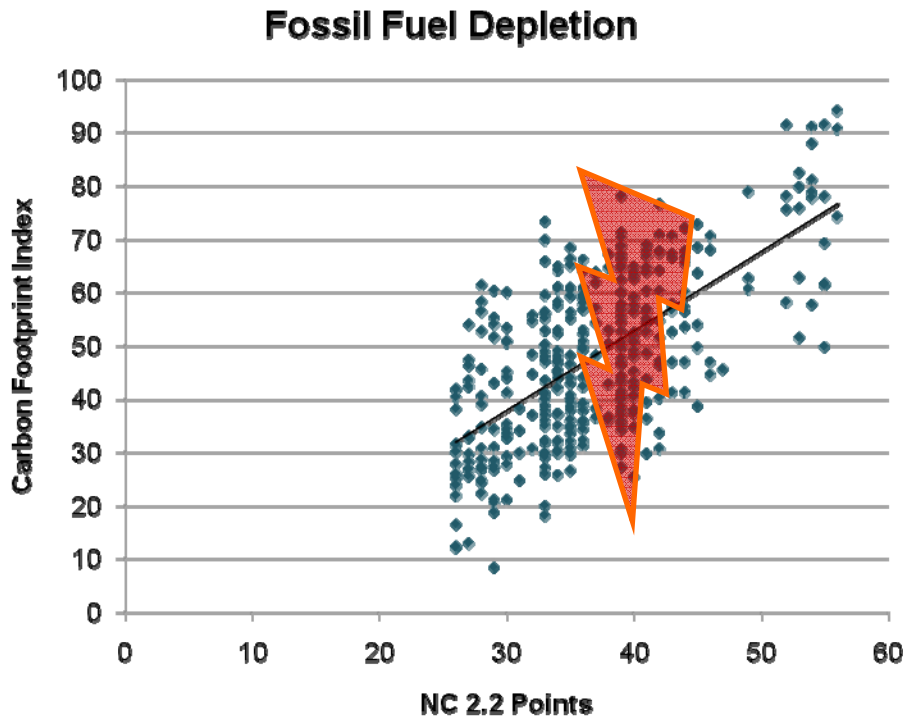
LEED Registered Projects in Oman



The Oberoi Resort at Al Khiran

LEED-NC2.2

Credit Achievement and Other Impacts on Carbon Reduction



Typical across impact categories on the 6 LEED Categories.

Muscat Green Days



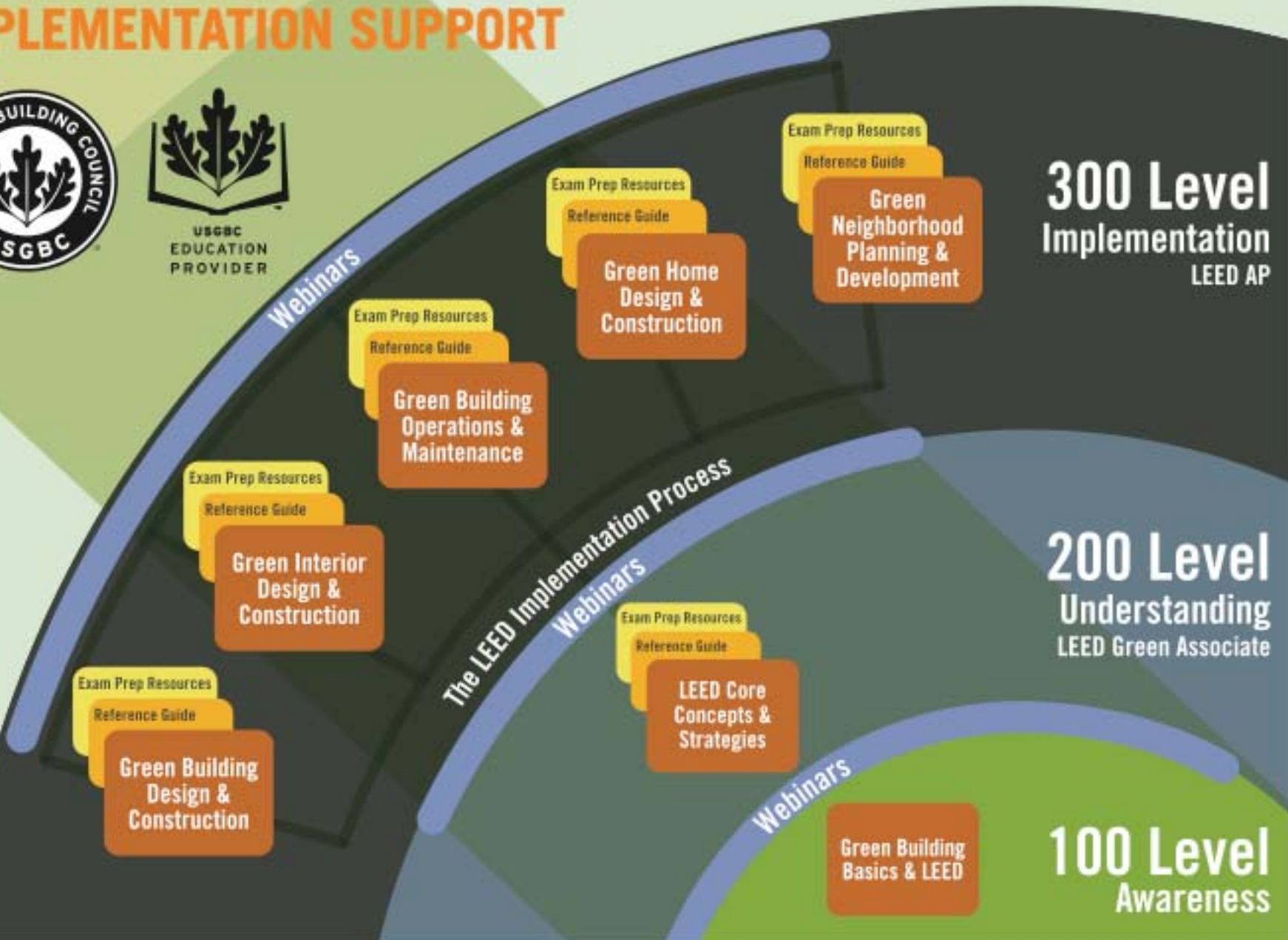
USGBC
EDUCATION

V3



CREDENTIAL MAINTENANCE & IMPLEMENTATION SUPPORT

400 Level



300 Level
Implementation
LEED AP

200 Level
Understanding
LEED Green Associate

100 Level
Awareness

Webinars

The LEED Implementation Process

Webinars

Webinars

Green Building Design & Construction

Green Interior Design & Construction

Green Building Operations & Maintenance

Green Home Design & Construction

Green Neighborhood Planning & Development

Green Building Basics & LEED

LEED Core Concepts & Strategies

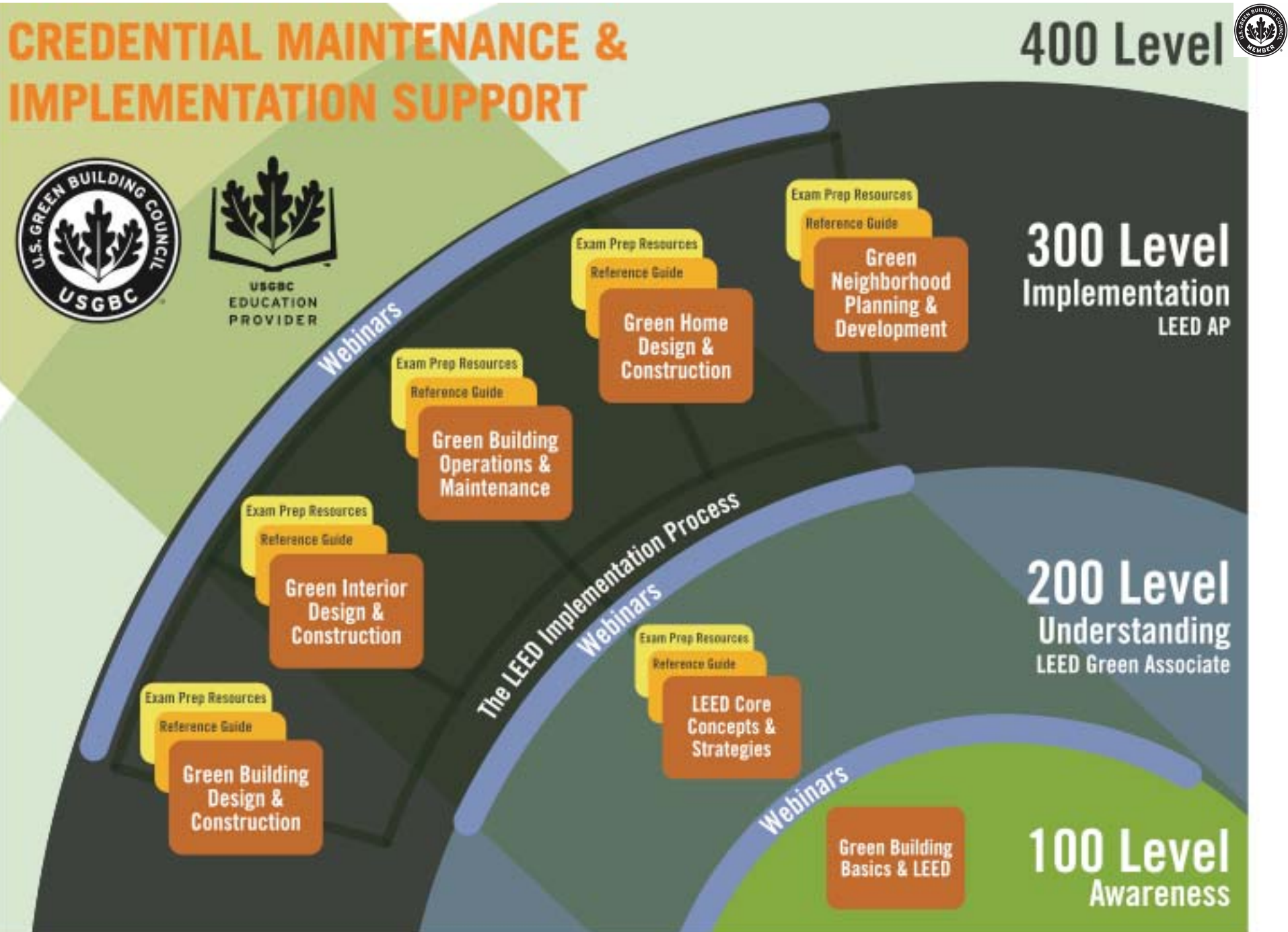
Exam Prep Resources
Reference Guide

Exam Prep Resources
Reference Guide

Exam Prep Resources
Reference Guide

Exam Prep Resources
Reference Guide

Exam Prep Resources
Reference Guide





NEW LEED CREDENTIALS



LEED Professionals in Oman

LEED Green Associates: 2

LEED Accredited Professionals without specialty: 4

LEED Accredited Professionals with specialty:

- BD+C: 1



LEED & Sustainability Training Courses : Year Planner 2010 - 2011*

	Course Description	Sept. 2010	Oct. 2010	Nov. 2010	Dec. 2010	Jan. 2011	Feb. 2011	Mar. 2011	Apr. 2011	May. 2011	Jun. 2011	Jul. 2011	Ramadan	Sept. 2011
USGBC LEED Training	101 – Level (Half-day): Green Building Basics & LEED¹													
	200 – Level (Full-day)													
	LEED 201: Core Concepts and Strategies			•			•			•				•
	BD+C 251: Understanding the Building Design + Construction LEED Rating Systems	•	•	•		•					•			
	300 – Level (Full-day)													
	BD+C 301: Implementing the Building Design + Construction LEED Rating Systems				•			•					•	
Sustainability & Engineering Training	Integrative Engineering for Energy Efficiency							•						•
	Whole Building Simulation Using eQuest (minimum of ten participants)				•					•				

1 - On request: Minimum 25 participants

2 - Private Workshops can be Scheduled on request

3 - Unless otherwise noted, all LEED Training will be conducted by Mr. Mario Seneviratne - USGBC Faculty Member & Faculty Mentor

In case of queries, contact talktous@greentechno.ae or call: +971-4-2997764

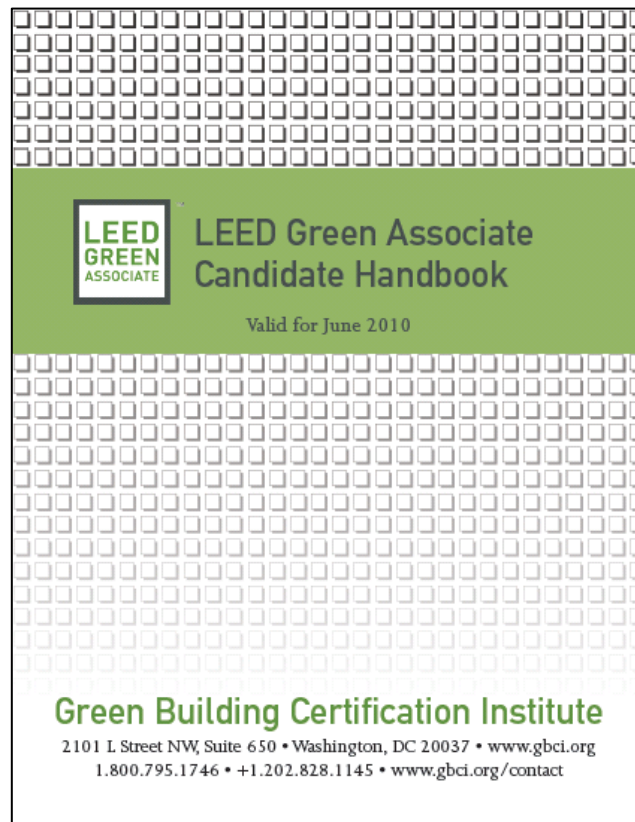
*Year Planner 2010-2011 is intended for planning purposes. Release dates and titles are subject to change.

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LEED Information

LEED Candidate handbooks – Are updated every month



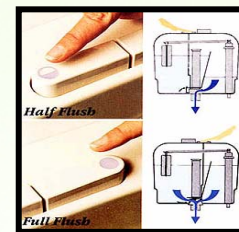
For all information:

www.usgbc.org

www.gbci.org

Proven Green Strategies

1. Improved Façade
2. Solar Hot Water Heating
3. Lower Lighting Power
4. Code Compliant HVAC System
5. Grey Water Treatment
6. Low Flow Water Fixture



Accelerate the Process to Carbon Reductions

Target Reductions Required

Select (A) Design and Rating System or (Many)

Use it to Gain the Experience in this New Arena

Modify to Suit

Continuous Monitoring and Improvement



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Questions?



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MUSCAT GREEN CONFERENCE

Green Building Rating Systems and Achieving Greater Levels of Sustainability in the GCC

5th October 2010

Muscat, Oman.

Mario Seneviratne *FIMechE., PEng., LEED AP (BD+C),
LEED Faculty Member , LEED Mentor*
Managing Director - Green Technologies FZCO

