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Opportunities & Constraints of Skyrise Greening in Hong Kong



Opportunities & Constraints of Skyrise Greening in Hong Kong



Skyrise Green

How to accelerate **changes** ... Skyscraper Greening in Hong Kong



Parents

小園丁 綠化校園天台

Aspiration

Operation

Regulation

Participation

聯合力量



Aspiration Regulation

May 2005

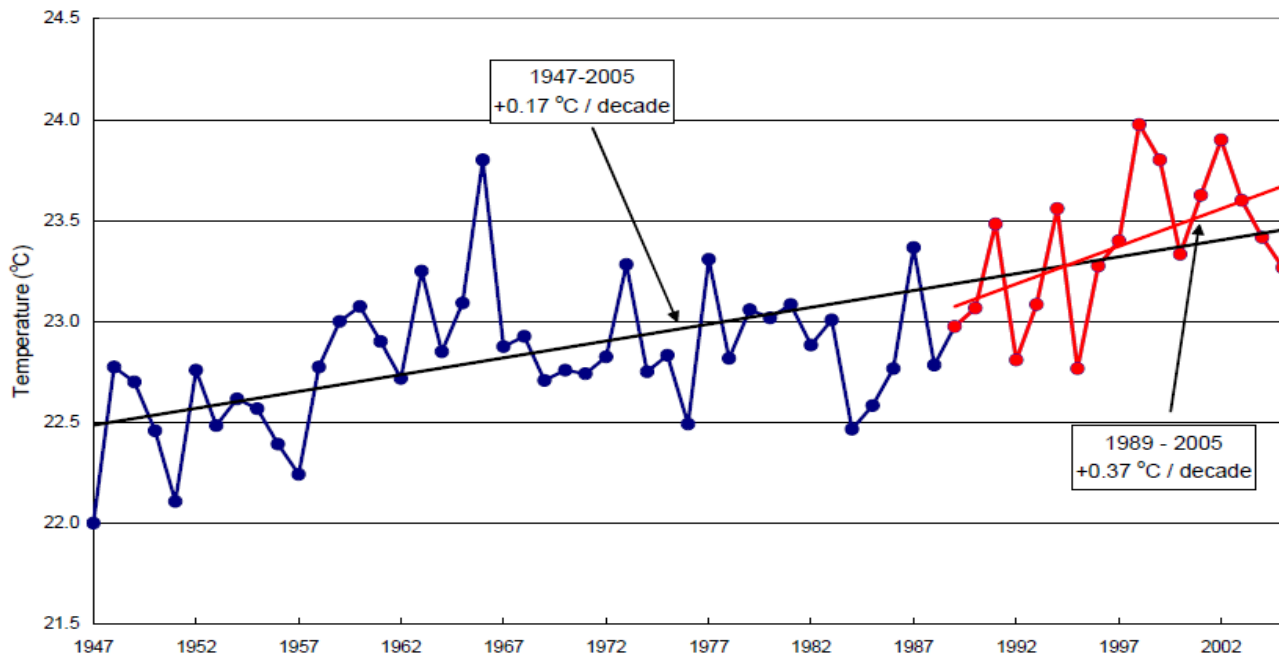
A First Sustainable Development Strategy for Hong Kong

April 2006

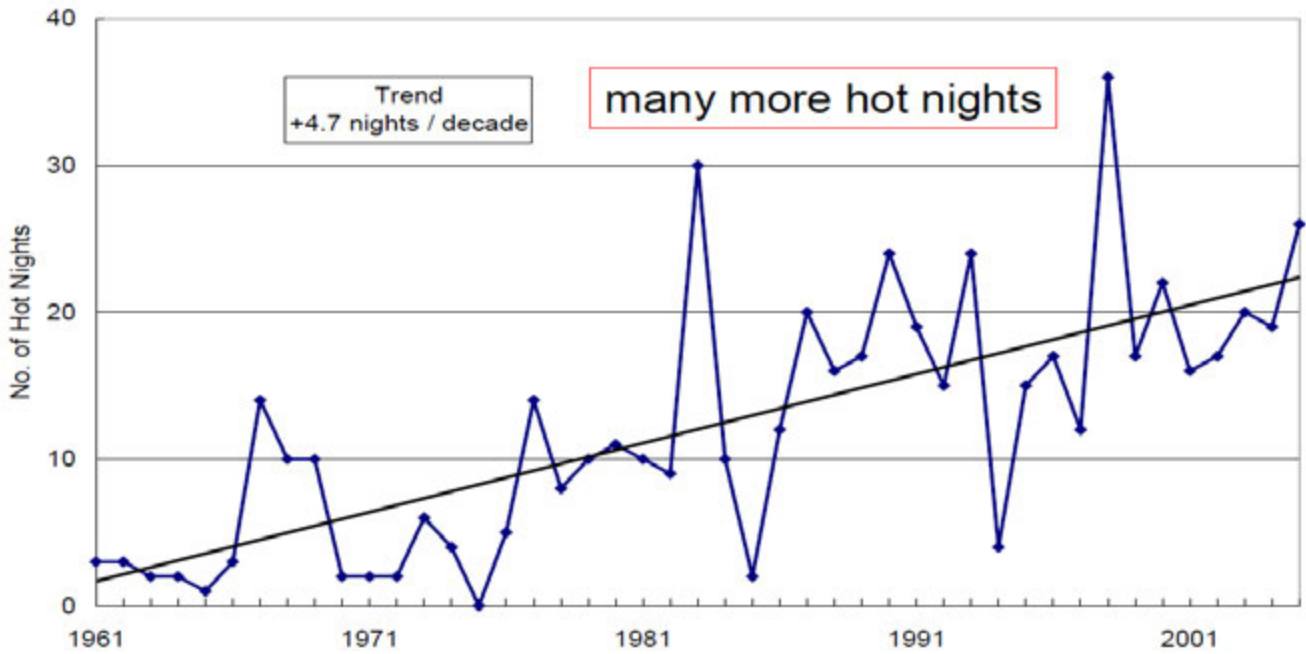
BD Consultancy Study on Building Design that Supports Sustainable Urban Living Space in Hong Kong



Urban Temperature



Hot Nights



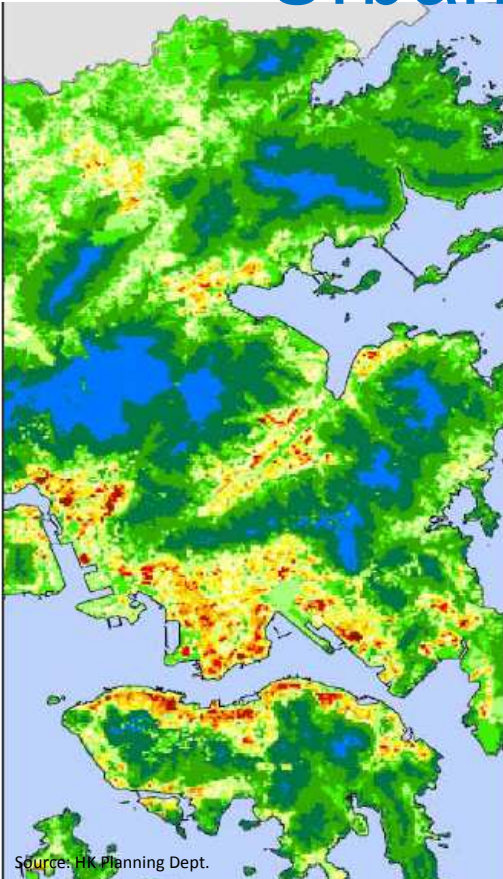
Source: HK Observatory

Air Ventilation Assessment

This collage provides a comprehensive overview of air ventilation assessment. It includes:

- Feasibility Study for Establishment of Air Ventilation Assessment System (空氣流通評估方法可行性研究):** A central document with sections on 'Issues' and 'Methodology'. The methodology section features a diagram with the equation $FR = \frac{\sum V_i}{V_c}$.
- Issues:** A section discussing the challenges and importance of air ventilation in urban environments.
- Methodology:** A section detailing the technical approach, including diagrams of airflow patterns and building layouts.
- Sciences into Design:** A section illustrating how scientific principles are integrated into architectural and urban design.
- What is next:** A section looking forward to future research and implementation strategies.

Urban Climatic Map

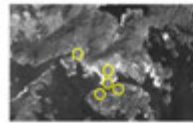


Planning Department

Urban Climatic Map and Standards for Wind Environment - Feasibility Study

Wind Tunnel Studies

Benchmarking studies using wind tunnel tests, in both 1:2000 and 1:400 scales, for selected sites have been conducted to investigate the urban wind environment of Hong Kong. The studies are still on-going and will provide further information for the study.



Consultancy Study on Building Design that Supports Sustainable Urban Living Space in Hong Kong

A Response to the Quest for Sustainable Urban Living Space under "The First Sustainable Development Strategy for Hong Kong"

對應香港可持續發展都市生活空間之建築設計顧問研究

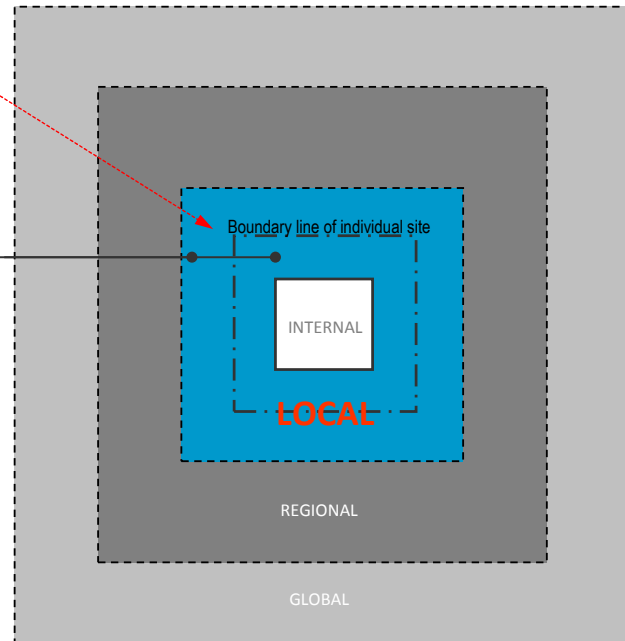


Focus of Study

Generic Sustainable Urban Living Space Issues in Hong Kong:



Air Ventilation, Heat Island Effect, etc Pedestrian Environment Greenery



To review **building regulations and practices** and recommend any areas for improvement with a view to promoting **new building design** of individual development sites that can make **urban living space** more sustainable.



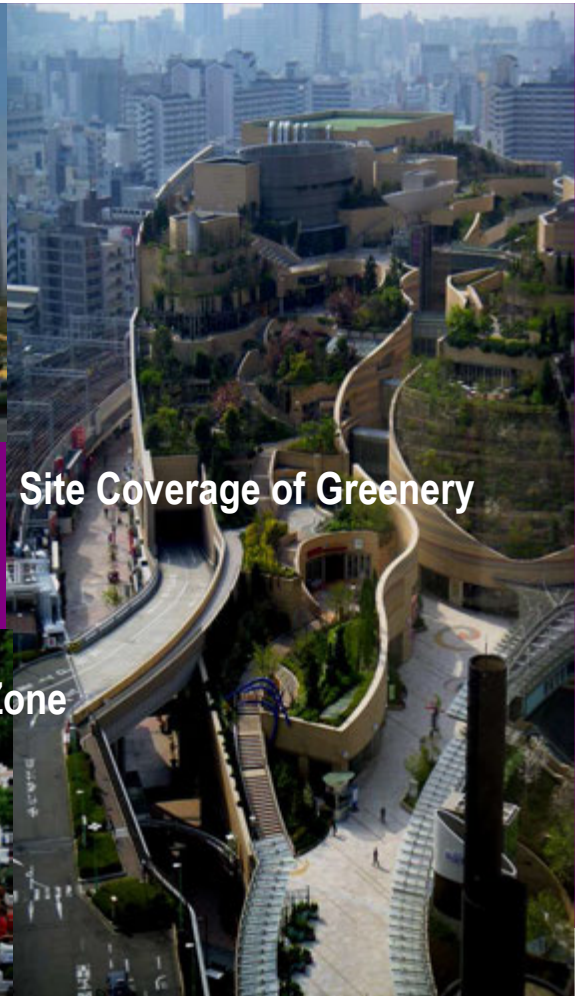
Identification of **Priority Areas** from the Stakeholder Consultation in 2006



1. Promoting building design that facilitates better **air ventilation**
2. Promoting building design that mitigates the **heat island effect**
3. Promoting building design that enhances the **pedestrian environment / public space**
4. Promoting building design that provides more **greenery**



Building Separation / Permeability



Site Coverage of Greenery

Necessity for Improvement



Setback for Min. Air Volume at Pedestrian Zone



Need for An **Overall Framework**

Sustainable City Programme Goals

Building Sector Objectives

Indicators

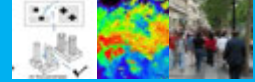
Building Design Guidelines

Recommended Practice



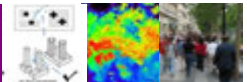
Key Recommendations

1. Building Separation / Permeability



- 2. Site Coverage of Greenery
- 3. Setback for Minimum Air Volume at Pedestrian Zone in Deep & Narrow Street Canyon

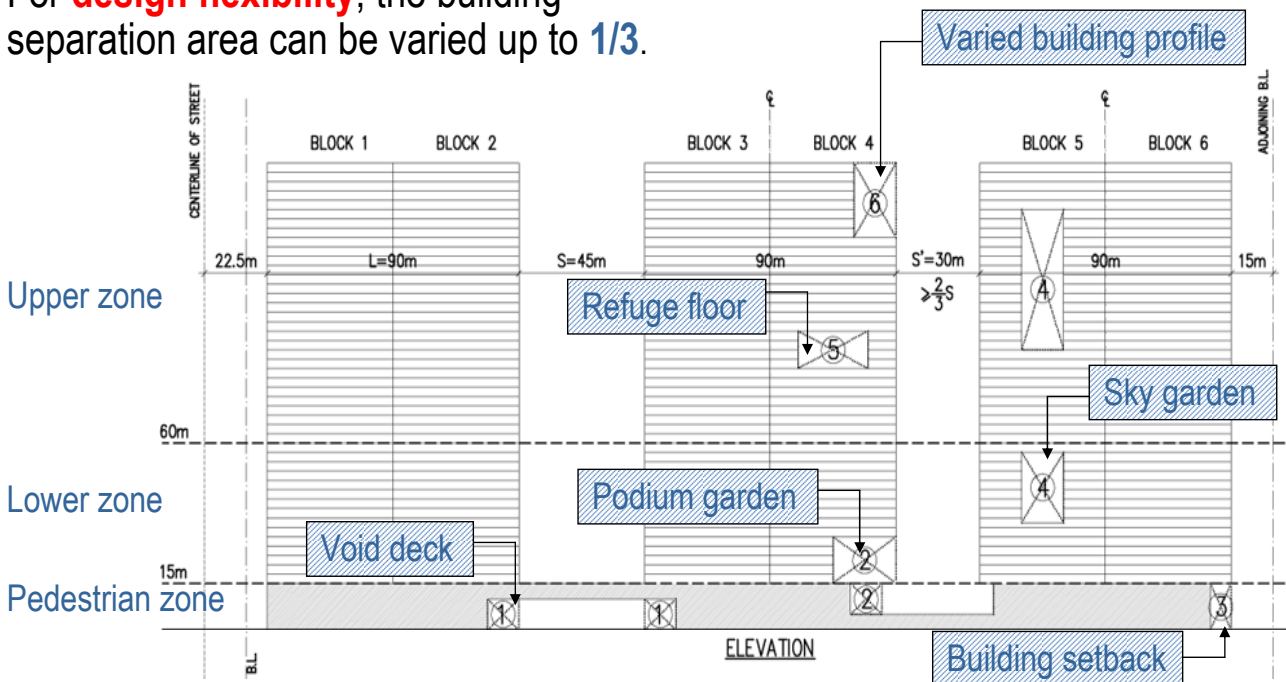
1. Building Separation / Permeability



Design Principle 3:

Building Design Alternative

For **design flexibility**, the building separation area can be varied up to $1/3$.





Key Recommendations

1. Building Separation / Permeability
2. **Site Coverage of Greenery**
3. Setback for Minimum Air Volume at Pedestrian Zone in Deep & Narrow Street Canyon



2. Site Coverage of Greenery



Reference Standards

Tokyo

Green Roof > 20%

[Since April 2001, the TMG required new buildings on site larger than 1,000m² (or 250m² for public buildings), have at least 20% of the rooftop as greenery, in addition to on-grade greening.]



2. Site Coverage of Greenery



Reference Standards

BEAM Plus, HK

2.2.4 Landscaping and Planters

1 credit for using pervious materials for a minimum of 50% of hard landscaped areas.

1 credit for providing appropriate planting on site equivalent to at least **30%** of the site area.



2. Site Coverage of Greenery



Recommendation:

Site coverage of greenery for new development to enhance urban greenery

$\geq 30\%$



2. Site Coverage of Greenery



Allowance for **Flexibility & Creativity**

1. For development with site area < 1,000m², recommended SC of Greenery can be waived.
2. For development with site area between 1,000m² and 2ha, recommended SC of Greenery can be reduced to **20%**.
3. Grass paver: accountable subject to the actual surface area of greenery of individual paving system.
4. Vertical greenery: accountable with a reduction factor of 0.5.
5. Other features (e.g. water body) that may improve the micro-climate in a similar way can be suggested for consideration as equivalence with or without a reduction factor.
6. Exemption can be considered on individual merits of special case, e.g. prison.

(Items 3, 4, 5 & 6 may be considered for site with high constraints. Items 4 & 5 may be capped by a max. allowable %.)



2. Site Coverage of Greenery



Overseas Examples:

Japan

High-density commercial development in Fukuoka, Japan, with A-rating in CASBEE-HI assessment:

Site area – 1.16 ha

Plot ratio – 6

Site coverage of greenery – **42.7%**

(Source: CASBEE-HI Tool-4 2006
by Institute of Building Environment and Energy Conservation, Japan)

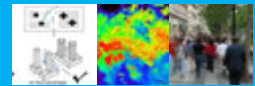




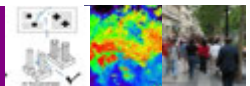
Key Recommendations

1. Building Separation / Permeability
2. Site Coverage of Greenery

3. **Setback for Minimum Air Volume at Pedestrian Zone in Deep & Narrow Street Canyon**



3. Setback for Minimum Air Volume at Pedestrian Zone in Deep & Narrow Street Canyon



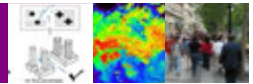
Recommendation:

For site with **depth $\geq 17.5\text{m}$**
min. setback of 7.5m
at Pedestrian Zone (0-15m)
for better air volume

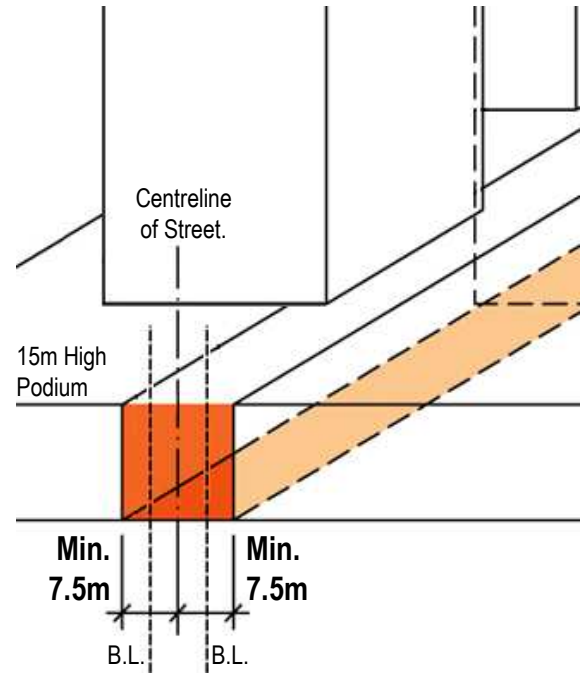
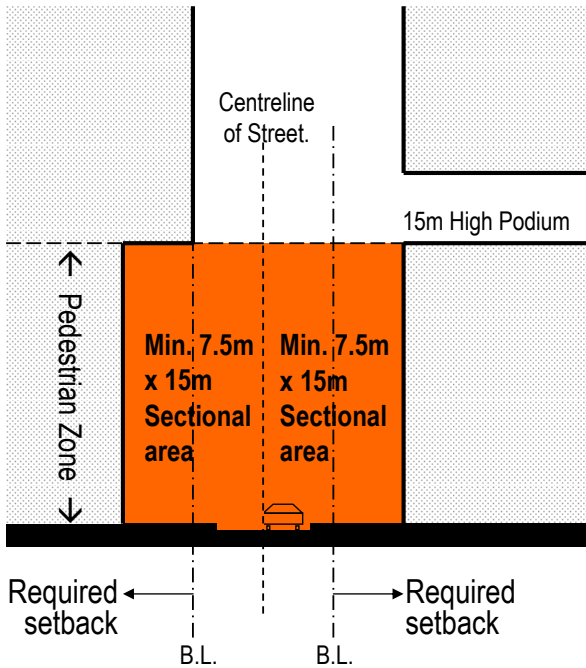
[dimensions measured from
centreline of street]



3. Setback for Minimum Air Volume at Pedestrian Zone in Deep & Narrow Street Canyon



Min. sectional area of urban canyon for better air volume at the Pedestrian Zone = **7.5m x 15m** or the equivalence



2009-2010
Council for Sustainable Development
Public Engagement Policy Address



2 Operation Regulation



2010
APR



Hong Kong Green Building Council
Green Labelling Committee

BEAM Plus

BEAM Plus
New Buildings

Version 1.1 (2010.04)



Building Environmental Assessment Method

BEAM Plus
Existing Buildings

Version 1.1 (2010.04)



Building Environmental Assessment Method



BEAM Plus Site Aspects (New Buildings)

CREDIT WEIGHTINGS AND OVERALL GRADE

The weighing system, i.e. the relative number of credits given for compliance with a particular aspect, is a critical part of a building performance assessment method. It is logical that BEAM should seek to assign credits or weightings to assessment criteria somewhat in accordance with the significance of the impact.

CATEGORY WEIGHTING

Having reviewed local and international assessment schemes and other relevant information, a weighting over each environmental performance category has been assigned to reflect its importance and global trends as follows:

BEAM Plus New Buildings

Category	Weighting (%)
Site Aspects (SA)	25
Materials Aspects (MA)	8
Energy Use (EU)	35
Water Use (WU)	12
Indoor Environmental Quality (IEQ)	20
	100

Version 1.1 (2010.04)



**DETERMINATION OF
OVERALL GRADE**

The Overall Assessment Grade is determined by the percentage (%) of the applicable credits gained under each performance category and its weighting factor. Given the importance of SA, EU and IEQ it is necessary to obtain a minimum percentage (%) of credits for the three categories in order to qualify for the overall grade. In addition, a minimum number of credits shall be earned under the category of Innovation and Additions (IA). The award classifications are:

BEAM Plus

New Buildings

	<u>Overall</u>	<u>SA</u>	<u>EU</u>	<u>IEQ</u>	<u>IA</u>	
Platinum	75%	70%	70%	70%	3 credits	(Excellent)
Gold	65%	60%	60%	60%	2 credits	(Very Good)
Silver	55%	50%	50%	50%	1 credit	(Good)
Bronze	40%	40%	40%	40%	-	(Above Average)

Version 1.1 (2010.04)



Building Environmental Assessment Method

Site Aspects (SA): BEAM 4/04 vs BEAM Plus (NB)

	BEAM 4/04	BEAM Plus
Prerequisites	0	1
Credits	25	22
Bonus Credits	0	3

BEAM Plus NB SA: CREDITS SUMMARY

SA P1 Minimum Landscaping Area

NA

Site Location	SA 1 Contaminated Land	1B
	SA 2 Local Transport	3
	SA 3 Neighbourhood Amenities	3
Site Planning & Design	SA 4 Site Design Appraisal	1+1B
	SA 5 Ecological Impact	1B
	SA 6 Cultural Heritage	1
	SA 7 Landscaping and Planters	3
	SA 8 Microclimate around Buildings	4
	SA 9 Neighbourhood Daylight Access	1
Construction / Emissions from Site	SA 10 Environmental Management Plan	1
	SA 11 Air Pollution during Construction	1
	SA 12 Noise during Construction	1
	SA 13 Water Pollution during Construction	1
	SA 14 Noise from Building Equipment	1
	SA 15 Light Pollution	1

TOTAL: **22+3B**

NB SA P1 MINIMUM LANDSCAPE AREA

Prerequisite

EXCLUSION

Buildings or sites not for **residential use**; or Residential sites less than / equal to **1,000 m²**.

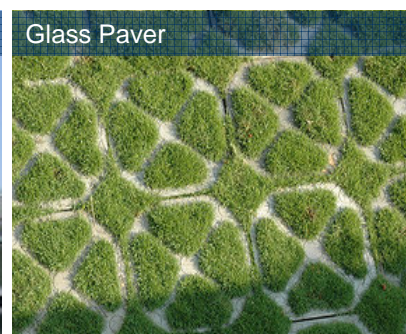
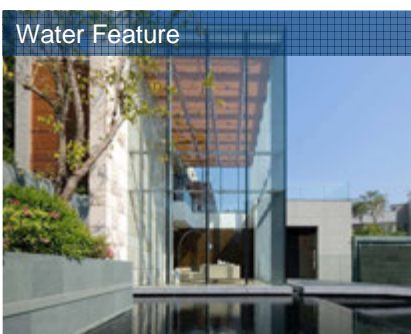
OBJECTIVE

Encourage **urban greenery**

REQUIREMENT

Appropriate planting \geq **20%** of the site area.

credit: **NA**



SA 3
NEIGHBOURHOOD AMENITIES

Site Location

credit: 1

EXCLUSION

Emergency Services Premises

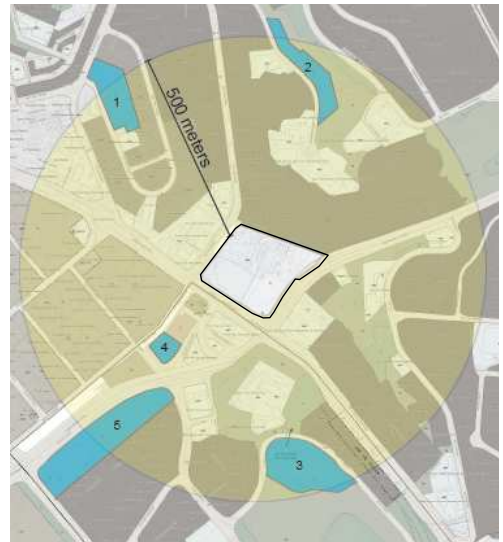
OBJECTIVE

Encourage integration with neighbourhood

REQUIREMENT

b) Neighbourhood Recreational Facilities
At least 2 facilities $\leq 500m$ from Site
connecting with pedestrian access

- Shaded / Covered Sitting-out Areas / Garden / Park
- Waterfront Promenade;
- Public Swimming Pool;
- Public Indoor Sports Hall;
- Public Outdoor Sports Facility;
- Bicycle Tracks.



SA 3
NEIGHBOURHOOD AMENITIES

Site Location

credit: 1

EXCLUSION

Emergency Services Premises

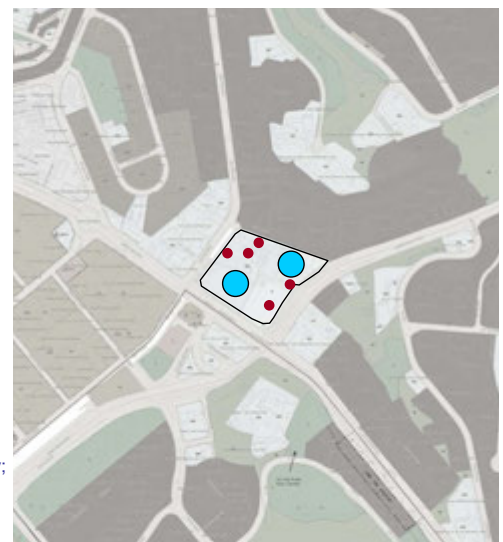
OBJECTIVE

Encourage integration with neighbourhood

REQUIREMENT

c) Providing Basic Services ≥ 5 OR
Recreational Facilities ≥ 2
within Site for public use

- | | | |
|--|----------------------------|---------------------------------|
| Restaurants; | Banks / ATMs; | Medical Facilities; |
| Dental Clinic; | pharmacy; | Supermarkets; |
| Convenience Stores; | School; | Library; |
| Kindergarten ; | Day Care Centre; | Post Boxes; |
| Laundry / Dry Cleaner; | Hairdresser; | Retail Shops; |
| Place of Worship; | Community Centre. | |
| Shaded / Covered Sitting Out Areas / Garden / Park | Waterfront Promenade; | |
| Public Swimming Pool; | Public Indoor Sports Hall; | Public Outdoor Sports Facility; |
| Bicycle Tracks. | | |



credit: 1B

SA 5 ECOLOGICAL IMPACT

Site Planning & Design

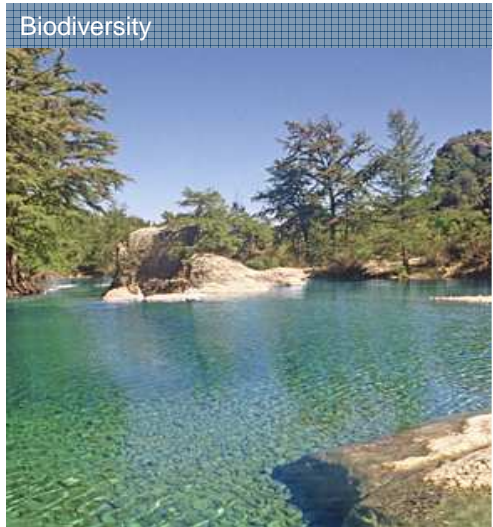
EXCLUSION
None

OBJECTIVE
Conserve / enhance the natural environment

REQUIREMENT
Nature Outlook Assessment
<30% score in Habitat Section +
<20% score in Biodiversity Section

Habitat	Weighting (%)
Naturalness	15
Habitat diversity	15
Size	10
Non-recreatability	10
Degree of disturbances	10
Biodiversity	
Species diversity & richness	20
Species rarity / endemism	20

Total :	100



credit: 1

SA 7 LANDSCAPING AND PLANTERS

Site Planning & Design

EXCLUSION
None

OBJECTIVE
Preserve / expand Urban Greenery
and reduce Surface Runoff

REQUIREMENT
a) Hard Landscaping: Pervious Materials
≥50% of Hard Landscaped Areas

Emergency Vehicular Access to be excluded from calculation.



SA 7 LANDSCAPING AND PLANTERS

Site Planning & Design

EXCLUSION
None

OBJECTIVE
Preserve / expand Urban Greenery
and reduce Surface Runoff

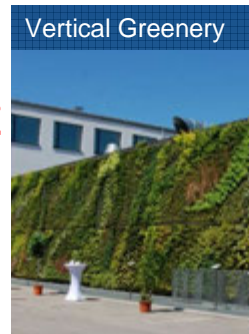
REQUIREMENT
b) Soft Landscaping: Appropriate Planting

≥ 30% of Site Area

credit: 1

≥ 40% of Site Area

credit: 2



SA 8 MICROCLIMATE AROUND BUILDINGS

Site Planning & Design

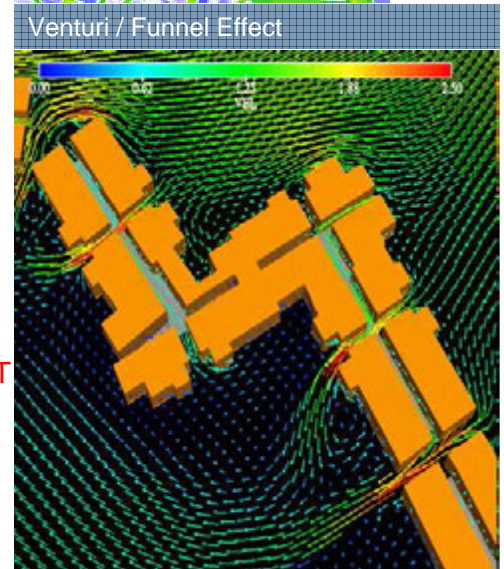
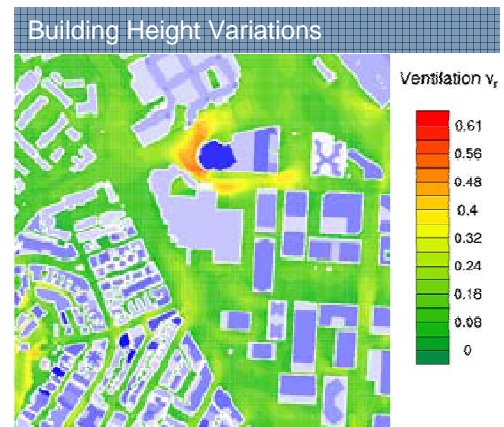
EXCLUSION
None

OBJECTIVE
Adequately considered microclimate around
& adjacent to buildings (pedestrian level)

REQUIREMENT
a) Wind Amplification
No Pedestrian Area subject to wind
amplification due to site / building design

DEMONSTRATED BY CFD OR WIND TUNNEL TEST

credit: 1



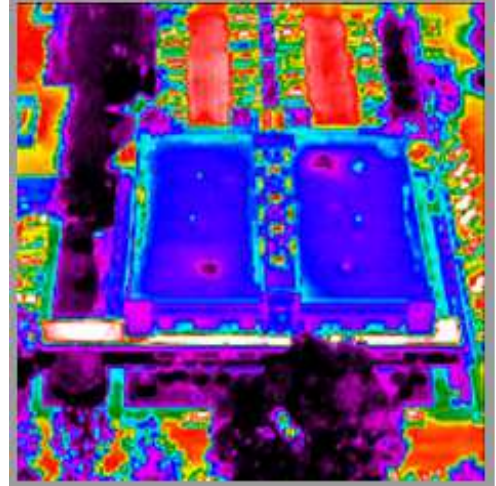
SA 8 MICROCLIMATE AROUND BUILDINGS

Site Planning & Design

EXCLUSION
None

OBJECTIVE
Adequately considered microclimate around & adjacent to buildings (pedestrian level)

- REQUIREMENT
- b) Elevated Temperatures
 - NON-ROOF:** credit: 1
Shade/Cover $\geq 50\%$ of impervious surfaces by light-coloured high-albedo materials (≥ 0.3 reflectance)
 - ROOF:** credit: 1
High emissivity (≥ 0.9) roofing or vegetated roof ($\geq 50\%$) of total roof area



3

Operation Participation

Parents

小園丁 綠化校園天台

「小園丁」活動，旨在鼓勵學生參與校園綠化工作，提高他們的環保意識。...

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Master Planning and urban design represents the pivotal initial stage that sets the roadmap towards sustainability. As the architect and master planner for the **HK Science Park Phase 3 Sustainability Master Planning Study**, RLP provides state of the art consultancy service that can steer the project to become the leading showcase of green buildings together with the vision of approaching **carbon neutrality**. RLP is blessed with expertise and experience in designing high-density, mixed-use developments and urban design. The key challenge lies in the balance between minimizing **eco-footprint** and optimizing livability, in particular with respect to **air ventilation** and **micro-climate** performance in the humid, sub-tropical region. An example is to enhance the master plan of MTRC LOHAS Park Development in Tsing Yi Island. Respecting **cultural heritage** and social cohesion is also one of the priority concerns, especially in the master planning of urban renewal projects.

Besides land-use optimization, new constructions should strive to be low carbon, conserve energy, resources and water, minimize waste, and provide healthy, livable and productive environmental quality both indoor and outdoor. The award-winning **YWCA Guesthouse & Conference Centre** in Lantau Island exemplifies how affordable, passive architectural design strategies can be applied innovatively. The **Centre for Healthy Life** in Tsun Mun Hospital will become another exemplar demonstration on how traditional courtyard architecture can be transformed into a contemporary consulting facility that not only eases our mind but also lightens our environmental loadings through creative design for natural ventilation, daylighting and 3-dimensional greening. An array of RLP new projects ranging from mixed use, commercial, institutional, educational to residential is also subject to **BEAM / LEED** certification.

Conserving and upgrading the existing building stock through alteration and addition is increasingly valued from the perspective of sustainability. The **United Christian College (Kowloon East) Extension** not only optimizes the passive design strategies for low carbon yet healthy living, but also serves as an education tool to heighten the environmental awareness and participation of students. The **Transformation of Jockey Club Environmental Building** into a Centre of Excellence in Sustainability aspires to demonstrate the best practice for office and institutional building renovation, surpassing the benchmark of current **BEAM Platinum** rating. In the commercial sector, the **ASA of China Resources Building** involving high performance external envelope will be a showcase of LEED certification in large scale retrofitting works. Regeneration is also extended to urban scale, such as urban design concept for the revitalization of "Yung Shu Tau" area in Yau Ma Tei, HK.

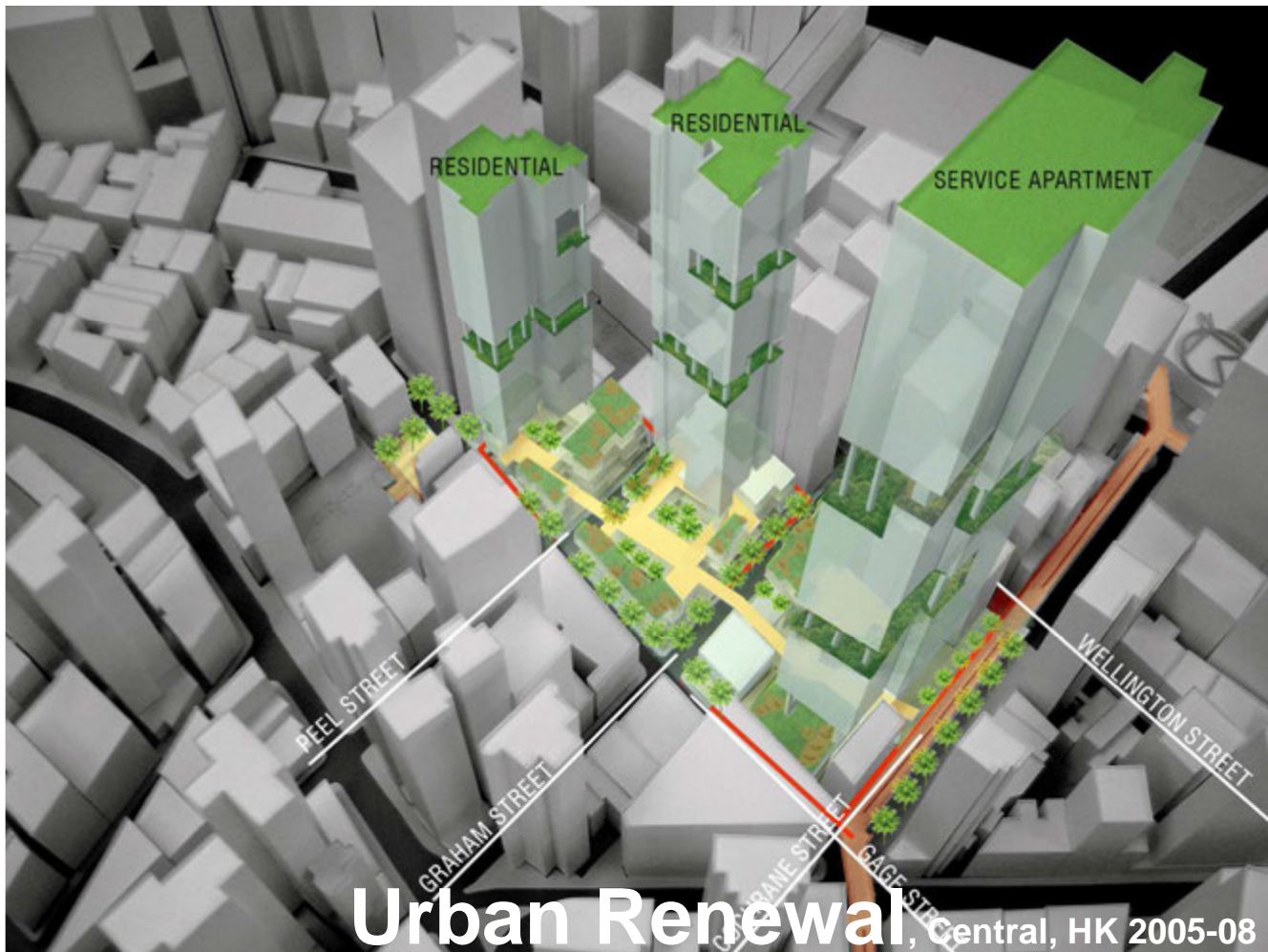
RLP integrates research and practice for optimizing sustainable design. With expert that has advised the Hong Kong Government on **regulation review** about lighting and ventilation in buildings, **consultancy study** on air ventilation and urban climatic map, and **design guidelines** on building design that supports sustainable urban living space in Hong Kong, RLP possesses the state of the art knowledge on sustainable architectural and urban design particularly in the high density urban context of Hong Kong and similar cities. RLP has also set up the in-house **Sustainability Steering Group (SSG)** to accelerate the integration of sustainable design and research into practice. The SSG is headed by Mr. K.S. Wong, who is also supporting the **interim upgrade of BEAM** in 2009 and chairs the **Professional Green Building Council (PGBC)** in HK.



Mixed-use Commercial Development
Environmental Centre
Science Park
Government Office
Library & Community Centre
School & Hostel
University Campus & Laboratory
Elderly Home
High-rise Residential
Low-rise Residential
Houses

LEED / BEAM Projects



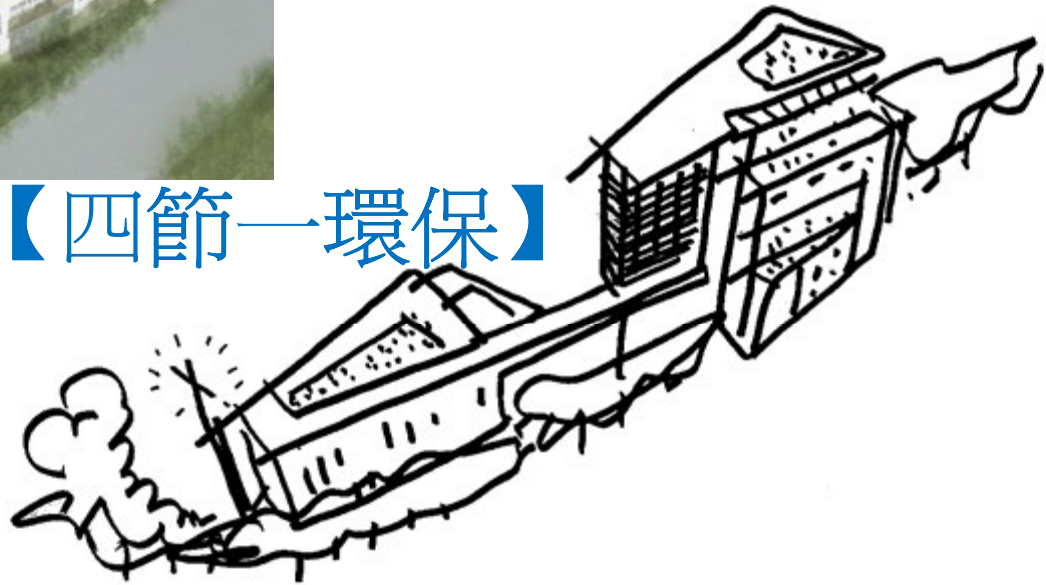


Urban Renewal, Central, HK 2005-08



NC

健築：【四節一環保】



United Christian College (Kowloon East)

2006-09

A CLOSE LOOK

"Be Realistic, Demand the Impossible"

The building site was originally the basketball court of our school, so how did you manage to fit such a big building into it?

Within the 2,350 sq. m of space, the seven-story Dormitory and Facility Extension Block is required to include a dormitory, chapel, lecture theatre, canteen, swimming pool, gym room and activity rooms. Without a doubt, the greatest constraint of the new building is space. It makes the project design a real challenge. **"Be realistic, demand the impossible!"** Mr. Wong quoted one of his favorite mottoes by Daniel Singer. He reasoned that your dreams would come true if you dare to dream, stretch out and go against the flow. **This project to them is very challenging, though the difficulty is no less demanding than any of their other large-scale projects.** They have to optimise the use of every single inch of the site in their design.

"We worked as a team" Mr. Wong honored his colleagues, pointing out that Mr. Wilson W.Y. Yik, the Senior Architect of Ronald Lu & Partners, has made a great contribution in solving the limitation of our site and Ms. Jessica W.Y. Yeung, the Architectural Assistant, through a fresh graduate from the Department of Architecture, CUHK, has also worked diligently on the project. It takes tremendous imagination and coordination to create a design that would live up to the standards and expectations of our School, and to include all the necessary facilities within the limited space.

"Less is More, Simple is Beautiful"

"Less is More" is a motto applied to quality. **One of the most important architectural qualities is simplicity.** A building doesn't need to have a lot of fancy decorations to make it beautiful. Through simple designs and well-utilization of resources, the architects can design the building to be environmentally friendly and beautiful. That's their design principle.

Sustainable Design Feature

- Natural Ventilation
- Day Lighting
- Green Coverage
- Connectivity & Spatial Flexibility
- Resource Conservation
- Waste Minimization
- Life Cycle Assessment
- User's Involvement

From left, Mr. Wilson Yik, Senior Architect, (second from right) Ms. Jessica Yeung, Architectural Assistant and Mr. K.C. Wong, Director of Sustainable Design of Ronald Lu and Partners Hong Kong Ltd.

4-R Resource Conservation Principles

Reduce

Using less than 10% of the total energy consumption.

Reuse

Reusing existing materials and components.

Renew

Using renewable materials and resources.

Conservation of Energy and Resources

With four-R conservation principles of Reduce, Reuse, Reuse and Recycle in mind, **reducing site wastage is their first priority.** To the architects, **fulfilling energy-saving target is equally important.**

Taking advantage of the prevalent southeast wind direction (about 2.2m/s), the architects are going to apply cross ventilation, stack effect, wind catcher and wing wall in the area of the dorm, canteen, chapel and indoor swimming pool. Moreover, they will make good use of the daylight for the dorm. Greenery on roofs and facades would reduce the inside temperature. Using the external solar shading from the south facade and installing large bay windows in the north facade according to the site's geographical feature will optimize light and air flow from a desirable direction in order to reduce the use of artificial lighting and air-conditioning respectively.

"Bamboo is renewable and with a better cooling effect, we thus use it as the materials for the floor", the architects are concerned with every details. The eco-glass blocks to be used around the chapel area contain something called titanium oxide. Titanium oxide is a kind of material which helps absorb the pollutants caused by vehicles. Some of our old basketball court materials were kept to be reused in the new basketball court to minimize waste. **The use of local made recycled paving blocks and plastic grille can minimize embodied energy.**

Minimization of waste

Beneficial use of waste water: Grey Water
Designing provision to facilitate the use of grey water from the swimming pool for routine cleaning of outdoor hard-paved areas.

Concept Designer: Ronald Lu & Partners

Minimization of solid waste: Composting
Integrating composting bin in the Eco-Path for turning segregated organic waste from canteen into fertilizer.

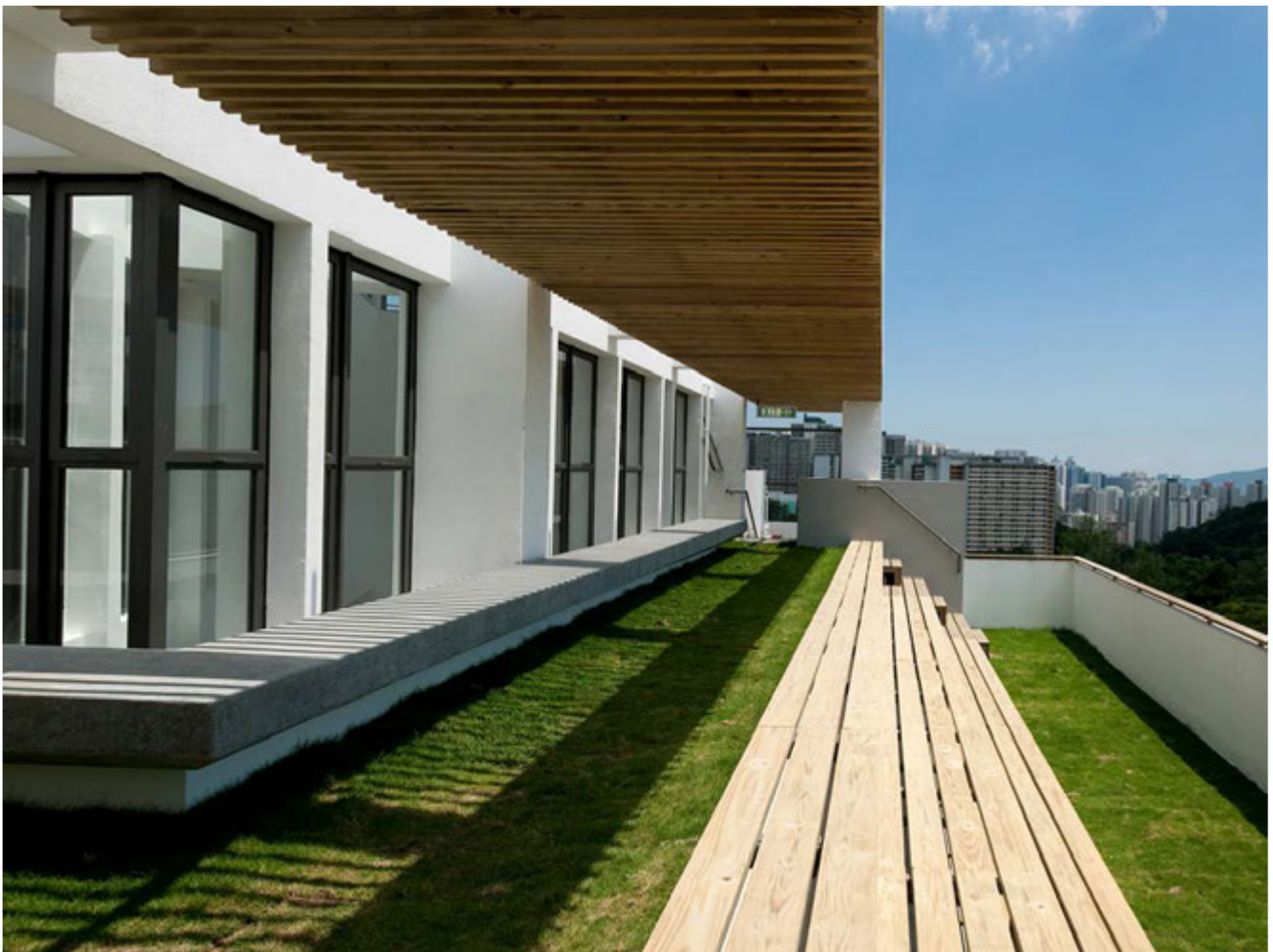
Although the green practice would bring up construction cost by less than 10 per cent, it minimizes negative impact on the environment and enhances healthy living. **The School thus can enjoy a long term energy savings of up to 10 per cent per annum.**

Recycle

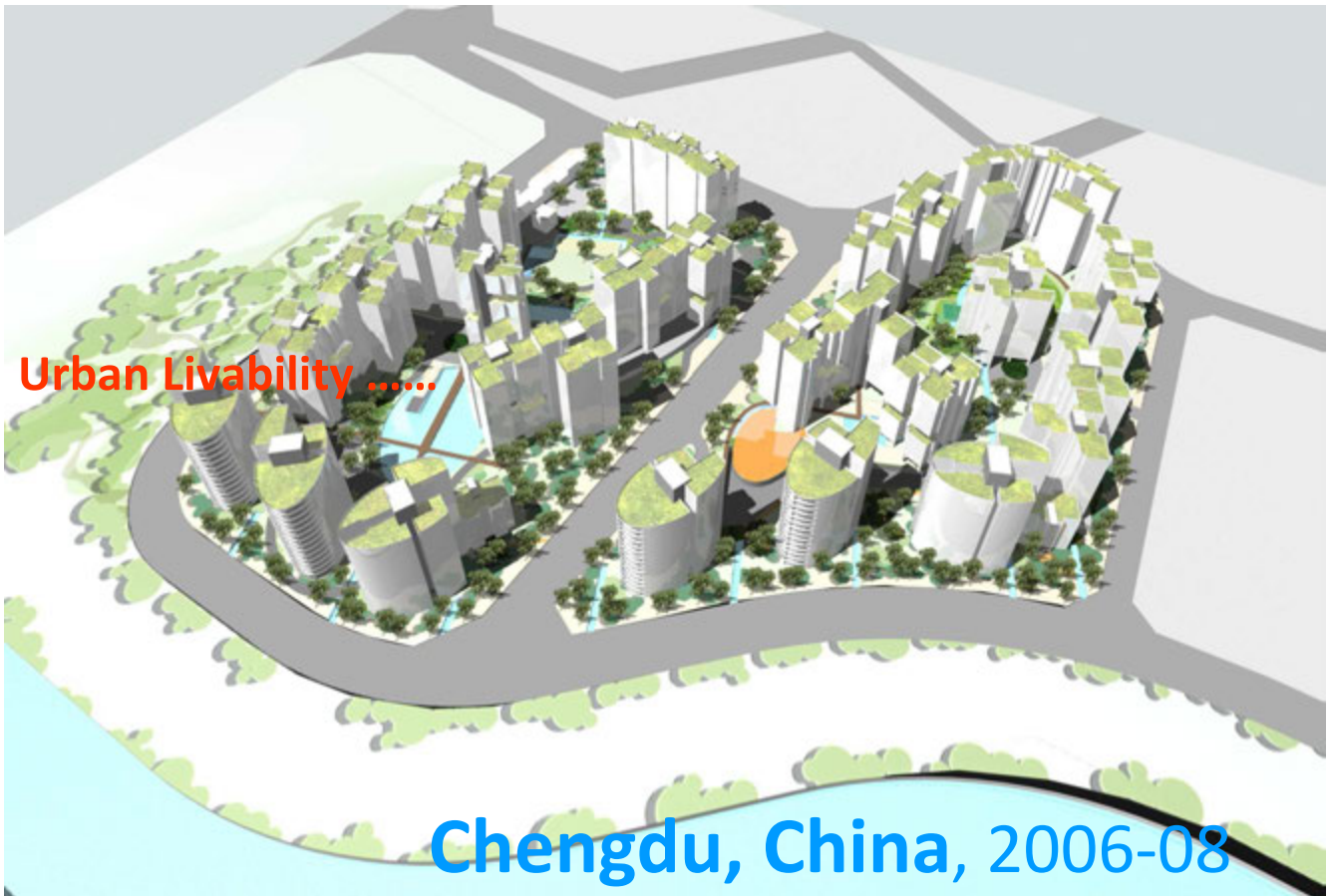
Reusing existing materials and components to save energy.

Concept Designer: Ronald Lu & Partners





NC



NC



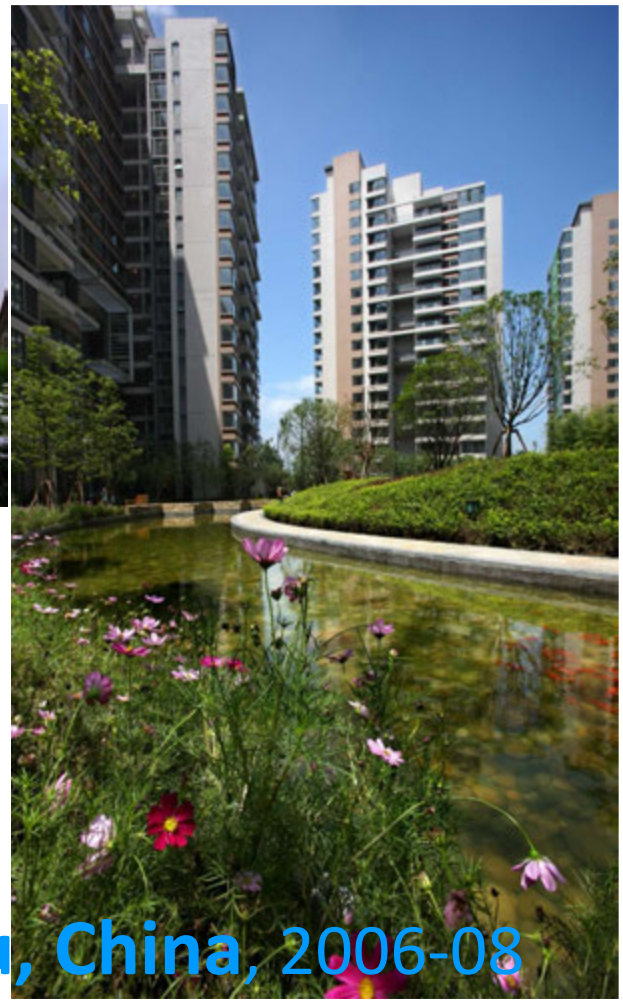
Permeability



4

Chengdu, China, 2006-08

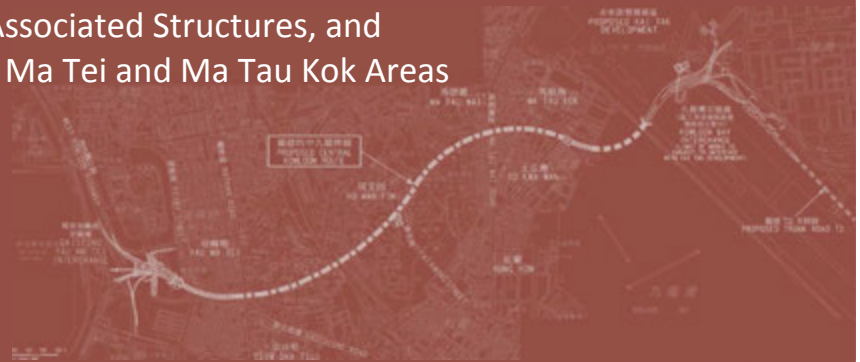
NC



Chengdu, China, 2006-08

Briefing on Central Kowloon Route

Preliminary Design for CKR Associated Structures, and
Urban Design Studies at Yau Ma Tei and Ma Tau Kok Areas



MMHJV

ronald lu
& partners
呂元祥建築師事務所

Urban Design for Central Kowloon Route, KIn 2008

SITE PHOTOGRAPHS



YAU MA TEI SITE

HO MAN TIN SITE

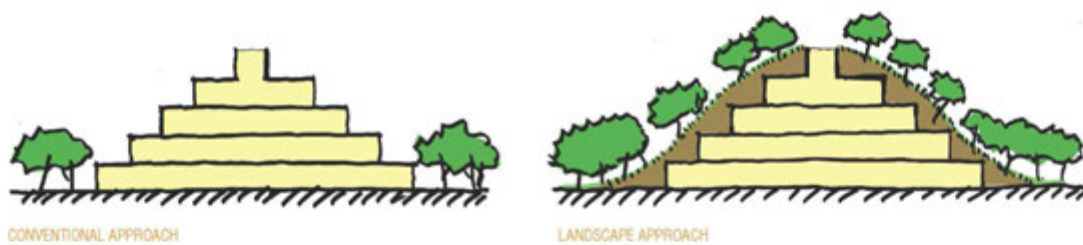
KAI TAK SITE

Fig. P1-3

AGREEMENT NO. CE 58/2006 (HY)
CENTRAL KOWLOON ROUTE AND WIDENING OF GASCOIGNE ROAD FLYER - INVESTIGATION



DESIGN OPTIONS



CONVENTIONAL APPROACH

LANDSCAPE APPROACH

Fig. P1-7

AGREEMENT NO. CE 58/2006 (HY)
CENTRAL KOWLOON ROUTE AND WIDENING OF GASCOIGNE ROAD FLYER - INVESTIGATION



HO MAN TIN SITE MASTER LAYOUT PLAN



Fig. P1-17



AGREEMENT NO. CE 58/2006 (HY)
CENTRAL KOWLOON ROUTE AND WIDENING OF GASCOIGNE ROAD FLYER - INVESTIGATION



HO MAN TIN SITE WEST ELEVATION

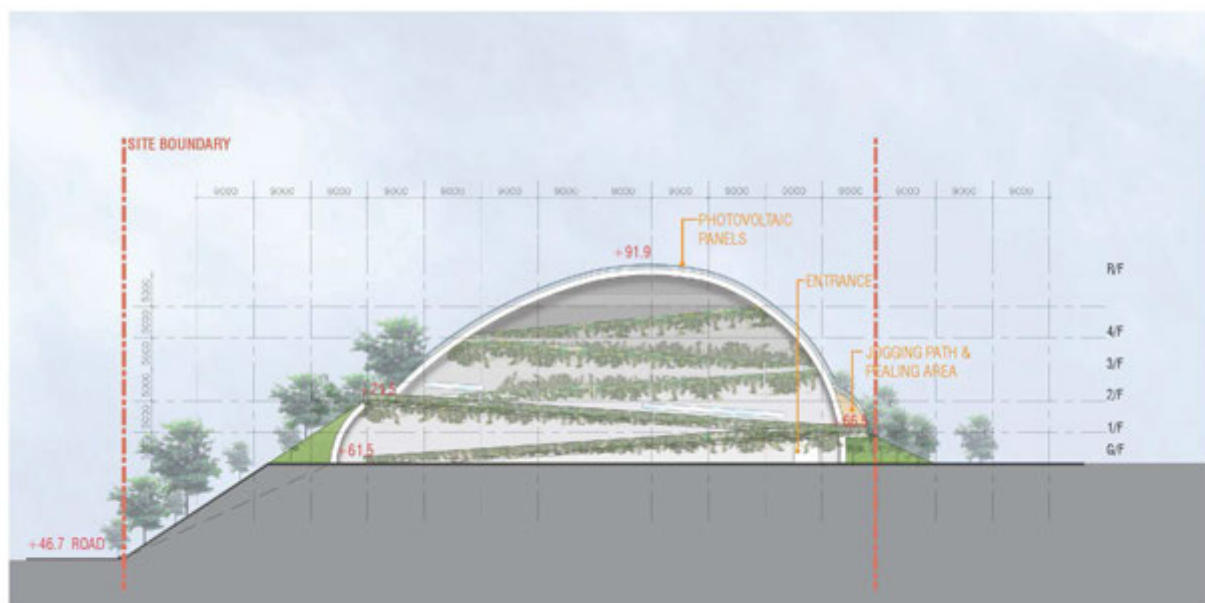


Fig. P1-23



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CENTRAL KOWLOON ROUTE AND WIDENING OF GASCOIGNE ROAD FLYER - INVESTIGATION



HO MAN TIN SITE PHOTOMONTAGE 2 (From Reservoir towards East)



Fig. P1-37

HO MAN TIN SITE SECTION BB

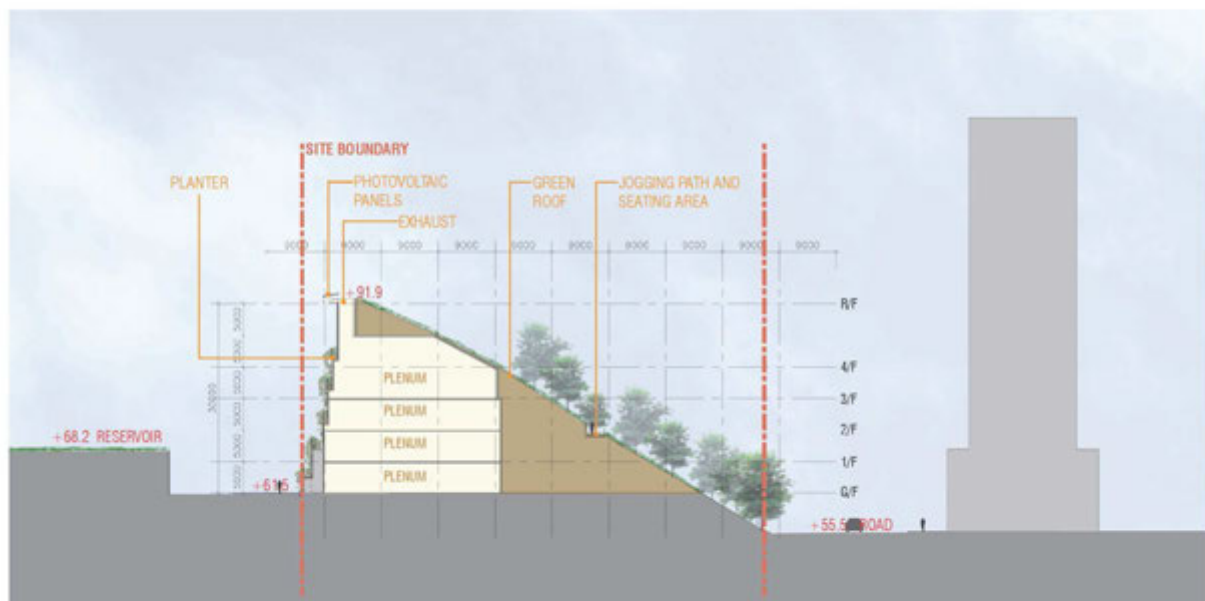
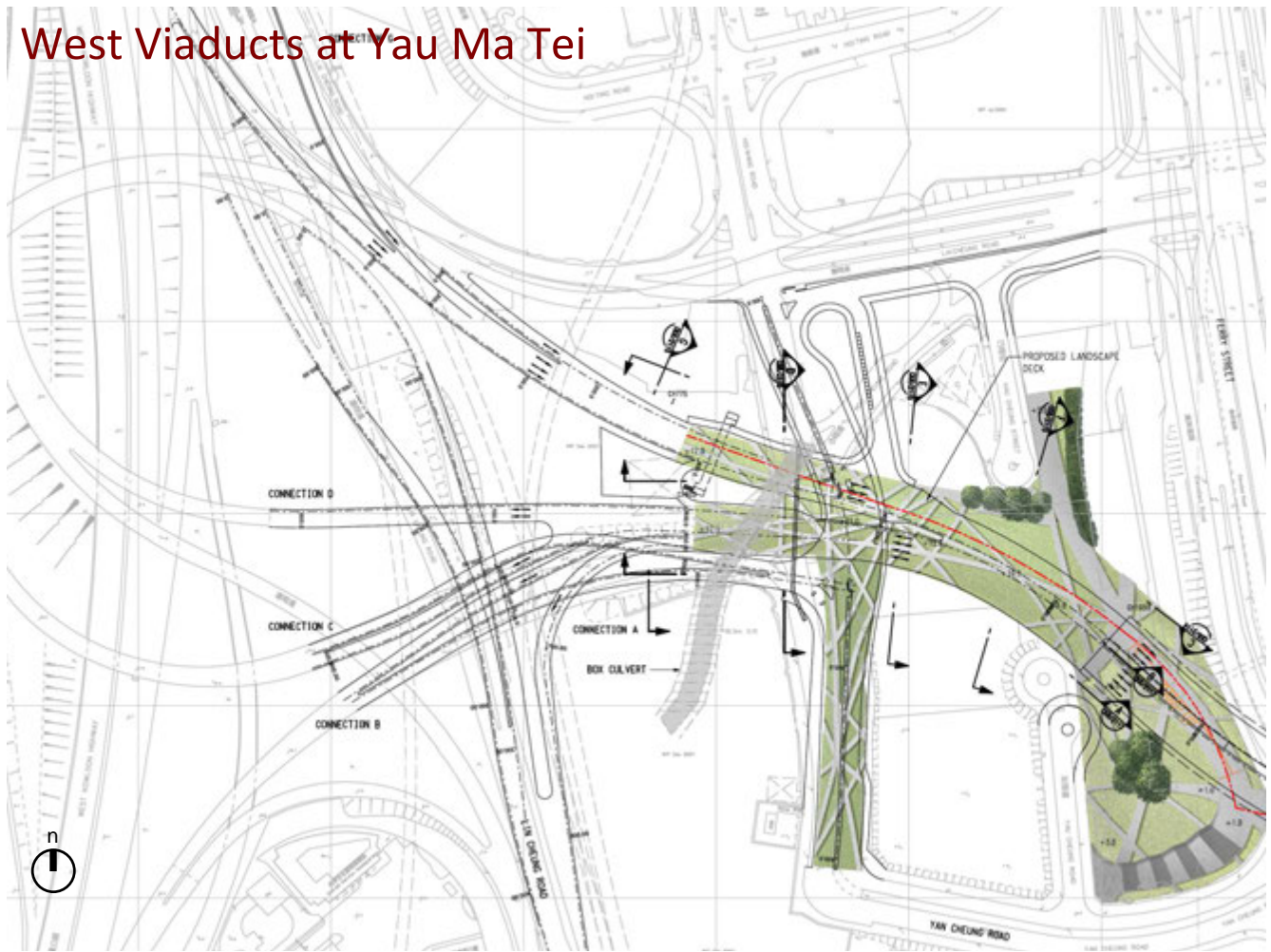


Fig. P1-24

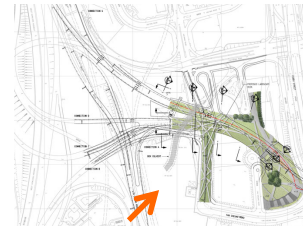
West Viaducts at Yau Ma Tei



Landscape Deck at Yau Ma Tei Master Layout Plan



West Viaducts at Yau Ma Tei Simulated View from Southwest



Connectivity, Livability, Permeability, Greenery



Urban Design for "Banyan Square", YMT, HK 2008



Our Aspiration (& City Goal)

Our Operational Benchmark

Our Regulation (& Incentive)

Public / Private Participation

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