GREEN DESIGN FORUM

PREVIEW OF GREEN BUILDING INDEX MALAYSIA
(Non-Residential)
3rd January 2009, Kuala Lumpur Convention Centre

Ir CHEN Thiam Leong
FIEM, FASHRAE, MIFireE, PEng, CEng, PjB
Going Green
Where do we stand?
Energy Per Capita in ASEAN

Source: APEC Energy Analysis Tools, 2003 Edition
POZNAN (AFP) — Sweden does the most of any country for tackling emissions of greenhouse gases, while Saudi Arabia does the least, according to a barometer published on Wednesday by watchdogs at the UN climate talks here.

The groups categorised dangerous climate change as an increase in temperature beyond two degrees Celsius (3.6 Fahrenheit) over pre-industrial levels.
Sweden's fourth place was followed by Germany, France, India, Brazil, Britain and Denmark.

The bottom 10 were listed in descending order as Greece, **Malaysia**, Cyprus, Russia, Australia, Kazakhstan, Luxembourg, the United States, Canada and Saudi Arabia.
So how do we go about achieving a GREEN BUILDING?
A **Green** or **Sustainable** building is designed:

- To save energy and resources, recycle materials and minimise the emission of toxic substances throughout its life cycle,
- To harmonise with the local climate, traditions, culture and the surrounding environment, and
- To be able to sustain and improve the quality of human life while maintaining the capacity of the ecosystem at the local and global levels
Green buildings have many benefits, such as better use of building resources, significant operational savings, and increased workplace productivity.

Building green sends the right message about a company or organization - it’s well run, responsible, and committed to the future.
Life Cycle Cost
30 year cost of a building

- Design & Construction
- Maintenance
- Personnel Salaries

% COST
ASSESSMENT METHODS FOR SUSTAINABILITY

1. BREEAM, UK – Building Research Establishment Environmental Assessment Method

2. LEED, USA – Leadership in Energy and Environmental Design

3. BEPAC, Canada – Building Environmental Performance Assessment Criteria

4. GBTool, (20 Countries) – Green Building Tool
5. CASBEE, Japan – Comprehensive Assessment System for Building Environmental Efficiency

6. LCA/LCC Tool, Hong Kong – Life Cycle Assessment/Life Cycle Cost

7. EEWH, Taiwan – Green Building Evaluation System

8. Green Star, Australia/New Zealand

## Comparison of established assessment methods

<table>
<thead>
<tr>
<th>Name</th>
<th>BREEAM</th>
<th>LEED</th>
<th>GREEN STAR</th>
<th>GREEN MARK</th>
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<tbody>
<tr>
<td></td>
<td>UK</td>
<td>USA</td>
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<tr>
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<td>1996</td>
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<td>Assessment Criteria</td>
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<td>7. Land Use</td>
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<td>8. Ecology</td>
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<td>9. Pollution</td>
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</table>

**Assessment Criteria:**
- Management
- Health & Comfort
- Energy
- Transport
- Water Consumption
- Materials
- Land Use
- Ecology
- Pollution
- Sustainable site
- Water Efficiency
- Energy & Atmosphere
- Materials & Resources
- Indoor Environmental Quality
- Innovation & Design / Construction Process
- Management
- Transport
- Ecology
- Emissions
- Water
- Energy
- Materials
- Indoor Environmental Quality
- Innovation
- Energy Efficiency
- Water Efficiency
- Environmental Protection
- Indoor Environmental Quality
- Other Green Features
<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>LEED USA</th>
<th>BREEAM UK</th>
<th>BEPAC Canada</th>
<th>GB Tool Europe</th>
<th>CASBEE Japan</th>
<th>EEWH Taiwan</th>
<th>Green Star Australia</th>
<th>Green Mark Singapore</th>
<th>Green Mark Hong Kong</th>
<th>HK_BEAM</th>
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<tbody>
<tr>
<td>1</td>
<td>Sustainable Site - Site Planning, Eco system</td>
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<td>Energy Efficiency - Energy Use &amp; CO2 Issues</td>
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<td>Material &amp; Resources</td>
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<td>Indoor Environment Quality</td>
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<td>7</td>
<td>Management before and/or after</td>
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<td>8</td>
<td>Health &amp; Comfort</td>
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<td>9</td>
<td>Transportation</td>
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<td>11</td>
<td>Pollution/Neighbourhood environment</td>
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<td>12</td>
<td>Depletion of Ozone Layer</td>
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<td>13</td>
<td>Services/Quality</td>
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<tr>
<td>15</td>
<td>Building Environment Quality &amp; Performance</td>
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<td>16</td>
<td>Quality of Service</td>
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<tr>
<td>17</td>
<td>Ecology - Biodiversity, Green, water retention</td>
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<td>18</td>
<td>Health - Waste conservation, sewage &amp; garbage</td>
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</table>

### Rating classifications

<table>
<thead>
<tr>
<th>Platinum Gold</th>
<th>Excellent</th>
<th>Very Good</th>
<th>Good</th>
<th>Pass</th>
<th>Diamond Gold</th>
<th>Silver</th>
<th>Bronze</th>
<th>Certified</th>
<th>6-Star World leader</th>
<th>5-Star Aussie Excellence</th>
<th>Platinum Gold plus</th>
<th>Certified</th>
<th>Gold</th>
<th>Platinum Gold</th>
<th>Silver</th>
<th>Bronze</th>
</tr>
</thead>
</table>
LEED V2 - Points Available (Core & Shell)

Maximum Points = 61

- Sustainable Sites
- Water Efficiency
- Energy & Atmosphere
- Materials & Resources
- Indoor Environmental Quality
- Innovation & Design Process
GREEN MARK
Certification Levels

- Meet minimum total points for the specific rating, and pre-requisite criteria
- Platinum and GoldPlus projects to demonstrate 30% and 25% energy saving respectively
Energy Efficiency: 79
Water Efficiency: 14
Environmental Protection: 32
Indoor Env. Quality: 8
Other Green Features: 7
Bonus: Renewables: 20

Total Points Allocated: 140
Total Points Allocated (include bonus): 160
Green Mark Score: 120
Malaysian “Green Mark Gold” Buildings

G Tower

ST Building
Working together to achieve Goal

- Owner/User
- Architect
- Civil Engineer
- Mechanical Engineer
- Electrical Engineer
- Landscape Architect
- Quantity Surveyor
- Contractor
- Vendors Sub-cons
- Energy Consultant

Owner/User Working to achieve Goal
Environmental Strategy

- Purchase locally produced materials
- Low environmental impact material
- Minimise running costs
- Non-toxic materials
- Energy Regeneration option
- Water use
- Waste separation for recycling
- Maximise Indoor comfort
Efficient Plug Load Procurement Policy - Energy Consumption

- 20 - 30 W: 20%
- 60 - 80 W: 60%
- 100 - 150 W: 100%
### Examples of Green building features

**Combination of EE, RE & conservation technologies**

- Sensor-controlled & compact fluorescent lighting
- High-efficiency heat pumps
- Geothermal heating (temperate countries)
- Building Integrated Photovoltaic (BIPV) system
- Solar Thermal Tubes
- Solar chimneys
- On-site cleaning
- Reuse of wastewater

- Building orientation
- Radiant cooling systems that takes advantage of naturally occurring conditions
- Salvaged lumber products
- Recycled concrete aggregates
- Green roof; rainwater collection
- Waterless urinals
- Facilities for bicyclists
- Permeable pavers, cork floors & use of local products
Does *green* pay off (in USA)?

<table>
<thead>
<tr>
<th>LEED</th>
<th>Certified</th>
<th>Silver</th>
<th>Gold</th>
<th>Platinum</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEED Points</td>
<td>23 - 27</td>
<td>28 - 33</td>
<td>34 - 44</td>
<td>45 - 61</td>
</tr>
<tr>
<td>Energy Savings</td>
<td>25 – 35%</td>
<td>35 – 50%</td>
<td>50 – 60%</td>
<td>&gt; 60%</td>
</tr>
<tr>
<td>Annual Utility Savings</td>
<td>US$0.40/ft²</td>
<td>US$0.60/ft²</td>
<td>US$0.80/ft²</td>
<td>US$1.00/ft²</td>
</tr>
<tr>
<td>Typ Payback</td>
<td>Under 3 yrs</td>
<td>3 – 5 yrs</td>
<td>5 – 10 yrs</td>
<td>10+ yrs</td>
</tr>
</tbody>
</table>

**Incremental Construction Cost**

<table>
<thead>
<tr>
<th></th>
<th>Small bldgs</th>
<th>Large bldgs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small bldgs</td>
<td>3%</td>
<td>1%</td>
</tr>
<tr>
<td>Large bldgs</td>
<td>7%</td>
<td>3%</td>
</tr>
</tbody>
</table>

**Source:** Enermodal Engineering, Denver, USA
## Green Cost Premium (Singapore)

<table>
<thead>
<tr>
<th>Green Mark</th>
<th>Certified</th>
<th>Gold</th>
<th>Gold Plus</th>
<th>Platinum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Points</td>
<td>50 - 74</td>
<td>75 - 84</td>
<td>85 - 89</td>
<td>90 - 100</td>
</tr>
<tr>
<td>Cost Premium</td>
<td>0.3 - 1%</td>
<td>1 - 2%</td>
<td>1 - 3%</td>
<td>2 - 8%</td>
</tr>
<tr>
<td>Payback Period</td>
<td>2 - 5 yrs</td>
<td>2 - 6 yrs</td>
<td>2 - 6 yrs</td>
<td>2 - 8 yrs</td>
</tr>
</tbody>
</table>

Source: BCA Singapore 2008
Developing the Malaysia Green Rating System
ENERGY EFFICIENCY

MS 1525:2007

CODE OF PRACTICE ON ENERGY EFFICIENCY AND USE OF RENEWABLE ENERGY FOR NON-RESIDENTIAL BUILDINGS (FIRST REVISION)

ICS: 91.040.01
Description: energy efficiency, renewable energy, non-residential, buildings, code of practice, energy conservation

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DEPARTMENT OF STANDARDS MALAYSIA
All buildings exceeding 4,000 m² of airconditioned space shall be provided with an EMS system and

OTTV shall not exceed 50 W/m²

RTTV shall not exceed 25 W/m²
Guidelines & Codes on EE

MALAYSIAN STANDARD

CODE OF PRACTICE ON ENERGY EFFICIENCY AND USE OF RENEWABLE ENERGY FOR NON-RESIDENTIAL BUILDINGS (FIRST REVISION)

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DEPARTMENT OF STANDARDS MALAYSIA

ENERGY EFFICIENCY AND CONSERVATION GUIDELINES for Malaysian Industries

Part 1: Electrical Energy-use Equipment
MELAYSIAN
ASEAN
ENERGY
AWARD
WINNERS
2001 ASEAN ENERGY AWARD
(completed in 1999)

• WINNER:
  SECURITIES COMMISSION OF MALAYSIA

• Building Information
  Total Number of Storeys  11 Floors
  Total Gross Floor Area  94,288 m²

Efficiency Chart
  Energy Efficiency Index  120 kWh/m²/yr
  Temperature  21.5 to 24.5°C
  Relative Humidity  55% to 65%
  Lighting Load  13.7 W/m²
  OTTV  < 35.0 W/m²
BEI of office buildings in Malaysia
Source: PTM
Malaysian Buildings

• Average BEI of office buildings in Malaysia is 200-250
• Only a handful of buildings has BEI ≤ 150

The benchmark buildings to-date are:

1. Securities Commission HQ (1999), BEI < 120
2. LEO building (2004), BEI = 100
3. PTM’s ZEO building (2007), BEI = 50 (0)
4. Energy Commission HQ (design), BEI = 80
Malaysian Office Buildings Energy Indexes

- Normal buildings
- LEO Building
- ZEO Building

Electricity consumption kWh/m²/year

- Solar energy
- Electricity consumption

0-energy (Zero Energy Office)

Normal buildings (Kuala Lumpur)

LEO building (Putrajaya)

ZEO building (Bangi)
Going Green in Malaysia

- To develop Malaysia’s own Green Building Rating Tool
- Identify our Priorities and to suit our local climate, culture and practice
# GREEN BUILDING INDEX vs Others

<table>
<thead>
<tr>
<th>Name</th>
<th>LEED USA</th>
<th>GREEN STAR Australia</th>
<th>GREEN MARK Singapore</th>
<th>GREEN BUILDING INDEX Malaysia</th>
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<tbody>
<tr>
<td>2.</td>
<td>Water Efficiency</td>
<td>Transport</td>
<td>Water Efficiency</td>
<td>2. Indoor Environmental Quality</td>
</tr>
<tr>
<td>5.</td>
<td>Indoor Environmental Quality</td>
<td>Water</td>
<td>Other Green Features</td>
<td>5. Water Efficiency</td>
</tr>
</tbody>
</table>
Green Building Index (Non-Residential)

- Energy: 35%
- IEQ: 21%
- Site: 16%
- Materials: 11%
- Water: 10%
- Innovations: 7%
### NON-RESIDENTIAL BUILDINGS

<table>
<thead>
<tr>
<th>Rating Tools</th>
<th>Energy Effy</th>
<th>IEQ</th>
<th>Sustainable Site</th>
<th>Materials &amp; Resources</th>
<th>Water Effy</th>
<th>Innovation</th>
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</thead>
<tbody>
<tr>
<td>BREEAM 2008</td>
<td>19%</td>
<td>*13%</td>
<td>*37%</td>
<td>*17%</td>
<td>5%</td>
<td>*9%</td>
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<tr>
<td>LEED V2</td>
<td>25%</td>
<td>22%</td>
<td>20%</td>
<td>19%</td>
<td>7%</td>
<td>7%</td>
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<tr>
<td>Green Mark V3</td>
<td>62%</td>
<td>5%</td>
<td>*20%</td>
<td>9%</td>
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<td>Green Star</td>
<td>20%</td>
<td>19%</td>
<td>*33%</td>
<td>16%</td>
<td>8%</td>
<td>4%</td>
</tr>
<tr>
<td>Green Building Index</td>
<td>35%</td>
<td>21%</td>
<td>16%</td>
<td>11%</td>
<td>10%</td>
<td>7%</td>
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</tbody>
</table>

* Denotes adjusted or amalgamated figures
CATEGORIES CONSIDERED

1) Energy Efficiency
2) Indoor Environmental Quality
3) Sustainable Site & Management
4) Materials & Resources
5) Water Efficiency
6) Innovation
1) Energy efficiency

Design

EE1 Minimum EE Performance
EE2 Lighting Zoning
EE3 Electrical Sub-Metering
EE4 Renewable Energy
EE5 Advanced Energy Performance - BEI

Commissioning

EE6 Enhanced Commissioning
EE7 Post Occupancy Commissioning

Verification

EE8 EE Verification
EE9 Sustainable Maintenance
BEI Calculations

\[
\text{BEI} = \frac{(TBEC - CPEC - DCEC)}{(GFA_{excluding carpark} - DCA - GLA*FVR) \times (52/WOH)}
\]
BEI = (TBEC - CPEC - DCEC) / (GFA excluding carpark - DCA - GLA*FVR)*(52/WOH)

Where;

• TBEC : Total Building Energy Consumption (kWh/year)
• CPEC : Carpark Energy Consumption (kWh/year)
• DCEC : Data Centre Energy Consumption (kWh/year)
• GFA excluding carpark : Gross Floor Area exclusive of car park area (m²)
• DCA : Data Centre Area (m²)
• GLA : Gross Lettable Area (m²)
• FVR : Weighted Floor Vacancy Rate of GLA (%)  
• 52 : Typical weekly operating hours of office buildings in KL/Malaysia (hrs/wk)
• WOH : Weighted Weekly Operating Hours of GLA exclusive of DCA (hrs/wk)
2) Indoor Environmental Quality

*Air Quality*

- EQ1  Minimum IAQ Performance
- EQ2  Environmental Tobacco Control
- EQ3  Carbon Dioxide Monitoring & Control
- EQ4  Indoor Air Pollutants
- EQ5  Mould Prevention

*Thermal Comfort*

- EQ6  Thermal Comfort Control
- EQ7  Air Change Effectiveness
2) Indoor Environmental Quality

* Lighting, Visual & Acoustic Comfort *

EE8 Daylighting
EE9 Daylight Glare Control
EE10 Electric Lighting Levels
EE11 High Frequency Ballasts
EE12 External Views
EE13 Internal Noise Levels

* Verification *

EE14 IAQ Before & During Occupancy
EQ15 Post Occupancy Comfort Survey
3. Sustainable Site & Management

Site Planning

SM1   Site Selection
SM2   Brownfield Redevelopment
SM3   Development Density & Community Connectivity
SM4   Environment Management

Construction Management

SM5   Earthworks, Pollution Control
SM6   QLASSIC Construction
SM7   Workers’ Site Amenities
3) Sustainable Site & Management

**Transportation**

SM8  Public Transport Accessibility
SM9  Green Vehicles Priority
SM10 Parking Capacity

**Design**

SM11 Stormwater Control
SM12 Greenery & Roof
SM13 Building User Manual
4) Materials & Resources

Reused & Recycled Materials

MR1 Material reuse and selection
MR2 Recycled Content Materials

Sustainable Resources

MR3 Regional Materials
MR4 Sustainable Timber
MR5 Storage and Collection of Recyclables
MR6 Construction Waste Management

Green Products

MR7 Refrigerants & Clean Agents
5) Water Efficiency

- WE1 Rainwater Harvesting
- WE2 Water Recycling
- WE3 Water Efficient Irrigation
- WE4 Water Efficient Fittings
- WE5 Metering and Leak Detection System
6) Innovation

IN1  Innovation in Design & Environment Design Initiatives

IN2  Green Building Index Facilitator
Does *green* pay off (in Malaysia)?
- Non-Residential Buildings -
  projected data by Ir TL Chen (not verified)

<table>
<thead>
<tr>
<th>Green Building Index Rating</th>
<th>Average M’sian Bldg</th>
<th>Meets MS1525</th>
<th>GBI Certified</th>
<th>GBI Silver</th>
<th>GBI Gold</th>
<th>GBI Platinum</th>
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<tbody>
<tr>
<td>BEI kWh/m²·year</td>
<td>250</td>
<td>200 - 220</td>
<td>150 - 180</td>
<td>120 - 150</td>
<td>100- 120</td>
<td>&lt;100</td>
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<tr>
<td>Energy Savings %</td>
<td>Base</td>
<td>10 - 20</td>
<td>30 - 40</td>
<td>40 -50</td>
<td>50 – 60</td>
<td>&gt; 60</td>
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<tr>
<td>Incremental construction cost %</td>
<td>Base</td>
<td>1 - 3</td>
<td>5 - 8</td>
<td>8 - 12</td>
<td>12 - 15</td>
<td>&gt;15</td>
</tr>
</tbody>
</table>
Thank You

tlchen55@gmail.com
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(Residential)
3rd January 2009, Kuala Lumpur Convention Centre

Ar Chan Seong Aun
M Arch (Distinction), B Arch (Hons), B Bdg Sc (NZ), APAM, AIPDM
1. WHAT IS SUSTAINABILITY?
2. WHY BE SUSTAINABLE?
3. WHAT THE KEY ISSUES FOR MALAYSIA?
4. KEYS COMPONENTS OF THE GREEN BUILDING INDEX MALAYSIA.
What is Sustainability?

“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”

Brundtland Commission report of 1987
WHY BE SUSTAINABLE?
Some 85-90% of the world primary energy consumption will continue to be based on fossil fuels.

**WORLD PRIMARY ENERGY CONSUMPTION BY FUEL**

- **Coal**: 24% in 2002, 25% in 2010, 25% in 2015, 24% in 2025
- **Oil**: 39% in 2002, 38% in 2010, 38% in 2015, 38% in 2025
- **Natural Gas**: 23% in 2002, 23% in 2010, 24% in 2015, 25% in 2025
- **Nuclear**: 8% in 2002, 8% in 2010, 8% in 2015, 8% in 2025
- **Renewable Energy & Hydro**: 7% in 2002, 6% in 2010, 6% in 2015, 5% in 2025

Source of data: International Energy Outlook (IEO) 2005
What is the effect?

Carbon dioxide concentrations at Mauna Loa, Hawaii
(parts per million by volume)
What is the result?

Average annual temperatures in the United States have increased more than 0.6°C since the late 1970s.

Source: DOE, NOAA and NCDC 2000
What is the result?

Figure 1: Dramatic changes in Arctic sea ice since 1979. The loss of Arctic sea ice may be caused by warming Arctic temperatures that result from greenhouse gas build-up in the atmosphere.

Source: NASA/Goddard Space Flight Center Scientific Visualization Studio
Climate Change

- Arctic is melting
- Coral Reefs dying
- Amazon rainforest drying out
- Many coastal cities could be flooded
- Increase in climate refugees
- Global Wipe Out
WHAT ARE THE KEY ISSUES FOR MALAYSIA?
KEY ISSUES FOR MALAYSIA

- **Urban Population** expected to grow by between 40% to 50% by 2030 from 70% to 80% of Total Population. The way we plan our Cities will be a Key component of a sustainable future.
- 24% of Urban Home Energy consumption is from the use of the **Car to & from work**
- 31% of Urban Home Energy consumption is from the use of the **Car for after work**
- Malaysia will become a **Net Importer of Energy** by 2015. How we design our homes will reflect how much energy they require to run.
MALAYSIA POPULATION

YEAR


POPULATION (Millions)

0 5 10 15 20 25 30

Rural population
Urban population

SOURCE: UN website
MALAYSIAN ENERGY BALANCE 2030

Net Exports

Malaysia as Net Energy Importer

SOURCE: PTM
OVERVIEW OF ENERGY USE IN MALAYSIA

- Petronas supplies gas to TNB at a discount of 76% international market rates
- 71% of power stations rely on natural gas
- If gas were supplied at international rates to power stations, Electricity Tariffs would increase by 25%
- Electricity Tariffs were last increased by 12% on 1st June 2006
ELECTRICITY CONSUMPTION BY SECTORS (ktoe)

Source: Department of Electricity and Gas Supply Malaysia, Ketua Merinyu Elektrik Sarawak, TNB, SESCo, SESB, and GDC (M)
KEY COMPONENTS OF THE GREEN BUILDING INDEX (RESIDENTIAL)
1. SUSTAINABLE SITE & MANAGEMENT

- Public Transport Availability
- Proximity of Basic Services such as Mini Markets, Schools, Places of worship, Libraries, Sports facilities, Community Halls and Parks, Transport Hubs
- Sufficient Green Open Spaces to counter the Urban Heat Sink effect
- Construction Systems that encourage IBS
- Storm Water management to prevent Localized Flooding
- Avoiding environmentally sensitive areas
- Re-development of Brownfield sites rather than opening new sites
MALAYSIAN HOME ELECTRICITY CONSUMPTION

Source: Ir Grumit Singh / CETDEM
MALAYSIAN HOME OVERALL ENERGY CONSUMPTION

- Refrigerator: 4.24%
- Cooking: 0.98%
- Heating: 2.18%
- Cooling: 8.73%
- Entertainment: 0.83%
- Lighting: 1.41%
- Others: 0.89%
- Gas (Kitchen): 5.66%
- Fuel (to/from work): 24.44%
- Fuel (during work): 19.19%
- Fuel (others): 30.98%

Source: Ir Grumit Singh / CETDEM
GREEN BUILDING INDEX - RESIDENTIAL

Points Distribution

SUSTAINABLE SITE PLANNING & MANAGEMENT, 39
ENERGY EFFICIENCY, 25
INDOOR ENVIRONMENTAL QUALITY, 10
MATERIALS & RESOURCES, 10
WATER EFFICIENCY, 7
INNOVATION, 9
2. ENERGY EFFICIENCY

- A parameter that measures the Energy Efficiency of the Building without inhibiting the design options and creativity of the Architect is used that is RTTV and OTTV.
- The Sun, Heat and High Humidity are the key elements Architects have to deal with for the Malaysian Climate.
- A low RTTV and OTTV means overall a lower heat gain into the home and therefore a lower Air conditioning load and less hours of operation.
- Use of renewable energy such as solar hot water systems and photo-voltaic panels is rewarded.
- Encourage the development which discourage commuting and encourage work from home.
\[ T = 39 - 25 = 14^\circ C \]
\[ \Delta \quad T = 32 - 25 = 7^\circ C \]
LACK OF GREENERY IN HOUSING INTENSIFIES URBAN HEAT ISLAND EFFECT
Urban Heat Island Effect: Case Singapore

Sketch of Urban Heat Island profile in Singapore

UHI intensity = 4.5 degrees C
ROOF INSULATION IS ONE OF THE MOST IMPORTANT DESIGN DECISIONS FOR ENERGY EFFICIENT BUILDINGS

• The roof plane receives the most Solar Radiation and for the longest period through the day

• >75% of the Solar Gain by a typical Intermediate Single Storey Terraced House is through its ROOF

• >50% of the Solar Gain by a typical Intermediate Double Storey Terraced House is through its ROOF

• >40% of the Solar Gain by a typical 5 Storey Bock of Flats is through its ROOF
Source: Dr Nigel / Lafarge
3. INDOOR ENVIRONMENTAL QUALITY

- Air change effectiveness
- Day lighting levels beyond the UBBL minimum & External Views
- Thermal Comfort
- Inter dwelling Noise Insulation
- Indoor Pollution & Volatile Organic Compounds
- Post Occupancy surveys
4. MATERIALS & RESOURCES

• Storage & Collection of Recyclables
• Materials Selection & re-use
• Construction waste management
• Regional Materials
• Certified Wood
• Environmentally Friendly Materials
5. WATER EFFICIENCY

- Rainwater Harvesting
- Water re-cycling
- Water efficient landscaping
- Water efficient fittings
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Source: SWAn
HOW WATER EFFICIENT ARE WE?

• The average Malaysian uses 300 liters of water a day, double the recommendation by United Nations and more than twice the average Singaporean.

• Selangor, KL & Putrajaya projected to face water stress as early as 2011 when demand reaches 4,415 mil liters while supply is at 4,401 mil liters.

• This is projected to remain until 2013 when Langat 2 increases supply by 1,000 mil liters.

• Most water shortages are cause by uneven people-water distribution.

• In the most densely populated states, the river basins have reached their limits for maximum supply, but demand continues to raise.

Source: Asia-Pacific Regional Water Conference 2008, Subang / The Star 28-12-2008
6. INNOVATION

- Innovative Planning that display “Less is More” and “Small is Beautiful”
- Innovative integration of Design elements that cool the building naturally
- Re-habilitation of existing buildings for re-use in innovative ways
- Natural ways that keep a building cool without the extensive use of Mechanical Air conditioning
KEYS TO CHANGE

• Force
• Fear
• Facts

• Mind Frame/Mindset
• Repeat
• Reinforce

Mindset → Think → Action → Results
Knowing is not enough; we must apply. Willing is not enough; we must do.
THANK YOU