Greening Singapore’s Built Environment

Presented by Justin Chew
General Manager, Singapore Green Building Council
AN ENERGY AND RESOURCE PERSPECTIVE
10% Green Space
Limited Resources

AN ENERGY AND RESOURCE PERSPECTIVE
### Intense Heat and Energy Perspective

<table>
<thead>
<tr>
<th>Month</th>
<th>Average Sunlight (hours)</th>
<th>Temperature Average</th>
<th>Temperature Record</th>
<th>Discomfort from heat and humidity</th>
<th>Relative Humidity am</th>
<th>Relative Humidity pm</th>
<th>Average Precipitation (mm)</th>
<th>Wet Days (+0.25 mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>5</td>
<td>23</td>
<td>30</td>
<td>20</td>
<td>34</td>
<td>High</td>
<td>82</td>
<td>78</td>
</tr>
<tr>
<td>Feb</td>
<td>7</td>
<td>23</td>
<td>31</td>
<td>19</td>
<td>34</td>
<td>High</td>
<td>77</td>
<td>71</td>
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<tr>
<td>March</td>
<td>6</td>
<td>24</td>
<td>31</td>
<td>19</td>
<td>34</td>
<td>High</td>
<td>76</td>
<td>70</td>
</tr>
<tr>
<td>April</td>
<td>6</td>
<td>24</td>
<td>31</td>
<td>21</td>
<td>35</td>
<td>High</td>
<td>77</td>
<td>74</td>
</tr>
<tr>
<td>May</td>
<td>6</td>
<td>24</td>
<td>32</td>
<td>21</td>
<td>36</td>
<td>Extreme</td>
<td>79</td>
<td>73</td>
</tr>
<tr>
<td>June</td>
<td>6</td>
<td>24</td>
<td>31</td>
<td>21</td>
<td>35</td>
<td>High</td>
<td>79</td>
<td>73</td>
</tr>
<tr>
<td>July</td>
<td>6</td>
<td>24</td>
<td>31</td>
<td>21</td>
<td>34</td>
<td>High</td>
<td>79</td>
<td>72</td>
</tr>
<tr>
<td>Aug</td>
<td>6</td>
<td>24</td>
<td>31</td>
<td>21</td>
<td>34</td>
<td>High</td>
<td>78</td>
<td>72</td>
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<tr>
<td>Sept</td>
<td>5</td>
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<td>31</td>
<td>21</td>
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<td>High</td>
<td>79</td>
<td>72</td>
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<td>Oct</td>
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<td>High</td>
<td>78</td>
<td>72</td>
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<tr>
<td>Nov</td>
<td>5</td>
<td>23</td>
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<td>High</td>
<td>79</td>
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<td>Dec</td>
<td>4</td>
<td>23</td>
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<td>21</td>
<td>34</td>
<td>High</td>
<td>82</td>
<td>78</td>
</tr>
</tbody>
</table>

Heavy Rain

Intense Heat
Population 5 Million
Land Area 710 sqkm
Density 7000 persons/sq km
In 40 years
Population increases 415%
Land area increases 21%
Heavy dependence on Air-conditioning
Singapore’s Energy Sources

Energy Sources

- Fossil Fuels (~98%)
  - Fuel Oil (~18%)
  - Natural Gas (~80%)

- Renewables (~2%)
  - Biomass/Waste
  - Solar Thermal
  - Photovoltaic
Singapore’s Carbon Dioxide Absolute and Intensity Emissions 1990 – 2005

Key:
- Absolute CO₂ Emissions
- CO₂ Intensity (CO₂ emissions per dollar GDP)
## Singapore’s Key CO2 Contributors (2005)

<table>
<thead>
<tr>
<th>Category</th>
<th>Primary Consumption (Combust Fuel)</th>
<th>Secondary Consumption (Use Electricity)</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity Generation</td>
<td>19,315 (48%)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Industry</td>
<td>13,465 (33%)</td>
<td>8,328 (21%)</td>
<td>21,793 (54%)</td>
</tr>
<tr>
<td>Transport</td>
<td>7,056 (17%)</td>
<td>930 (2%)</td>
<td>7,986 (19%)</td>
</tr>
<tr>
<td>Buildings</td>
<td>325 (1%)</td>
<td>5,910 (15%)</td>
<td>6,235 (16%)</td>
</tr>
<tr>
<td>Consumer/ Households</td>
<td>216 (1%)</td>
<td>3,415 (8%)</td>
<td>3,631 (9%)</td>
</tr>
<tr>
<td>Others</td>
<td>-</td>
<td>732 (2%)</td>
<td>732 (2%)</td>
</tr>
</tbody>
</table>

**TOTAL CO2 = 40,377 kilo tonnes**
Buildings are part of the problems.

**Fuel Consumption in Singapore (2005)**
- 51% Power Generation
- 31.7% Industry
- 15.8% Transport
- 0.9% Buildings
- 0.6% Households

**End-use Electricity Consumption in Singapore (2005)**
- 3% Others
- 43% Industry
- 18% Households
- 5% Transport
- 31% Buildings
BCA **Green Mark Scheme** recognised as one of the International Green Building Rating Systems by the World Green Building Council.

**BCA Green Mark** is a suitable green building assessment system for tropical countries.

About 400 buildings certified under BCA Green Mark Scheme.
BCA’s Green Building Initiatives

BCA Green Mark is a voluntary scheme

A green building rating system to evaluate building for its environmental impact and performance

Launched in Jan 2005
BCA Green Mark has 4 levels of rating

<table>
<thead>
<tr>
<th>Green Mark Rating</th>
<th>Green Mark Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platinum</td>
<td>90 &amp; above</td>
</tr>
<tr>
<td>Gold&lt;sup&gt;Plus&lt;/sup&gt;</td>
<td>85 to &lt;90</td>
</tr>
<tr>
<td>Gold</td>
<td>75 to &lt;85</td>
</tr>
<tr>
<td>Certified</td>
<td>50 to &lt;75</td>
</tr>
</tbody>
</table>

Assessment Criteria covers the following areas:
- Energy Efficiency
- Water Efficiency
- Environmental Protection
- Indoor Environmental Quality
- Other Green Features
Green Mark for New Buildings

Evolution of the criteria towards a more holistic approach

Versioning of GM for New Building

GM Version 4.0
(in progress)

Area of improvements
- Advocate Passive Design
  - Natural Ventilation
  - Daylighting
- Promote Sustainable Construction
- Greater Emphasis on Greenery
- Enhanced pre-requisites for higher GM rating

Getting industry feedbacks and fine-tuning criteria
Green Practices and Features

Study of the air flow for effective ventilation simulation

Green Wall

Sun Path Analysis Study
Green Practices and Features

Heat Pump

Dehumidifier

Sun Pipe

Energy & Water Labeling

Recycled Materials
Construction Site Practices

Water Recycling Plant for Construction Usage & Silt Water Management
Membrane filtration
Use of recyclable and renewable children’s play equipment

Use of environmentally-friendly products that uses recycled material

Timber3 decking fulfills your outdoor living dreams. Take off your shoes and come outside. Life just feels better when you are on our products. We designed our decking to fit perfectly beside your pool, in your backyard and your lifestyle. Nothing else even comes close.
Solar energy from BIVP to light up the sunken plaza at urban park

More than 400 m² (366 pcs.) of Solar PV Panel installed 75.03 kWp
Zero-Energy Building (ZEB) @ BCA Academy

1st Anniversary Report Card out in September this year!

Showcase

Retrofitting from an existing building

190 kWp PV
Success of 1st Green Building Masterplan

- Govt Bldgs - Green Mark Certified
- BCA Green Mark Scheme
- $50 mil MND Research Fund
- Zero Energy Building @ BCAA
- Public Sector Taking the Lead
- Incentives for the Private Sector
- R&D for GBT
- Imposing Minimum Standards
- Successfully Implemented

- $20mil Incentive Scheme
- Green Mark Champion Award
- Legislation On Environmental Sustainability
- Review of ETTV / RTTV
Key Planning Objective: promotion of green buildings is essential to sustainable development (SD)

BCA formulated the 2nd Green Building Masterplan
- In support of the IMCSD’s targets
- To step up efforts in delivering a sustainable built environment
IMCSD’s Target for our Built Environment

80% OF EXISTING BUILDINGS ‘GREEN’

by 2030
6 Strategic Thrusts

1. Public Sector Taking The Lead
2. Spurring The Private Sector
3. Furthering The Development Of Green Building Technology
4. Building Industry Capabilities Through Training
5. Profiling Singapore And Raising Awareness
6. Imposing Minimum Standards
New Buildings

**Key Initiatives:** Newly Implemented

**NEW Public Sector Buildings with more than 5000 m² air-conditioned floor areas to achieve Green Mark Platinum rating**

Beyond current mandatory requirement of GM Certified rating

Existing Buildings

**Key Initiatives:** Newly Implemented

**Existing Public Sector Buildings with more than 10,000 m² air-conditioned floor area to achieve Green Mark Gold™ rating by 2020**
Key Initiatives:

GOVT Land Sales Sites to require higher-Tier Green Mark ratings *(Platinum and GoldPlus)*
For strategic development projects in new growth areas

Objective:
To achieve at least 25% reduction in energy use
$100 million

GREEN MARK INCENTIVES FOR EXISTING BUILDINGS (GMIS-EB)
For private sector to retrofit their building for better energy efficiency and building performance
Singapore Green Building Council (SGBC)

- Registered as a not-for-profit society in May 2009
- Officially launched in October 2009
- Started with 142 founding members
- Recognised as an Emerging Member by WorldGBC

Get the Established Member Status in 1 year

Attained WorldGBC Established Member status in Feb 2010 (7 months ahead of target)

Minister Mah Bow Tan as SGBC’s Founding Patron

...championing green building developments in Singapore
The Mission of SGBC

To propel the Singapore building and construction industry towards environmental sustainability by:

- Promoting green building design, practices and technologies
- Integrating green thinking and practice into mainstream design, construction and operation of buildings
- Building capability and professionalism in green building development and practices
Exciting upcoming events!!!

Singapore will be hosting the annual WorldGBC International Congress 2010

SGBC Inaugural Green Building Conference
Bex Asia Trade Exhibition (South East Asia’s Premier Trade Show for Green Building Technologies and Solutions)

13 – 16 September 2010
Marina Bay $and$, Singapore
We welcome you to join us at this 3-in-1 event in Singapore this coming September 2010.