Sustainable Communities in a Vertical City

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Vertical Neighbourhoods Summit, Toronto 19 November 2018
Message from Ms Yvonne Ho:

We would like Ada to speak about Hong Kong's experience with planning for, building, and managing high-rise, high density communities - What are the lessons learned? How can we do this well (from a environmental sustainability, social, and economic prosperity standpoint)?

Some key points that could be touched on are - transportation/transit system, energy/utilities, community spaces, public services, etc. Toronto (and its surrounding regions) is growing rapidly with new high-rise condos and neighbourhoods currently being built and quickly occupied all over the city - what advice would you give to us based on what you have l
Outline of presentation

1. About Green Building Movement in the World

2. About the Hong Kong Green Building Council

3. Case Study: Planning & Design for Sustainability of Quality Public Housing by Hong Kong Housing Authority

4. Exemplary Project : Hong Kong Housing Authority’s Hung Fuk Estate (Quality Building Grand Award 2018; Green Building Grand Award 2016)

5. Moving Forward
1. About Green Building Movement in the World
We have only one Earth!

39% of global energy-related emissions*

82% of final energy consumption in buildings was supplied by fossil fuels in 2015.*

28% operating*

11% building and construction

*Source IEA global only
“The World Needs More Green Building!”
What is green building?

A ‘green’ building is a building that, in its design, construction or operation, reduces or eliminates negative impacts, and can create positive impacts, on our climate and natural environment.

Green buildings preserve precious natural resources and improve our quality of life.

There are a number of features which can make a building ‘green’. These include:

- Take an intelligent approach to **energy**;
- Safeguarding **water** resources;
- Minimizing **waste** and maximizing reuse;
- Promoting **health and well-being**;
- Keeping our environment **green**;
- Creating **resilient and flexible** structures;
- Connecting **communities and people**;
- Considering **all stages** of a building’s life-cycle
When asked about trends GBCs reported climate change, energy transition and energy efficiency were key trends. This has led to a focus on existing building – retrofits as well as performance in operation. GBCs pointed to an increase in the supply of green products and a focus on the circular economy. The residential market is greening, starting with social and affordable housing and supported by green mortgages. GBCs are working collaboratively with government and in many countries incentives are being provided for green building. Technology is being used as an enabler for sustainability, especially among the millennials. There is a focus on healthy people, including air quality.
2. About the Hong Kong Green Building Council
Buildings and activities in buildings account for:

- **90%** Total Electricity Consumption
- **60%** Greenhouse Gas Emission

Worldwide Buildings account for **40%** Greenhouse Gas Emission
Driving the **GREEN** Building Movement!

**Vision**
To help save the planet and improve the wellbeing of the people of Hong Kong by transforming the city into a greener built environment.

**Mission**
To lead market transformation by
- advocating green policies to the Government,
- introducing green building practices to all stakeholders,
- setting standards for the building profession, and
- promoting a green lifestyle to the people of Hong Kong.
BEAM Plus Assessment Tools

Masterplanning

BEAM Plus Neighbourhood (ND)

Building Design & Construction

BEAM Plus New Buildings V1.2 (NB)

Post-Construction & Operation

BEAM Plus Existing Buildings V2.0 (EB)

Fit-out

BEAM Plus Interiors V1.0 (BI)

2 Provisional Platinum Projects from China State
A forefront impact report of green building in HK
Hong Kong’s Unique Built Environment

Significance of Buildings

90% electricity consumption or 60% greenhouse gas emissions.

42,000+ buildings in private sector

8,000 high-rise buildings and skyscrapers

24% People live and work in 24% of Hong Kong’s total area

1 km² Average population density of built-up areas 27,330 persons/km²

Data as of 31 Dec 2017
A Strong Green Building Movement in over 20 Years

Data as of 31 Dec 2017

Strong Market Participation

Since 2014, the annual percentage of private sector projects joining BEAM Plus has reached nearly: 50%
Combating Climate Change

Total saving of BEAM Plus assessed projects compared to the baseline:

- Estimated annual electricity reduction: 506,800 MWh
  - Saving: 354,800 Tons CO₂e
  - Equivalent to 104,000 average electricity consumption households

- Estimated annual fresh and sea water reduction: 13.7 billion L
  - Saving: 7,200 Tons CO₂e
  - Equivalent to 5,550 Olympic-sized swimming pools

Data as of 31 Dec 2017
Total estimated carbon emissions saved each year:

362,200 Tons of CO$_2$e

= 15.7 million trees planted
Liveability and a Sustainable Lifestyle

Pleasant Environment

Total area of soft landscaping in certified projects: 982,100m²

= 102 Hong Kong Stadium pitches

Walkability and Mobility

45% of certified projects have undergone an air ventilation study to enable better ventilation and thermal comfort.

88% of certified projects located within 500m walking distance of public transport.

Data as of 31 Dec 2017
Community Facilities and Amenities

- 91% of certified projects have nearby recreational facilities
- 89% of certified projects provide enhanced universal access
- 89% of certified projects are well-equipped with building amenity features

Data as of 31 Dec 2017
Greenview Villa (綠悠雅苑)

Green Features:

- People-oriented design
- Cross-ventilation in flats and lobbies
- Recycling bins on each floor
- Regenerative drives in lifts
- Twin-tank system
- Low-VOC materials indoor
- EV charging facilities in car parks
- Energy reduction: 20%

Greenery ratio at 41%

Clean indoor environment

Prefabrication off-site

Clean indoor environment
3 Muk Chui Street (煥然壹居)

Green Features:

• Majority of the windows are facing north or south directions
• Cross natural ventilation inside living rooms and lift lobbies
• Greenery spans across >30% of site area
• 80% of total rated power of appliances and equipment are certified energy efficient appliances
• Annual water saving of 30% by use of water saving devices
• Use of low emission double insulation glass units in habitable space
• Low VOC content for material use
Enhanced social value from revitalising the last H-shape factory into a residential development

**Eco-wells:** to enhance natural ventilation and introduce daylight into residential units

**Greenery:** Over 40% soft landscaping coverage

Two-level lighting control in common corridors and lift lobbies – reduce energy consumption

Fire resistance test for existing concrete slabs – to retain the original H-shape appearance, and reduce the demolition and re-construction of floor slabs
Download your copy of
Hong Kong: Green Building in Action
(2017 Edition)
Our Vision
To help low-income families with housing need gain access to affordable housing.

Our Mission
• To provide affordable quality housing, management, maintenance and other housing related services to meet the needs of our customers in a proactive and caring manner;
• To ensure cost-effective and rational use of public resources in service delivery and allocation of housing assistance in an open and equitable manner; and
• To maintain a competent, dedicated and performance-oriented TEAM.
Housing Estates in Hong Kong

- Adopt **functional and cost-effective design** in the Planning, Design, Construction and Management of housing projects;
- Promote **healthy living and green environment** in the work;
- Act with **caring and partnering** culture beyond baseline performance.

- **756,000 flats in use**
- **90,000+ new rental & subsidized sale flats from 2016/17 to 2020/21**
- **2,140,000 (30%)** population
- **14,000+ workers daily**
- **99 listed contractors**
- **80+ active suppliers**
- **9,000+ HA staff**
Delivery of public housing estates starts from city planning and urban design at the macro level

How to provide a better living environment than the baseline performance?

Caring for PEOPLE, Planning for PEOPLE
Planning & Design

We deliver the public housing -

- from **Macro** level: City planning and Urban design to **maximize site potential** while **designing for people with nature in mind**
- to **Mirco** level: Interior space and furniture layout of the domestic flats bringing care and attention to details for **quality living space and services**; and applying **lean design and sustainable construction**

Residents Survey (from 2011 to 2014) and 10 years Customer Satisfaction indexes for newly completed Public Rental Housing Estates
Planning for People

- **Baseline performance** - Hong Kong Planning Standards and Guidelines & Statutory
- **Consult Stakeholders** - other Government Departments, District Councils and Local community
- **Comprehensive approach** – transport, car parking, community centre, social welfare, educational and commercial facilities, pedestrian circulation, local open spaces and landscaping etc.

Public transport terminus and pick-up areas linked up with covered walkways and lift towers ....

Tactile Guide Path System at strategic locations of housing estates to lead people to domestic blocks
Designing for People with Nature in Mind

1. Ensure **public health and safety, living in comfort and convenience**
2. Host of Technical studies **helping designers to integrate passive design elements holistically and refine the estate layout and building disposition**
3. A balanced design **assuring social, economic and environmental sustainability**, maximizing development potential, fast tracking the delivery of public housing
Bringing Breeze and Daylight: Passive Design

- Since 2004, apply micro-climate studies and air ventilation assessments to facilitate passive design at planning and design stages of all new projects.

Sun Shadowing Analysis

Wind Permeability

Ventilated corridors with natural daylight achieve energy saving up to 15%.

Providing breezeway for the community
Micro-climate Studies

**Mirco-climate Studies** cover the *wind environment, outdoor thermal comfort* and *sun shadowing analysis* at site level, *daylight penetration* as well as *indoor environmental quality* for all flats of each building block.

**Sun Shadowing Analysis**

Ventilated corridors with natural daylight achieve energy saving up to 15%

**Wind Permeability at Pedestrian Level**

*Vertical Daylight Factor / Indoor Environment Quality*  
*Thermal Comfort at Outdoor Environment*
Noise Mitigation to Create Quiet Living Environment

At Source
- Low noise road surfacing
- Noise Enclosure

At Propagation Path
- Noise Barrier
- Non noise sensitive building
- Acoustic Balcony

At Receiver End
- Building setback
- Flat configuration & Disposition
- Acoustic Windows

- Compliance Considerations
  - Value for Money
  - Site & technical constraints
  - Urban Design Aspect

→ A Balanced Solution
Noise Mitigation to Create Quiet Living Environment

OR a combination of all these measures like -

1. low noise road surfacing
2. noise enclosures/barriers, building setback, orientation and vertical fins
3. other innovation – acoustic windows/balconies design to secure comfortable environment whilst maintaining the valuable natural ventilation at the living areas.
**Acoustic Window**

*Designed in 2009, and completed in early 2017*

**Site Plan**

<table>
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<tr>
<th>Financials</th>
<th>Details</th>
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</thead>
<tbody>
<tr>
<td>No. of Blocks</td>
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</tr>
<tr>
<td>No. of Flats</td>
<td>857</td>
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<tr>
<td>Population</td>
<td>2400</td>
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</tbody>
</table>

**Noise Mitigation Measures:**

- Set Back & Orientation: **3dB(A)**
- Low Noise Road Surfacing: **2dB(A)**
- Architectural Fins: **2dB(A)**
- Flat with Acoustic Window: **8dB(A)**

**Overall = - 15dB(A)**

**Noise Reduction up to 8.0dB(A)**

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**Stakeholder Visit to Mock up in 2012**

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2nd Generation Acoustic Balcony
Design Concept

Acoustic Window
(San Po Kong Public Housing Development)
Noise attenuation
max. 8 dB(A)
Limitation
Site having appropriate wind environment to secure min. 1.5 air change/hour

1st Generation Acoustic Balcony
(Wing Cheong Estate)
Noise attenuation
~2 to 6 dB(A)
Limitation
Only for Wing Cheong Estate (Site specific)

2nd Generation Acoustic Balcony
(Full scale mock-up at a vacant school at Yue Wan Estate)

Better Noise Attenuation
~6 to 10dB(A)*
Better Ventilation
Sufficient air flow.
User-friendly Application
Prescriptive approach for window calculation.

Remark* - The final figures are subject to EPD's agreement.
2\textsuperscript{nd} Generation Acoustic Balcony

Noise Mitigation Components

Main Features –
1. Sliding screen \textit{in front of balcony door}
2. Plenum configuration \textit{of balcony for better air flow} (concept of acoustic window).

Optional Features to further reduce noise-
3. Sound absorptive lining \textit{at walls and ceiling}
4. Projected panel \textit{outside the parapet}
5. Acoustic windows \textit{at living areas}

Plan
Putting Research to Reality

Forerunner of 2nd Generation Acoustic Balcony

Wah Ha Estate at Chai Wan

(Designed in 2012, completed in 2016, 187 flats)

On-site verification
Noise Reduction: up to 10 dB(A)
Greening for Healthy Living and Avoid Urban Heat Island Effect

Greening offers better air quality and avoids urban heat island effect, aside from ecological and amenity value. We -

- maximize greening in new estates
- planting at least one tree for every 15 flats
- greening ratio: at least 20% (up to 30% for larger sites)
- providing “Community Farm” in every new estate

The Kai Tak Development in Kowloon City has adopted the green and healthy environment as one of the key features in the design theme of “Homes in the Park” with an overall greening ratio over 30%.
Assuring Safety & Economy - Geotechnical, Foundation and Structural

The design and disposition of buildings need to be carefully adjusted and refined to –

1. **minimize encroachment in deep cavities** and complicate the foundation system
2. **minimize cut and fill**
3. **Reduce special transfer structures, deep excavation**
4. **retain existing trees** on slopes using soil nail etc.

*The Ex-Yuen Long Estate site applied a special pile type “Shaft Grouted Barrette” is adopted to underpin the two domestic blocks. Overall reduction of concrete volume in the foundation works is about **21,000 m³**, and hence likewise the equal amount of excavated waste.*

*The project was awarded the highest rating for the two local Green Building Assessment Systems, namely the Beam Plus version 1.2 for new development and the China Green Building Design Label (CGBL) in 2013.*