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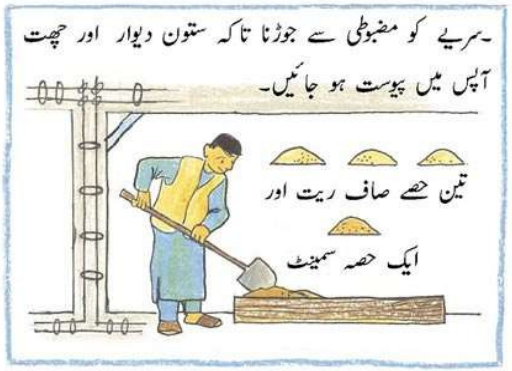
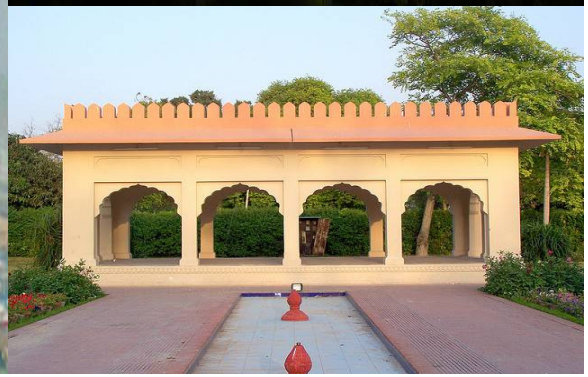




PAKISTAN HVACR SOCIETY

(Associate Society of ASHRAE - USA)

Pakistan HVCAR Society

Sustainability
Un-definable Success in a Defined World

02 March 2013

E. Mitchell Swann P.E., LEED AP

F. CIBSE, C.Eng

Principal

MDC*Systems*®

www.MDCSystems.com

Program Overview

- Overview of Green/Sustainable Design
  - Objectives of Green Buildings
- Overview of Rating Systems
- Issues and Risks in Green Building Design
- Tools to Mitigate Risk
- Summary
- Questions & Answers

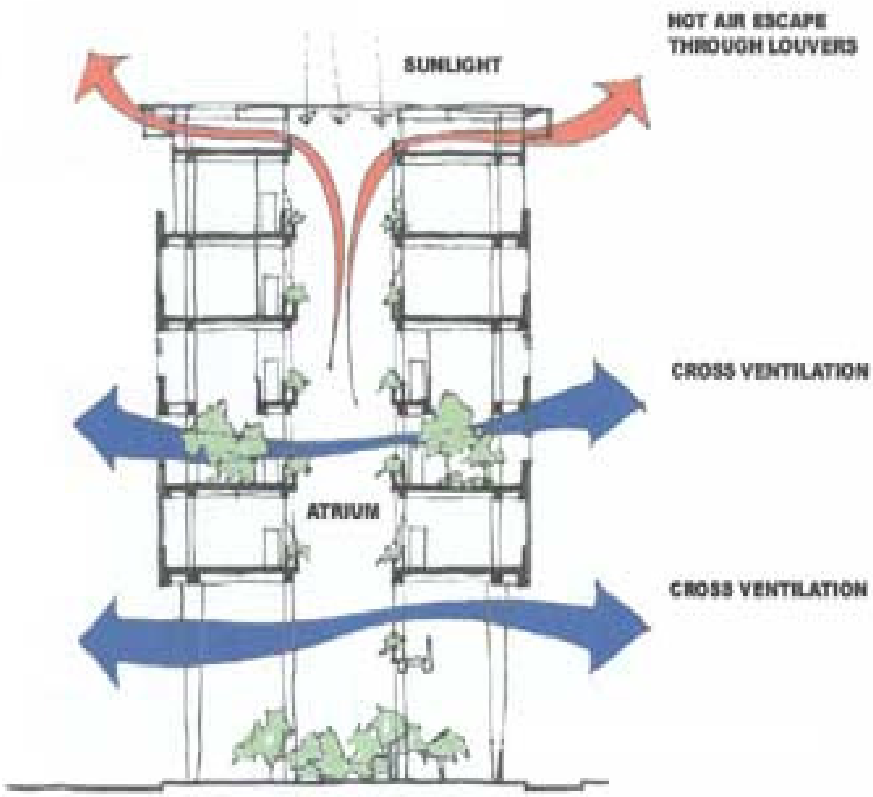
God has gifted us with many talents, the least we can do is explore them.

Danish Rahi

What are the objectives?

Green Building Objectives

- greater efficiency
  - Energy
  - Resources
- lower life cycle cost
  - Total Cost of Ownership
    - Operations
    - Maintenance
    - "Cradle to grave"
      - "cradle to cradle"
- healthier environment
  - IAQ/IEQ
  - waste management
  - increased productivity
    - "enhanced wellness"
- <u>better performance</u>



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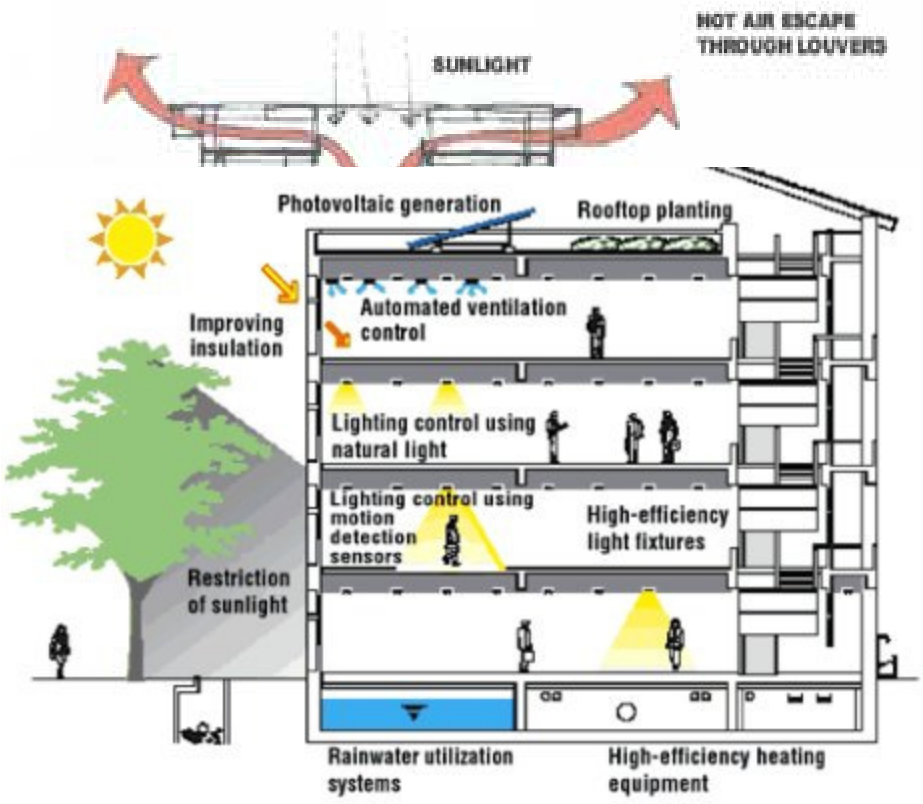


A Balancing Act

of

Expectation and Intent

The Cost of Green

New Construction	LEED Silver	Best Energy	ZNE
Urban High-Rise, Class A	0%	2% - 10%	?
		40kBtu/sf/yr	
Urban High-Rise, Code Minimum	1% - 3%	8% - 15%	?
		40kBtu/sf/yr	
Low-Rise, Low Density, High End	0%	0% - 20%	+5% - 10%
		25kBtu/sf/yr	
Low-Rise, Low Density, Code Minimum	2% - 8%	15% - 30%	+5% - 10%
		25kBtu/sf/yr	
Branch Library, Good Quality	0%	-3% - 5%	+3% - 8%
		20kBtu/sf/yr	

Current Trends in Green Real Estate June 19, 2012 Davis Langdon An AECOM Company

Table III. Green certification, green cost premiums and payback periods

BCA Green Mark Award type	Green cost premium (%)	Payback period (years)
Platinum	2-8	2-8
Gold^{PLUS}	1-3	2-6
Gold	1-2	2-6
Certified	0.3-1	2-5

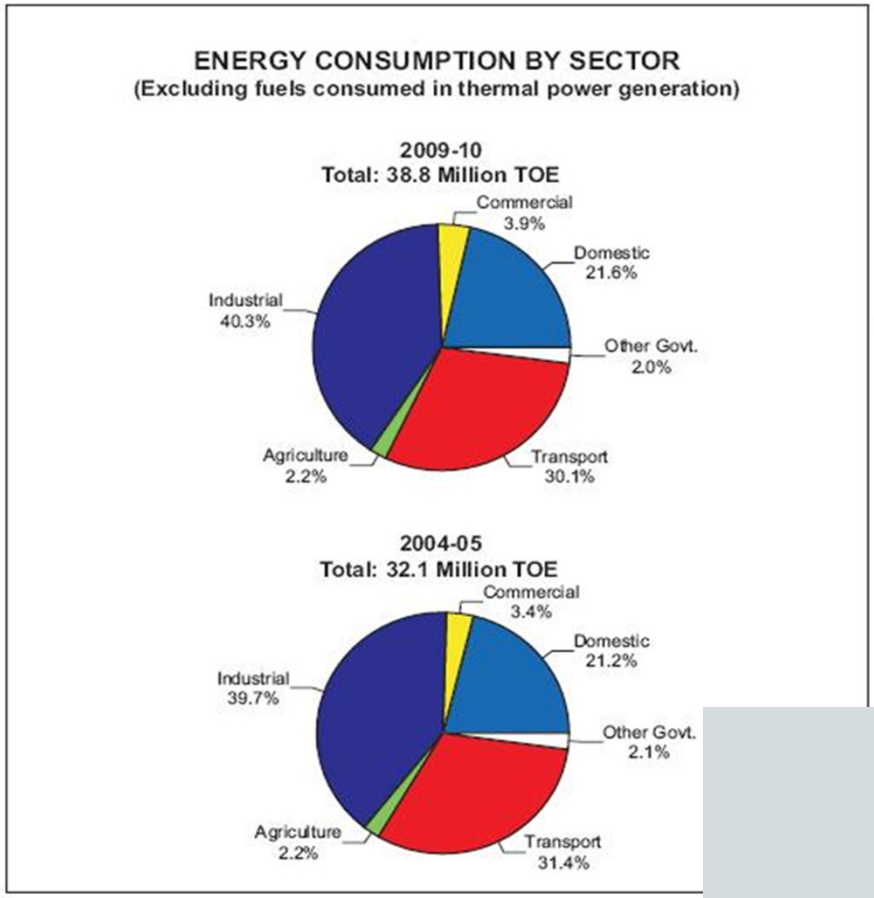
Source: BCA (2007)

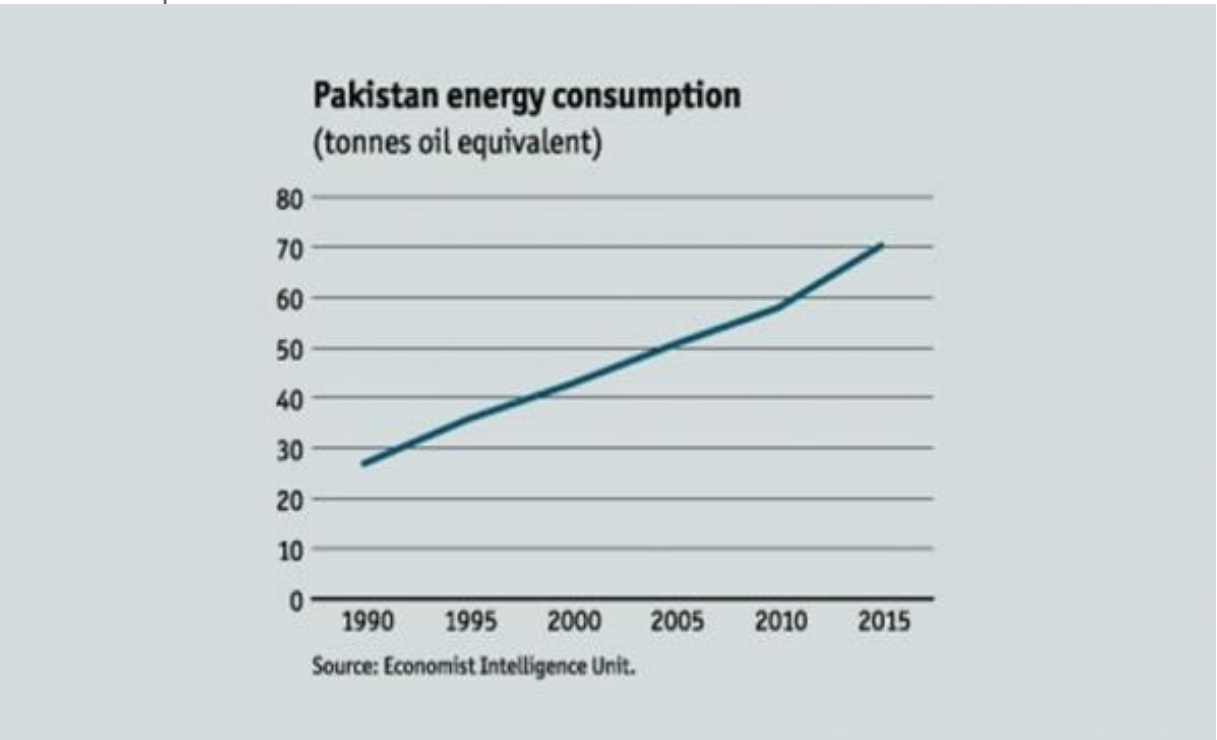
from Sustainable Facilities: Institutional compliance and the Sino-Singapore Tianjin Eco-city Project (2009) by S. P. Low, (National University of Singapore (NUS), J. Y. Liu, (Tianjin University, Tianjin, China), P. Wu, (NUS) Emerald Group Publishing Limited

Why do this?

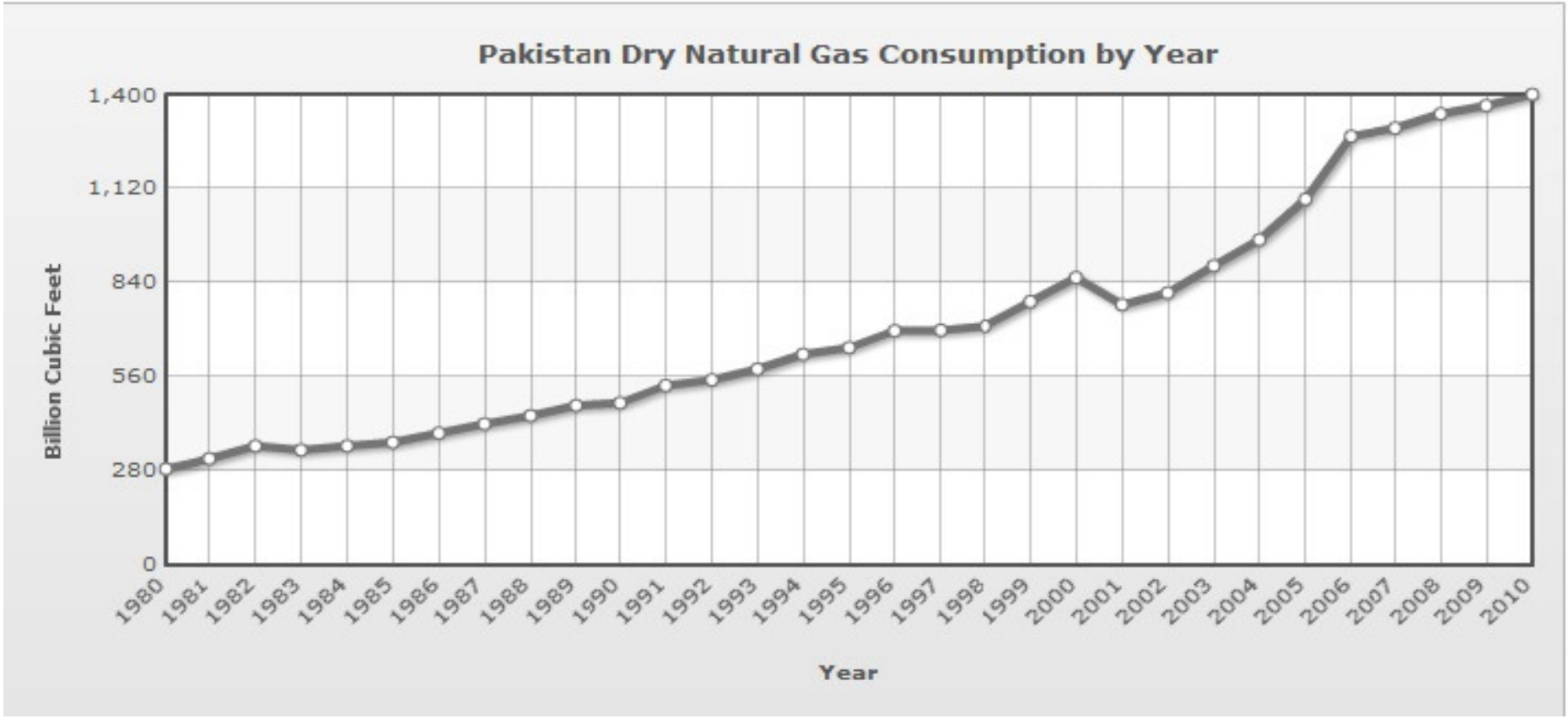
Some context

Energy Trends

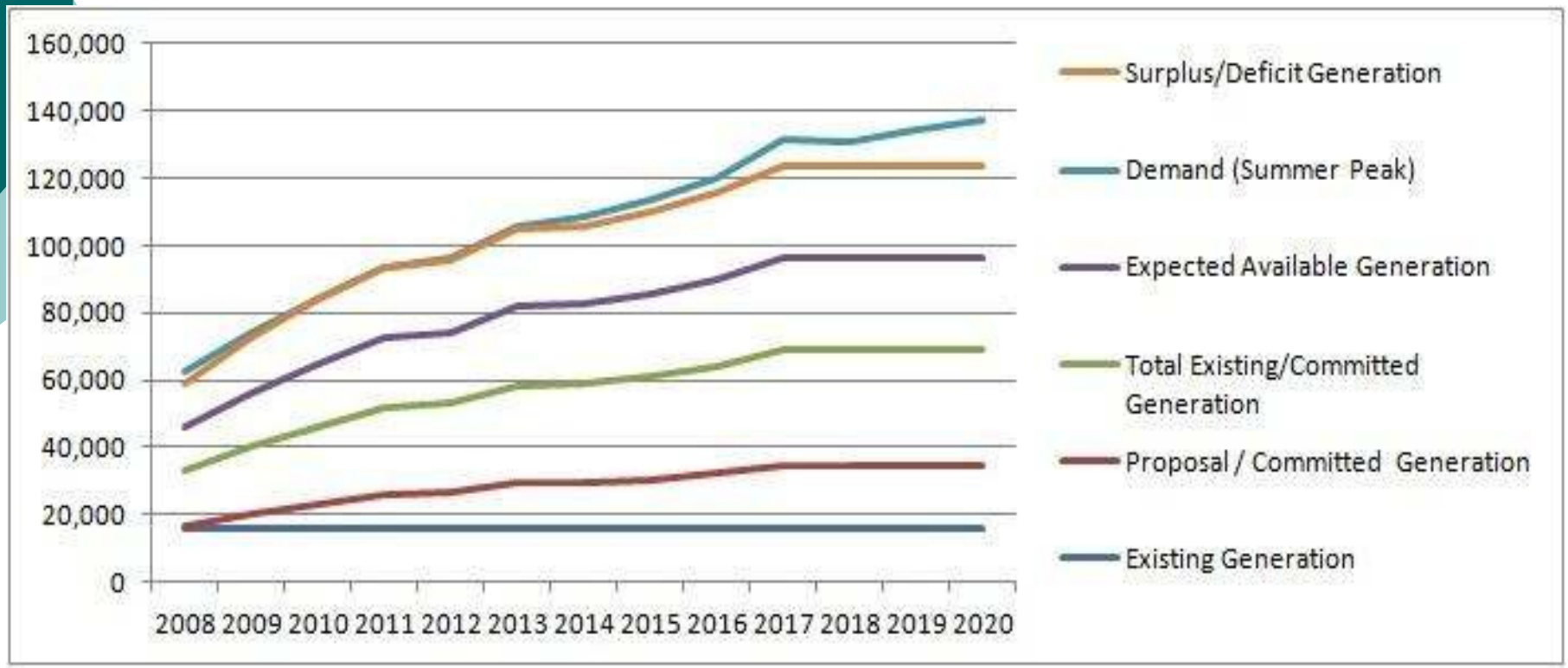




Some context - Energy Trends



Some context - Energy Trends



Energy:

Electricity Consumption and the Human Development Index

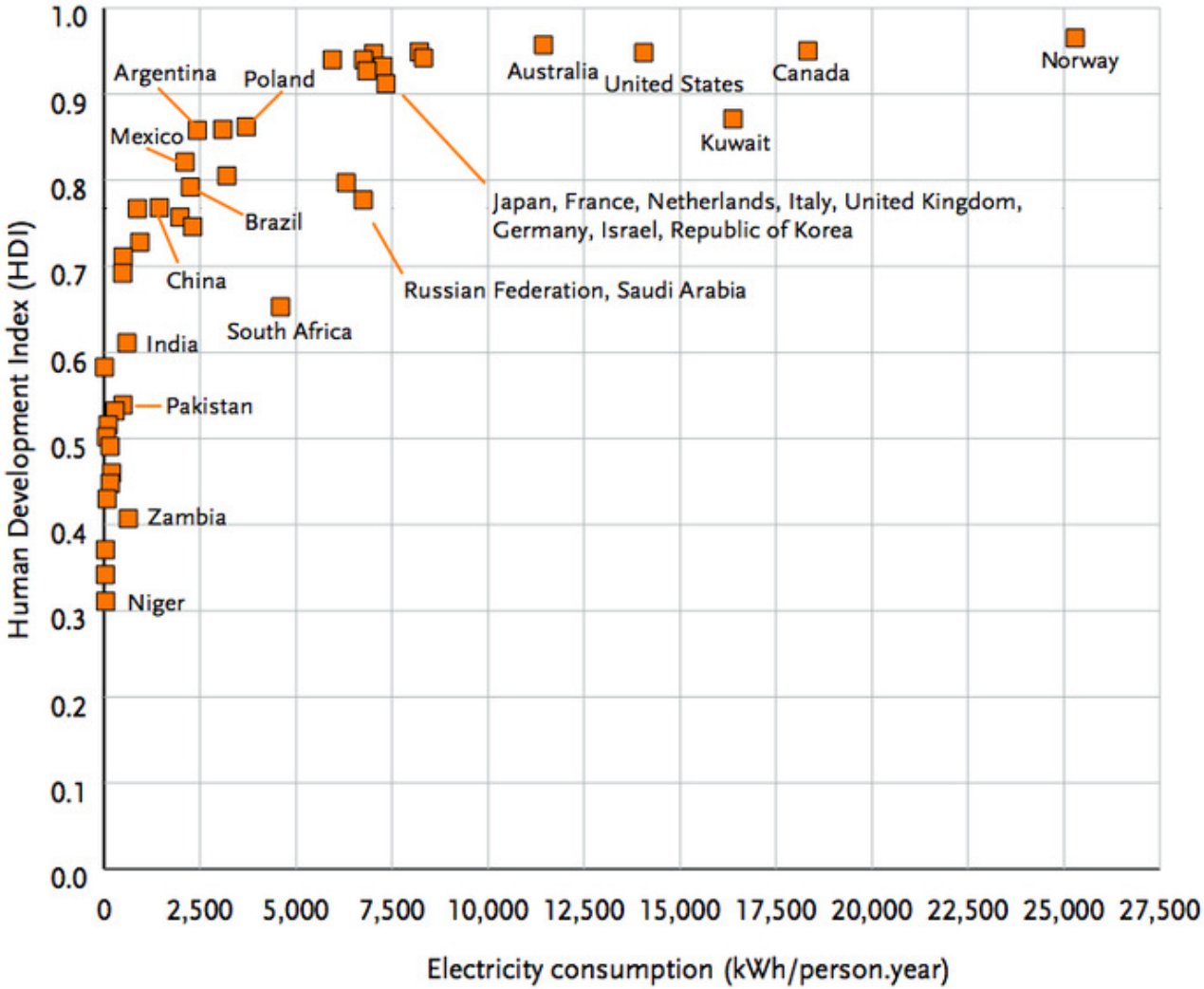


Figure 1.6 Relationship between human development index (HDI) and per capita electricity consumption, 2003 – 2004

Note: World average HDI equals 0.741. World average per capita annual electricity consumption, at 2,490 kWh per person.year, translates to approximately 9 gigajoules (GJ)/person.year [10,000 kilowatts (kWh) = 36 GJ]

Source: UNDP, 2006.

How do we measure?

Rating Systems

U.S. GREEN BUILDING COUNCIL
LEED
USGBC

Vietnam Green Building Council
LOTUS

breeam

BCA GREEN MARK

绿色建筑标识
GREEN BUILDING LABEL

إستدامة
estidamá

green star SA
Rating System
Green Building Council of South Africa

QSAS
QATAR SUSTAINABILITY ASSESSMENT SYSTEM
المنظومة القطرية لتقييم الاستدامة

CASBEE® 建築環境総合性能評価システム
Comprehensive Assessment System for Built Environment Efficiency

GID+C Checklist:

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

USGBC's LEED Categories v3.0

GID+C Checklist:

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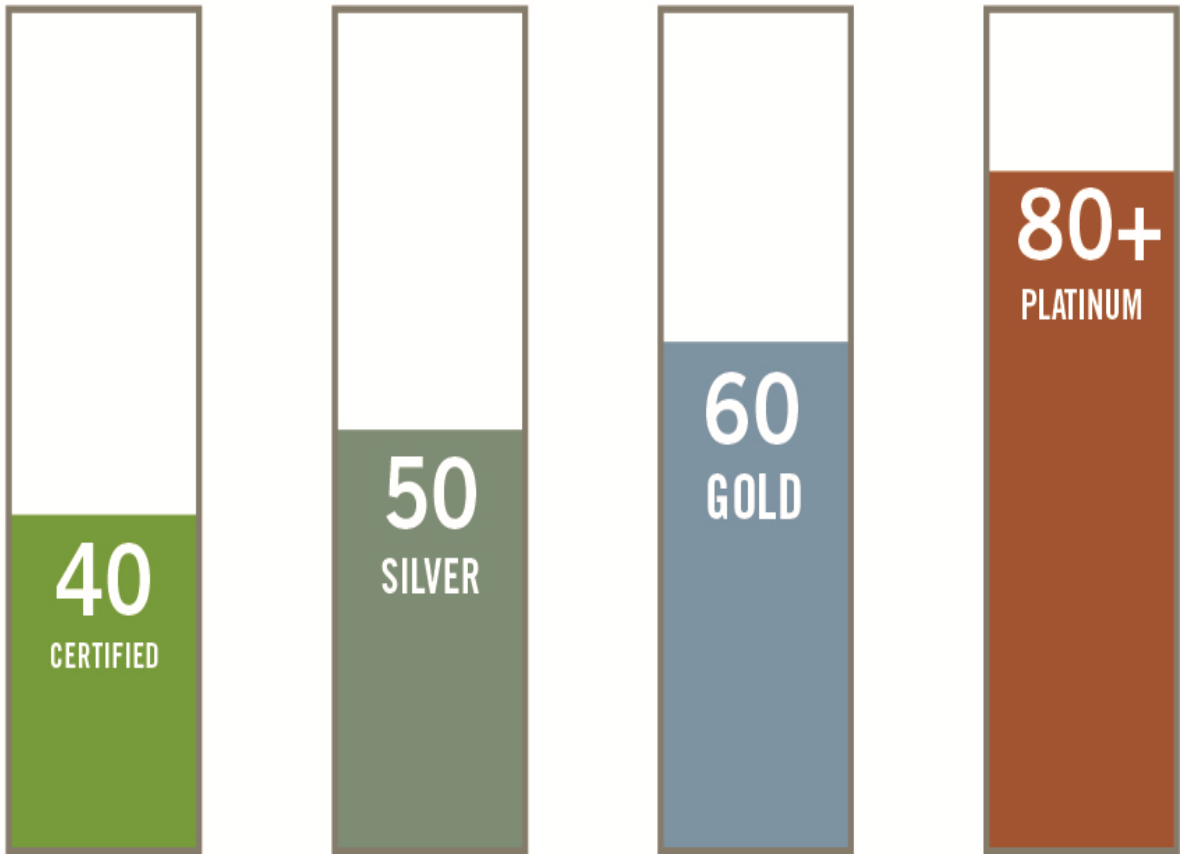
100-POINT



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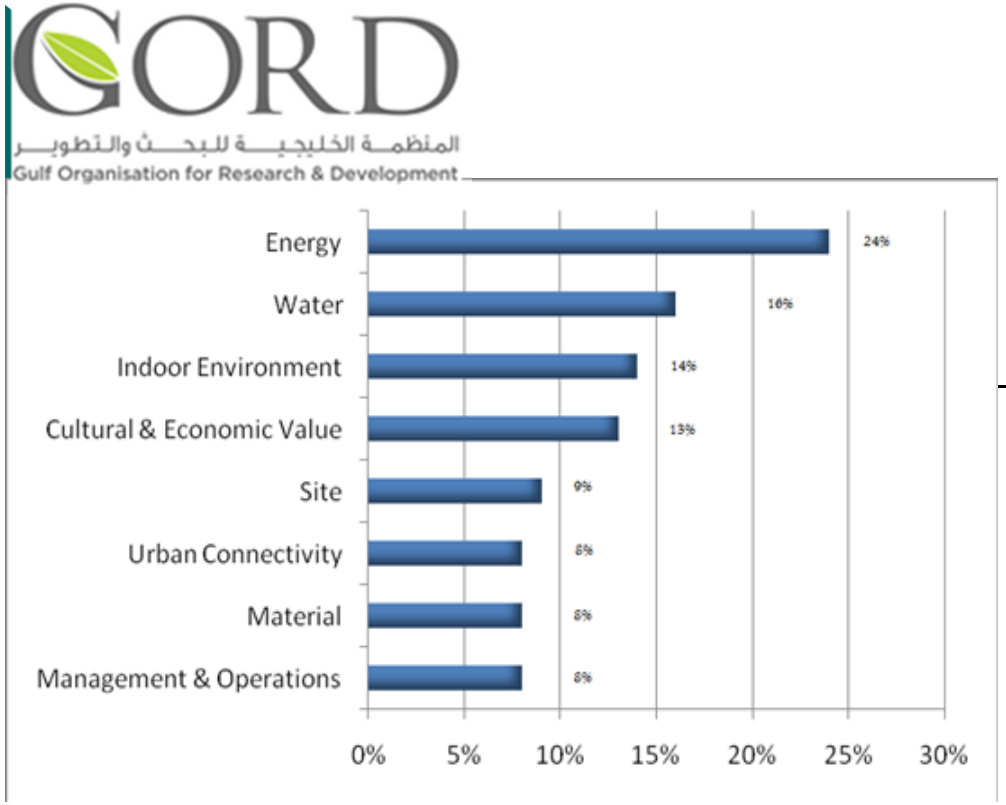
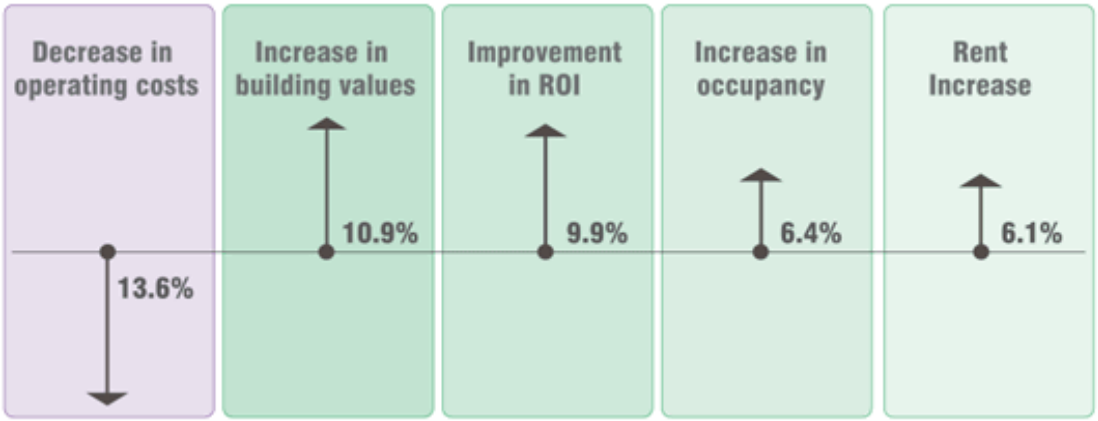




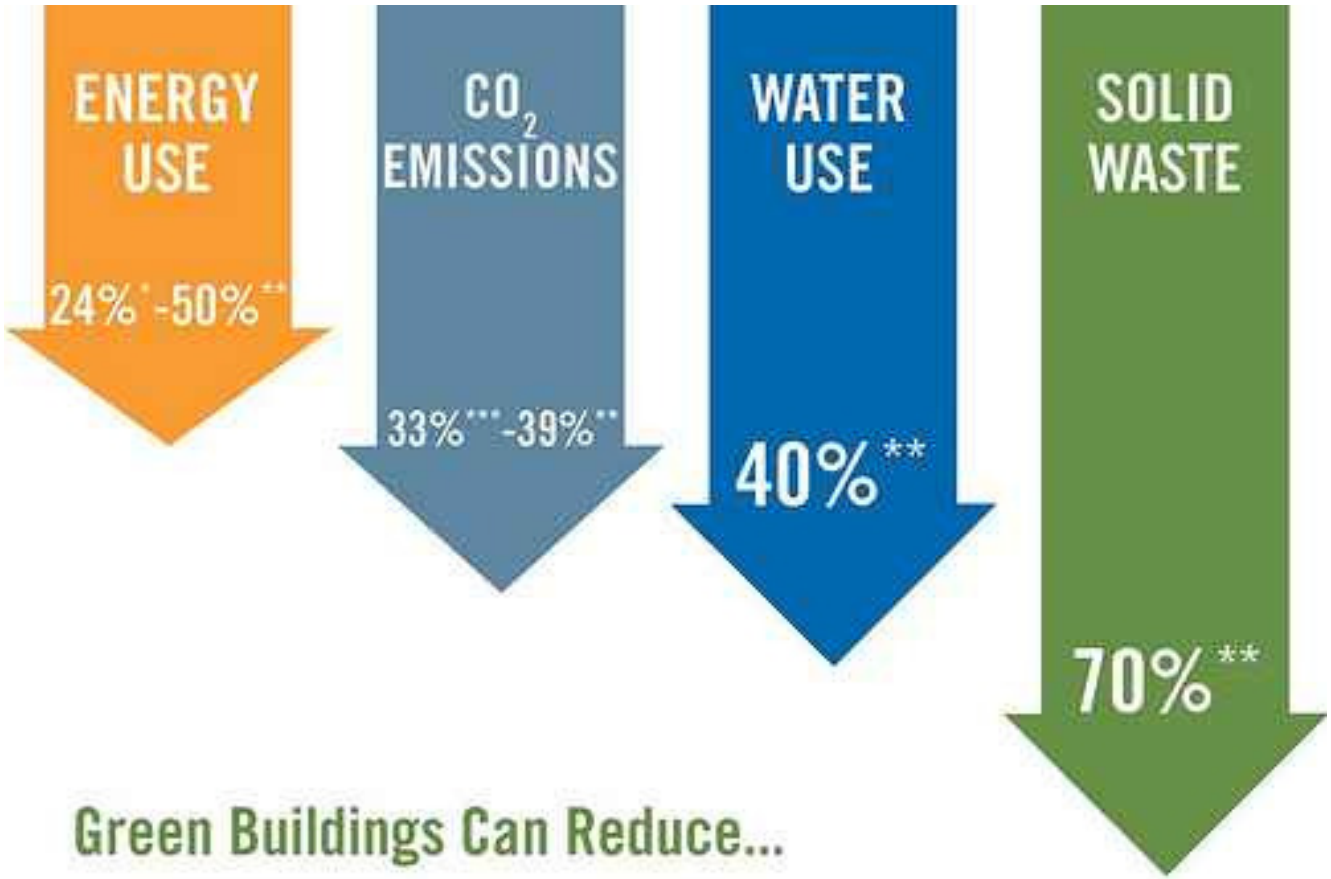
QSAS
QATAR SUSTAINABILITY ASSESSMENT SYSTEM
المنظومة القطرية لتقييم الاستدامة

Global Sustainability Assessment System

Qatar Sustainability Assessment System

Criteria divided into eight categories with different weights.

Performance Metrics



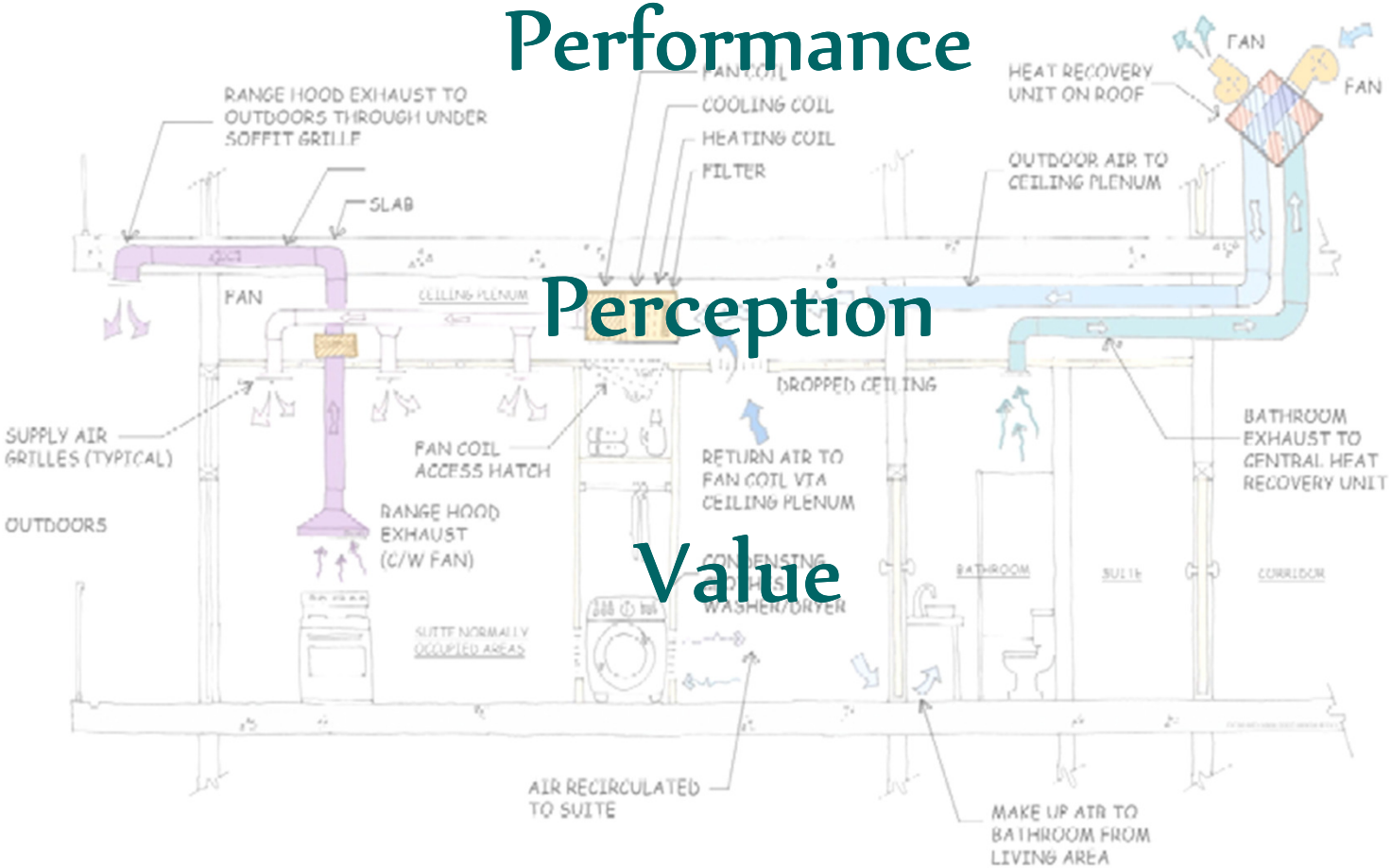
* Turner, C. & Frankel, M. (2008). Energy performance of LEED for New Construction buildings: Final report.
** Kats, G. (2003). The Costs and Financial Benefits of Green Building: A Report to California's Sustainable Building Task Force.
*** GSA Public Buildings Service (2008). Assessing green building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

Why do this?

Performance

Perception

Value



What are the risks?

Performance Concerns

Failure in performance could impact…

- Energy use\Resource use
- Indoor Environment
- Waste Streams
- Materials (Incompatibility)
- Operations & Maintenance

Perception Issues

What are the perception issues/concerns?

- Social Responsibility
- Environmental Stewardship
- Accountability
- "World Class"

Value Impacts

How is value created? How is it measured?

- Operating Cost
  - Net Operating Income
- Return on Investment
- Market Value
  - Leasing/Rental rates
  - Resale
- Productivity? (health, wellness - "IEQ")

How do we mitigate these risks?

A hallucination is a fact,

not an error;

what is erroneous is a judgment based upon it.

Bertrand Russell

Establish clear project objectives

(Know where are you going)

- Establish reasonable performance targets
  - original input, assumptions & criteria
    - Statement of criteria
    - Basis of design
    - include weather data 'basis' with some acceptable deviation
- learn what is "customary" based on industry 'norms' <u>including first cost.</u>
    - targets should accommodate some "misbehavior".
- Energy Modeling - quality is key!

Intent and Expectation

Tracking the trip; marking the destination

Documentation…

- Managing Expectations; Clarifying Intent
  - Basis of Design – describe design solutions early on to clarify solution 'thought process'
- In depth Intent – design specifications & drawings
  - Details
  - Sequence of operation
  - Multiple modes of operation

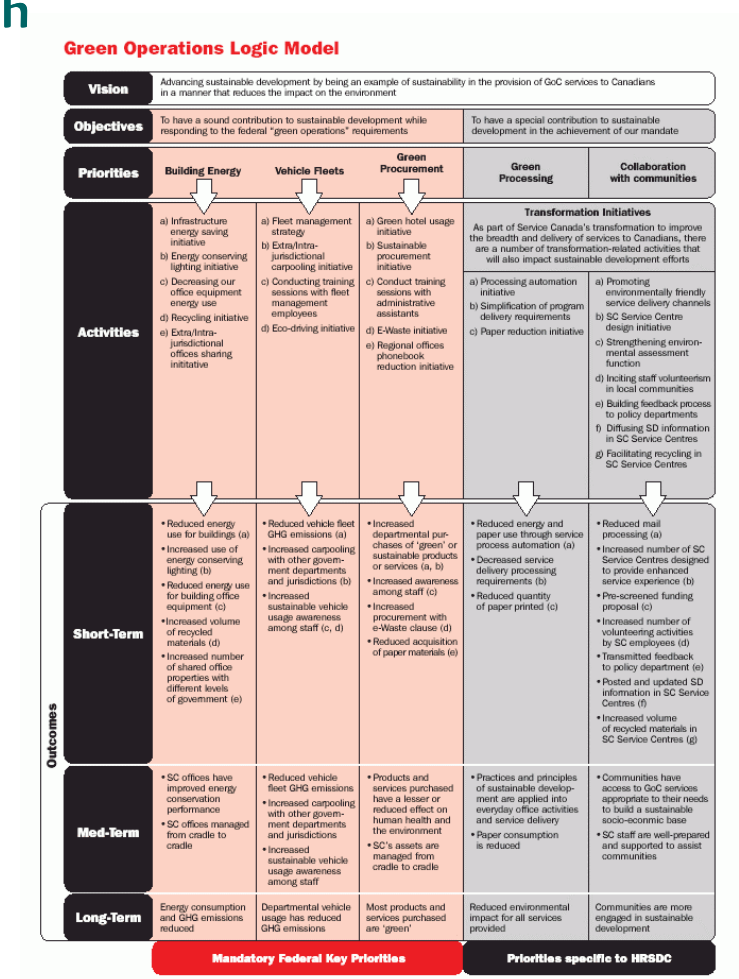
Expectations and Understanding

Beyond traditional "turn over" approach

- Training Programs
  - include methods, modes and schedules of operation;
  - maintenance guidelines.
  - integral with project execution
  - require sign-off

Consider…

- Videotaping sessions
- 'fault-tree' studies and analysis (up front!)



Trust, but verify

Monitoring , Measurement & Verification

- Building Automation Systems are good!
  - Use the BAS to facilitate verification & audit
  - Data Monitoring, Retention and Trending
- Audit – performance audits after occupancy
  - 3rd Party Auditor?

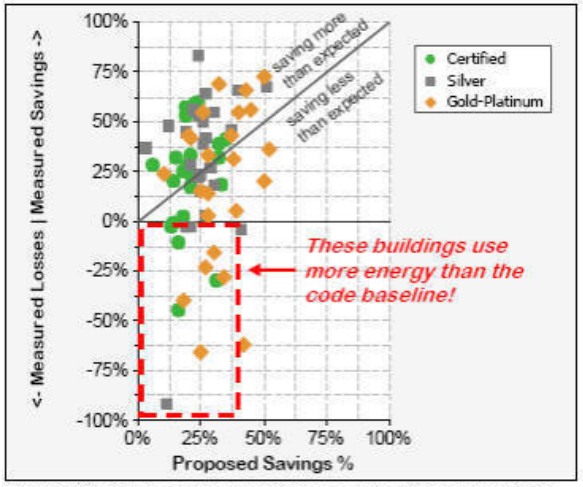


Figure ES- 5: Measured versus Proposed Savings Percentages

Construction Issues

Materials, means & methods

- Product substitutions
- "incompatibility"
- Subcontractors
  - "suitable" experience
- Schedule Delays
  - 'time is of the essence'

Valuing Outcomes

A Question:

Is Sustainability an instantaneous thing?

Or performance over time?

Valuing Engagement

A Question:

How does operations and maintenance impact that performance over time?

Some new thinking required…

- Establishing Project specific performance targets
  - set a 'life span' for assessment.
- Set 'reasonable' goals
  - understand both cost and 'complexity';
- Include criteria for operations & maintenance
  - facilitate 'best use';
- Performance measured over time;
  - Remember: things fall apart

Performance outcomes will control 'value' perception.

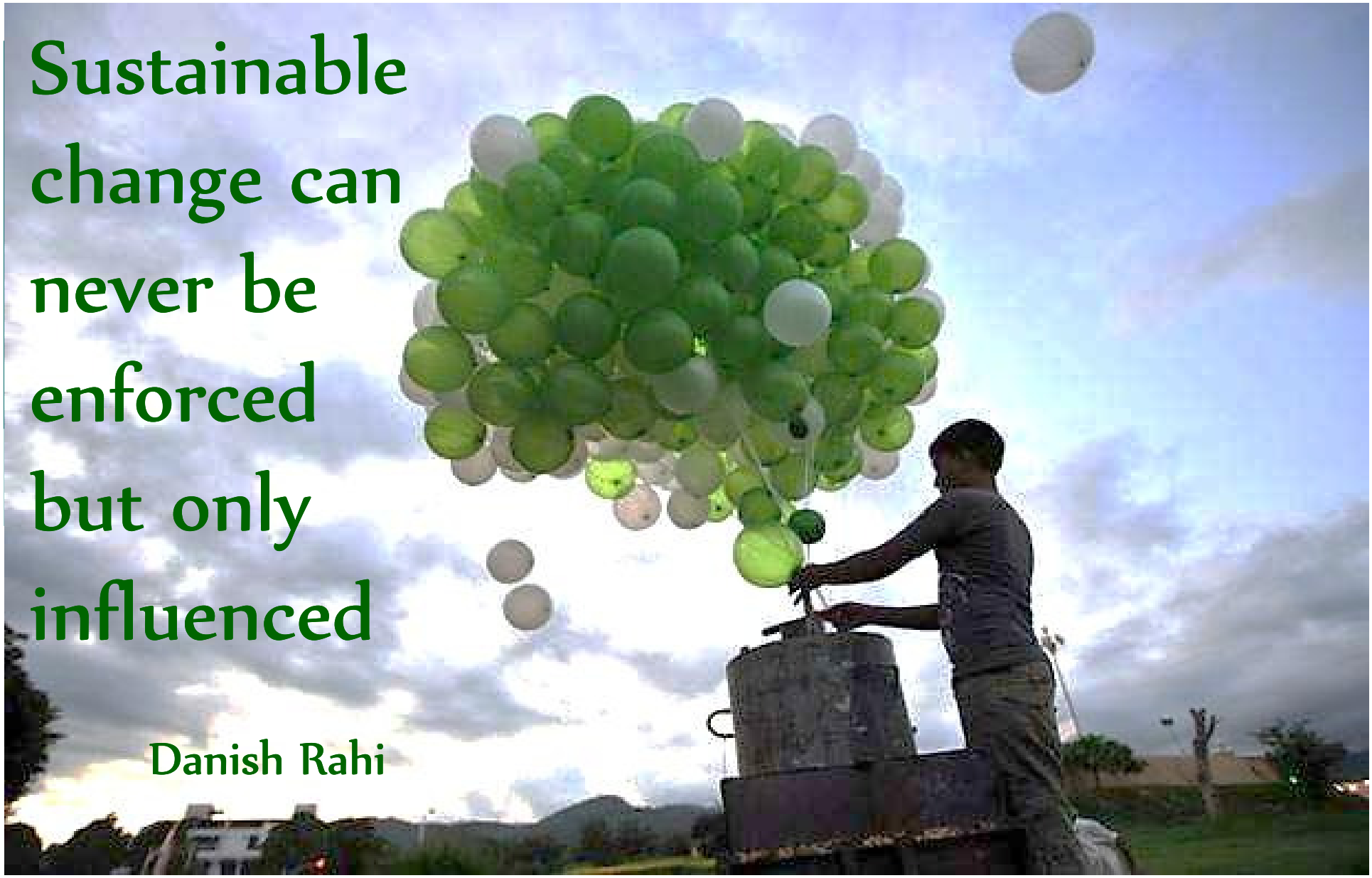
What becomes of Sustainability?

- value will increase as demand increases;
- increased value will increase importance of measurement.
- integration into 'the custom and practice';

  - the new 'normal' –

    - New execution philosophies & context required?

Differences in execution, delivery and evaluation of sustainable projects will require new approaches to defining a successful project.


Sustainable change can never be enforced but only influenced
Danish Rahi

آپ کا شکریہ!