10th Annual Affordable Housing Projects Conference
Kuala Lumpur, Malaysia 2019

Affordable Housing to address Sustainability

including Urban Micro-climate, Health, Resilient and Adaptable Communities

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香港房屋委員會
Hong Kong Housing Authority

Introduction

*The **Hong Kong Housing Authority (HKHA)** was established in 1973 under the Housing Ordinance.*

*The HKHA **plans, builds, manages** and **maintains** different types of public housing.*

Vision 理想

- To help all families in need to gain access to adequate and affordable housing.

4Cs Core Values
Caring,
Customer-focused,
Creative; and
Committed

Mission 工作目標

- To provide affordable quality housing, management, maintenance and other housing related services in a proactive and caring manner.
- Cost-effective and rational use of public resources.
- Competent, dedicated and performance-oriented team.

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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.

770,000+ flats in use

280,000 new rental & subsidized sale flats from 2017/18 to 2026/27

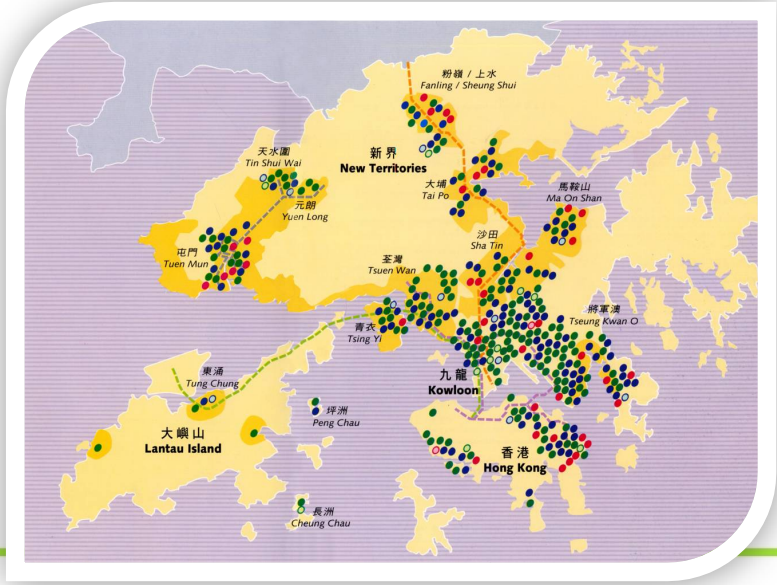
(30%) population

14,000+ workers daily

99 listed contractors

80+ active suppliers

9,000+ HA staff



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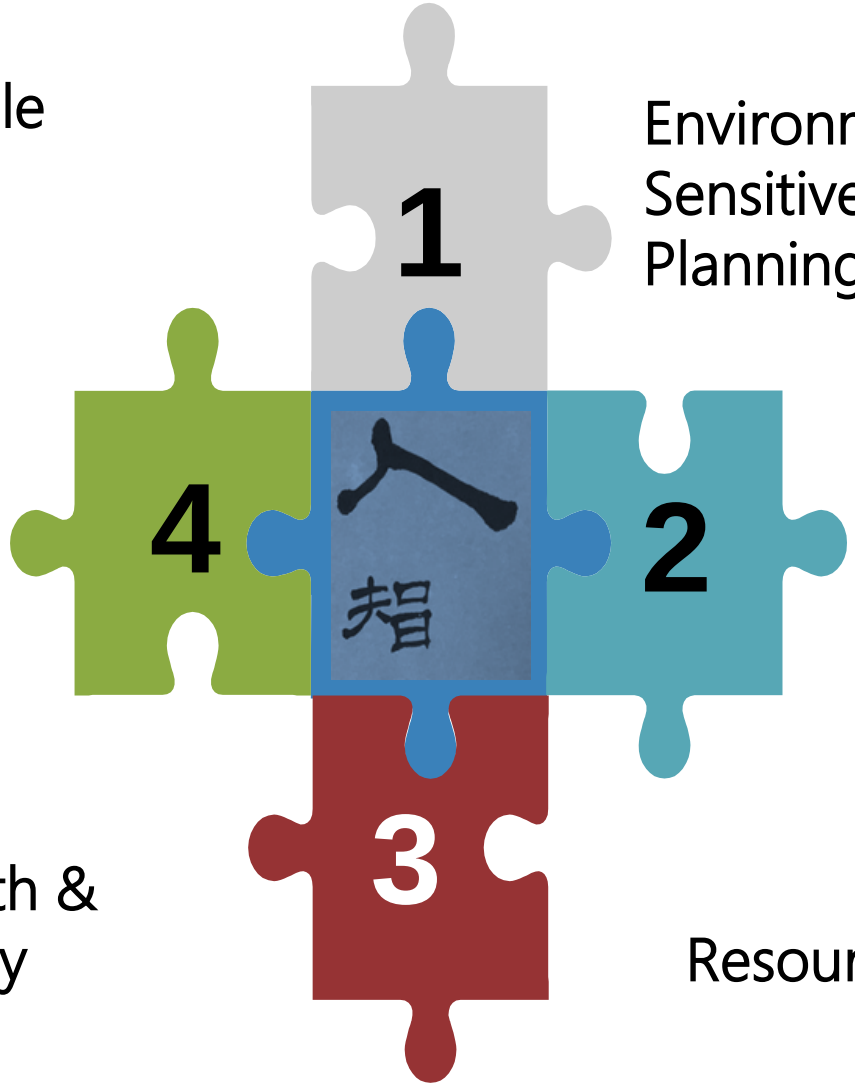
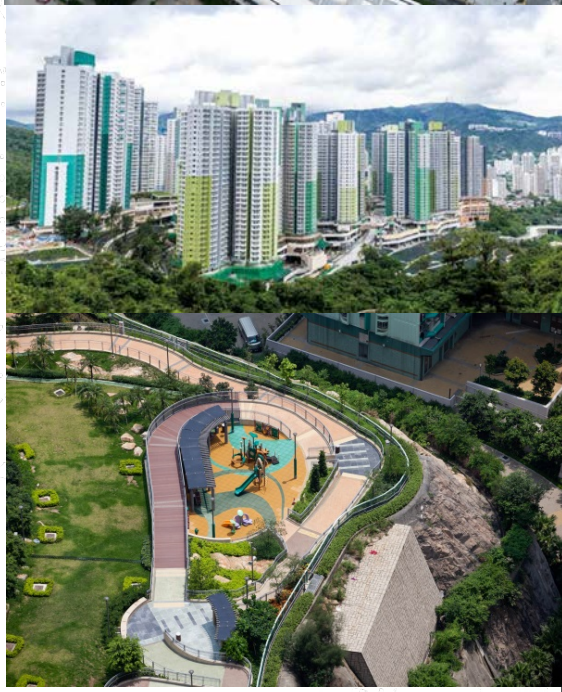


Health & Safety

Resources



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1.

People

Planning for Sustainable Community

Estate Planning : Adopt passive design approach with "Functional & Cost Effective" concept

Since 2000, we adopt ***Site-specific Design*** *with a* ***"People-oriented approach".***

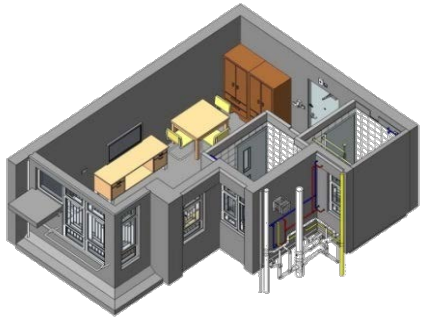
- *Respond to land supply & site constraints*
- *Maximize development potential*
- *Enhance Micro-climate*
- *Respond to Community feedback*

Modular Flat Design (starting from 2008)

4 modular flat types - 7m2 IFA/Person min.

1-Person / 2-Person Flat

14 m² IFA



2-Person / 3-Person Flat

21 m² IFA

3-Person / 4-Person Flat

30 m² IFA

4-Person/5-Person Flat

35 m² IFA

- Adopt modular dimensions and spatial arrangement to enhance buildability
- Standardize the components to enhance scale of economy
- Enhance flexibility for modular combination

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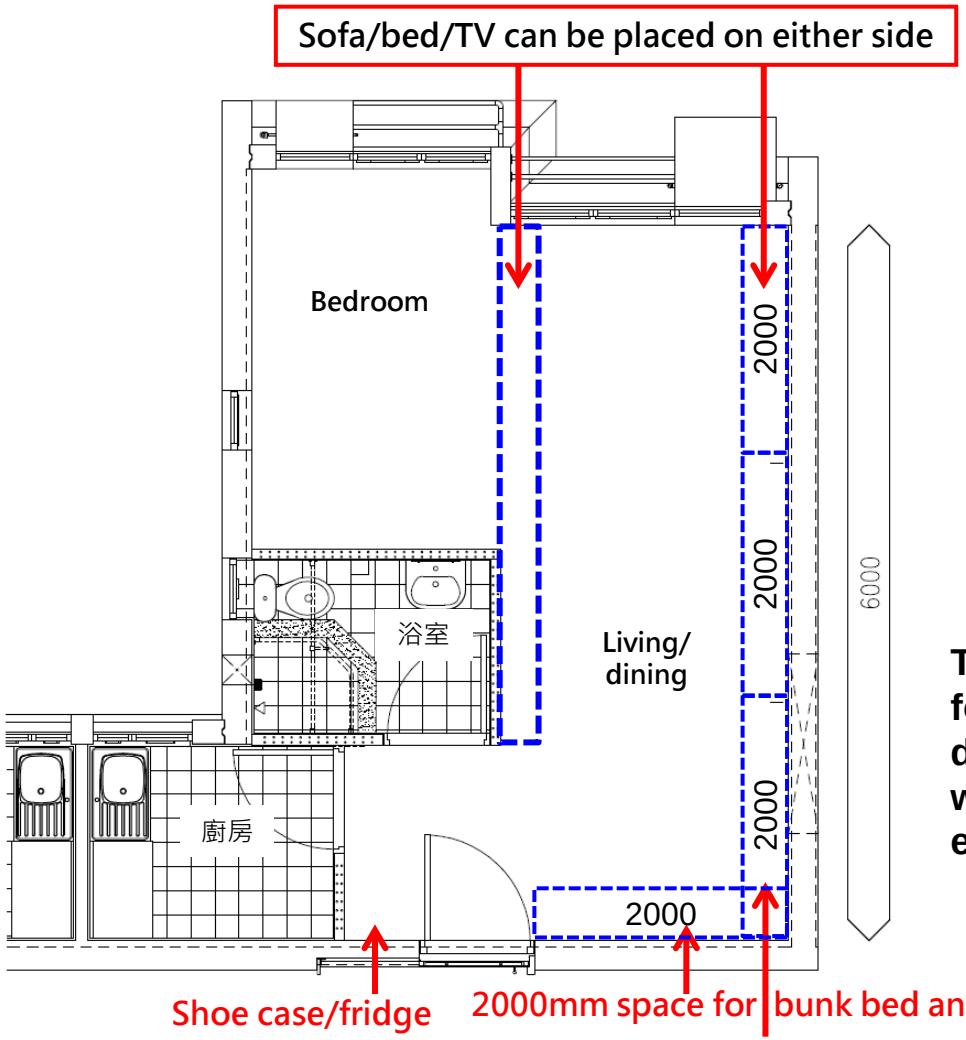
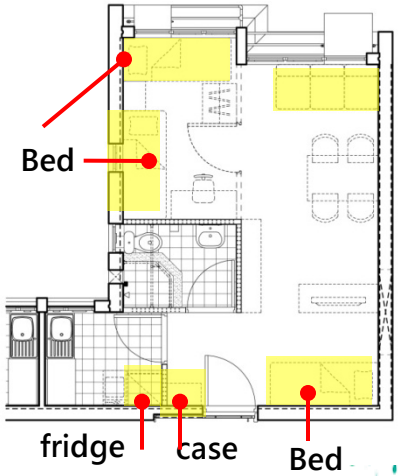
Type C Flat - (3 or 4-Person Flat) Internal Floor Area : 30.2 m² - 31.0 m²

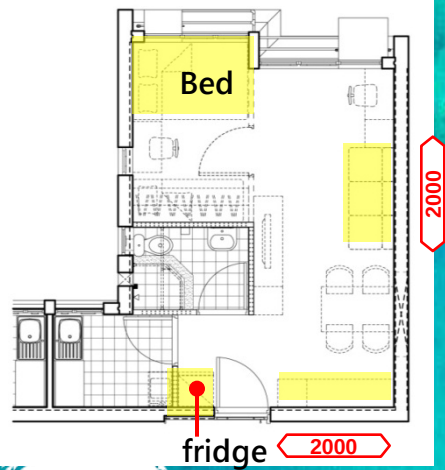
Enhance Flexibility in Furniture Layout



2000mm/2000mm/2000mm arrangement to enhance furniture layout flexibility for bed/dining table/sitting

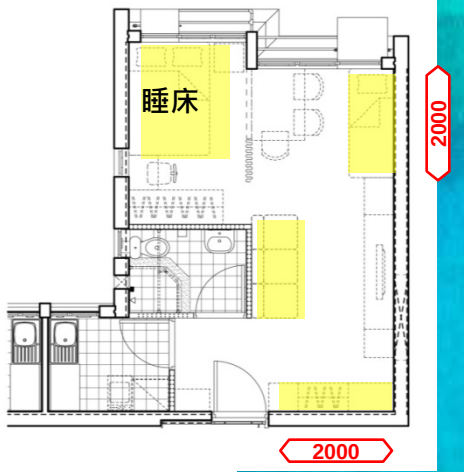


Option 1



Option 2

The 2m module fits for the bed, sofa, dinning table as well as wardrobes etc.



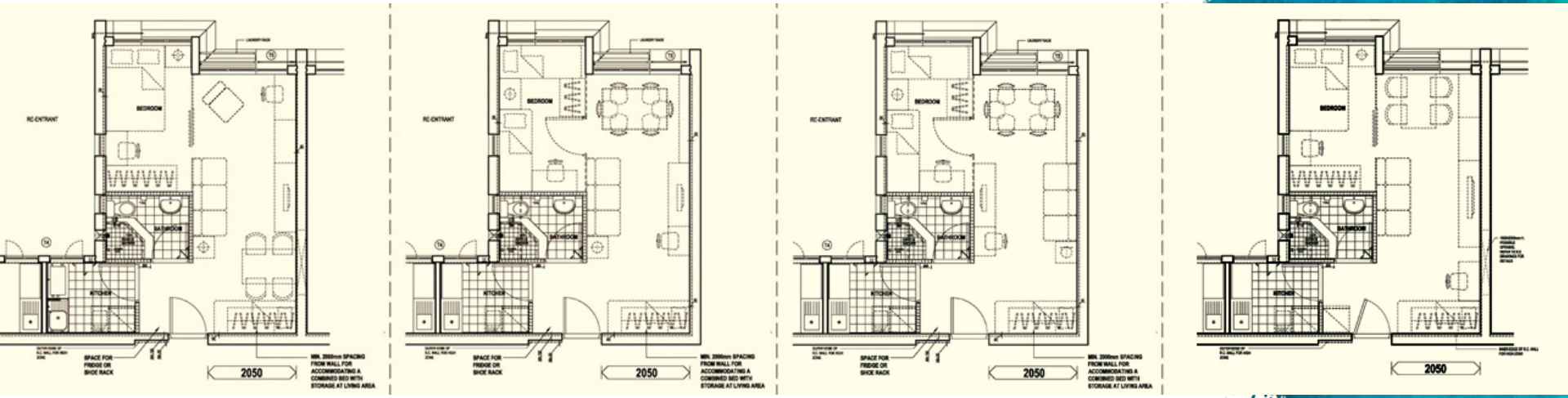
Option 3

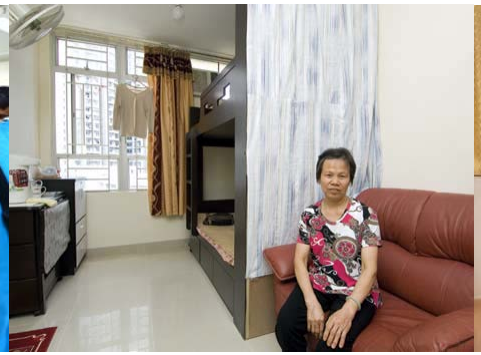
Modular Design Approach

Rationalized Flat Layout

Options of furniture layout

Option 1 **Option 2** **Option 3** **Option 4**

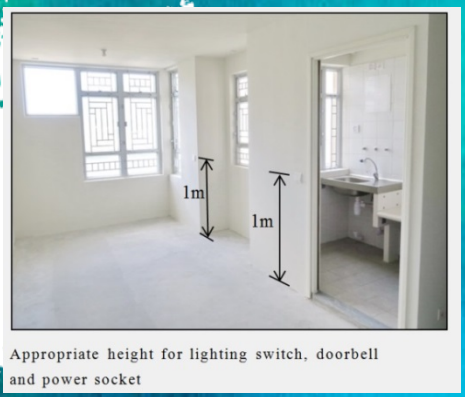




Modular Flat Design

Universal Design

..... Self contained flat with universal design for occupants of any age and any physical condition to enhance the sustainability throughout their stay in the domestic unit .....



Appropriate height for lighting switch, doorbell and power socket

Open Plan Design in domestic units allowing flexibility to suit tenants need with basic provisions including flat entrance gateset, window grilles, sink & cooking bench, wash basin & sunken shower and laundry facility etc.

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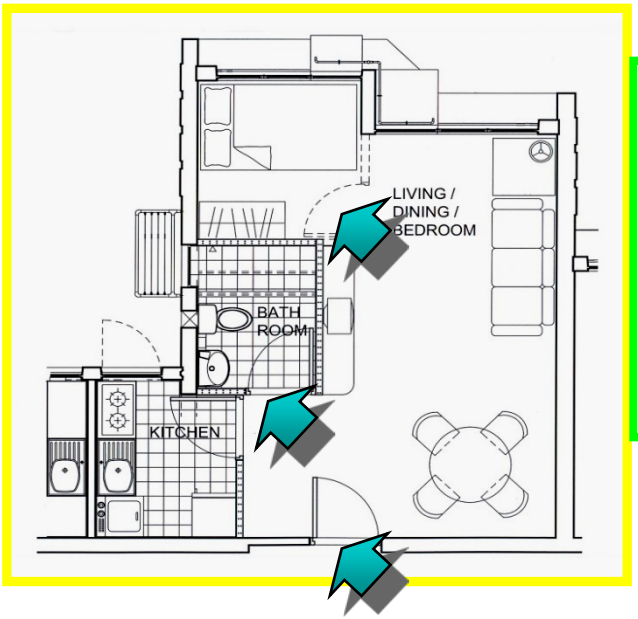
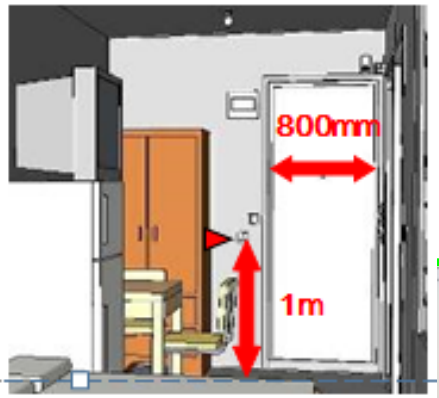
Flat Internal space

Universal Design Approach





- **Clear door width** :
  800mm (main entrance);
  750mm (kitchen and bathroom)

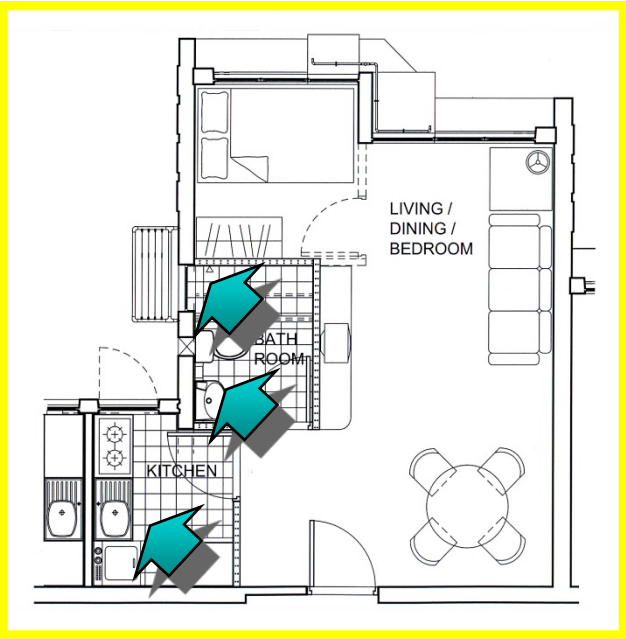
- **Shallow door threshold with bevelled edges**

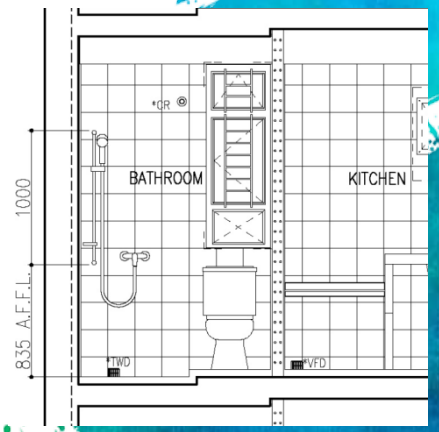
- **Lever type or D-shaped door handle**

Bathroom & Kitchen

Universal Design Approach

- **Convenient for Use**





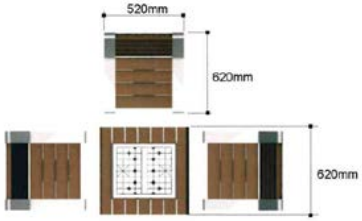
- **Vertical rod type shower-head and soap holder**
- **Lever type shower, basin & sink mixer**
- **Sunken shower**

Domestic Block Ground Floor Lobby and Staircase

- Part of security counter at 750mm high
- Tactile warning strip, high colour contrast for staircase
- Spare letter boxes at low level for wheelchair users

External Area

Barrier Free Access Routes – Tactile Path



- We design chess table with 3 chairs and one space reserved for the disabled

- Covered walkway with seats and tactile path connecting domestic blocks to major estate facilities


to service counter


along footbridge

Comprehensive Planning for Community Facilities

We provide community facilities in new public housing developments not only serving public housing tenants but also addressing the local needs of the community.

Community Hall

Wet Market

Social Welfare Facilities

Lift Tower and Footbridge

Public Transport Interchange

District Open Space

Preservation of Memories of the Community

We capture the collective memories of old estates in their redevelopments to enhance the sense of belonging and raise public interest in conservation.

Adaptive reuse of the historical Chai Wan Factory Estate as public rental housing in **Wa Ha Estate**

So Uk Estate Redevelopment with preserved building structures of the former estate to be reused for retail and exhibition

Amenity Area Design in **Upper Ngau Tau Kok Estate** showing life in the past

Material collection and reuse activities in the demolition of **Lower Ngau Tau Kok Estate**.

Engagement of the Community

We engage the community with inclusiveness and creativity throughout different project stages to foster a sense of belonging and create harmonious community.

Community Engagement Workshop to collect views and feedback from the community in early planning stages.

Community Artwork nearing project completion to beautify the environment with enhanced sense of belonging and to create a harmonious community.

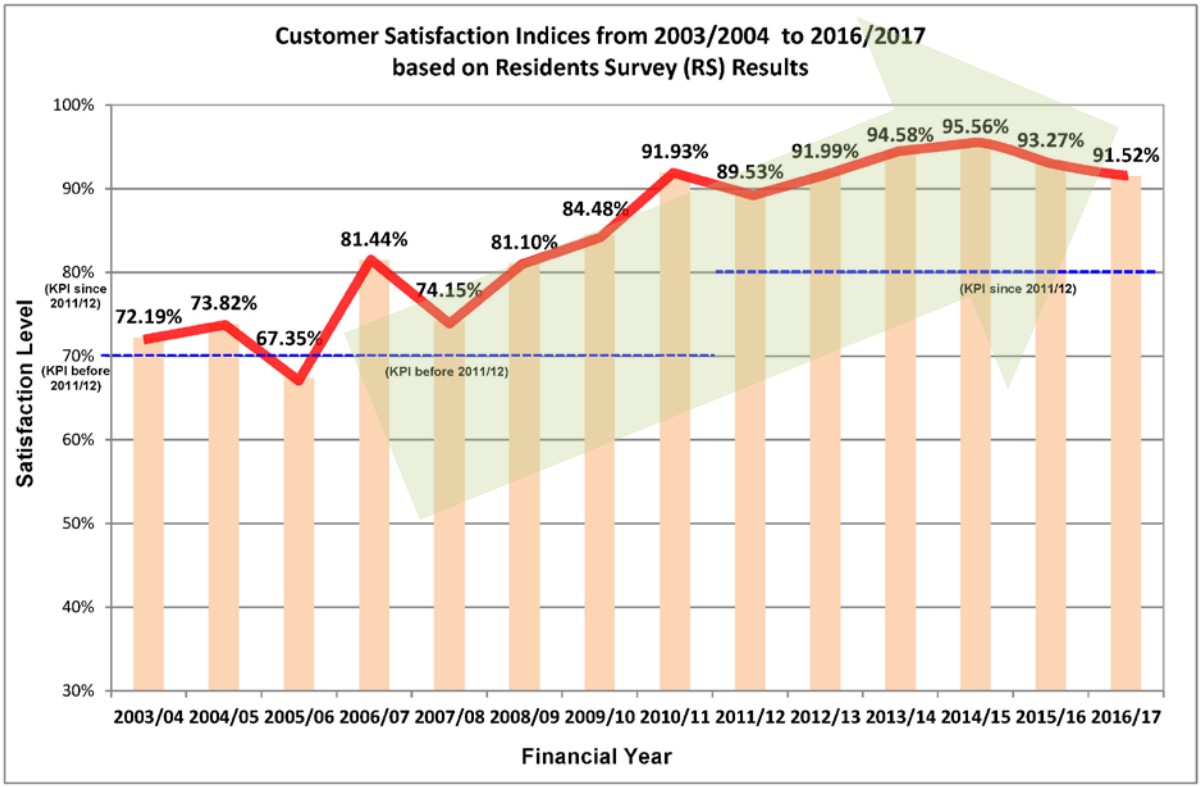
Action Seedling at post-completion stage encourages community participation in the greening of estates and improves the living environment.

Resident Survey about 10 months after project completion to gauge residents' satisfaction level and collect feedback for review of future design.

Smart Housing for People

Building a Sustainable Community

...Community engagement workshops ... Surveys of residents .... Post Completion Review Workshops



Collect user feedback on-

- safety and comfort,
- sustainability and environmental friendliness,
- efficiency,
- cost-effectiveness.

High Customer satisfaction index

>90%

in last 5 years

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2.

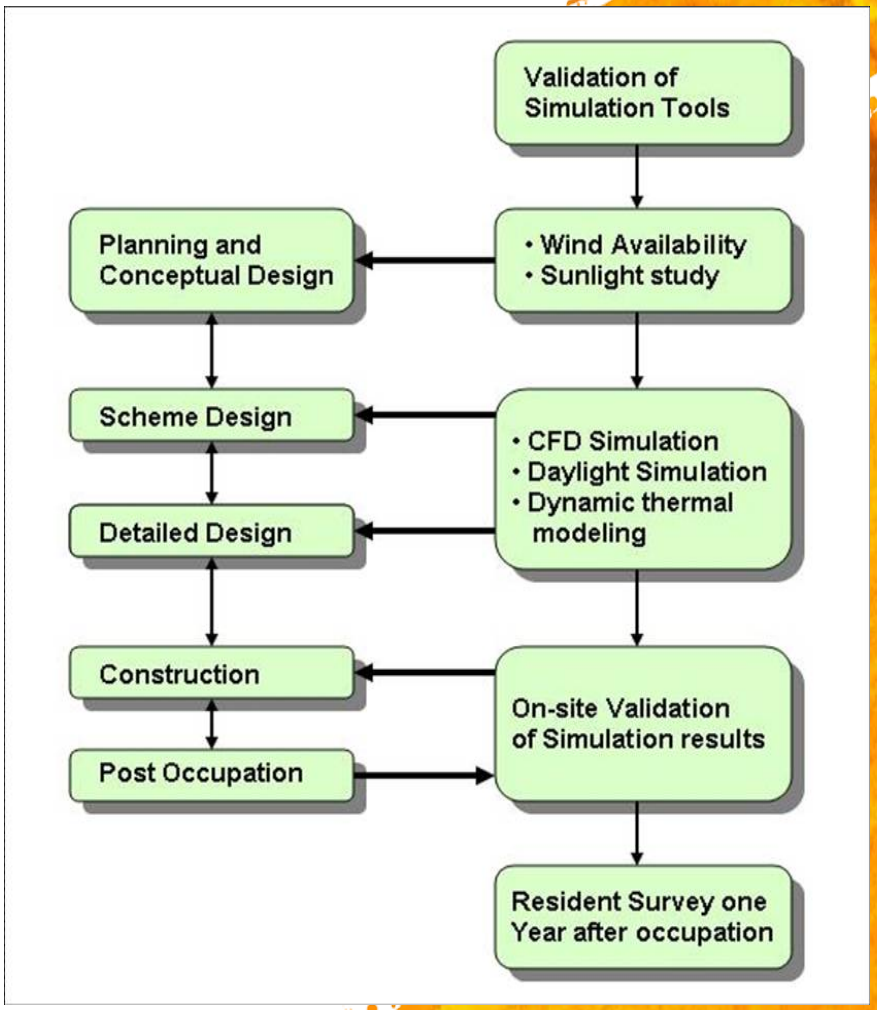
Environment-Sensitive Planning

Process of Micro-climate Studies

1. *Simulation at Planning & Design Stage –*

*Involve application of **proven** scientific technologies, including **Computer Simulation by calibrated software**, to compare different design options with topics including:*

a) Wind Environment
b) Natural Ventilation
c) Daylight and Sun-shading
d) Solar Heat Gain etc.



2. *Validation at Post Occupation Stage*

*A) **On-site measurement** upon building completion*

*B) **Resident Survey** one year after occupation*

Resident Survey – *one year after occupation*

Kai Ching Estate		
Item	***Areas***	***Survey Findings (Satisfactory Rating)***
(a)	Overall satisfaction levels of the "**Estate as a whole**"	***93%***
(b)	**Pedestrian wind environment** at the External Areas	***Over 95%*** Main entrance of the block (**96.1%**), Covered walkways (**99.3%**), Outdoor leisure areas (**99.5%**) Children's playgrounds (**99.5%**)
(c)	Planning and Design of **Domestic Blocks**	***90%***
(d)	Natural lighting and ventilation in the **public areas inside blocks**	***90%***
(e)	**Greenery** and **soft landscaping** design	***85%***

Satisfactory rating above 80% is well acceptable.

Kai Ching and Tak Long Estate

Theme – "Homes in the Park"

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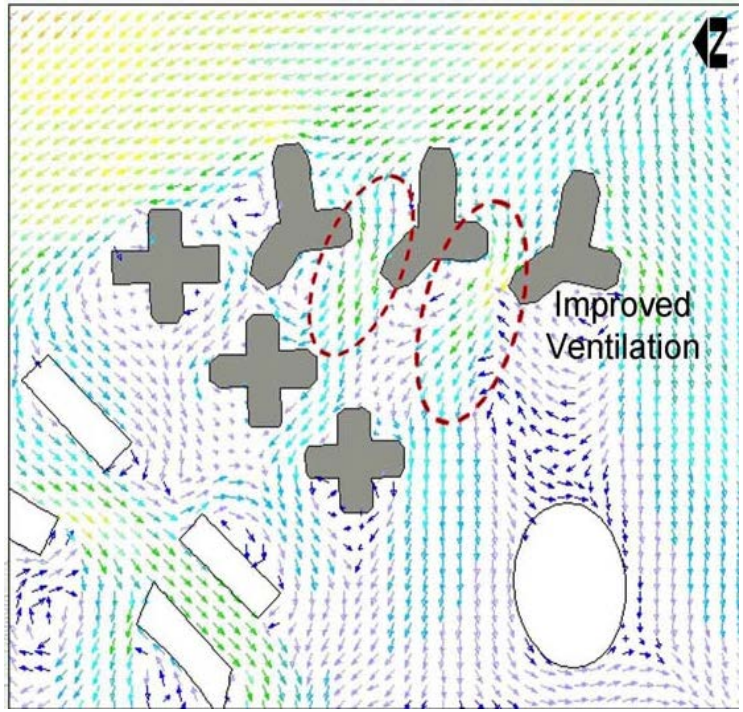
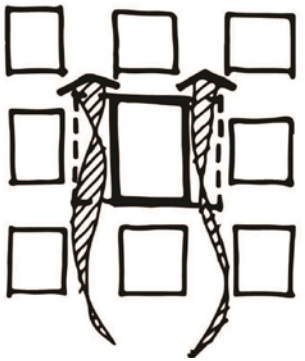
Urban Micro-climate Design Strategies

Kai Ching Estate		
Wind		
Increase ventilation with site planning		
1	Manipulate layout massing to increase wind flow	▪
2	Wind corridor to align with the prevailing wind	▪
3	Connect open spaces	▪
4	Arrange buildings to channel wind	▪
5	Building setback (adopted in planning terms)	
6	Increase permeability of building blocks / no wall buildings	▪
7	Stepped building height profile (stepped by H/2 demands large site area)	
Increase ventilation with building design		
8	Increase building permeability (building permeability optimized)	
9	Permeable sky garden (users' preference in resident survey)	
10	Reduce building frontage (optimization for domestic use)	
11	Ventilation bay / permeable podium	▪
12	Reduce ground coverage (ground coverage minimized without podium)	
13	Increase ground zone air volume (ground level permeability optimized)	

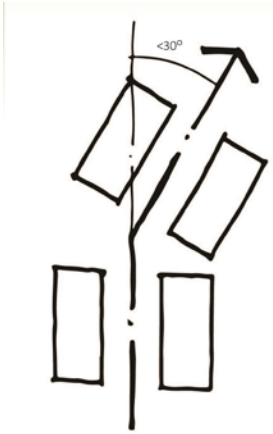
Urban Micro-climate Design Strategies





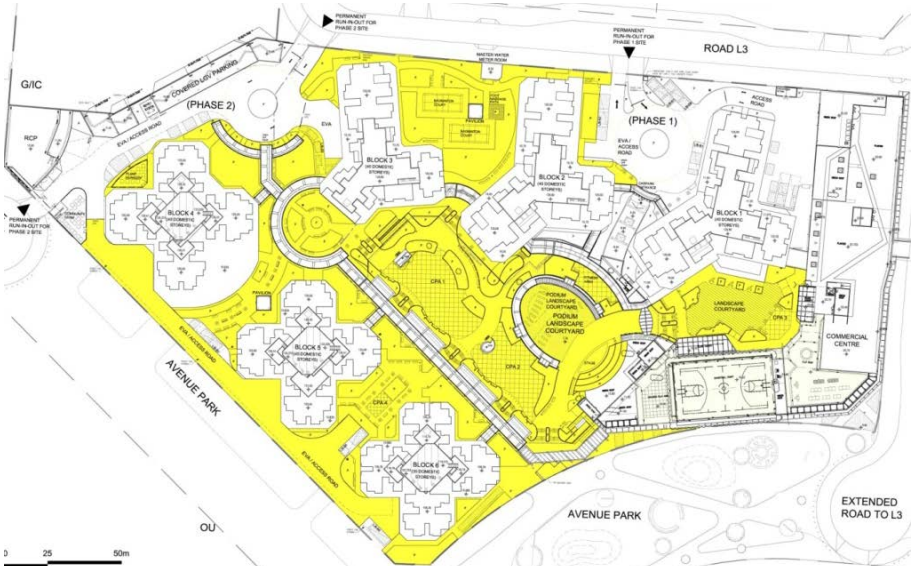
Strategy 1

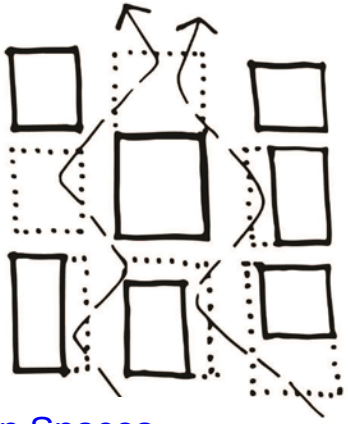
Manipulate layout massing to increase wind flow



Strategy 2

Wind Corridor to align with the prevailing wind

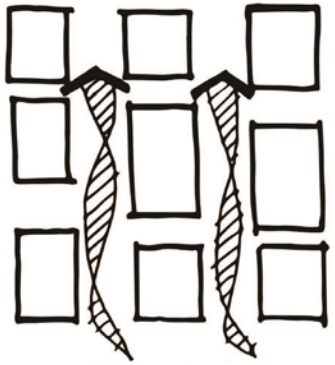




Strategy 3

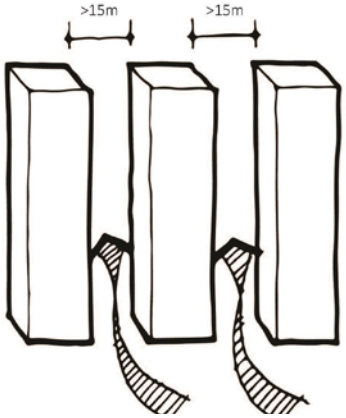
Connect Open Spaces

Urban Micro-climate Design Strategies



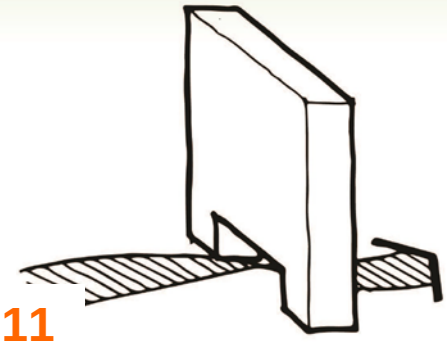
Strategy 4

Arrange buildings to channel wind



Strategy 6

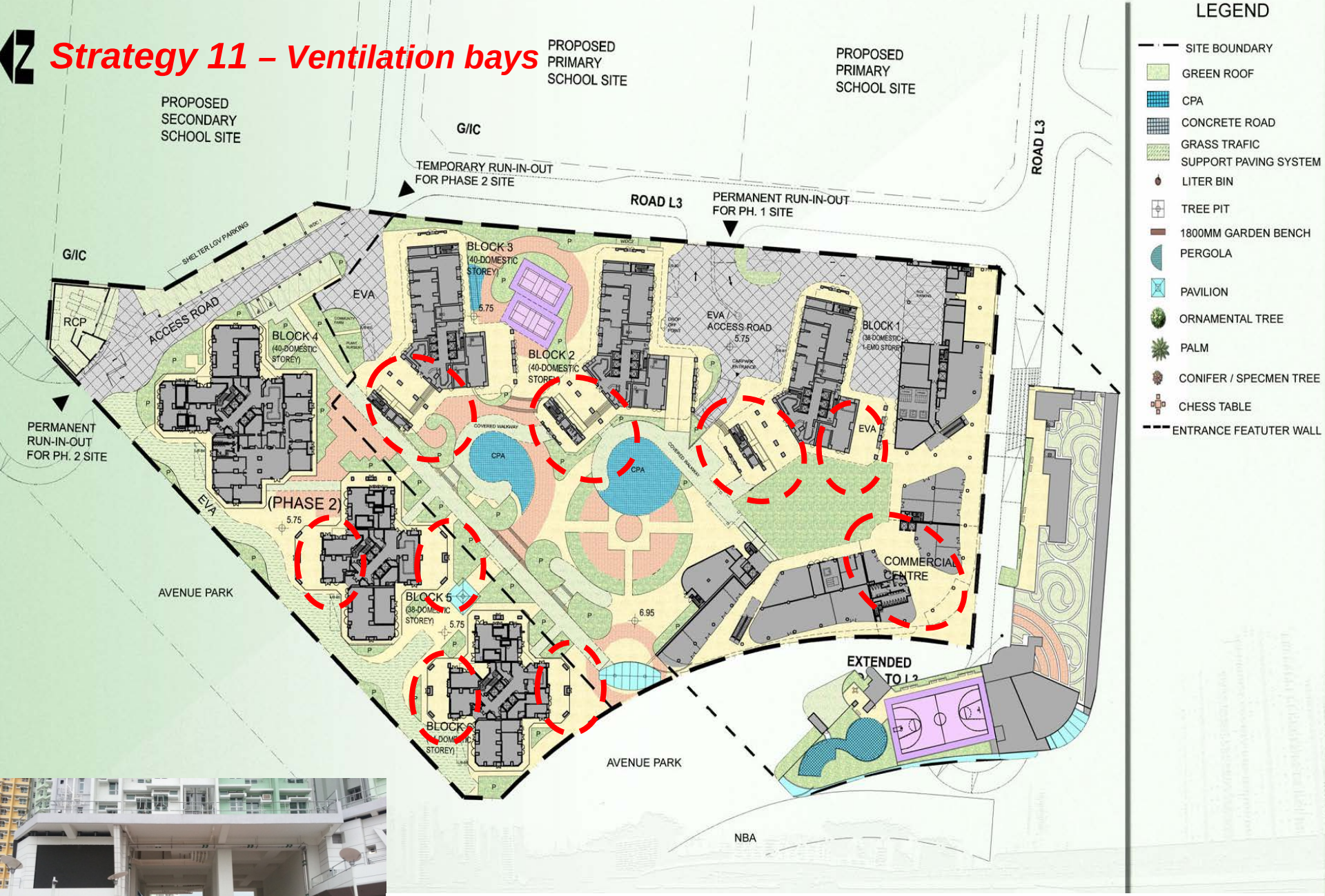
Increase permeability of building blocks / no wall buildings



Strategy 11

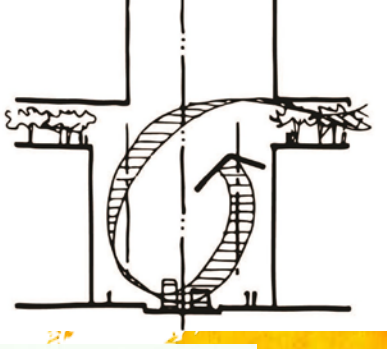
Ventilation bay / permeable podium

Strategy 11 – Ventilation bays

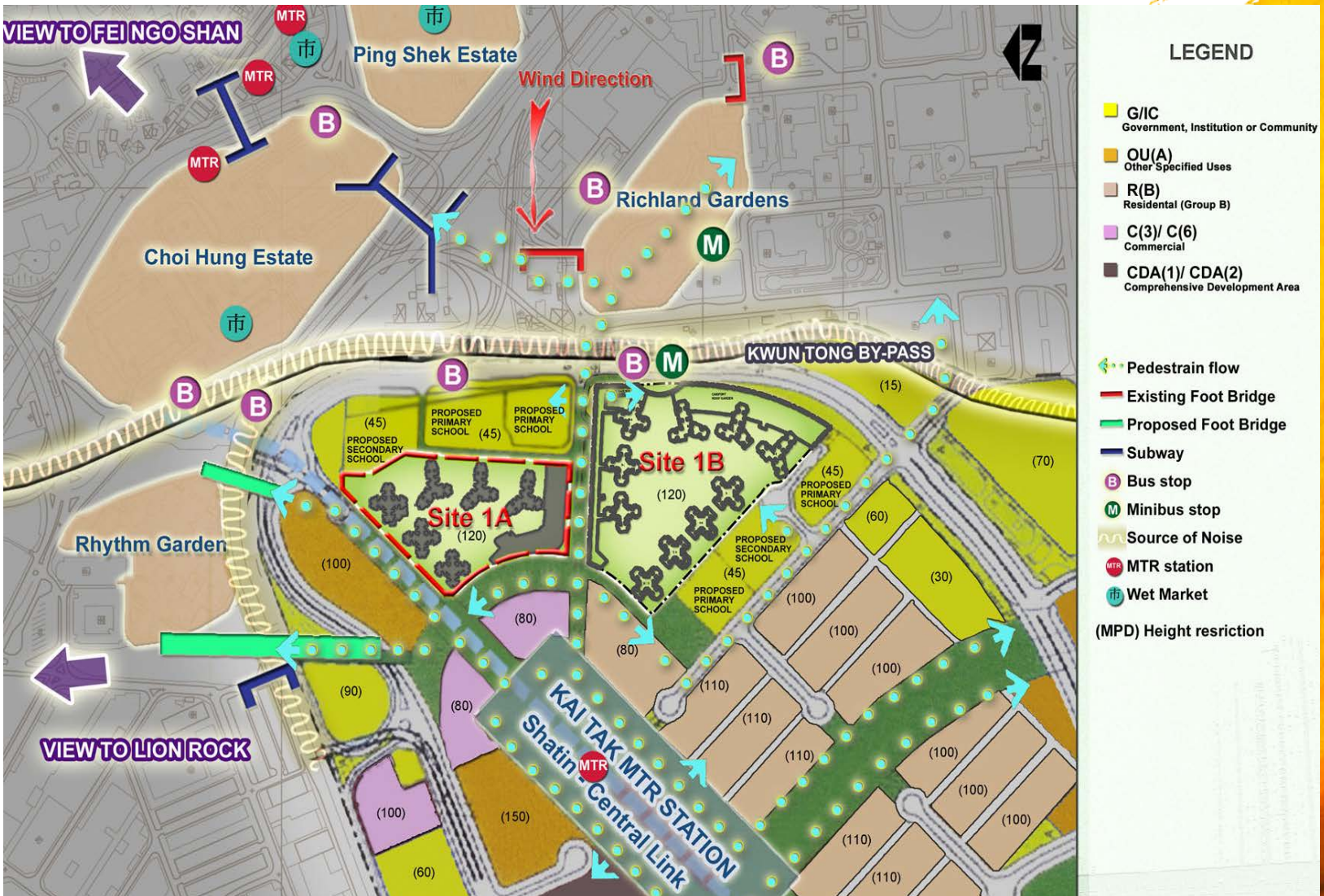


Ground Floor Ventilation Bays to enhance Wind Environment at Pedestrian Level

Strategy 5 – Building Setback

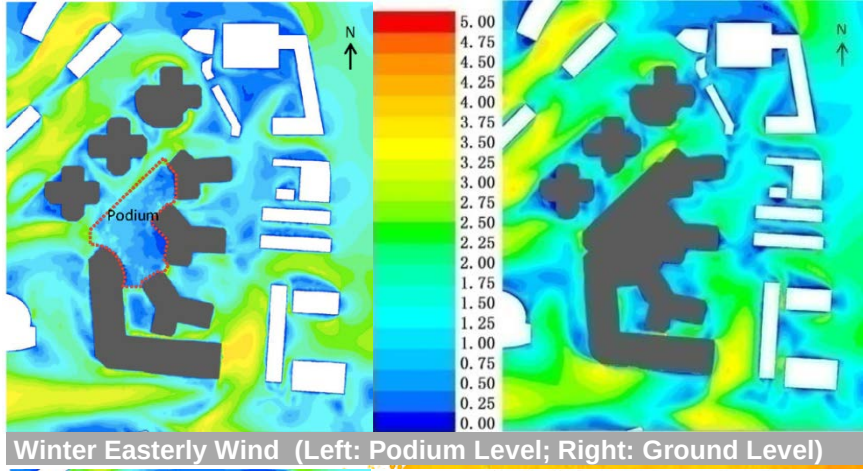


***The Site has been set back** and surrounded by **schools** and **district open spaces** as **buffering zones**.*

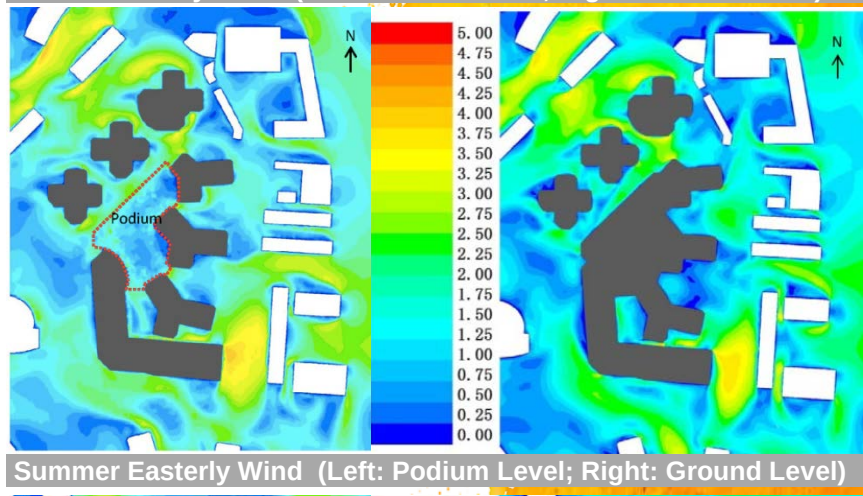


Computer Simulation Result of the Urban Micro-climate Conditions

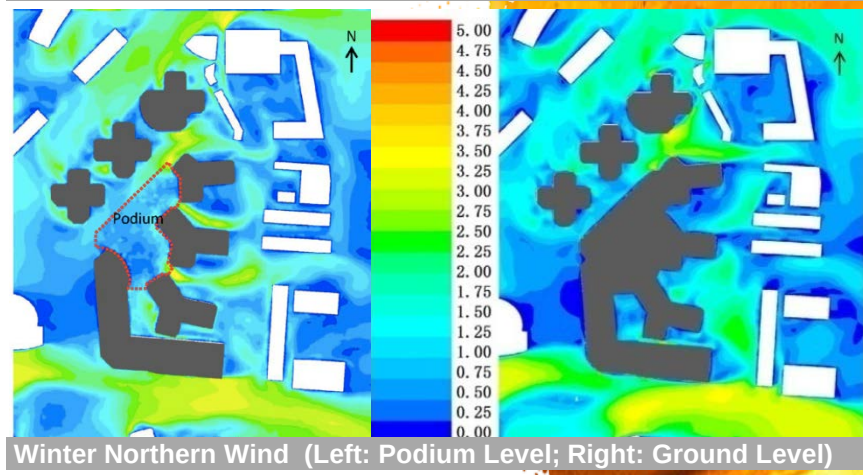
Wind Direction	Pedestrian Level Wind Speed （≤5 m/s）
Sunmmer East erly Wind (Max.)	**3.00 m/s**
Winter Northern Wind (Max.)	**2.93 m/s**
Winter Easterly Wind (Max.)	**3.00 m/s**
Sunmmer East erly Wind (Average)	**1.73 m/s**
Winter Northern Wind (Average)	**1.61 m/s**
Winter Easterly Wind (Average)	**1.73 m/s**



Winter Easterly Wind (Left: Podium Level; Right: Ground Level)

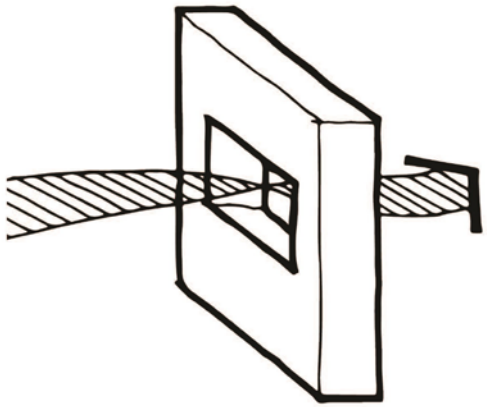


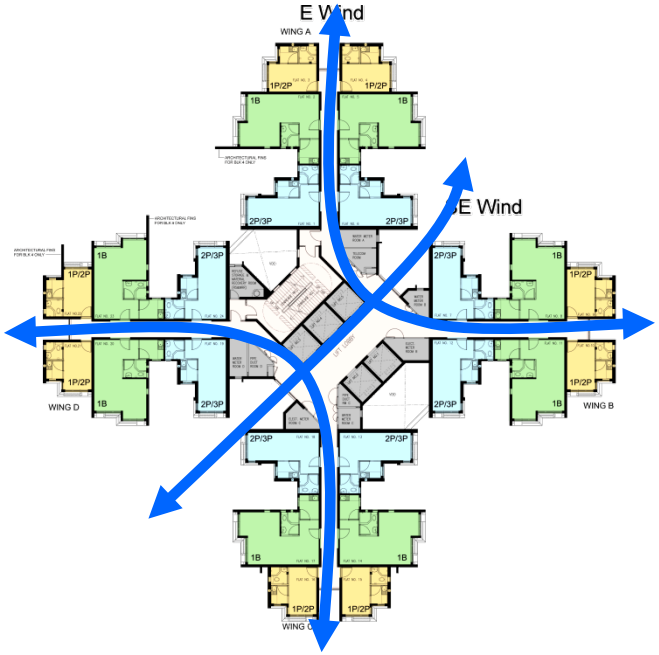
Summer Easterly Wind (Left: Podium Level; Right: Ground Level)



Winter Northern Wind (Left: Podium Level; Right: Ground Level)

Strategy 8 – Increase Building Permeability



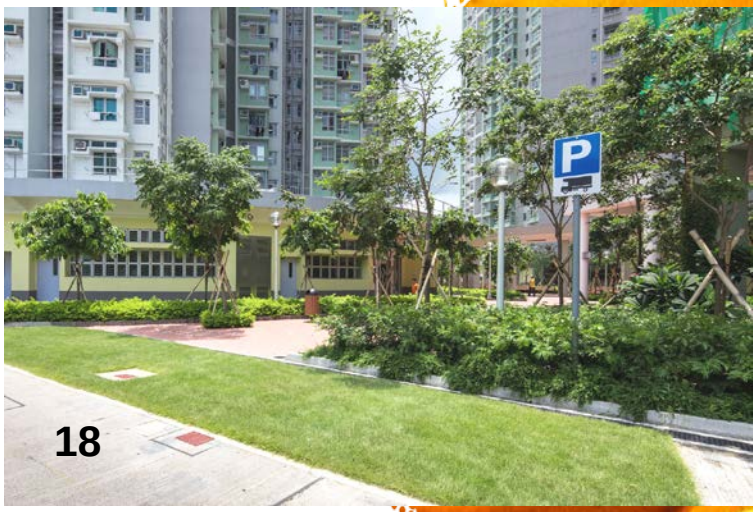


Natural ventilation performance rates in **domestic flat** - **7.3 – 13.7 Air Change per Hour (ACH)**

Natural ventilation performance rates in **corridor and lift lobby**: **8.3 – 18.3 ACH**

Urban Micro-climate Design Strategies

Thermal Radiation		
Reduce direct solar radiation		
14	Provide shading for pedestrian activities	▪
15	Provide tree canopies	▪
16	Manipulate building façade design to provide shading	▪
17	Shade open space by building blocks	▪
Reduce surface temperature		
18	Use cool material for ground surface	▪
19	Green wall to reduce façade surface temperature	▪
20	Increase albedo in buildings	▪
21	Increase sky view to improve night cooling (Design Optimized)	



Urban Micro-climate Design Strategies

Temperature		
Increase Evaporative cooling		
22	Water features to increase evaporation (Resident Survey)	
23	Green wall to increase evapotranspiration	▪
24	Greening to increase evapotranspiration	▪
25	Use permeable paving	▪
Reduce heat accumulation		
26	Increase ventilation to carry away heat energy (Design optimized)	
27	Allow downhill wind flow (not applicable for this flat site)	
28	Allow sea breezes (Design optimized)	
Reduce heat release		
29	Reduce anthropogenic heat discharge near pedestrian area	▪
30	Reduce thermal mass heat storage of building materials (Not applicable for low cost housing)	
Precipitation		
Provide Rain protection		
31	Provide cover for rain protection	▪

Lighting and Ventilation (Internal)

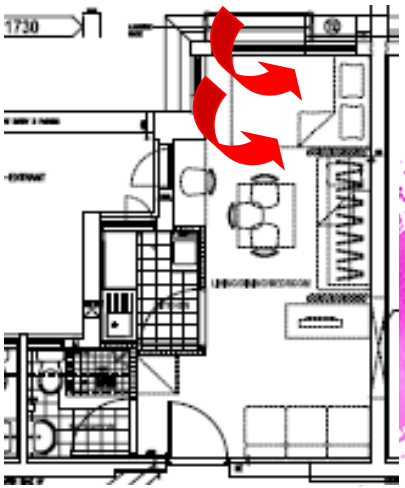
Bring breeze and air

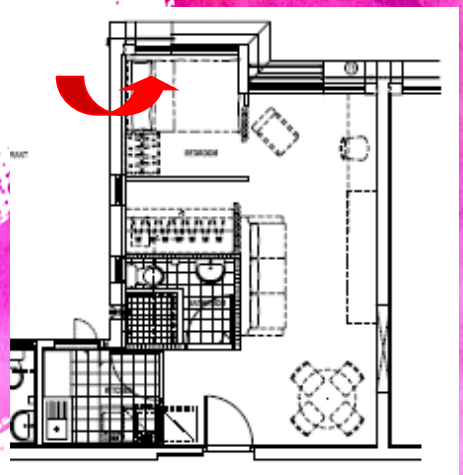
Corridors and Lobbies

- Additional and enlarged windows to enhance natural lighting and cross ventilation

Domestic Flat –

- Additional and enlarged windows for better natural lightings and cross ventilation in living areas, bathroom and kitchen.





Microclimate Studies

Sun-shading (Outdoor Environment)

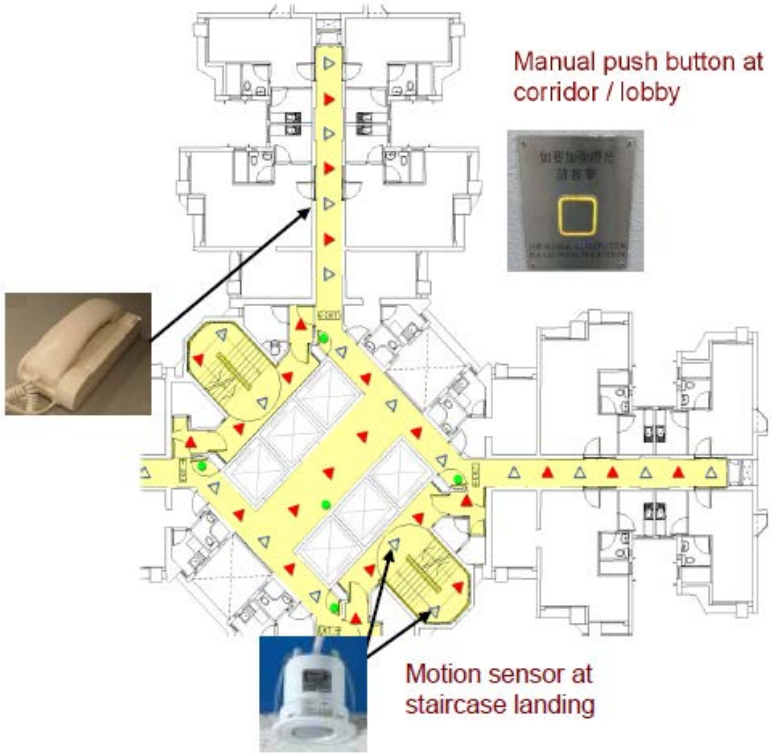
Daily and annual solar pattern and wind environment to assure thermal comfort for individual activity.

3.

Resources

Towards low carbon

Two level lighting design in Common Area



Normal (50 lux)

Operating (85 lux)

Grid Connected Photovoltaic System

Energy performance

Private Estates	kWh per flat per year
Manhattan Hill	6,834
One Beacon Hill	6,725
The Pacifica	4,359
Aqua Marine	3,409
Central Park	3,294
Island Harbourview	3,127
Housing Authority PRH	807 (Green Peace's figure)

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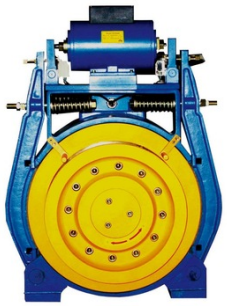
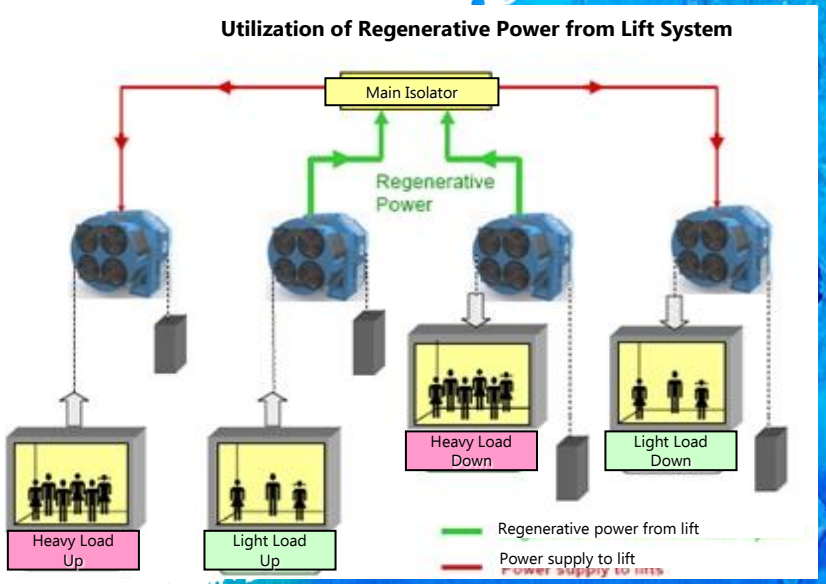
Hong Kong Housing Authority

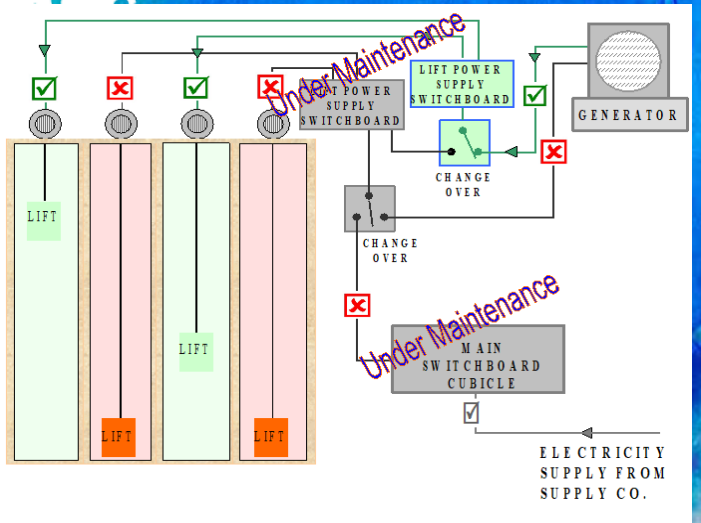
Towards low carbon

Caring for the users to allow for continuous usage with energy saving design



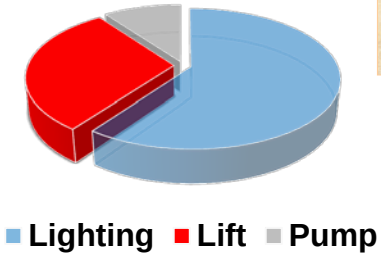
- ***Lift design*** *– to allow usage even during* ***5-years*** *electricity inspection and testing*
- **variable voltage variable frequency since 1996**
- **Light weight lift design**
- **Gearless lift drive**
  (**save about 10% energy**)
- Permanent Magnet Synchronous motor
- **Lift regenerative power systems**
  (**regenerate about 15 – 20% energy**)





CSR consideration :

Since 2008, electrical supply system enhanced for **Uninterrupted Lift Services**, providing convenience to users, particularly the elderly and people with disabilities



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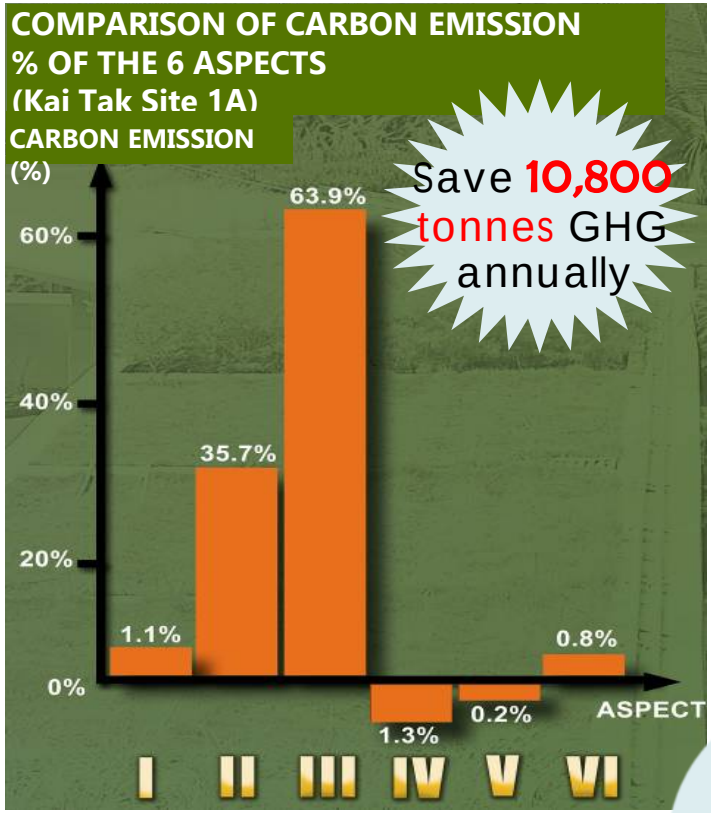
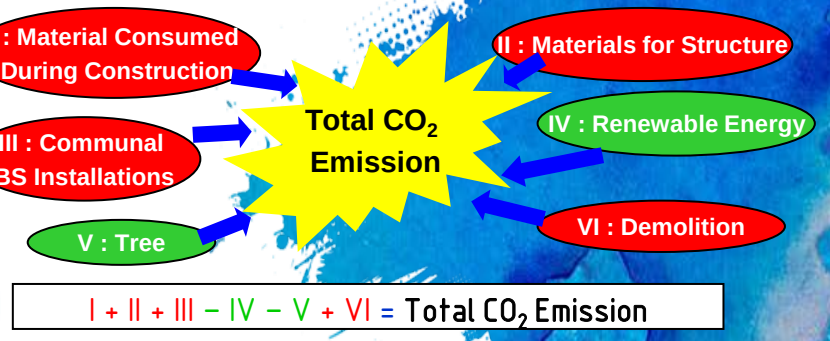
Towards low carbon

Carbon Emission Estimation (CEE) Model

- Every new project would check its CEE against benchmark performance
- Provide a design verification tool with an indication of the holistic carbon emission



- Estimated a reduction in carbon emission of around 12% for the whole life cycle of a building, since 2011
- An Energy Management System (EnMS) to ensure the energy efficiency of communal building services installations
- In 2014, further reduce 10% energy consumption by lowering the Energy performance Indicator from the original 30 kWh/m² to 27 kWh/m² 。



Our buildings are designed to last **100** years

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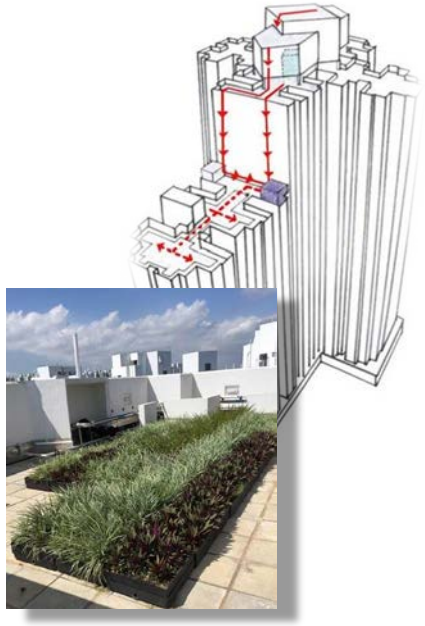
Towards low carbon

Save Every Drop of Water

- **Study on Irrigation Systems :**

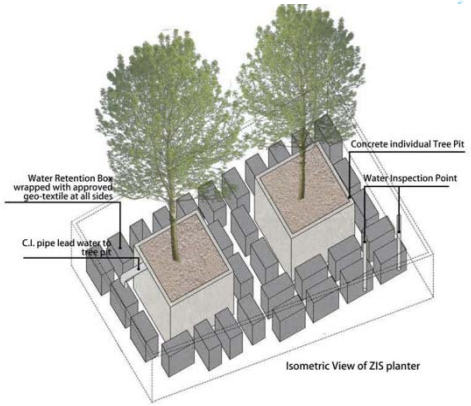


① Zero Irrigation System (ZIS),
② Modular ZIS,
③ Rootzone Irrigation System,
④ Dripline Irrigation System

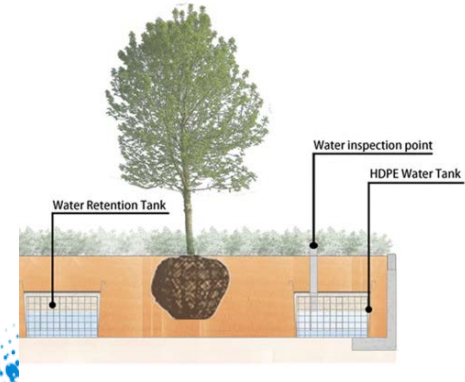
Green Roofs

- Rain Water Harvesting System is adopted at roofs of domestic blocks.
- AC Condensation Water recycling for irrigation for green roof
- Automatic irrigation with timer for plants at height

Modular ZIS



Warm reminder in every flat. 單位內的溫馨提示



Zero Irrigation System (ZIS)

- Pioneered to apply sub-soil irrigation method to achieve 'zero irrigation' in residential projects
- No manual watering operation and portable water required for over 24 months of trial
- Self-sustained design to the vegetation and to minimize topsoil evaporation
- 100% saving of irrigation water

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Towards low carbon

Caring for the Natural Resources

Transfer of C&D Waste Materials

- Established an inventory on quantities of C&D materials available from each site.
- Facilitate bulk transfer between HA's contracts.

- Over **116,000** tonnes of C&D waste have since been reduced.

Use of Recycle Materials

- Marine mud
- recycled glass & aggregates
- bore-logs
- GGBS
  (**11,000** tonnes per year)
- recycled excavation rock materials

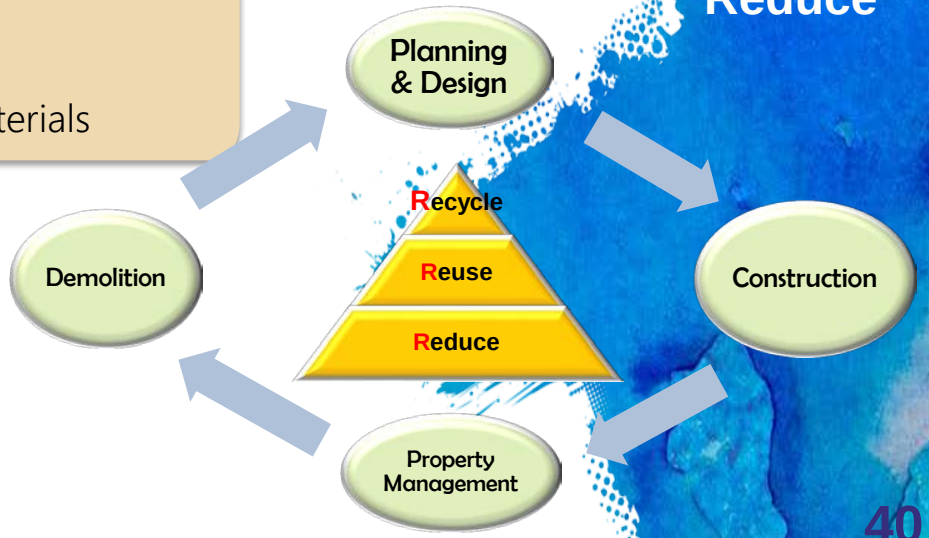






3R Principle

Recycle
Reuse
Reduce



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Towards low carbon

Caring for Labour and Natural Resources

Large Panel Formwork & Metal Hoarding

Save over **39,000** tonnes of timber per year

....Collaboration with Stakeholders

Save over **2,000,000** m^2 of plastering per 10,000 flats

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Towards low carbon

Mechanized Construction

Quality, Site Tidiness, Labour Resources, Site Safety, Waste Generation.....

Insitu Concrete

Precast Concrete Components (inside domestic flat)

Precast Concrete Components (common area)

Precast Façade

Volumetric Precast Bathroom (VPB)

Precast Water Tank

Precast Parapet

At the Main Roof

Precast Tie Beams

Precast Drywall (Building Component)

Precast Partition Wall

Semi-Precast Slab

Precast Half Landing

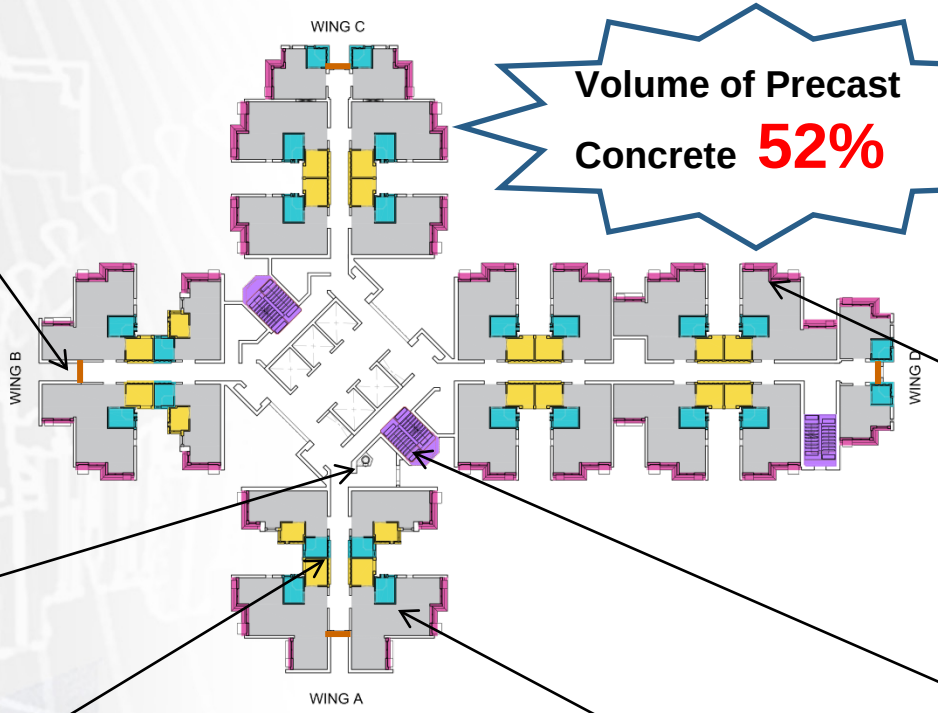
Precast Staircase

Precast Balcony

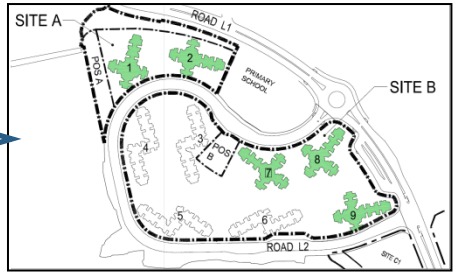
Towards low carbon

Precast Tie Beams

Refuse Chute



Volume of Precast Concrete **52%**



Precast Facades

Volumetric precast bathroom & kitchen

Semi-precast Slab

Precast Staircase

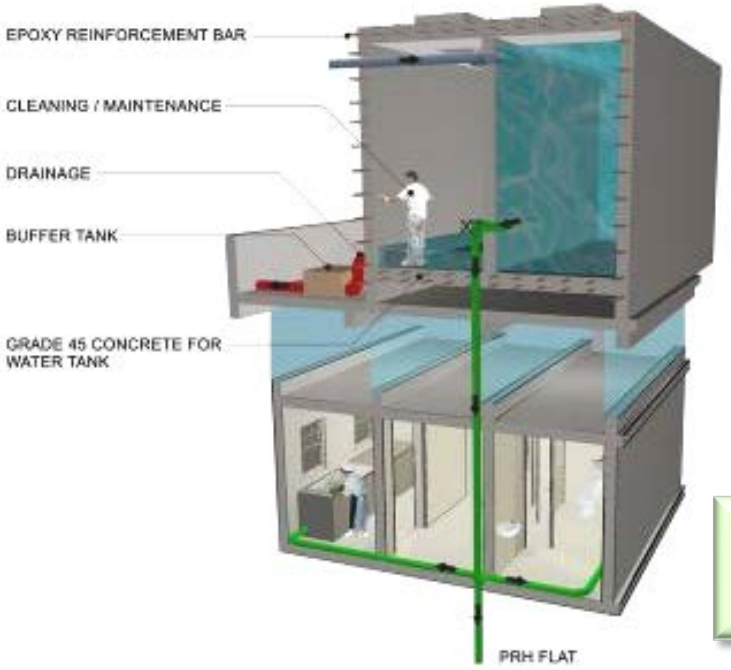
4.

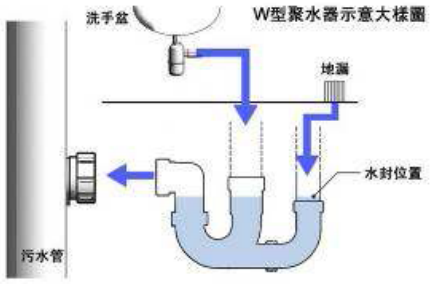
Health & Safety

To Achieve sustainability

Safe to Construct & Easy to Maintain

- Incorporate Common W-Trap System in drainage system to prevent dry up floor drain trap.





- Twin Tank System for uninterrupted supply of fresh / flush water.

Save ***370,000*** litres of water per 10,000 households

- Stainless Steel water pipes in Common Areas.

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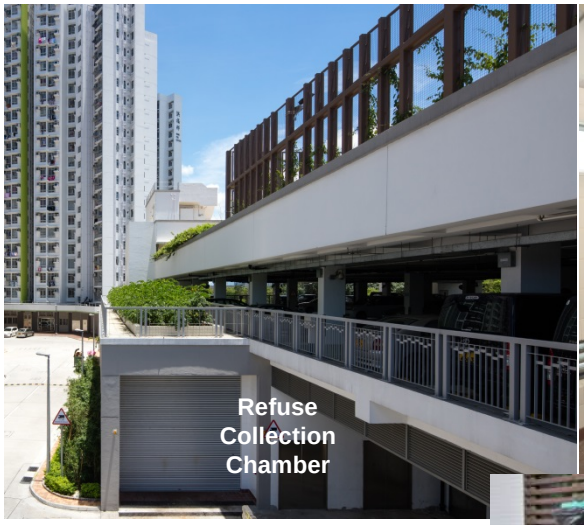
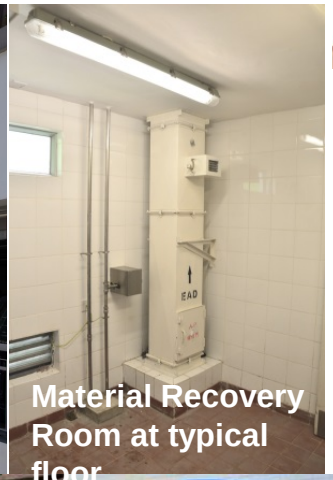
Clean & tidy back of house

Caring for A Sense of Hygiene

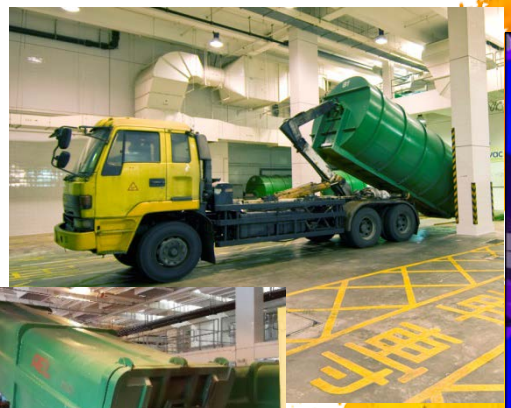
We provide -

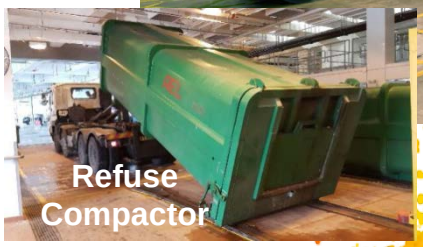
- ventilation and filter system for refuse room on each floor, with space allowed for waste separation and material recovery
- refuse handling systems with or without Central Compactor for cleanliness and hygiene.


Refuse Collection Chamber


Material Recovery Room at typical floor

- Our Refuse Collection Point is equipped with smart odour control & in harmony with welfare facilities and roof garden on top




Refuse Compactor

Refuse Collection Chamber equipped with

- Odour removal system
- Central Compactor System
- Mechanical ventilation and filter system


Micro-climate Study

Computer simulation on odour dispersion

Refuse Room at Typical Floor

- Ventilation and filter system
- Ample space for recycling bins and waste separation

Green Initiatives

- Compost bins in community farm for garden waste recycling

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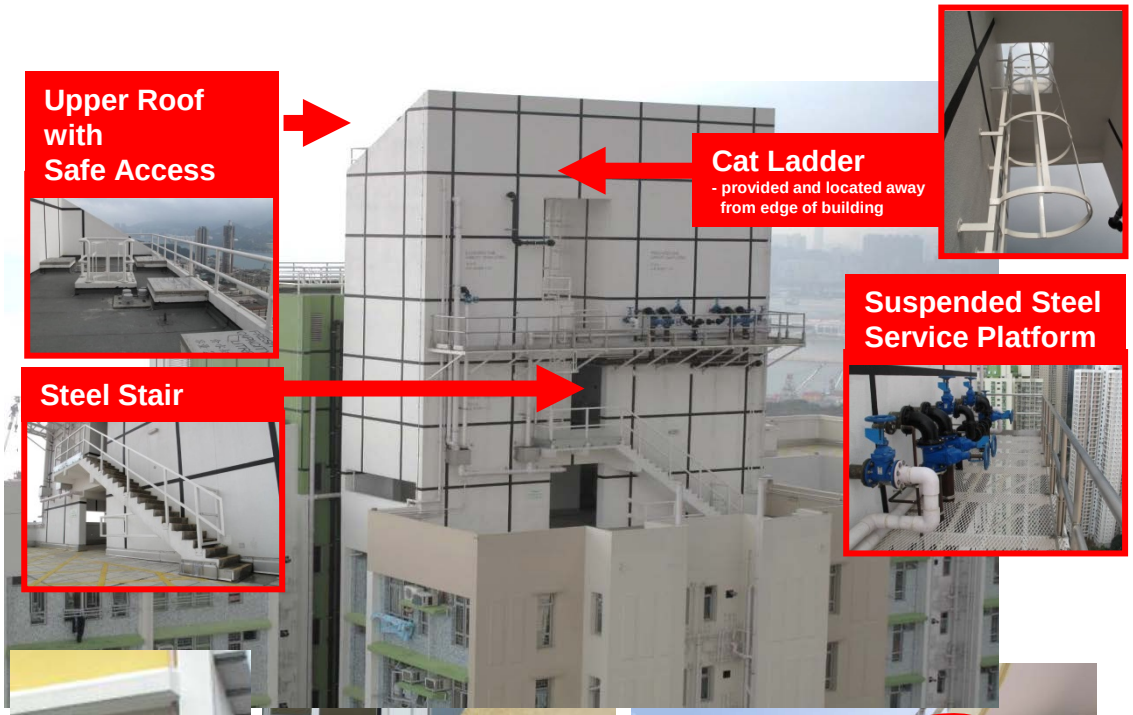
To Achieve sustainability

Safe to Construct & Easy to Maintain



Easy maintenance for A/C hood

Provide railing to all roofs

Permanent anchorage to access lift pit

Strengthened Parapets to fix gondola

Space for BS maintenance

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Conclusion
&
Way Forward

Caring, Committed, Creative, Customer-focused

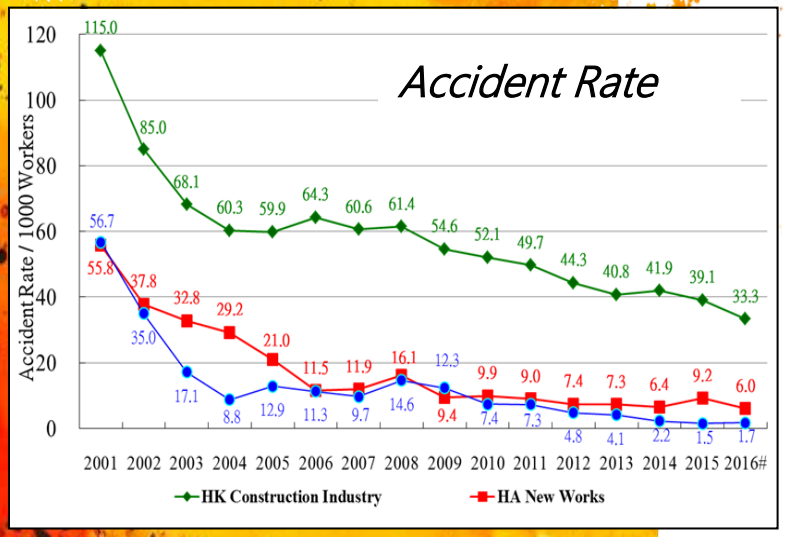
We are committed to achieving "SMARTER and better public HOUSING design in the 21st Century HONG KONG" as we truly believe "Living in Harmony" and a people-centric approach.

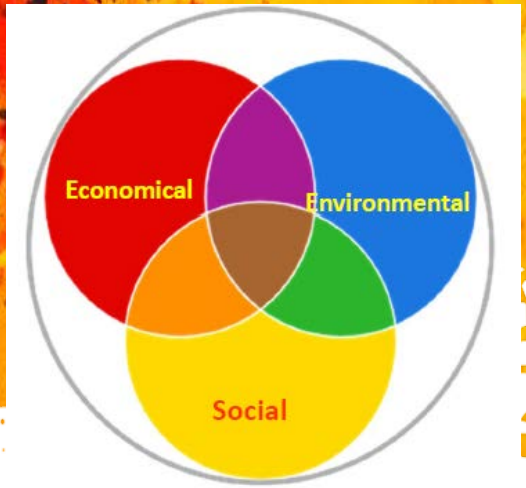
Benchmarking our sustainability targets, HA is –

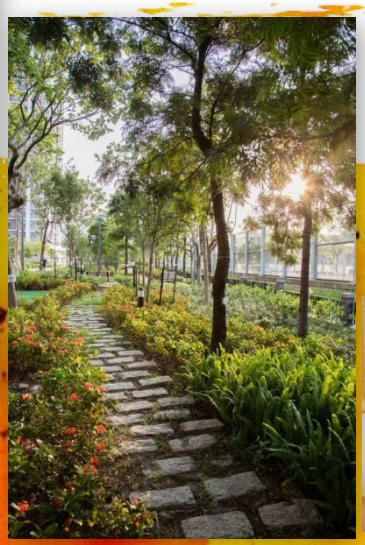
(a) ***building 40% less costly*** *in comparison with similar buildings in the private sector of Hong Kong;*

(b) ***generating 30% less construction waste*** *in our construction process; and*

(c) ***having 75% lower accident rates*** *than the norm in Hong Kong*







Forerunner of SMART HOUSING IN HONG KONG

Building green for healthy community

Provide all the convenience of modern community living

Environmental advances and sustainable initiatives for lively estate

Thank You !

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