

A Report on the State of Sustainable Building in Hong Kong 香港環保建築狀況報告 2008

In Search of a Compact Livable City:
Lighter Footprint • Higher Livability

探索密集宜居城市：
減輕足印 • 添宜居性

Copyright © 2008

by the **Professional Green Building Council**
Hong Kong



Contents

Foreword.....	3
1. Introduction	
1.1 Background: A Hong Kong Report on the State of SB	4
1.1.1 Two Purposes of the Report.....	4
1.1.2 Five Aspects of SB.....	4
1.2 Challenge: Creating a Compact Livable City.....	5
1.2.1 Compact City.....	5
1.2.2 Eco- Footprint.....	5
1.2.3 Living Quality	5
2. Status of Developing Policies that Further SB	
2.1 Overview.....	6
2.2 Lighter Footprint	6
2.2.1 Reduction of GHG& Enhancement of Energy Efficiency.....	6
2.2.2 Waste Minimisation, Green Materials & Equipment and Total Water Management.....	8
2.3 Higher Livability	9
2.3.1 Concerns over Development Intensity, Air Ventilation & Urban Livability.....	9
2.3.2 Indoor Environment Quality.....	11
2.3.3 Social Sustainability: Friendly/ Safe Built Environment & Heritage Conversation.....	11
2.4 SB Whole-building Performance Rating System & Way Forward.....	12
3. Status of Adopting SB in the Investor Community	
3.1 Public Sector.....	14
3.1.1 Architectural Services Department	14
3.1.2 Hong Kong Housing Authority.....	18
3.1.3 Hong Kong Housing Society.....	20
3.1.4 Hong Kong Science and Technology Parks Corporation	21
3.1.5 Urban Renewal Authority.....	24
3.2 Private Sector	25
4. Status of Education and Training in SB	
4.1 Academic Institutes	31
4.1.1 Department of Architecture, the Chinese University of Hong Kong (CUHK), Department of Architecture, The University of Hong Kong (HKU), and Department of Mechanical Engineering, The University of Hong Kong (HKU).....	31
4.1.2 City University of Hong Kong.....	33
4.1.3 Department of Architecture, Chu Hai College of Higher Education.....	33
4.2 Professional Institutes and NGO.....	34
4.2.1 Building Environment Council (BEC).....	34
4.2.2 The Hong Kong Institute of Architects (HKIA).....	34
4.2.3 The Hong Kong Institution of Engineers (HKIE)	34
4.2.4 Professional Green Building Council (PGBC)	35
5. Status of Adopting New SB Technologies & Techniques	
5.1 Public Sector	36
5.1.1 Electrical and Mechanical Services Department	36
5.1.2 Hong Kong Housing Authority	37
5.1.3 Architectural Services Department.....	38
5.2 Private Sector	40
5.3 Research Institutes	41
5.3.1 Chinese University of Hong Kong: Air Ventilation Assessment & UCMaP.....	41
5.3.2 The City University of Hong Kong.....	41
6. Status of Adopting SB Whole-Building Rating System	
6.1 BEAM: The Way Forward.....	43
6.2 BEAM: The Background	44
6.3 CEPAS: The Background	45
6.4 Adopting SB Whole- Building Rating System: The Future	45
7. Acknowledgements	46

Foreword

In Search of a Compact Livable City: Lighter Footprint • Higher Livability

In retrospect, we can see mostly voluntary adoption of measures for moving our built environment towards sustainability over the past fifteen years. The government and the business community have been engaged in various sustainability efforts. Good starts had been made but the overall results were not enviable.

In recent years, sustainable development penetrates into every facet of our work. Government, private sector and concerned professions contribute by thoughtful planning of building disposition, material selection, construction and adoption of environmentally-friendly technologies and compiling researches under scientific approach. This Hong Kong Report evidences our support to the sustainable built environment and our endeavor to do better.

Government and community shall work hand-in-hand towards SB for our next generation. Government's leadership in setting new policies to reduce the environmental loadings, especially the energy issue, and to improve the urban livability, including density review is vital in the moulding a more sustainable future for Hong Kong. Furthermore, the community and government have been proactive in reviewing various existing regulations and measures to furthering sustainability in our uniquely compact built environment.

The next step will also hinge on the question of unifying efforts and enhancing standards in SB whole-building rating system, an inevitable tool to recognize environmental loading. Much would be in the hands of government as well as the practitioners and professionals in the field. Nonetheless, the future of SB whole-building rating system in Hong Kong, and similarly in other high density tropical cities, depends on how successful we will embrace and respond to the key challenge: **lighter eco-footprint and higher livability**.

We, Hong Kong, are on the same pulse with the World in SB.

Mrs Carrie LAM, JP

Secretary for Development, HKSAR Government
Honorary Advisor, PGBC

The attempt to coordinate and collect evidence of achievements and activities in sustainable buildings across all sectors of Hong Kong is undoubtedly a daunting task. Nevertheless, all parties have acted zealously. There has been no shortage of contributions.

Thanks to Mr K S WONG for styling the input from all corners of Hong Kong into such a readable document that stands testimonial to the achievements in Hong Kong in response to the call for sustainability. I hope we learn by recapping our achievements and can move forward in much bolder steps in contributing to the wellness and wholeness of the built environment and preserving our natural environment.

Kenneth CHAN Jor Kin

Chairman, SB08 Hong Kong Delegation
Immediate Past Chairman, PGBC
Fellow Member, Hong Kong Institute of Surveyors (HKIS)

1. Introduction

1.1 Background: A Hong Kong Report on the State of SB

1.1.1 Two Purposes of the Report

The Report is compiled for submission to the global SB08 Regional Committee, constituting an important part of the SB08 World Conference in Melbourne. The two key purposes of the Report are:

- To summarize the current state of sustainable building (SB); and
- To outline an action program for rapid implementation in Hong Kong.

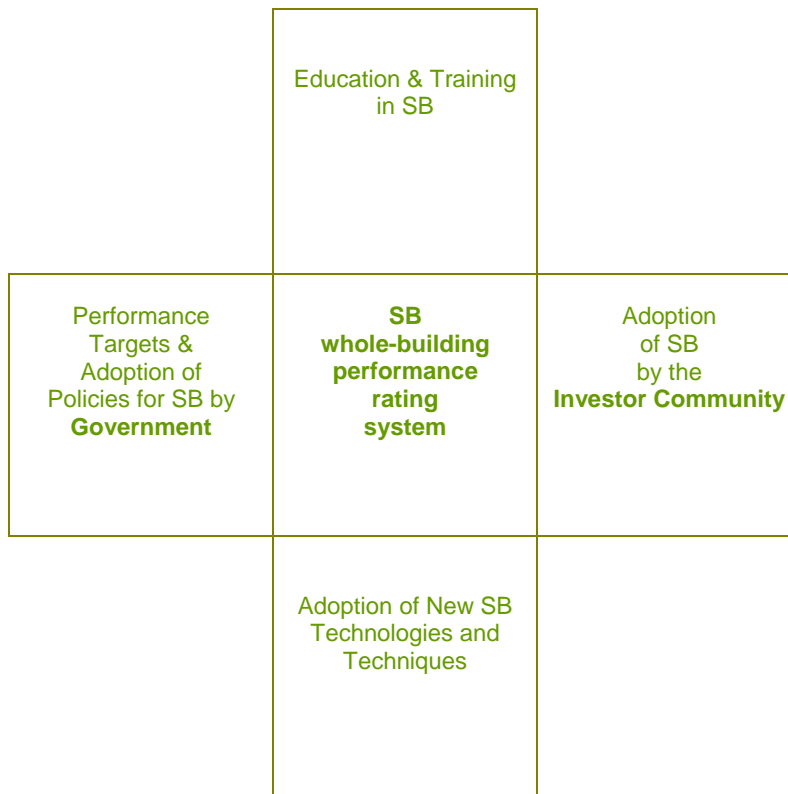
1.1.2 Five Aspects of SB

In accordance with the brief, the Report covers the following five topics:

- Status of development of performance targets for SB and adoption of policies (regulations, incentives etc.) that will further SB;
- Status of adoption of SB by the investor community;
- Status of education and training in SB;
- Status of adoption of new SB technologies and techniques; and
- Status of adoption of SB whole-building performance rating systems.

These five aspects represent the pull and push factors in the transformation of mainstream market towards wider adoption of SB. Their significance and relationship can be interpreted as follows:

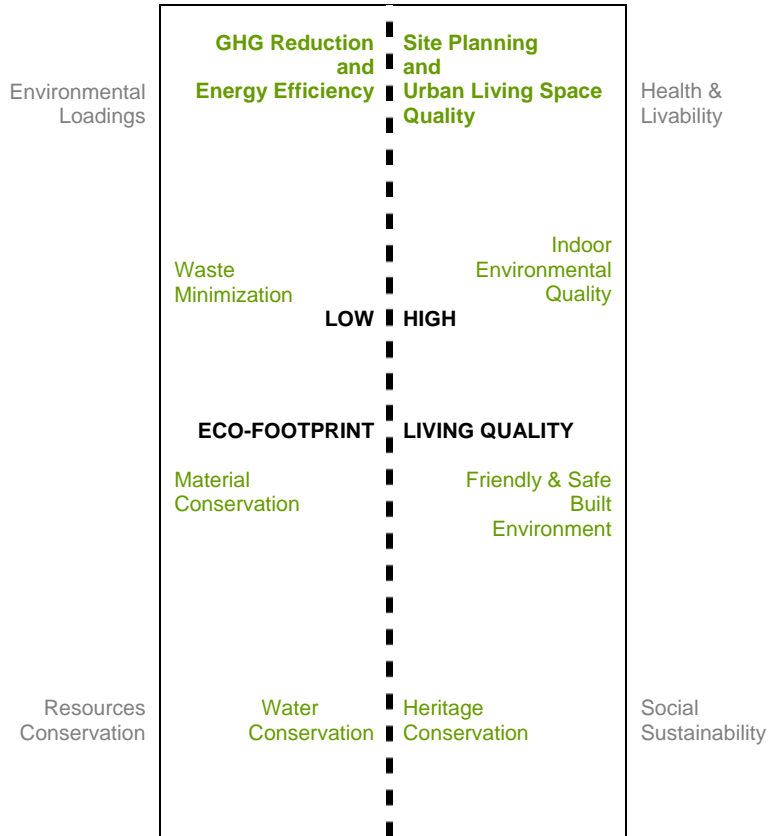
- The key stakeholders encompass the Government and the Investor Community. The role of Government is highly pivotal, especially in establishing performance targets and adopting policies that will further SB.
- For effective market transformation, we have to capitalize on both software and hardware in terms of education & training in SB and adoption of SB technologies & techniques respectively.
- At the same time, the whole-building performance rating system should be the “centre of gravity” for rapid market transformation.



1.2 Challenge: Creating a Compact Livable City

1.2.1 Compact City

Hong Kong is renowned for its hyper density. The challenge is how to create a compact livable built environment for the population of 7 million in the territory of merely about 1,000 square kilometers. The aspiration is to create a city with high living quality yet with low eco-footprint.



1.2.2 Eco-Footprint

With respect to ecological footprint and carbon footprint, Hong Kong people are currently on average about 4 hectares per capita and 6.5 tonnes per capita respectively. Largely owing to the mode of high density development, the footprint of Hong Kong people on average is lower than those in North America and Australia, but still doubles that of the global fair share.

For further managing the footprint, the key challenge critically hinges on the aspect of reducing greenhouse gas (GHG) emissions and improving energy efficiency. Other key issues encompass waste minimization and resources conservation, including material and water. The associated environmental benefits embrace global, regional and local dimensions. Locally, air quality and solid waste management are priority issues.

1.2.3 Living Quality

Despite the potential benefits of densification, there is a need to strike a balance between density and livability. After the 2003 SARS outbreak, Hong Kong people aspire for better health and livability, including the quality of urban living space and indoor environment. The challenge critically hinges on town planning and site design of individual developments.

Hong Kong people also increasingly aspire for heritage conservation as well as a friendly and safe city. Hong Kong faces high pressure in terms of space competition: heritage conservation and provision of a pedestrian friendly environment, in particular, the needs for those persons with a disability or elderly may have been compromised. On the other hand, the maintenance of extensive high-rise buildings in a compact city is another special local concern from the perspective of sustaining a safe high-rise living environment.

2. Status of Developing Policies that Further SB

2.1 Overview

Hong Kong is in a state of transformation. In the 2007-08 Policy Address by the Chief Executive (CE) of the Hong Kong SAR Government, a new direction for Hong Kong is being set. An important policy statement of CE is "Quality City and Quality Life":

"By 'Progressive Development' I mean overall progress rather than economic development alone. Apart from economic benefits, we should strive for benefits to culture, the society and the environment... sustainable, balanced and diversified development."

New policies are being set to reduce the environmental loadings, especially the energy issue, and to improve the urban livability, including density review. Various existing regulations and measures are also subject to review with a view to furthering sustainability in the uniquely compact built environment of Hong Kong.

2.2 Lighter Footprint

2.2.1 Reduction of GHG Emissions & Enhancement of Energy Efficiency

The 2007-08 Policy Address admits the crisis of global warming together with the following responses, target and policy development:

"Global warming has become a challenge to the international community. In light of their own economic, social and environmental characteristics, governments around the world have to formulate measures to strike a balance between economic development and the reduction of greenhouse gas emissions, with a view to achieving sustainable development. In the same vein, we should do our part to improve the regional environment. We have been taking vigorous measures to reduce greenhouse gas emissions. From 1995 to 2005, the energy intensity in Hong Kong, that is, energy consumed per unit GDP, dropped by 13%."

*We welcome the Asia-Pacific Economic Co-operation (APEC) Leaders' Declaration on Climate Change, Energy Security and Clean Development recently adopted in Sydney. As an APEC member, Hong Kong will honour its pledge and seek to achieve a **reduction in energy intensity of at least 25% by 2030** (with 2005 as the base year). To this end, the Government will endeavour to raise public awareness of climate change and to introduce energy saving measures at different levels. We will consult the public on the proposed mandatory implementation of the Building Energy Codes by means of legislation. When we have completed the legislative work related to the Energy Efficiency Labelling Scheme (first phase) for household electrical appliances early next year, we will start planning for the second phase."*

To further reduce greenhouse gas emissions, the Government will set an example by conducting a Carbon Audit and implement an emissions reduction campaign in the new Central Government Complex at Tamar. I believe that the business sector will respond positively by implementing measures in suitable commercial buildings for this campaign."

Buildings account for 89% of the total electricity consumption in Hong Kong. Therefore, significant amount of energy could be saved through incorporating green building features and using energy efficiency technologies and products. For buildings and related issues, the relevant measures and the respective action program are summarized as follows:



We managed to build compactly and at the same time have retained a large area of countryside for conservation and recreational uses.

Top - Tin Shui Wai New Town and Wetland Park
Middle - Tai Po New Town
Bottom - Tung Chung New Town

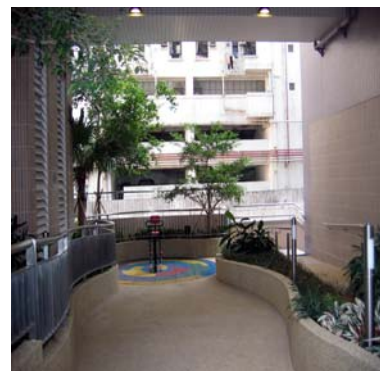


Tseung Kwan O New Town -- High-density developments with planned breezeways/view corridors

Issue / Government Intervention	Government Leadership	Action Program for Rapid Implementation
Overall Thermal Transfer Value (OTTV) Mandatory since 1995. Building (Energy Efficiency) Regulation to control the building envelope design of commercial buildings & hotels: Tower – Max. 30 W/sm Podium – Max. 70 W/sm	Majority of new government buildings are designed to achieve an OTTV of less than 23W/sm, and for certain building types, even less than 18W/sm.	A review of the regulatory mechanism will soon be conducted to see if there is a need for adjusting the OTTV requirements.
Building Energy Codes (BEC) Voluntary since 1998. The Energy Efficiency Registration Scheme for Buildings stipulates the minimum energy efficiency standards for 4 main types of building services installations (BSI): - air-conditioning; - electrical; - lighting; - lifts & escalators.	All new government buildings are designed to meet the BEC and registered under the Energy Efficiency Registration Scheme for Buildings.	The Government completed a public consultation exercise on the proposed mandatory implementation of the BEC for certain types of new and existing buildings in March 2008. It is estimated that for new buildings, the proposal will result in energy saving of 2.8 billion kWh in the first decade of implementation, which contributes to a reduction in carbon dioxide emissions in the region of 1.96M tonnes. Taking into account the comments received during the public consultation exercise, the Government is preparing the legislative proposal for the mandatory scheme.
Incentives for Provision of Green Features in New Private Buildings Joint Practice Notes (JPNs) since 2001 To minimize the consumption of energy, in particular those non-renewable types, e.g., balcony as a green feature.		The inclusion of many of these green features on a gross floor area/site coverage exemption basis naturally increases the height and bulk of the buildings concerned. The Government is reviewing the effectiveness of the incentive scheme.
Energy Efficiency Labelling Scheme through the Energy Efficiency (Labelling of Products) Ordinance Voluntary since 1995 / Mandatory since May 2008. First phase of the mandatory Energy Efficiency Labelling Scheme (EELS) covers 3 types of electrical appliances below: - room air conditioners; - refrigerating appliances; - compact fluorescent lamps. Labels are required to be shown on the products to inform consumers of their energy efficiency performance.		The implementation of the mandatory EELS for the 3 prescribed products, can achieve additional electricity saving of 150 GWh per year. This amounts to the annual electricity consumption of 105,000 units of room air conditioners, or a saving of HK\$135 million in electricity bill per year. In terms of environmental benefits, an annual reduction of carbon dioxide emission of 105,000 tonnes will be achieved. (The planning for the coverage of the second phase of the Scheme will also start in the year 2008.)
Renewable Energy (RE)	Integrated PV systems, solar water heating systems etc., are among the sustainable design objectives to be considered where applicable.	
Carbon Audit Policy statement in 2007.	To conduct a carbon audit for the new Government complex at Tamar when it comes into operation.	The Government encourages the private sector to do the same for their buildings. Taking account of internationally



New highrise residential developments in West Kowloon development - slender tall blocks will have less obstruction to air flows, but spacing and layout of the blocks should take account of the direction of the prevailing wind.



Sky garden and Podium Garden

- *Providing space for greening and recreational*
- *Improving microclimate and air flow between buildings*

		<p>recognized approaches, the Government has drawn up a set of guidelines, formally launched in July 2008, to facilitate building owners, managers & occupants to conduct carbon audit and identify measures for reducing the emissions. Different organizations from the property development and management sectors, professional bodies, container terminals, airport, universities etc had joined the "Green Hong Kong • Carbon Audit" campaign to carry out and to promote carbon audit in buildings.</p>
--	--	--



Wider common corridor

- Alleviating the stuffiness in corridors and lift lobbies
- Allowing ease of movement
- Improving air quality, lighting and ventilation

2.2.2 Waste Minimization, Green Materials & Equipment and Total Water Management

Solid waste management has become a critical municipal issue in Hong Kong, especially in view of the shortage of landfill sites. While the Government continues its efforts to encourage the wider community to avoid, reduce, reuse and recover waste through various voluntary programmes and community education, new legislation has been introduced to mandate new residential buildings to provide refuse storage and material recovery room, and to provide a legal framework for implementing producer responsibility schemes in accordance with the "polluter pays" principle. Economic incentives are also in place to reduce construction and demolition waste.

The conservation of material and water resources are mainly demonstrated through best practice in the government projects.

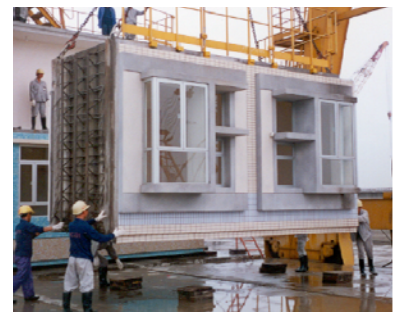
The relevant measures and the respective action programmes are summarized as follows:

Issue / Government Intervention	Government Leadership	Action Program for Rapid Implementation
<p>Waste Separation & Recovery</p> <p>Voluntary since around 1998.</p> <p>In recent years the Government has tested various forms of domestic waste separation and recovery to identify systems that are convenient to residents, cost-effective and best suit local needs. The Programme on Source Separation of Domestic Waste was launched territory-wide in January 2005 to encourage more people to separate their waste for recycling.</p> <p>The Source Separation of Waste Programme was also extended to the commercial and industrial buildings in October 2007.</p>	<p>All government quarters have joined the Source Separation of Domestic Waste Programme since 2006.</p>	<p>As many existing domestic buildings do not have sufficient space on each floor to implement source separation, the Building (Refuse Storage and Material Recovery Chambers and Refuse Chutes) Regulations under the Buildings Ordinance was amended in July 2008 to mandate the provision of space for material recovery on every floor of new domestic buildings and the domestic part of new composite buildings. The commencement date is on 1 December 2008.</p>
<p>Construction & Demolition Waste Reduction: Incentives for Prefabrication</p> <p>Joint Practice Note (JPN) since 2002.</p> <p>Non-structural prefabricated external walls are promoted as a green feature to not only reduce construction waste, but also improve quality of construction and cost control.</p>		<p>The inclusion of many of these green features on a gross floor area/site coverage exemption basis naturally increases the height and bulk of the buildings concerned. The Government is reviewing the effectiveness of the incentive scheme.</p>



Balcony

- Improving lighting and ventilation
- Providing outdoor space and space for greenery
- Act as sunshades



Prefabricated External Wall

- Improving quality of construction
- Reducing construction waste and better cost control

Environmentally Friendly Materials & Equipment	For government buildings, the use of green materials such as certified timber from sustainable forest, low VOC paints have been incorporated in the General Specification for Building 2007 Edition. Environmentally friendly building services equipment & installations are also specified in a series of General Specifications for BSI in Government Buildings 2007 Edition.	The Government is in the process of enacting new legislation to regulate the use of VOC-containing products, from paints to organic solvents, adhesives and sealants etc.
Total Water Management	Total water management has been implemented in new government buildings. Water-saving devices for sanitary appliance are widely adopted. The use of rainwater / grey water recycling system for toilet flushing, cleansing & irrigation has also been adopted where appropriate.	

2.3 Higher Livability

2.3.1 Concerns over Development Intensity, Air Ventilation & Urban Livability

Call for Sustainable Community Development

Sustainable development is not only concerned with the development of individual buildings, but also with whole areas and the impact of those buildings on the adjoining areas.

Hong Kong is a compact city. The urban development and rural settlements are contained to under 24% of the total area of the territory, whilst about 44% have been reserved as country parks or kept under conservation related controls. The spatial development strategy is underpinned largely by the concept of prudent use of land resources by planning for more development around rail stations to facilitate fast and mass movement of people by an environmentally friendly mode of transport, coupled with better utilization of development opportunities in the existing built-up areas where infrastructure capacities permit.

Whilst such development pattern has merits in terms of energy and resources efficiency, the public has become more conscious of the visual, air ventilation and other microclimate impacts resulting from building bulks.

In terms of SB rating, for denser developments in a compact urban context, higher weighting should be given to the neighbourhood concerns.

In response to the ever-increasing intensification of urban development in Hong Kong, the relevant improvement measures (or counter-measures) and the respective action program are summarized in the table below.

Review of Green Features under JPNs

In this connection, the incentives for provision of green features in private building developments are also under review by the Government. To encourage the design and construction of green buildings, the Buildings Department, together with the Planning Department and Lands Department, issued two Joint Practice Notes (JPNs) to provide incentives in the form of exemptions from gross floor area and/or site coverage calculations for eleven specific types of green features in new private building developments. These features include balconies, wider common corridors and lift lobbies, communal sky gardens, communal podium gardens, acoustic fins, sunshades and reflectors, wind catchers and funnels, utility platforms, non-structural prefabricated external walls, mail delivery rooms, and noise barriers.

Since the promulgation of incentives to encourage the incorporation of amenity features in buildings and the issue of the joint practice notes, a series of surveys and studies have been carried out to gauge the public response and review the effectiveness of the incentive scheme. This encompasses:

- conducting questionnaire surveys with stakeholders;
- carrying out on-site evaluation on the usage of green & amenity features in sample buildings;



- conducting focus group meetings with green groups and the professional institutes; and
- conducting public opinion surveys.

The findings of the surveys and studies indicate that the incentives promulgated under the JPNs are generally effective in promoting construction of green and innovative buildings and the benefits of various green features are generally recognized and welcomed by the public and stakeholders. However, the inclusion of many of these green features on a gross floor area / site coverage exemption basis naturally increases the height and bulk of the buildings concerned. According to the views collected from the survey, the exemption criteria of some of the green features may worth further review. Some also opined that the Government should strike a balance between the provision of green features and their effects on building height and bulk.

The benefits brought about by the provision of green features in buildings to individual flat owners versus public interest in terms of impact of building bulk and height on the neighbourhood is a matter that requires some fine balancing. The Government intends to engage the stakeholders and community in more in-depth discussion after the review on the incentive scheme has been completed.

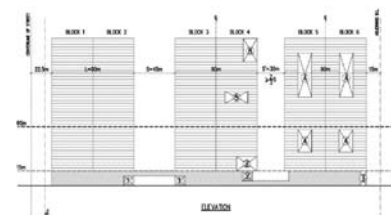
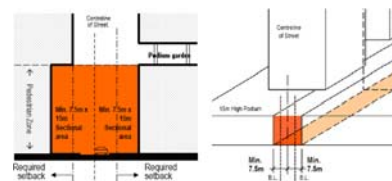


Diagram on concept of building permeability



Proposed requirement on building setback at pedestrian zone in narrow street

Issue / Government Intervention	Government Leadership	Action Program for Rapid Implementation
<p>Feasibility Study for Establishment of Air Ventilation Assessment (AVA) System</p> <p>Voluntary guidelines since 2006.</p> <p>Following the AVA Study in 2003-05 under the commission of the Planning Department (PlanD), the performance-based AVA methodology and a set of qualitative guidelines to achieve better air ventilation objectives are incorporated into the Hong Kong Planning Standards and Guidelines (HKPSG).</p>	<p>In July 2006, the Housing, Planning & Lands Bureau and the Environment, Transport & Works Bureau jointly issued a Technical Circular on AVAs, demonstrating the Administration's resolve to take the lead in using AVA in the planning of major development / redevelopment projects and in plan-making. Proponent bureau / departments for major government projects are required to undertake AVA to ensure that air ventilation impact is given due consideration in the planning & design of the projects.</p>	<p>Quasi-government bodies and the private sector are encouraged to conduct AVA in the planning & design on a voluntary basis. The Urban Renewal Authority has adopted the guidelines set out in the Technical Circular and conducts AVA for its large-scale projects under planning. The MTR Corporation Ltd. would take into account the guidelines and conduct AVA for the railway related property development where required.</p>
<p>Development Restrictions in OZP: Building Heights, etc.</p> <p>Policy statement in 2007.</p> <p>Pursuant to the CE's 2007-08 Policy Address, the PlanD is progressively stipulating in outline zoning plans (OZPs) clear development restrictions, where justified, for all to follow. Priority is given to reviewing building heights in areas subject to high development / redevelopment pressures, waterfront areas along Victoria Harbour and congested built-up areas.</p>		<p>In the review of the OZPs, account has been taken of the topography, local character, existing building height profile of the concerned planning areas as well as the prevailing planning circumstances & urban design principles. AVA will be undertaken for the planning area of each OZP to assess the wind environment within the area, identify problem areas and propose counter-measures.</p>
<p>Development Restrictions in the Lease: "Eco-Density", etc.</p> <p>Policy statement in 2007.</p> <p>The Government has assessed each site in the 2008-09 Application List carefully to review the development parameters, lower the development bulk as appropriate, and include relevant development restrictions. Where justified, the parameters such as building height limit and max. gross floor area (or plot ratio) have been or will be specified</p>		<p>AVAs have been or will be conducted where necessary in accordance with prescribed guidelines & any appropriate development restrictions arising from such assessments would be incorporated in the lease conditions. For some of the sites, where applicable, site coverage limits or non-building areas have been or will be prescribed.</p>

in the Conditions for Sale.		
<p>Building Design that Supports Sustainable Urban Living Space</p> <p>On-going study to be completed in 2008.</p> <p>Increased permeability can provide “air paths” through the development site to the neighbouring area. Building setback can help mitigate the deep street canyon effect and hence improve the pedestrian environment. Greenery can mitigate heat island effect and enhance public health & amenities.</p>	<p>The policy is to incorporate as much greenery as practicable in all new government buildings while considering the function of the buildings.</p> <p>Green roofs or terrace gardens are provided where space is available. Vertical greening features are new attempts in some of the government buildings.</p>	<p>Draft recommendations put forward by the consultant include:</p> <ul style="list-style-type: none"> - Building Permeability, - Building Setback, - Green Site Coverage. <p>The Government will carefully consider the recommendations and decide the way forward, including the review of JPNs No.1 & No.2.</p>

2.3.2 Indoor Environmental Quality

IAQ

To improve the indoor air quality (IAQ) and promote public awareness of the importance of IAQ, the Government has implemented an IAQ Management Program. One of the core tasks of the Program is to have launched a voluntary IAQ Certification Scheme for Offices and Public Places since 2003. Premises having their IAQ meeting the two-level IAQ objectives (Good or Excellent) are awarded with “Good Class” or “Excellent Class” IAQ certificate. IAQ labels are also issued to these premises for posting at prominent locations to make known to the public of such achievement.

All new government buildings are designed to achieve the excellent class of the IAQ Certification Scheme for Offices and Public Places as far as possible. Majority of the completed buildings have achieved “Good Class”, with some achieving “Excellent Class”.

Natural Lighting & Ventilation

Through the JPNs issued in 2001 and 2002, green features such as balcony and wider common corridor are promoted in the private sector residential developments. Such provisions can benefit the indoor environmental quality in terms of lighting and ventilation at the habitable space and the communal area respectively



2.3.3 Social Sustainability: Friendly/Safe Built Environment & Heritage Conservation

Building an Accessible Built Environment

People with different abilities are entitled to play an active role in the community life. Thus, the Government encourages community care and integration, and promotes caring for people of all ages and abilities.

The Architectural Services Department has adopted a holistic approach in meeting the needs of all sectors in the society, including those with different abilities, the young and the elderly, and has taken the lead in raising public awareness on this issue through active promotion and through setting examples in public projects.

The Buildings Department issued, in 1997, the Design Manual : Barrier Free Access 1997 to provide guidance to practitioners of the construction industry to pursue access to and facilities in a building for persons with a disability. Taking into account changes in building technology and expectation of the community, the Government conducted a review of the Design Manual which was finalized in late 2007. The obligatory design requirements therein were made to the Building (Planning) Regulations for commencement in December 2008 tentatively.

Mandatory Building & Window Inspection Schemes

Since 2001, the Buildings Department has intensified the enforcement actions and embarked on a number of large-scale operations to clear unauthorized building works and repair defective drains and buildings. Results have been encouraging but government actions have its limitation and active participation of the public will improve efficiency.

To attain a long-term solution to the problem of building neglect, the Government has carried out a two-stage public consultation and is currently developing a legislative proposal to introduce a mandatory building inspection scheme and a mandatory window inspection scheme.

When developing these schemes, the Buildings Department has reviewed its policy from the owner's perspective and has aimed to strengthen all the support services & assistance available to owners. A code of practice will set out the control mechanism, the site supervision requirements and the inspection & repair standards clearly and systematically so that the quality of works can be guaranteed.

To complement the schemes, the support of a non-government organization with special expertise in building management and maintenance, the Hong Kong Housing Society, has been solicited to provide assistance to owners in need. The Hong Kong Housing Society will put in place a range of financial incentives, technical support and assistance throughout the process from pre-inspection stage to final completion of rectification works. In addition, the Buildings Department currently operates the Comprehensive Building Safety Improvement Loan Scheme that offers low interest or interest-free loans to those owners in need. To address the needs of the elderly owner-occupiers, the Government has recently established a Building Maintenance Grant Scheme for Elderly Owners. The Scheme provides grants to eligible elderly owner-occupiers to repair and maintain their self-occupied buildings and improve building safety. The Hong Kong Housing Society is appointed by the Government to administer the Scheme.

Meanwhile, the Buildings Department will strive to continue its enforcement work, in particular actions against uncooperative owners and the removals of unauthorized building works in order to assist other owners or the owners' corporations to organize building repairs.

Adaptive Reuse of Heritage Buildings

Cultural life is a key component of a quality city life. It is indispensable in any sustainable society. As Hong Kong develops progressively with some of its old and historic buildings replaced by contemporary ones, people are aspiring for better quality living and, in recent years, have expressed passionately to the conservation of historic sites and buildings.

To demonstrate the Government's commitment to heritage conservation, a comprehensive package of measures has been launched. In February 2008, the Government introduced a scheme to revitalize historic buildings in public ownership. Under the scheme, stakeholders and the public are engaged to submit proposals for using these buildings to provide services or business in the form of social enterprise. For the first phase, a total of seven historic buildings have been identified. The Government will provide professional support for successful applicants to take forward their proposals in the areas of heritage conservation, land use and planning, building architecture and compliance with building laws. Where justified, financial support will also be provided.

The Government has set up an Office of the Commissioner for Heritage to provide a focal point to take forward heritage conservation work. The Buildings Department has also set up a dedicated team, the Heritage Unit, to help process submissions related to heritage buildings, to provide technical advice to practitioners and other Government departments and to expedite pre-submission enquiries so that any issues relating to heritage conservation and compliance with building regulations could be resolved at the earliest opportunity. In addition, the Unit has been tasked to prepare guidelines for adaptive reuse of heritage buildings to meet the required health and safety standards.



North Kowloon Magistracy (Upper) and Lui Sang Chun (Lower) are amongst the first batch of buildings selected for "Revitalising Historic Buildings Through Partnership Scheme"



2.4 SB Whole-building Performance Rating System & Way Forward

- Comprehensive Environmental Performance Assessment Scheme (CEPAS)

As initiated under the 2001 Government Policy Objectives to the formation of a 'green building labelling system', Buildings Department of Hong Kong Government SAR commissioned a consultancy study to devise a system for assessing environmental design and performance of local buildings – CEPAS. The implementation of CEPAS is to create a positive shift on the current environmental performance of buildings in Hong Kong, as well as to keep in line with the global trend of building sustainability.

CEPAS is a holistic assessment tool for various building types with clear demarcation of the entire building life-cycle, which covers the pre-design, design, construction & demolition and operation stages. The element of sustainability has been built into this assessment scheme. Issues of broader sense of sustainability as well as extending environmental sustainability to social and economic aspects are also integrated into all CEPAS categories and indicators.

Stakeholders and organizations in the building industry are free to download the CEPAS manuals for voluntary adoption. It is hoped that the adoption of CEPAS will not only help in improving the building design and performance but also in improving existing assessment schemes.

- BEAM Certification

In practice, new public buildings are increasingly required to adopt the SB whole-building performance rating. The local rating system is BEAM.

However, the Government has yet to formalize a clear policy for adopting BEAM in public and public funded projects.

In light of the fact that BEAM is going to undertake an upgrade in 2008-09, including assimilation of the relevant research findings of CEPAS, it is timely for the Government to make a further step in establishing a policy together with clear target in the adoption of SB whole-building performance rating system. Given an appropriate policy framework, the tool can serve as an effective means to accelerate the comprehensive integration of sustainable building principles in the mainstream market – both the public and the private sectors.

3. Status of Adopting SB in the Investor Community

3.1 Public Sector

In Hong Kong, the following government departments and quasi-government organizations represent the key players in the public sector investor community:

- Architectural Services Department
- Hong Kong Housing Authority
- Hong Kong Housing Society
- Hong Kong Science and Technology Parks Corporation
- Urban Renewal Authority

3.1.1 Architectural Services Department

The Architectural Services Department is one of the works departments overseen by the Development Bureau. The Department plays a number of roles covering a spectrum of services including:

- as government agent for facilities development responsible for the development of new government buildings and facilities;
- as steward of government facilities providing services for the maintenance and repair of all government buildings and facilities;
- as architectural corporate advisor to Government providing professional advice on architectural policies, building planning and maintenance issues;
- as promoter of best practice and standards in the construction industry working closely with the construction industry to strive for a high standard and also to promote best practice in design and construction management methods aiming to raise the standard of the design, construction and maintenance of the construction industry.

Architectural Services Department, as the Government's Architect, always encourages project teams and consultants to explore every opportunity to adopt sustainable design by setting a list of sustainable design principles, such as sustainable site planning, conservation of existing heritage and habitats, energy conservation, waste management, use of environmentally friendly building materials and equipment, landscaping, operation and maintenance, etc.

The following are some of the completed projects incorporating various sustainable design features.

Stanley Municipal Services Building

Regarded as a blend of scenic views with historical monuments, Stanley is a renowned tourist destination. To serve as a welcoming landmark as well as a focal point of the Stanley community and to accommodate the growing local population needs, Stanley Municipal Services Building has been constructed. It is a four-storey building which caters for various individual needs including community hall, exhibition area, performance stage, library, sports arena, dance room, table-tennis room, multi-activities room and children playroom. Other than the functional support, it also facilitates the progressive development of cultural, recreational, learning and environmental aspects.

Awards

- Hong Kong Institute of Architects Annual Awards 2006 – Medal of the Year
- Green Building Award 2008 - Grand Award (New Construction Category)
- Quality Building Award 2008 – Certificate of Merit (Non-Residential Category)
- Quality Building Award 2008 – Certificate of Merit (Special Award Category – Sustainability)
- Provisional BEAM rating of Platinum
- Chartered Institute of Architectural Technologists 2007 Technical Excellence Award – Highly Commended



Environmental Considerations

- The courtyard not only allows cooling by cross ventilation, but the thick float laminated glass floor with motorised louvres helps maximise the use of daylight in the Community Hall during daytime, and helps to illuminate the courtyard when the motorised louvres are closed at night.
- The courtyard acts as a vent shaft and cross ventilation allows natural ventilation to flow to the semi-outdoor spaces to enhance air circulation.
- In summer time in the main lobby, solar gain is minimised by the use of double glazing with low E-coating together with planting. In winter time, solar gain warms up the main lobby, and natural ventilation is used to minimise energy consumption.
- A curved glazed wall in the library allows in natural daylight, thereby minimising energy consumption for lighting during daytime. At night, it acts as a beacon guiding visitors towards the Stanley waterfront.
- To enhance the penetration and utilisation of daylight, the external wall of Conference Room and Offices are made of glazing and glass blocks.
- A metal screen and planting are used to screen off direct sunlight during the hot summer months to prevent solar gain. However, in winter, there is solar gain which saves heating costs.
- The design of air-conditioning system, lighting, electrical and lift installations strictly complies with the Code of Practice for Energy Efficiency to save natural resources consumption.
- The waste energy from Total Energy Heat Pumps (TEHP) is used to preheat the shower water in the recreation centre.
- Energy saving measures have reduced consumption by 15% through the installation of:
 - T5 fluorescent tubes with electronic ballasts,
 - CO₂ sensors for fresh air supply,
 - perimeter zone photocells for lighting in library,
 - Variable Voltage Variable Frequency (VVVF) drive for lift installation,
 - TEHP system for air-conditioning system,
 - Separate metering system and multi-functional power analyzer for facilitating the energy audit and management issue of this joint-user complex.
- The chiller plant is designed to allow remote control monitoring. A maintenance team can thus closely monitor its performance.
- Bamboo is planted inside the courtyard for sun shading and for greening.
- The roof garden not only increases the amount of open space in the built up area but also provides visitors a venue from which to enjoy sea views.



Hong Kong Wetland Park

The Park, located on the NE edge of Tin Shui Wai in the New Territories, occupies 61 hectares of land. It is envisaged as a prime example of harmony of human and nature, of environmental practice and sustainable development. It is unique to Hong Kong, which seeks to serve different purposes, such as conservation, tourism, education and recreation, all with equal importance. Special features are incorporated to cater for the purpose of integrating man-made structures with the natural environment in the Park. These unique features include landscaped roof, timber cladding and multiple layers of shades. The Visitor Centre with a footprint of approximately 10,000 s.m. provides integral facilities to visitors, including three major Galleries, Resource Centre, Office, Café, Shop, Play area and Toilets. The Satellite Building and three Bird Hides are located in the outdoor area. Each facility serves unique functions for conveying wetland messages.

Awards

- Hong Kong Institute of Architects Annual Awards 2005 – Medal of the Year
- Hong Kong Institute of Architects Annual Awards 2000 – President's Prize
- Urban Land Institute Awards for Excellence 2007, Asia Pacific and Global Award for Excellence 2007
- Hong Kong Institute of Landscape Architects Landscape Design Awards 2006, Excellence in Landscape – Gold Medal and Silver Medal (Landscape)

Design Project)

- Landscape Institute National Awards 2006 – Design (over 5- hectare category) Award
- Waterfront Centre's 21st Annual International Honour Awards, Excellence on the Waterfront 2007
- Hong Kong Institute of Engineers and Institute of Structural Engineers Joint Structural Division, Structural Special Award 2007 – Commendation Award
- Green Building Award 2006 Grand Award (New Construction Category – Institutional Building Design)
- Chartered Institute of Architectural Technologists 2006 Open Award for Technical Excellence in Architectural Technology – Commendation

Environmental Considerations

- **Low Overall Thermal Transfer Value (OTTV)**
The Green Roof and the orientation of the building allow the Visitor Centre envelope to achieve energy efficiency performance of approximately OTTV 16W/m².
- **Geothermal Heat Pump Air-conditioning System**
A Geothermal Heat Pump Air-conditioning System is installed at the Visitor Centre. It utilises the mass earth of the park for heat exchange to keep the park environment quiet and undisturbed. Approximately 468 units of 32mm-diameter flow and return high-density polyethylene (HDPE) pipes are buried underground at 50m deep and embedded in bentonite clay and cement grouting for heat exchange with the constant underground temperature. This system is capable of providing approximately 390 tonnes of air-conditioning per day. This method eliminates the use of visible and noisy heat dissipation air-conditioning equipment, reduces external louvers, and precludes direct heat dumping into the environment which is particularly favourable and suitable for the environment of wetland park.
- **Lighting / Ventilation and Renewable Energy**
Skylights are installed at the Atrium (north light) and external toilets to allow the use of natural light. External artificial lighting is minimised to reduce power consumption. Natural ventilation is implemented by means of elevated windows at the Satellite Building. Other energy efficient and saving features adopted in the building services design include photovoltaic panels for oscillating fans in Bird Hides, T5 fluorescent tubes with electronic ballasts, occupancy sensors for office lightings, CO₂ sensors for fresh air supply, wind sensors for toilet ventilation, photo sensors for the lighting system in the Atrium, rain sensors for the automatic irrigation system, the Variable Voltage Variable Frequency (VVVF) drive for the lift installation and the variable speed drive for condensing water pumps etc.
- **Ramp Access**
Circulation ramps are built throughout G/F and 1/F galleries at the Visitor Centre to facilitate the access of disabled visitors and minimise the use of mechanical lifts.
- **Minimised Water Consumption**
Low capacity, 6-litre water closets are used to reduce water consumption for toilet flushing. The design of the Satellite Building is tailored for collecting rainwater as flushing water. Recycling of lake water for a water feature further cuts down water consumption.
- **Recycled Brick Wall and Fenders**
Recycled Chinese bricks are used for building a brick wall on the south face of the Visitor Centre and the Ticket Office to minimise the effects of solar gain to the building. Timber fenders are re-used in the freshwater marshes to serve as resting posts for habitats.
- **Shading by Timber Screens**
Sustainable timber from identified renewable sources is used throughout the whole project as vertical & horizontal louvers to provide shading for the buildings and external landscaping work.
- **Recycled Aggregates and PFA**
A total of 15,300 tonnes of recycled aggregates/rock fill are used as sub-base, hardcore & fill materials in the development together with 5,600 tonnes of recycled coarse aggregates in the structural concrete. The majority of the recycled aggregates are generated from a nearby recycling plant. 75% of the total amount of structural concrete used by volume contains recycled aggregates or PFA as partial cement replacement.
- **Re-use of Existing Materials**
Existing materials used at the Phase 1 and Phase 2 site, such as recycled granite paving, was originally from the wall of the Hong Kong Police Headquarters, Chinese bricks were recycled from the demolished old houses in a Chinese Village, and oyster shells were sourced from the



nearby Lau Fan Shan oyster farm. The existing Phase 1 Visitor Centre has been converted into a new Ticket Office, some of the aluminium wetland habitat sculptures are relocated to Phase 2 site. All existing trees and many other plants from the Phase 1 site are also preserved within the Phase 1 site or transplanted to the Phase 2 site.

- Soft Landscape Species
Native plant species, which require less maintenance and irrigation, are used in the landscaping work.



Fire Station with Ambulance Depot & Police Post at Penny's Bay, Lantau

Following the announcement of the construction of a new Theme Park on Lantau Island, the Government immediately assessed the facilities required to support the planned future developments. The Penny's Bay Police Post and Fire Station/Ambulance Depot are identified as essential facilities to support Northwest Lantau. These facilities are key to a fire-fighting mission during an event of disastrous hillside fire in the area which threatens the surrounding environment and local residents.

The complex consists of a 7-bay fire appliance building with a light and airy single-storey structure utilising photovoltaic panels as an integral element of the roof. Such an arrangement has double benefits, not only allowing the use of natural light and ventilation, but also at the same time generating renewable solar energy. Adjacent to the appliance bay are offices, barracks and ancillary accommodation that are housed inside a two-storey building with a central landscaped courtyard. A separate four-storey practice centre allows confined space, height and ladder practice. A central utility building with shared facilities such as the electrical and mechanical plants are provided for the two clients to achieve efficiency of the building services plant. The single-storey Police Post is arranged separately at the eastern side of the complex.



Awards

- Provisional BEAM rating of Platinum
- Green Building Award 2006 Merit Award (New Construction Category)– Institutional Building Design)



Environmental Considerations

- Architectural Design
 - Functional orientation suits the use of building integrated photovoltaic panels with the roofs to provide renewable energy;
 - The roof design blends in with the low-rise design to minimise visual impact, collects rainwater for reuse and provides wide overhangs to shade walls;
 - Use of pergolas in key areas to shade walls;
 - Clerestory lighting and natural ventilation are provided; and
 - A combined building services utility building is shared between the two facilities.
- Renewable energy – Innovative use of building integrated photovoltaic panels
 - Photovoltaic panels are utilised to generate electricity;
 - Opaque photovoltaic panels are used to form solid roofs (except appliance bay).
 - Double benefits from the use of building integrated photovoltaic panels as roof and solar power collectors.
 - Triple benefits for appliance bay: transparent, functions as roof and power generators.
 - The building integrated photovoltaic panels are designed to generate 10% of total electricity energy consumed by the complex.
- Energy Conservation and Efficiency
 - Efficient building envelope design;
 - Extensive roof overhangs and sun shading devices to minimise solar heat gain;
 - Target OTTV: <15 W/m²; actual OTTV: Police Post 10.72 W/m², Fire Station 12.64 W/m²;
 - Energy efficient lighting design;
 - Reduction in artificial light usage through maximising daylight;
 - Luminaries with high intensity discharge lamps (HID) provide high lighting output and occupancy sensors to reduce energy use;



- Timer controls are provided for external lighting facilities; and
 - Compliance with the Code of Practice for Energy Efficiency of Air Conditioning, Electrical and Lighting Installations.
- Others
 - Collection of rainwater on the roof for reuse in vehicle washing and landscape irrigation;
 - The use of artificial materials minimizes natural resource consumption;
 - The use of long life and low maintenance prefabricated materials; and
 - Optimal use of daylight and natural ventilation.

3.1.2 Hong Kong Housing Authority

The primary role of the Hong Kong Housing Authority (HKHA) is to provide subsidized public rental housing to low income families who cannot afford private rental accommodation. The public housing programme has evolved to meet public expectations, from an emergency housing programme in the 1950s, into the more sophisticated public housing services nowadays, covering planning, design, construction, management and maintenance.

Over the years, the HKHA has been working to ensure the implementation, maintenance and sustainability of an effective housing programme that will not only meet Hong Kong's requirements but also contribute towards a stable and happy community. The improvements are a direct response to public demand as society has prospered and as public expectations and the demographics of Hong Kong have changed.

At the end of March 2008, about a third of Hong Kong's population was living in 680 000 public rental housing flats.

One of the key missions is to provide affordable quality housing with a healthy living environment, thereby improving the quality of life in Hong Kong. This allows the tenants to contribute more effectively to the community and the local economy, and allows the HKHA to contribute to the overall sustainability of Hong Kong. As a public sector client, The HKHA has been driving sustainability initiatives through the value chain, in collaboration with all stakeholders from planning, design, construction, maintenance and estate management fields in the public sector. The HKHA continually works to improve the operations with the full integration of environmentally friendly, user friendly, functional and cost effective considerations.

Sustainable development goals are now major considerations in the development of Hong Kong. The HKHA is progressively exploring ways to improve the performance, balancing the priorities in three aspects: environmental, social and economical.

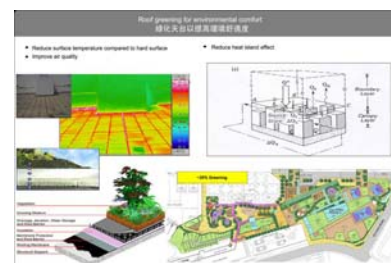
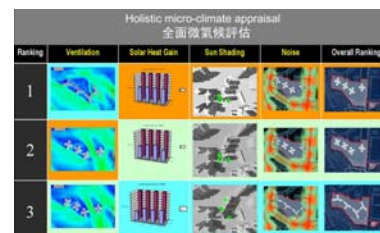
The best results can be achieved through the full integration of the needs for economic and social development with those of conserving the environment. The HKHA has to find ways to maintain prosperity and improve the quality of life, while reducing the environmental impact of the activities and help to preserve common resources and so creating a sound basis for future generations. The HKHA cannot achieve this alone and needs to collaborate with the stakeholders in the value chain, to ensure achieving sustainable development goals.

The HKHA has put this vision into action through the *Strategy for Sustainable Housing*, identifying the sustainability priorities in three aspects: **environmental, social, economic**.

• Environmental Priorities

Given the high-density, high-rise environment in Hong Kong with its enormous political, technical, time and cost constraints, the HKHA needs to build efficiently and act in an environmentally friendly manner through effective design, construction and management to the benefit of the tenants and the community at large.

The HKHA is committed to properly managing and reducing the consumption of resources in the day to day activities, in particular the reduction of waste and energy consumption. The HKHA is always looking for better construction methods to decrease the environmental footprint and reduce the overall impact of the development, occupation, management and maintenance processes.



- Social Priorities

Social sustainability enhances the well-being of people. Low rents in public housing represent a subsidy to low income families and consequently the housing programme promotes social stability, economic prosperity and harmony in the community. The HKHA wants to see public housing estates as safe, healthy and secure places to live, so that the tenants enjoy a satisfying and good quality living environment.

The HKHA must therefore prioritize the demands on the organisation according to the policy pledges, by providing public housing to those who need it most. The goal of providing a safe and healthy living environment applies not only to the tenants, but also in the working environment, safety and protection for those who are engaged in the construction, maintenance and property management services. The policies are geared to enhancing social cohesion and contributing to the well-being of the community as a whole.

Engaging The Community has become a vital process in the delivery of public housing. Comprehensive design approval processes, and a mature feedback system, ensure estate planning and design match with tenants and community needs. The HKHA has explored several models of user-oriented neighbourhood design. At Yau Tong Estate, Ma Hang Headland, Upper Ngau Tak Kok Estate and Lam Tin Estate, the HKHA has worked with a variety of interest groups; academics, residents, schools and NGOs in a series of facilitated workshops, where they were briefed on the constraints and opportunities of the project, and help them to articulate the concerns and aspirations in the neighbourhood.

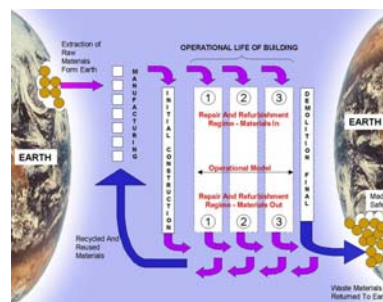
- Economic Priorities

The economic performance of an organisation is the key to its success and hence its ability to continue in business. Cost effectiveness is critical to the HKHA because decisions on the housing programme, whether design, construction, or operations and maintenance will have an impact on the public purse. The HKHA achieves cost-effectiveness through a number of measures, including the public listing of some of the assets and the constant review of management measures to get the best returns out of HKHA resources and sustain the useful life of the buildings. Enforcing tenancy controls is critical to reduce abuse of public housing. Refurbishment programme and allocation policies reduce vacancies in flats. The HKHA prolongs the service life of the stock by providing efficient maintenance and upgrading the housing blocks through the Total Maintenance Scheme.

In view of the large stock of buildings and large customer base, the HKHA has a culture of using simple designs and materials that are long-lasting, easy to care for and environmentally friendly. In 2002 to 2005, the HKHA commissioned consultants to study the life-cycle costing and assessment on typical domestic buildings. The study confirmed that the materials that the HKHA uses achieve an optimum environmental performance and life-cycle cost effectiveness. Designers are now using this tool to help their decisions on the choice of new materials in future designs, thereby reducing the maintenance burden in future.



Community Participation Design Workshops



Application of Life Cycle Costing Concept

3.1.3 Hong Kong Housing Society

Founded in 1948 as a non-government organization with a social mission, the Hong Kong Housing Society (HKHS) has been providing quality housing to the residents of Hong Kong for six decades. Today, the HKHS caters for the changing housing needs of the Hong Kong population and seek to improve the living environment to provide not just quality housing, but quality living. The HKHS is committed to developing sustainable housing by integrating social, economical and environmental considerations in the planning, design, construction, operation and maintenance provisions of housing projects.

Apart from being Hong Kong's first organization in housing development to be awarded the ISO14001 Certificate, the HKHS has introduced a number of sustainable initiatives in the projects over the years.

- Verbena Heights, a Rental and Flat-for-Sale housing development in Tseung Kwan O, won the HKIA Silver Medal in 1998 and the ARCASIA Gold Medal in 1999-2000 for its environmental innovations and achievements.
- Jolly Place, the first purposely-designed project under the Senior Citizen Residences Scheme, won the Quality Building Award 2004 for its innovative and sustainable concept and the excellence of the special features, medical facilities and caring services tailored for its residents.
- Moon Lok Dai Ha, built in 1964, was the first rehabilitation project for the HKHS' existing estates. Based on the sustainable principles, the HKHS decided to go for rehabilitation rather than redevelopment: Economically, the useful life of the estate could be extended for at least 20 years after rehabilitation. Socially, the daily living, family ties and social network of the residents could be maintained. Environmentally, rehabilitation would only produce one-tenth of those construction waste generated by redevelopment. The project was completed in 2006 with commendations from the residents and local community. The success of Moon Lok Dai Ha has demonstrated that rehabilitation under certain circumstances could be a better option than redevelopment. This project won the Green Building Award 2008 Grand Award –Rehabilitation.
- Kwun Lung Lau Phase I was a newly completed Rental estate in Western District. Environmentally friendly design and construction methods were widely adopted. Jump lifts, metal formwork, pre-casted elements, energy saving lightings, water saving facilities, sustainable and recycled materials, green slope, green roof and vertical greening were carefully integrated in the project.
- City Revitalization projects are to socially and environmentally enhance the urban environment. A successful City Revitalization model recently completed in Sham Shui Po created a very supportive environment among governments departments, District Councils and local residents. More than 10 City Revitalization projects are being planned and implemented.
- As a social mission, the HKHS launched the Building Management and Maintenance Scheme (BMMS) in 2005 to help private property owners to properly maintain and manage their properties. The HKHS is also implementing the Building Maintenance Grant Scheme (BMGS) on behalf of the Government to enhance the living environment for the elderly owners.

In the years to come, the HKHS will continue the efforts in helping develop and maintain a sustainable living environment in Hong Kong through implementing rehabilitation, elderly housing, city revitalization and other schemes.



Verbena Heights



City Revitalization – Sham Shui Po



Moon Lok Dai Ha (Before)



Moon Lok Dai Ha (After)



Kwun Lung Lau Phase I



Jolly Place

3.1.4 Hong Kong Science Park and Technology Parks Corporation

The Hong Kong Science and Technology Parks Corporation (the Corporation) has been contributing proactively to the green and sustainable development of its Hong Kong Science Park (the Science Park) projects at Pak Shek Kok both during construction and subsequent operation phase.

Initiatives have been taken to promote the widest possible environmental and sustainable awareness amongst staff, its partner companies and the general public especially the younger generation. To contribute to a healthier community and more livable urban environment, the Corporation has supported and sponsored activities promoting the use of solar energy and green building, and participated in demonstrating environmental applications to students and members of various environmental associations. Popular events held at the park recently included the “InnoAsia 07: Innovating for Sustainability”, and Hong Kong’s First Open Green Auto Circuit Competition “The Road to Zero Emissions and Sustainable Transportation”.

Awards

Buildings have been assessed by recognized professional bodies since 2002 and have been presented with the following awards in recognition of its success in achieving the best practice standards of sustainability and environmental designs and provisions:

- BEAM “Excellent” rating;
- AIB Intelligent Building Award 2003 for Buildings 1, 2, 4a, 4b and 5 in Science Park;
- Registration Certificates of the Hong Kong Energy Efficiency Registration Scheme for Buildings awarded by EMSD of the HKSAR for Phase 1 buildings;
- Indoor Air Quality Certification Scheme (Good Class) for all R&D office buildings in Phase 1; and
- Green Building Award 2006 for Merit of New Office Building Design (for buildings in Phase 1).

Environmental Considerations

- Green Environment

The master planning has created an extremely high ratio of open space to built space in a region known worldwide for its density. Features such as the central lake, the dramatic auditorium and extensive landscaping allow the occupants great freedom and space for interaction to exchange and develop ideas. The character established for each area defines the use and aesthetic of its sub-spaces which variously comprise specific and functional landscaped areas each of which, when combined, declares the green agenda.

With all car parking located underground, the ground level is freed for easy pedestrian access between buildings. Greater freedom of connectivity between buildings is created and opportunity enhanced for the provision of more extensive soft and hard landscaping, sitting areas and covered walkways to promote a park-like atmosphere.

With the current Master Layout Plan (MLP), the waterfront blocks in Phase 2 have been carefully sized, oriented and placed in order to maximise ocean views for up to 80% of the waterfront building perimeter. Each building is given the space and presence it deserves, while all are clearly visible from the harbour and waterfront promenade. Uniform in height and shape, the lowrises methodically dot rather than loom over the verdant neighbourhood. The row of roof forms, when viewed from a distance, forms a wave profile suggestive of the Park’s proximity to the seafront.

Phase 2 uses a zone approach with clear divisions between the Campus, Core and Corporate Buildings linked by a vehicular ring road which connects to Phase 1 and Phase 3. Orthogonal planning together with the careful placement and orientation of the individual buildings has encouraged the development of wide and open “view corridors” that enhance the development as a whole, allow light and air in eliminating any “wall effect” and capitalize on its waterfront location – the site’s principal asset.

Through the inclusion of these planning concepts, the MLP footprint embodies the principle concept of meeting the needs of the present without



Auditorium and Lake



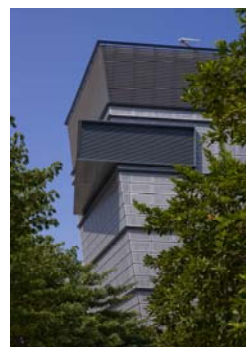
Building Integrated Photovoltaic System



Green Auto Circuit Competition



Amphitheatre



Energy Towers

compromising the opportunities of future generations, thus facilitating the long term cultural, socio-economic and environmental vitality, quality of life and health of the community. In order to capitalize on the green environment further, the Corporation has collaborated with the Government in its development of the waterfront promenade that bridges the Science Park with the Tolo Harbour.

- Sustainable Design

In the ever-increasing development of technology, adaptability to changes is a pre-requisite for the Science Park. To achieve this, a modular concept has been adopted incorporating the universal building feature for the laboratories and decentralized cores. Interstitial floors are introduced in the laboratories to enable grouping together of services, ease of maintenance works and services upgrades. They also free up usable floor space below. By using the universal concept in the space planning, sustainable flexibility to allow easy spatial re-organization of the building with minimal wastage or loss of energy efficiency and adaptability to accommodate the future tenants would be achieved in the building blocks. To make the environment visually stimulating, opportunities for maximising daylight penetration have been taken in the design. Natural light is provided whenever possible supplemented by artificial lighting to all buildings.

- Waste Minimization and Management

The Science Park is one of the pioneers in adopting a campus-wide automatic refuse collection system to centrally collect refuse / debris for Phases 1 and 2. Different shafts are used to separate general waste from paper waste. The system is very effective in achieving a clean and hygienic environment. Nuisance from odour, waste disposal and movements across the Park can be kept to a minimum. All forms of waste are stored in sealed containers before disposal to avoid exposure to open air in the Park.

- Energy Saving and Conservation

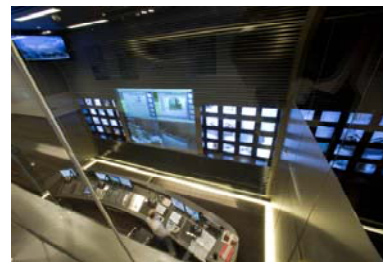
The Corporation aims to minimize energy consumption by adopting energy efficient, energy saving and conservation in building services (BS) design. The BS systems are controlled and monitored by intelligent building management systems enabling the most appropriate programme to be adopted in achieving the highest energy efficiency. Energy saving provisions such as automatic occupancy detection system, energy saving lamp/electronic ballast, VAV zoning & heat recovery facilities in the air-conditioning systems, etc. have been widely adopted.

The two energy towers house the central district air-conditioning equipments for the whole of Phase 2 that are fed to the buildings via underground services tunnels. Low ozone depletion potential refrigerant (R407C) is used for both the chillers and heat pumps. Some rejected heat from the air-conditioning chillers is recovered via heat pumps to provide low temperature hot water for space heating as an energy saving measure and reducing the heat discharge to atmosphere. Chillers are coupled to energy efficient water cooling towers. By providing a centralised system, capital, management and maintenance costs are reduced as less standby central equipment is required and items of equipment are clustered for ease of maintenance and operation. The chilled water systems are designed to provide full district cooling capacities to the whole of Phase 2. To provide small air conditioning part load capabilities without sacrificing the energy efficiency during part load, the main plant is divided into a number of small components. These components can be operated individually or in combination to match the part load demand. The chillers are selected particularly to cater for further part load without degrading the high COP.

Furthermore, the building envelope is a combination of concrete structure, low heat transmission curtain wall, sunshades, special metal roofing and skylight to achieve an OTTV of 17.9 - 23 W/m² which is significantly lower than the statutory permitted value of 30 W/m². Taking the case of Buildings 1 & 2, the reduction in heat transmission is in the region of 200kW which is roughly equivalent to the energy required for air-conditioning an office of 820 to 1000m² and bringing about an annual saving in electricity charges at around \$0.2 million.

- Water Conservation and Grey Water Recycling

Water conservation is a primary goal pursued through a number of actions. First is the adoption of electronically controlled water taps for hand washing and toilet flushing. Rain sensors have been installed in landscape areas to control the operation and consumption of irrigation water. Condensation collected from air-conditioning system and rainwater is recycled for flushing.



Building Management Office

- Clean Energy Supply

The Corporation is committed to promoting the use of clean and renewable energy sources. The building integrated photovoltaic system has been installed in Phase 1. It is the first on-grid system completed in Hong Kong with formal agreement from CLP Power for connection into its distribution grid. Not only does it showcase the state-of-the-art clean energy technology, it also promotes the high-tech image of the Park. Solar water heating is provided for the swimming pool and use of solar light for internal lighting application.

- Indoor Air Quality

Indoor humidity, dust and odour are also under control with the provision of chemical filters, UV disinfection, CO₂ sensors and humidifiers in the HVAC system.

- Environmentally Friendly Building Materials

The Park has built in as many low-environmental impact and resource efficient materials as possible to minimize potential impact on the environment. Semi-precast concrete slabs and reusable formwork systems have been used in all the buildings to reduce timber consumption and waste generation.

Besides, in Phase 1, environmentally friendly paving blocks recycled from waste glass and soil have been used. Wherever practical, the surface materials are permeable (grass, granite sets and timber). Certified sustainable timber has been widely used in Phase 2.

In addition, ceiling panels made from waste glass instead of mineral fiber have been adopted. Commonality of materials and systems has been introduced to speed up procurement and reduce the overall quantity of spare parts required.

- Reliability and Maintainability

System reliability and maintainability policy have been adopted in the provision of BS systems. The underground service tunnels are provided in the Park for running the major water pipes, electrical cables, bus ducts and the refuse conveyance pipes. Apart from minimizing the disruption of operation to all tenants during maintenance, it enhances the efficiency of daily operation and management and in turn saves some staff resource employed.

A further benefit derived from these features is that the vibration-control performances of the Phase 2 buildings are enhanced by the absence of the vibration-inducing mechanical system sources which are normally found on the rooftops of buildings in Hong Kong.

- Control Environmental Impacts During Construction

During construction, various sustainable design methodologies have been considered to minimize the direct and indirect impact on the environment. The Phase 2 project has been selected for the Considerate Contractors Site Award for 2006.

3.1.5 Urban Renewal Authority

The Urban Renewal Authority (URA) endeavours to redevelop dilapidated buildings into new buildings of modern standard and environmentally-friendly design, and to promote sustainable development in the urban area of Hong Kong.

Whilst pursuing excellence in project planning, building design and construction standards in redevelopment projects, the URA also places strong emphasis on environmental friendliness, maintenance efficiency and durability. Environmental and social benefits such as open space and community facilities are achieved through careful replanning and rebuilding of the redevelopment sites. About 20,000 m² of open space have been/are being implemented in the 37 redevelopment projects commenced by the URA since its establishment in 2001, providing much-needed planting coverage ranging from about 30% to 60% for the enjoyment of the public.

Impacts on the neighboring environment are assessed and mitigated during the planning stage of redevelopment. If necessary, environmental assessments such as air ventilation assessments and daylight studies would be conducted. During the implementation stage, appropriate measures are implemented to minimize nuisance to the environment. These include adoption of environmentally-friendly demolition methods to minimize generation of noise and dust, and use of non-percussive piling systems to minimize generation of noise and vibration.

It is the URA's established policy to incorporate into the design and construction of its redevelopment projects appropriate environmental provisions such as:

- energy saving facilities, e.g. natural lighting, natural ventilation, energy efficient building services, domestic appliances with energy labels;
- water conservation installations, e.g. low water consumption sanitary fixtures and fittings, systems collecting rain-water and air-conditioning condensate for watering plants and cleansing;
- "green" features promulgated by the Government, e.g. balconies, utility platforms, wider corridors, and sky-gardens;
- environmentally-friendly building materials, e.g. re-cycled landscaping materials, insulation materials and refrigerants with nearly zero ozone depletion potential;
- facilities for collection of recyclable domestic wastes;
- reduction of construction waste and environmental nuisance, e.g. pre-fabricated external walls, dry-walls, on-site sorting of demolition materials; and
- extensive and well-planned greening.

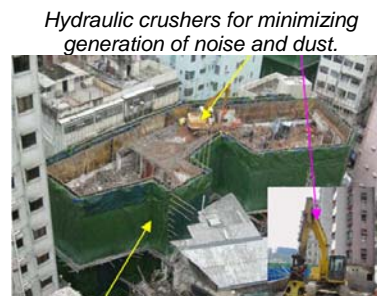
The URA has also actively explored the possibilities of providing vertical greening in its re-development projects. It recently completed a consultancy study on vertical greening which recommends practical means of implementing vertical greening in its redevelopment projects. In addition, the URA's first large scale green wall of about 800m² was recently installed at its Vision City project in Tsuen Wan Town Centre.

In recent years, the URA's efforts have been recognized by the BEAM rating of Platinum for its Mount Davis 33 project in Ka Wai Man Road in 2006/07 and its Vision City project in Tsuen Wan Town Centre in 2007/08.

Looking ahead, the URA stands ready to expand on its effort in environmentally-friendly building design and promotion of sustainable development through its urban renewal program.



Open Space at 8 Waterloo Road
Area of about 18,000 ft² (40% of total site area) with 60% planting area provided



Hydraulic crushers for minimizing generation of noise and dust.

Heavy duty tarpaulin sheet for noise absorption

Project H15 – Lee Tung Street



Vertical Greening at Vision City Vertical Greening

3.2 Private Sector

There are a number of leading private-sector developers in Hong Kong, which consider the protection of the environment as one of the most pressing issues facing our world today and regard sustainable development as a fundamental aspect of sound business management. It is not only economic and political developments that will shape the business, but increasingly social and environmental factors as well. Examples include the following:

Hongkong Land

Hongkong Land has been actively developing initiatives, capability and knowledge of sustainability since the last decade. The commitment has been to apply environmental friendly practice wherever practical in the design, construction and management of buildings and their surroundings for the benefit of tenants, employees, the local community, shareholders and the environment. The objective of on-going sustainability programmes has been to integrate viable long-term, sustainable practices as part of the business platform in a way that is measurable, accountable and beneficial to the business partners and shareholders. In addition, it also needs to emphasize best practices, leadership and innovation. Below is a brief summary of main programmes and how these seek to minimise our adverse impact to the environmental.

- **Green Buildings**

The built environment has a profound impact on our natural environment, communities, health and productivity. With this growing awareness of the impact on the built environment and breakthroughs in building science, technology and operations, a number of recognised industry standards, design initiatives, and operating practices have been developed since early 1990. These industry standards are commonly referred to as green building assessment schemes, and seek to aspire beyond government of regulatory requirements, and provide definitive benchmarks for what constitutes a "green building".

Since its initiation in 1996 and originally based on the UK BREEAM Standard, BEAM (Building Environmental Assessment Method) has been the recognised standard in Hong Kong. This has been the spearhead of their own programme with assessments being carried out in both new and existing buildings across their portfolio, as such addressing the lifecycle of the built environment. Of their portfolio of 11 office buildings, nine have undergone assessment and achieved the highest rating upon award with a further two Gloucester and Edinburgh Towers currently under assessment.

- **Kill-A-Watt: Energy Management Programme**

Annually across the portfolio, Hongkong Land consumes around 108 million KWH of electricity. Via the associated indirect emissions from power stations, this electricity consumption is responsible for 98,280 tonnes of carbon dioxide being released into the atmosphere. Hongkong Land recognised that adoption of greater energy efficiency is one of the quickest ways to reduce emissions. As part of their structured "Kill-A-Watt" Energy Management Programme, they have targeted a 10% reduction per sq. ft. in consumption across the portfolio over a four-year period, 2006-2009.

This target is supported by a programme to audit all buildings within the four-year period, with five buildings being audited to date. Staff has also been encouraged to act in an energy-conscious manner and to suggest energy projects under the Chairman's Energy Award Scheme. Five awards were given in 2006/7 for energy projects with payback of within six months or less. Currently some 35 energy conservation measures including upgrades to building services and operative changes are in progress moving Hongkong Land towards their targets. During the initial two years of the current programme, a 6.3% reduction in consumption per sq. ft. was achieved against our baseline (based on LEED assessment). Indirect emissions of 5,827 tonnes of carbon dioxide were also saved, equivalent to getting 1,099 cars off the road per year.



York House, the latest addition to Hongkong Land's central portfolio received a Platinum Beam rating upon completion in 2006.



"The construction of Chater House involved extensive advanced techniques to improve quality, cut waste and raise safety standards for workers"
- James Robinson, Executive Director, Hongkong Land.

Projects initiated to reduce energy consumption and indirect emissions include the following:

- Installation of condenser cleaning systems for chillier condenser tubes;
- Upgrade of Direct Digital controls for variable air volume air-conditioning system to optimal control and efficiency;
- Tuning of automation refrigerant pressure to ensure chillers operate at optimal level;
- Lighting upgrades to high efficiency fluorescent T8s and electronic ballast;
- Fitting of variable speed drives (VSD) to pumps and air handling units for optimal efficiency at low loads;
- Educational programmes and toolbox talks; and
- Switching off or turn down of equipment outside periods of use.

- **Indoor Air Quality**

To ensure optimal conditions for the delivery of conditioned air to the premises, Hongkong Land employs an active programme of maintenance, source control and air cleaning for air-conditioning systems. For further assurance of actual performance, Hongkong Land has sought certification under the Hong Kong Government's Voluntary Scheme, known as the Indoor Air Quality Certification Scheme for Offices and Public Places and has achieved certification for nine of their 11 office buildings, with Chater House and York House currently undergoing assessment.

- **Waste and Recycling**

Buildings generate significant quantities of waste. Source reduction, reuse, recycling and other waste diversion strategies reduce both the volume of waste going to landfills and the use of virgin materials and are an important part of sustainable building operations. Within their managed portfolio, Hongkong Land recycles paper, plastic, aluminium and fluorescent tubes. In order to enhance the recovery of paper for recycling, Hongkong Land recently rolled out a voluntary programme across the portfolio that encourages clients to place recycled paper material into a recycling boxes provided by Hongkong Land. This will provide better separation at source and avoid the co-mingling of different waste products.

- **Green Cleaning across Common Areas and Office Premises**

Hongkong Land works closely with the cleaning contractor's on a cleaning process that aims to extract the maximum amount of bio-contaminates and particles from the premises during cleaning in the most benign way. This embodies the idea of going beyond the simple appearance of cleanliness. As Hongkong Land also cleans tenants premises, this programme has been adopted across the whole building platform. Modelled on best practices from the US Environmental Protection Agency and Johnson Diversity, features of this programme include the following:

- Vacuum cleaners are specified to the American Carpet and Rug Institute Green Standard and fitted with HEPA filters;
- Change of process and minimisation of product where relevant;
- Cleaning products are the least toxic (or benign), with most being accredited under the US Green Seal or Nordic Eco label; and
- These processes are adopted across the building platform in both common and tenanted areas, a key component of a healthy, high-performance cleaning regime.

- **Building a Green-Savvy Team**

A key component in delivering and ingraining sustainability into a business platform is staff education. "Greening your people" is important in building capacity and encouraging change and represents one of the more tangible challenges of any sustainability programme. Hongkong Land conducts toolbox talks and outlines policies and objectives to all operational and technical staff. Hongkong Land also supports staff attendance at relevant conferences and courses. A recent example is the Certificated Energy Managers (CEM) Course, where some six engineers from the technical team attended in 2007.

Hongkong Land is also a member of the BEAM Society, Business Environmental Council and the Climate Change Business Forum, all of which have helped gaining the accesses to latest developments from industry advisers as well as the opportunities to learn from the experience of other participants.



Recycling boxes have been provided to all office tenants to encourage separation at source and greater recovery of materials.

Swire Properties

Swire Properties has undertaken various sustainable building initiatives in property development and property management since the founding of the company more than 30 years ago and has continued to do so today. Swire Properties has always integrated environmental considerations into building designs and layouts from the first to the latest development. For example, designs maximise energy efficiency by making best use of natural lighting and employing sensors to turn off lights when not in use, by using energy-efficient lighting and equipment, and by including sunshades and glazing with low thermal transmission to reduce heat gain and lower air-conditioning loads. These measures minimise the impact of power generation on the global and local community.

Through the years, the Company has received the 'Excellent' rating* of BEAM as follows:

- 1998: Lincoln House
- 1999: One Pacific Place, Oxford House, and Devon House
- 2000: Dorset House
- 2001: Two Pacific Place, Cityplaza Three, and Cityplaza Four
- 2002: Cityplaza One
- 2003: Cambridge House (the highest score achieved) and The Orchards (the first urban residential development to receive an 'Excellent' rating)
- 2004: Three Pacific Place
- 2006: Festival Walk (a 'Platinum' rating achieved)
- 2008: One Island East (provisional rating of "Platinum" achieved)

Other examples of property development include the following design aspects:

- **Taikoo Shing**
The first residential development in Hong Kong to integrate landscaping into the design some 30 years ago.
- **Piazza Verde & Via Fiori**
Adjacent to the Cityplaza retail and office complex in Taikoo Shing, Piazza Verde and Via Fiori are two public areas with seating and shaded areas designed to enhance the leisure time of both residents and office workers in Island East. Via Fiori, the open space adjacent to Taikoo Shing Road is now undergoing a major renovation to go in line with the development of the latest commercial building, One Island East.
- **Pacific Place**
In 1986, Swire Properties made a commitment to the Government to take all necessary precautions to protect a Banyan tree located on the site. It was also agreed that expenses incurred in protecting the tree would be borne solely by the Company. In ensuring its protection, Swire Properties spent approximately HK\$24 million, not to mention the tremendous time and effort expended by staff and colleagues. These facts probably make this 130-year-old Banyan the world's most expensive tree!
- **The Albany**
Built in 1990, this luxury residential development included pioneering sky gardens on two levels. Sky gardens are now actively encouraged by the Buildings Department as a green feature.
- **TaiKoo Place**
Natural light is used wherever possible to reduce the consumption of electricity. Lincoln House was the first building in Hong Kong to achieve an 'Excellent' rating under BEAM. Some of its features include extensive use of natural light; double glazing to reduce noise and solar heat gain; and a heat recovery wheel, which recovers energy from exhaust air systems to pre-cool fresh air before it enters the air-conditioning system.
- **One Island East**
In 2005, a Building Information Model (BIM) was adopted. This 'Digital Project' modelling tool provides 3-dimensional information on the buildability of a design during the planning stage, and therefore minimised potential abortive works due to clashes, subsequent waste generation as well as cost and time. The system is effective in detecting 'clashes' between building elements during the design stage. By the end of 2006,



Taikoo Shing – Design integrating landscaping



Retaining Banyan tree at Pacific Place during construction

3,328 clashes had been identified for the project, thus avoiding the generation of 250m³ of potential waste volume and achieving HK\$11 million in savings.

With respect to construction and demolition, all building materials, construction methods and systems for the Company's developments are carefully selected to minimise impact on the environment.

- **Project communication system**

For new projects since 2001, project teams have been using an online project extranet system. Project managers, consultants and building contractors are able to access the system at any time from anywhere for project communication, review and decision-making. The system can increase efficiency in communication, transparency for project data and accountability, while minimising paper use throughout the project.

- **Environmental Procurement**

Timber from a sustainable source is encouraged as this avoids depletion of natural resources.

- **Pre-fabrication**

Swire Properties' use of pre-fabricated elements, minimal waste trades and recycled materials can help to minimise construction waste.

- **Construction Management Systems** – Swire Properties also works closely with contractors to implement an Environmental Management Plan and Waste Management Plan in order to reduce the impact of noise, dust, water pollution and waste from construction sites.

Examples of minimizing environmental impacts on construction sites include:

- **Cambridge House**

Overhead nozzles for dust depression and wheel wash were installed at the site entrance to minimise air pollution, while water collected from these devices and from the temporary drainage system for the stairs were treated and recycled by the on-site construction water recycling plant, which helped reduce water consumption throughout the construction process. Proper chemical storage and use of non-lead paint minimised impact on the environment, and waste separation and recycling facilities helped reduce material wastage. The use of jump lifts, M&E prefabrication and semi-precast structure have significantly improved speed, quality, safety and environmental control of the construction work for this 36-storey office building.

- **The Orchards**

The impact of the development on the local environment during construction and operation was carefully considered since the site-planning phase of this residential project, in areas such as microclimate, air quality, noise impact and transportation and pedestrian access. The Company also conducted a thorough analysis of the lifecycle costing of this project before and during development. Various construction practices, such as the adoption of prefabricated elements for building façade and balconies, were thoroughly explored to locate methods best suited to the nature of the development and the surrounding area while minimising impact to the environment. The project was the first urban residential development to receive 'Excellent' rating of the BEAM.

- **Three Pacific Place**

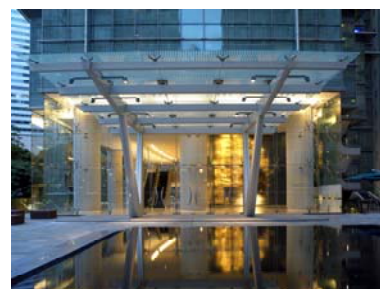
Construction Design Management (CDM) philosophy was adopted. Systemised formwork such as aluminium table forms, self-climbing hydraulic climb forms and steel column moulds were used not only to ensure quality of construction but also minimise consumption of timber and the production of waste as well as provide a safe workplace for workers. A first of its kind, waste water recycling system for automatic dust suppressing refuse chamber utilised treated site effluent for debris and rubble handling. Prefabricated wall and pipe risers were adopted to enhance quality and minimise wastage. This is also one of the first projects to adopt electronic-tendering for construction contract procurement.

- **One Island East**

At the demolition stage, this project adopts a non-percussive demolition method, which is environmentally friendly and minimises impact on the nearby residential and commercial areas neighbourhood. The concrete crusher will cause less noise, dust and vibration, as well as consume less water in the process. Health and safety standard on site is further improved. Reusable demolished materials such as crushed concrete, reinforcement steel bars, electrical wires and metal are collected and



Precast wall segments used in facades of The Orchards



Three Pacific Place

sorted for recycling to reduce construction waste.

Swire Properties ensures that environmental consideration is given not only to the planning, design and construction of development projects but also to the operation and maintenance of all its facilities and services. Examples include:

- **Waste Management**

In Taikoo Shing, hopper or waste chute rooms were renovated to provide compartments for waste separation, enhancing efficiency in waste recycling. In Island Place, an innovative compactor is installed for compressing and reducing bulk of discarded plastic bottles and cans to facilitate waste recycling, which also won the Award for Innovation in the Source Separation of Domestic Waste 2006/07 as presented by Environmental Protection Department.

Swire Properties takes pride in its leadership in providing excellent property management and in striving to improve upon current environmental standards in the following areas:

- **Demand Side Management**

Swire Properties has been actively working, together with utility companies and the Government, on various programmes which can reduce energy consumption. Such initiatives include:

- Energy Management (across Swire Properties' portfolio);
- The use of energy efficient fluorescent tubes and electronic ballasts in its buildings;
- The use of more energy efficient variable speed drives; and
- The use of water cooled air conditioning systems which require significantly less energy than air cooled systems.

- **Energy Saving Measures**

Swire Properties has a dedicated Energy Efficiency Team, which is committed to developing measures and monitoring energy conservation programmes for its business activities. Energy efficiency is reviewed continuously throughout the buildings' life cycle. Continuous improvement of energy performance has always a key consideration. What makes Swire Properties' energy management system different is that they act on information and researches. In recent years, Swire Properties is proactively implementing a "Best in Class" exercise to combat Climate Change, benchmarking best practices with international leading property development and management companies that are recognised as leaders in this aspect. Overall, Swire Properties' efforts include:

- A comprehensive energy database has been developed for each building where energy data are transformed into useful information for energy monitoring and research;
- A Fault Detection and Diagnosis software has been developed and which can automatically detect malfunctioning of VAV boxes and chillers to ensure energy usages are optimised;
- Action research projects for optimising plants are on-going. Swire Properties has reduced its overall energy consumption of commercial buildings by 6.5%, amounting to a reduction of 15,000 MWh and 10,500 tonnes of greenhouse gas emission a year since 2002.
- Swire Properties has established a building energy efficiency research fund, at HK\$1 million a year for the coming three years, and is carrying out projects with Tsinghua University on optimisation of plant efficiencies with the aim to further reduce energy consumption and carbon dioxide emissions;
- The use of automatic tube cleaning equipment for improving the heat exchange efficiency on the chillers; and
- Liaison with tenants to develop measures which can reduce energy consumption in their premises, through briefings and publications.

- **Indoor Air Quality (IAQ)**

Swire Properties is a major provider of commercial buildings in Hong Kong. To ensure a high standard of air quality in its buildings, Swire Properties has adopted various practices:

Internal Guidelines: Swire Properties has internal guidelines for measuring indoor air quality. The guidelines are used for screening purposes, to identify whether any further investigation is required. When further measurement is needed, Swire Properties normally commissions an independent third party to conduct tests. In Swire Properties' guidelines, the following parameters are measured:

- Carbon dioxide (CO₂) fresh air supply quantity; and
- Respirable suspended particulates (RSP). The results from measurements are mostly within acceptable levels.

Liaison with Tenants: Swire Properties also works with tenants to reduce

the use of such products as formaldehyde and solvent based paints which can affect IAQ. Swire Properties provides tenants with Fitting Out Guidelines and Environmental Guidelines for this purpose.

Industry Benchmarking: In addition, Swire Properties is working with the Environmental Protection Department to refine a voluntary standard on IAQ for use in buildings across Hong Kong.

4. Status of Education and Training in SB

4.1 Academic Institutes

The promotion of sustainability education could be found in majority teaching and learning curriculum in Hong Kong's tertiary institutions. It is evident that the study of sustainability related to the building and construction industry has become an integral part of the teaching as well as research curriculum as well as profession-related activities. The following is a highlight of these activities from four academic institutes in Hong Kong.

4.1.1 Department of Architecture, the Chinese University of Hong Kong (CUHK), Department of Architecture, the University of Hong Kong (HKU), and Department of Mechanical Engineering, the University of Hong Kong (HKU)

A Shared Mission

It is always the goal of the curriculum to provide undergraduate and professional graduate students a proper learning environment to understand the principle and acquire the implementation skills of sustainable building design and planning. In order to reflect the needs of the professional practice, case-based learning has been adopted to introduce students the overall framework of sustainable design, and also to assist students to know the possible strategies to integrate the architecture design with the sustainable building concepts. Since the development of sustainable built environment will be a long-term task for young professionals, the school is trying to lay the foundation to support the graduates to carry out continuous learning in their professional years. Meanwhile, the school also encourages the faculty members to link their research activities with teaching curriculum for senior students, and this approach could explore the students to the research methodologies of subject areas.

The following is a quick summary to illustrate the approach to implement sustainable building design in the curriculum and research:

• Foundation Courses

For the lower year students, foundation courses in seminar format have been provided to help students to develop their basic knowledge regarding the sustainable building design. Examples can be the Introduction to Environmental Design, Building Services and some topics of Professional Practice.

• Advanced courses

For the M. Arch. professional program, students have the opportunity to engage with issues and challenges of sustainability by means of individual efforts.

• Research electives

For students who are interested in the special topics in sustainable building design, they could propose research ideas to individual faculty members to conduct independent research study.

• Studio integration

Architectural and Urbanism Studio has been one of the main platforms to integrate environmental design knowledge in the process of architectural perusals.

• Postgraduate Research Students Activities

Typically, sustainability is one of the main foci of the postgraduate program at both universities.

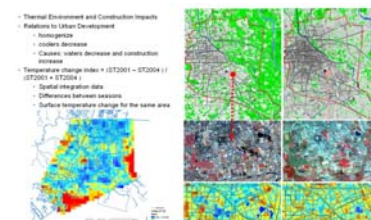
• Research activities

Since research plays a crucial role in the development of domain knowledge of sustainable building design, several faculty members have formed specific research groups to work on public-funded or contract-funded research.

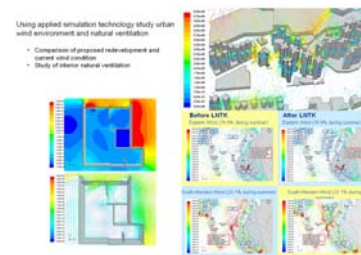
The following are research and teaching examples from the HKU:

• Building energy efficiency and urban air environment

Improved clean energy utilization is crucial for both improving energy efficiency and reducing air pollution. Improving energy efficiency in different industry sectors is now the most important national strategy in China today. Energy efficiency is now the bottle neck of energy policy in China, and the Chinese government has set a goal of reducing energy consumption per unit GDP by 20% in the 5-year period from 2006 to 2010.



Remote Sensing and Sustainable Planning - CUHK



Micro-climate Study: Urban Wind Environment and Natural Ventilation



Sustainability found in an Urban Infill proposal, Master of Architecture Thesis, HKU



An Urban Ecological Observatory, Master of Architecture Thesis, HKU



Adaptive Reuse, Master of Architecture Design Studio, HKU

Buildings consume 19% of the total energy consumption in China in 2005 and it was 13% in 1996. This ratio is expected to rise to 33% in the next 10 years. As one of the most energy efficient cities in China, Hong Kong offers a unique opportunity for developing urban building energy efficiency strategies in China.

- **Focus on building energy efficiency research in mega-cities**

Hong Kong is the ideal place for such a study. Rapid urbanization is currently under taking in the Mainland China. In 2000, there were 379 cities with a population of > 100k, 130 cities >1 million, 6 cities >5million. There are 40 billion m² buildings in 2005, and by 2020, 30 billion m² more buildings will be built. At the same time, 20 of the world's 30 most polluted cities are in China today, largely due to high coal use and motorization. In addition to investigating different building energy efficiency measures such as solar technologies, passive design, new lighting, efficient mechanical systems etc., students are trying to understand the future heat island effect in our cities, and future building design and urban planning should consider these effects. The hypothesis is that there is a need to predict the future heat island effect and air ventilation in the cities, and future building design and urban planning should consider these effects. The preliminary objectives are to develop a fundamental understanding of ventilation flow rates and heat island phenomenon for dense high-rise cities, and/or a part of a city, due to wind penetration, canopy "roof" turbulence exchange and buoyancy-driven flows (i.e. natural ventilation of a city), as well as to develop an understanding of how the future urban heat island and air ventilation in cities like Hong Kong will affect the energy consumption of buildings as well as future building energy and environmental design.

- **Focus on the rural home heating technology transition in the Mainland**

Urban building heating now constitutes 25% of total building energy consumption in China. It is also known that home heating is the largest energy consuming sector in building energy consumption in the US and Europe. But there are still nearly 200 million rural populations waiting to be provided with new heating systems in their home in China. Students have identified that rural heating transition will be the most crucial sector in the building energy consumption in the Mainland China. Most of the existing relevant research efforts in China have focused on residential, commercial and public buildings in the urban environments, but not in rural homes, where more than 70% of the Chinese population (i.e. about 910 million people) live and work. Chinese rural buildings have a tradition of using what's been now considered as sustainable approaches such as natural ventilation, biomass etc. However, such tradition and culture is being challenged by modern development. For example, the proportion of biomass use by rural population in China was reduced from 84% in 1980 to 56% in 2002, replaced by coal, electricity and gas.

Teaching and Education

- **Related university courses:**

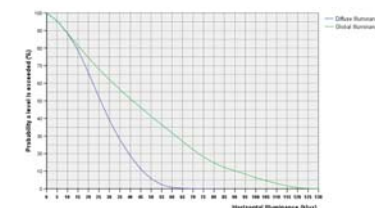
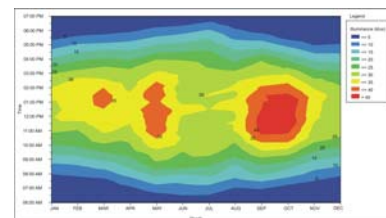
- Arch 5303: Sustainable Building Systems (Guest Lecture to HKU Architecture), <http://www.hku.hk/mech/cmhui/sbs/index.html>
- YMEH0001 Engineering for a Sustainable Built Environment, <http://www.hku.hk/mech/broadening/sbe/index.html>
- YARC0002 Sustainability in the Built Environment, <http://arch.hku.hk/teaching/sbe>

- **Training courses conducted:**

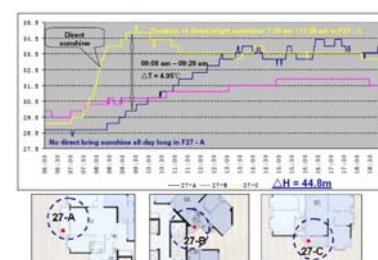
- Sustainable Architecture: Concepts and Techniques / Energy Efficiency in Buildings
- Building Energy Codes and Energy Performance Evaluation
- Introduction to Building Performance Simulation / DOE-2 Building Energy Simulation
- Building Simulation Techniques for Architects and Related Professionals
- Advanced Computer Simulation Tools for Building Design and Analysis
- VisualDOE - A Green Design Tool

- **Web-based information systems:**

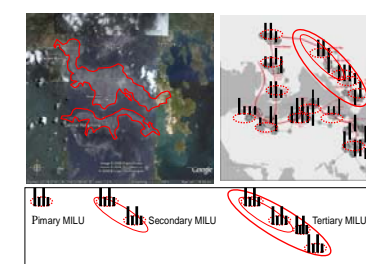
- Studies on Sustainable Buildings, http://www.hku.hk/mech/sbe/case_study/index/top.htm
- Web Links on Sustainable Buildings, http://www.hku.hk/mech/sbe/web_links/index.html
- References on Sustainable Buildings, <http://www.hku.hk/mech/sbe/refs/index.html>



Doctoral work on the study on daylight availability and cumulative frequency in Hong Kong



Doctoral work on the study on daytime temperature pattern Horizontal comparison



Doctoral work on the study of sustainable city (the application of MILU in Hong Kong)

4.1.2 City University of Hong Kong

Under the Faculty of Science and Engineering, the Department of Building and Construction (BC) and the Division of Building Science and Technology (BST) are the two academic units at the City University of Hong Kong mainly responsible for the dissemination and generation of knowledge and skills in the various aspects of sustainable building.

- Department of Building and Construction (BC)**
 Offering degree programs at the bachelor, master and doctorate levels, BC students are presented with the opportunity to study a wide range of courses regarding sustainable building. These courses, taught by leading experts, require students to develop critical and analytical skills in sustainable building through experiments, case studies, research, applications and computer simulation techniques. Samples of these courses: *Building and Environment*; *Advanced Construction Technology*; *Sustainable Architectural Design and Development*; *Green Building, Architecture and People*; *Intelligent Building Assessment*; and *Built/Natural Environment Harmony*. BC also offers a Master of Science in Building Engineering (Intelligent Building) program, an advanced degree specializing in intelligent building systems, technology and assessment.
- Division of Building Science and Technology (BST)**
 At the Associate Degree level offered by the Division are fundamental aspects of sustainability related to the four programme subject areas of architectural studies, building services engineering, construction engineering and management, and surveying. Besides acquiring key knowledge and skills in sustainable building through lectures and seminars, students are given abundant opportunities to applying them in different situations, e.g. use of computational fluid dynamics (CFD) softwares to study ventilation, use of a heliodon to evaluate passive solar design strategies, regeneration of old buildings, etc.



Left: Student project - revitalisation of Mei Ho Estate

Middle: Student project – green office design

Right: Study of photovoltaic panel during a visit to Tokyo



Left: Students working on drum tower reconstruction in Guizhou;

Middle: Winning entry in Ideas Competition for Mei Ho House;

Right: Honourable Mention in Student Sustainable Project Award

4.1.3 Department of Architecture, Chu Hai College of Higher Education

Since formally accredited by the Hong Kong Council for Accreditation of Academic and Vocational Qualifications (HKCAAVQ) in 2004, the Bachelor of Science in Architecture (Hons) degree offered by the Department of Architecture of Chu Hai College of Higher Education has been emphasizing the importance of sustainability concept in architectural design training. The Sustainability Stream provides knowledge for understanding and exploration in the new realm of sustainability with an emphasis on the holistic approach embracing the socio-cultural, economic and technological sectors. Students are exposed to both mechanical and computer applications and are required to be aware of the respective use for the architecture field.

In the first year final projects, students are required to produce an environmental responsive house. The program calls for a design that embodies the parameters of fundamental environmental aspects, including solar heat gain, breeze direction and temperature control in a hypothetical site. Students design a house according to the given program, and modify the design through different experiments with on-site tests (Fig.1 and 2) and heliodon application.

In the first semester of year 2007-08, the theme sustainability was expanded from environmental to social, economic concerns. Collaborated with founders of 'Ventures in Development', a Harvard University Business School award-winning social enterprise project, the final year students joined the 10th National Universities Academic and Science Competition. It was valuable for students to propose design based on real brief in the poverty nomad area in Yunnan and Qinghai in China, accompanying a long-term goal of achieving sustainable development in these regions. The aim was to set up an attentive circus that would make use of the less attentive raw materials extracted from yaks biomasses to generate energy and hence income for the nomads.

To sum up, the education of the concept of sustainability has been expanded from pure environmental and mechanical concerns to the one that embodies social, economic and technical aspects in the senior years. It is with a hope that through the studio assignments and electives, students' interest towards the subject is raised and the discourse of contemporary concept of sustainability is opened.



4.2 Professional Institutes & NGO

This section is a summary of work by professional institutions and NGO that are continuously committed to sustainability. Their contribution is seen in the professional training of practitioners through classes, seminars and conferences.

4.2.1 Business Environment Council (BEC)

BEC is a lead partner for the ***Integrated Built Environment Quality Management Program***, a cross-disciplinary program being led by the City University of Hong Kong to enhance skill sets in energy efficiency, safety, hygiene, as well as ventilation and central air-conditioning operation and maintenance. Running from June 2007 to July 2008, the program targets local facility managers, building engineers, IAQ inspectors and OSH practitioners, and is funded by Government's *Professional Development Services Assistance Scheme* (PSDAS). BEC is providing organizational support and, via the BEC IAQ Solutions Centre and BEAM, expert speakers for the various events.

Examples of BEC course activities:

- Indoor Environmental Quality: 2-day seminar, June 2007 (200 people)
- Energy Efficient Systems: 2-day seminar, August 2007 (200 people)
- HVAC Management & Maintenance: 2-day seminar, October 2007 (200 people)
- Integrated IEQ Management Training: late 2007 (Eng. 8 wks); mid 2008 (Chi. 2 wks)
- BT2008 International Conference: 4th - 6th Jun 2008 (200-300 people)
- Hong Kong, Beijing / Shanghai Field Trip: July 2008 (one week, 50 people)

4.2.2 The Hong Kong Institute of Architects (HKIA)

The HKIA has founded its committee on environment and sustainable development since 1998. One of the key tasks of the committee is to promote CPD events on sustainable buildings for the members.

Greening CPD Events

In 2000, a comprehensive CPD program coined as "Greening 2000" was launched. The annual program encompassed a series of seminars, workshops, site visits and forum to raise the awareness of sustainable development and to share the know-how in the practice. A highlight of the program was the Green Tour to Germany and the Netherlands, ended with the delegation to the World Conference SB2000 in Maastricht, the Netherlands.

Green Tours

The "Greening 2000" has set a model for the subsequent CPD events on SB in recent years. The subsequent Green Tours included 2002 Nordic, 2004 Brazil & Peru, 2005 Japan, 2007 Beijing, and 2008 Australia. These excursions provide an excellent platform for experiencing in-person the latest development of SB in different parts of the world. There is also travel scholarship for architecture students to participate in these Green Tours.

Sustainable Architecture Student Project Awards

To heighten the awareness of sustainable architecture among the future architects, a student award program has also been launched since 2007. It honours outstanding student design studio or research projects which advocate the principles of environmentally responsible and sustainable design. The award is divided into two categories: undergraduate division and graduate division.

4.2.3 The Hong Kong Institution of Engineers (HKIE)

Engineers have an important role to play in the advancement of sustainability concepts that are critical to the future of our future generations. Engineering educators have a duty to put students on this path. The HKIE is the internationally recognized body for the accreditation of undergraduate engineering degree programs in Hong Kong. This recommends that graduates of programs accredited by any of the signatory bodies be recognized by the other bodies as having met the academic requirements for professional practice of engineering.

In the past few years, HKIE and a number of universities in Hong Kong have conducted a series of educational workshops and forums for the incorporation of

sustainable design strategies into construction projects. These workshops covered sustainability topics such as construction design processes, site selection, energy efficiency and indoor air quality. For instance, in 2003, the City University of Hong Kong, in partnership with the Canadian Chamber of Commerce in Hong Kong, launched the *Hong Kong Sustainable Development Index (HKSDI)*, which was designed primarily to measure the progress of sustainable development in Hong Kong. Public awareness and support, which drives public policy, is critical in the promotion and acceptance of sustainable buildings. Changing people's mindset and attitude requires a sustained effort and education at all levels must be geared up to take up this challenge.

4.2.4 Professional Green Building Council (PGBC)

One of the three key objectives of PGBC is to organize research seminars and training courses in green building design and technology. Since its inauguration in 2003, PGBC has offered various CPD seminars, workshops, design charettes, site visits, symposiums, and conferences on SB for both the professionals and/or the general public. PGBC believes that the education on SB is important for not only building professionals but also other stakeholders and the people in the street.

Local Series

In Hong Kong, PGBC organized the symposium on SB on an annual basis. The symposiums include the following themes relevant to the topical local issues:

- 2004: Green Building Labelling
- 2006: Urban Climate + Urban Greenery
- 2007: Zero Carbon Charter

PGBC has also founded the **Green Building Award (GBA)** since 2006. On top of the objectives to provide recognition to building and related research/planning projects with outstanding contributions in sustainability and to encourage adoption of sustainable planning, design, construction, maintenance and renovation of buildings, the awards represent excellent opportunities for educating both the professionals and the public about the latest development of SB. The GBA is being organized on a biennial basis.

Mainland Series

Since 2004, PGBC has also established a series of joint symposiums on SB with individual Chinese cities almost on an annual basis. Started with the exchange and training event with Shanghai in 2004, the symposium was subsequently jointly organized in Guangzhou and then Hangzhou. PGBC believes that the extension of education and exchange program to Mainland China is of profound importance.

International Series

PGBC further leads the Hong Kong delegation to participate in the World Conference on SB, including SB05Tokyo and SB08 Melbourne.

5. Status of Adopting New SB Technologies & Techniques

5.1 Public Sector

5.1.1 Electrical and Mechanical Services Department

Electrical and Mechanical Services Department (EMSD) has an operating structure organized along two service lines, Trading Services and Regulatory Services. The Trading Services arm provides a wide range of E&M engineering services from consultancy and design to operation and maintenance for government departments and public bodies in Hong Kong. The Regulatory Services arm safeguards public safety through implementing a set of comprehensive regulatory framework and systems on electrical, mechanical and gas installations, monitors the operation and development of public utilities, as well as promotes energy efficiency and conservation.

Sustainable Operation & Maintenance

At Trading Services, the mission of giving the community a better quality of life represents an underlying principle of operation of EMSD. To this end, EMSD sees the importance of operation and maintenance, the values they create, and their impacts to the environment. EMSD aims at reducing energy, water and other resources and materials consumed in the course of rendering services. At the same time, EMSD also works to minimize environmental pollution and recycle spent materials as well.

EMSD combined the quality (ISO9001), environmental (ISO14001) and occupational health and safety management system (OHSAS18001) into a single system – Integrated Management System, and attained the IMS certification in 2002. The system helps to align the day-to-day activities to address most basic issues requested in the society, and reorient the focus to energy conservation and sustainability growth through good operation and maintenance practices. EMSD provides customized and convenient one-stop IAQ services for other government departments and public body's customers to improve indoor air quality in the workplace, improve the level of health and reduce sickness among staff, and help improve efficiency and productivity. EMSD also provides energy management services inclusive of energy audits for identifying and implementing Energy Management Opportunities to help the government departments and public bodies maximizing their energy efficiencies and reducing energy consumption and costs. EMSD has also recently developed an E&M asset replacement prioritization model using a scientific, systematic and risk based approach to support decision making on asset replacement with a view to meeting modern day requirements, including the wider use of environmentally friendly installations.

Promoting Energy Efficiency and Conservation

At Regulatory Services, the mission is to enhance the quality of life of our community by ensuring that E&M and energy technologies are harnessed in a safe, reliable and economical and environmentally friendly manner. One of the major factors in ensuring this quality of life is the need to conserve and sustain a green environment. The efficient use of energy makes a significant contribution in this direction, ensuring both the wiser use of the world's resources as well as generating less pollution in the production of energy. Over the years, EMSD has launched a number of schemes and programmes for participation by different sectors of the society which have brought about substantial energy saving. Besides Building Energy Codes and Energy Efficiency Labelling Scheme, the energy efficiency initiatives include the following:

Wider Use of Water-cooled Air Conditioning System

Since 2000, the Government has launched a pilot scheme for the use of fresh water cooling towers in air conditioning systems for non-domestic buildings in designated areas. Over the years, the scheme has covered about 73% of the non-domestic building floor area of the economy. It is estimated that the completed installations could save 89 million kWh of electricity consumption and reduce carbon dioxide emission by 62,400 tonnes annually.

Life Cycle Energy Analysis for Buildings

Commercial buildings accounted for 37 percent of Hong Kong city's total energy end-use in 2005. To enhance sustainability of building development, the Government has developed a software tool for assessing the energy use, environmental and cost impact of building development which is for free use by the local industry.

Promotion of Energy Conservation and Renewable Energy

The Government has endeavoured to explore emerging energy saving technologies, assess their energy saving potential and performance through desktop studies and pilot projects, and promote the viable ones to the public. Some of the technologies being successfully promoted in the past few years

include electronic ballasts, T5 fluorescent tubes, variable speed drive for air-conditioning systems, and Plug-and-Enhance lighting retrofit technology.

5.1.2 Hong Kong Housing Authority (HKHA)

In the high-rise, high-density environment of Hong Kong, environmental performance of buildings has a significant impact on the public. High density living has the advantage of efficient land use, public transport and infrastructure, as well as the benefits of closer proximity to daily amenities. Hong Kong has more than 7 million people living in 1,100 sq. km of which, only about 200 sq. km is developed and another 400 sq. km is devoted to country parks. There is a global trend in the shift from rural to urban populations and the corresponding increase in population densities and urban consumption patterns is reflected in every urban city.

About one-third of Hong Kong's population is residing in public housing. Among the stock of over 2,300,000 permanent residential flats, over 680,000 flats are public rental housing stock under the management of HKHA. Environmental aspects of sustainable housing design comprise low energy consumption and high performance concept. Since 2004, HKHA initiated the comprehensive application of Micro-climate Studies in the planning and design of public housing development using latest proven technologies, including computational fluid dynamics simulations and wind tunnel tests etc. These studies enable holistic consideration to optimize the development potential and enhance the built environment of the neighbourhood. They cover core topics of wind environment, natural ventilation, daylight and solar heat gain, as well as other special topics such as urban heat island effect, pollutant dispersion, etc.

Up till end of 2007, over 25 public housing projects in Hong Kong have adopted the micro-climate studies, which provide greater human comfort for residents by enhancing sustainability with cleaner and greener environment for healthy communities.

Wind Environmental Initiatives

In achieving the objectives to optimize estate planning, disposition/orientation of blocks and building permeability, we apply computer fluid dynamics (CFD) analysis to study the wind flow pattern and magnitude at low, mid, high zones of the high rise domestic towers (up to 40 storeys or above) for different enhancement measures in site planning and building design options, external circulation and open spaces, and impact on as-built surroundings. By comparing the micro-climate study results of various green initiatives, the most optimal planning and design option is worked out on both qualitative and quantitative basis in a scientific approach.

Natural Ventilation and Lighting Initiatives

By simulating the wind flow pattern and magnitude of typical domestic units, lobby and public areas at low, mid and high zones of the high-rise domestic blocks, and ground floor entrance lobby etc., ventilation coefficients are determined to identify the ventilation performance of each design option at scheme design stage and fine tune the detailed design, in quantitative terms, to enhance natural ventilation with effective pollutant dispersion from toilet accommodations & refuse storerooms etc.:

- Effectiveness of "Cross Ventilation Corridor" for Domestic Blocks
- Hybrid Ventilation Concept for Commercial Centres

Sun shading Initiatives

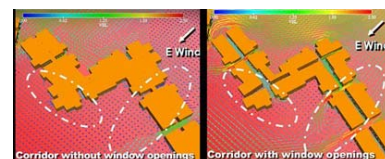
Simulation of annual 3-D sun path diagram dedicated to Hong Kong context identifies the sunlight and shade pattern at external areas of the proposed housing development at different time of the day and different seasons of the year, taking into account of the site surroundings. It is an integrated design approach for optimizing the sunlight exposure to green areas, morning exercise and outdoor laundry space, sun-shading for leisure sitting, children play and ball courts, particularly for west facing open spaces.

Environmental Façade Design Initiatives

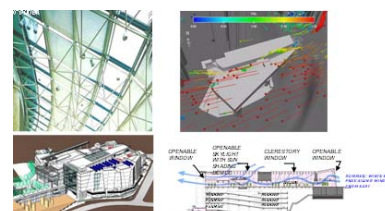
HKHA applies advanced computer programme which consists of modules of ventilation, thermal comfort and building energy analysis for computing the temperature profile for the internal environment of habitable rooms. Since the



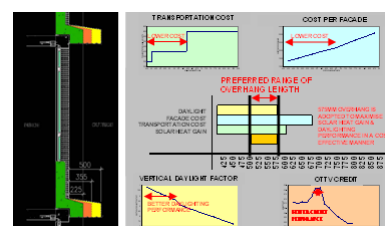
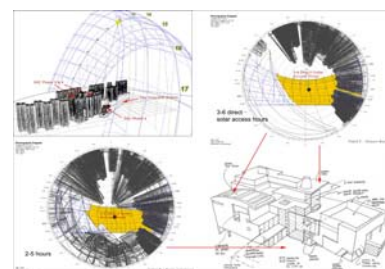
Left: Without wind corridor
Right: With wind corridor



Effectiveness of "Cross Ventilation Corridor" for Domestic Blocks



Hybrid Ventilation Concept for Commercial Centres



façade features that affect cooling load and achievable ventilation rates and daylight illuminance include (but not limited to) wall/roof construction, window/wall area ratio, glazing type, building orientation, configuration and separation, floor level, external wall finishes and colour, shading device etc., it demands an optimization study (e.g. Ant Colony Optimization (ACO) method etc.) taking optimization of the life cycle cost of the public housing blocks.

5.1.3 Architectural Services Department

Sustainable Water Edge Architecture

Water, as a source of life, is a medium linking different continents on the globe, one that transcends all the boundaries of East and West tradition. Interactions between water and its adjoining settlements gave birth to the early great civilizations and it also became the source of prosperity for Hong Kong.

As our land is mostly surrounded by water, the waterfront projects designed by the Architectural Services Department (ArchSD) concerned with the making of places that relate the 2 reigns. Through displacement or re-arrangement of the old surroundings, these projects achieved harmony with their respective contexts as well as the edges of the seafront to establish various forms of urban intercourse. These locations enable occasions to take place in unique manners and formed parts of our collective memorable experiences.

- Make Connections:

Integrated physically and visually; easily accessible by foot, bicycle, public transport and private car

The improvement to Sai Kung Waterfront in the New Territories was to enhance Sai Kung Town as a designated region for tourism development. A concept of visual corridor with series of bell towers was implemented to connect various open spaces with Tin Hau Temple, to recall the memories & integration of urban fabric. It involved conversion of an existing park and the promenade into a multi-functional area with a Visitors' Centre, kiosks, outdoor dining area, a feature pool, and a chess garden, and to enliven the promenade with alfresco dining and street performance.

- Make Use of the Existing:

Existing structure was used to form part of the new overall waterfront environment

The design of the Blake Pier has made use of the old Blake Pier roof, originally completed in the early part of the twentieth century, transferred from its existing location at Morse Park in Kowloon, where it had resided since being dismantled from its original position in Central in 1965. The roof style, colour and timber soffit are related to the adjacent historical Murray House's traditional tile roof, which has a similar architectural style and historical value. This project provided an opportunity for the roof to be put back to its original use, maximizing its heritage value and ensuring the new pier would blend harmoniously with its surroundings and enhances the local characteristics and ambience of Stanley.

- Design for Change:

Flexible enough to respond to future change in use, lifestyle and demography

Plans to develop the reclaimed strip of land into a major cultural hub are being discussed in the community. Whilst this transitory zone awaits its final destiny, the plot in West Kowloon has been transformed into a temporary waterfront promenade for the public to enjoy the view of this world famous harbour. The project's impermanent nature inspired a cost-effective and environmentally friendly design.

- Manage the Investment:

Be economically viable, well managed and maintained

The market kiosks in Stanley Waterfront are situated along the continuous waterfront boardwalk facing towards the sea. The open space area around shopping kiosks has been developed as a piazza to encourage business opportunities and offer maximum flexibility for different uses to utilize the space. As the kiosk facilities serve not only the local needs but also as an attraction to tourists, the project is considered a unique design solution that balances the aspiration of the local community and the need of creating a tourist attraction.

- Sustainable Technology in Architectural Design:

Natural lighting is by means of skylight, artificial lighting is minimized to reduce power consumption



Sai Kung Waterfront



Blake Pier in Stanley Waterfront



West Kowloon Waterfront



Market Kiosks in Stanley Waterfront

The courtyard in Stanley Municipal Services Building in Stanley Waterfront not only allows natural light to enter into the heart of the Building, the same concept was applied to the major space below the courtyard by installing a glass floor to facilitate natural light to penetrate into the Community Hall on lower ground floor. A motorized louvre system modifies the amount of daylight at different times of the year, while at night the Community Hall below provides the major source of lighting through the glass floor to lit up the courtyard.

- Mix Uses and Forms

Different building forms, uses to define different characters

The Pak Shek Kok Waterfront Promenade in New Territories provides a breathing space for the public, together with a cycle track alongside serving as a linkage from Shatin to Tai Po. ArchSD designed a series of small buildings along the promenade including public toilets, a pavilion, a management office, a refuse store, a refreshment kiosk and an open air café. These facilities were designed as sculptural elements along the waterfront corresponding to different contexts of different project sites at various locations of the promenade.

- Greenery

Greeneries and landscape design help to create a pleasant waterfront environment, and to enhance the identity of the area

If every city of the world deserves a centre de ville, then the area delineated by the Star Ferry concourse and the harbour promenade towards Hong Kong Cultural Centre, extending inwards to Salisbury Road, Star House and Peking Road must be worthy of that accolade. Along the lane, thematic plantings, additional planters and existing rows of palm trees enhanced the strong sense of public space in this tourism hub.

Use of Clean Energy Technology and Renewable Energy Buildings

Architectural Services Department has taken the lead to promote the application of renewable and clean energy technologies in building design to reduce the emission of green house/hazardous gases to the atmosphere. Back in the 90s, the application of renewable energy in the form of solar panels for hot water heating has been adopted.

With the advancement of technology in recent years, and with collaboration with the client and the utility company, the incorporation of BIPV and photovoltaic panels in Science Park Phase I Buildings at Pak Shek Kok and the new Electrical and Mechanical Services Department Headquarters in Kai Tak are the showcases for implementing renewable energy technology in buildings.

In the Hong Kong International Wetland Park, the first geothermal heat pump air-conditioning system was installed. Through 468 pairs of vertical geothermal pipe heat exchanger buried in the wetland, heated water from water-cooled refrigeration plants and cool water from water source heat pump are circulated in a common condenser water loop to exchange their energy directly. The system operates at a high efficiency, substantial low running cost and without direct rejection of waste heat into the atmosphere.

Methodology and Experience in Post Occupancy Evaluation (POE) of Government Projects

In view of the increasing technical complexity on building and building services systems design and the growing public concerns on sustainability and energy efficiency issues, Architectural Services Department has implemented the Post Occupancy Evaluation (POE) approach to ensure that the sustainable design features are properly implemented and operated to meet the occupants' need and on the other hand to assess the performance of some new technologies.

POE is an effective tool to assesses and evaluate how effective and efficient the building is from the perspective of a variety of stakeholders, particularly occupants and operators. It encompasses continuous and extensive data collection and stakeholder engagement, to evaluate the performance of the building facilities and to ensure that they are functioning as the original design intent and comprehensively utilised and operated to fulfill occupants' demands. During the POE, massive data and feedback were collected and analysed; fine tuning of systems was carried out; evaluation of the effectiveness of new technologies installed was taken; energy review was also conducted with a view to further identifying and proposing means to achieve energy efficiency and conservation after occupation as well as to recommending good energy saving housekeeping practice.



Stanley Municipal Services Building in Stanley Waterfront



Pak Shek Kok Waterfront

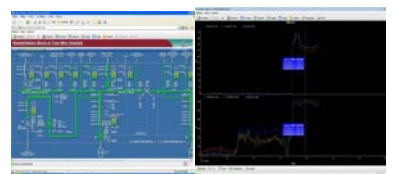


Tsim Sha Tsui Waterfront



Left: Intelligent Switchboard for AC installation

Right: Local computer and data logger



Left: System status monitoring

Right: Harmonic current of individual main or sub-main circuit

5.2 Private Sector

Introduction

Construction waste amounts 70% of the total waste generated in Hong Kong

Designing out Waste

It has been recognized in the building construction industry that wastage up to 25% of the total construction cost could result from reworks due to incompatibility of designs from various trades such as architectural, structural and MEP. In the past, clash checks were manual and random in the pre-construction stage by consultants and leave the bulk of clash management tasks to the contractors. This is inefficient and late. Initiatives have been taken by developers at the outset of the project to design out waste as far as possible, and ultimately to the industry as a whole.

3-Dimensional design software

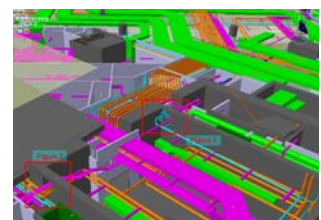
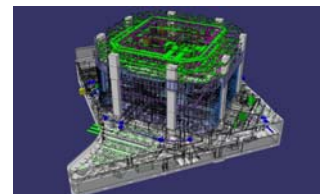
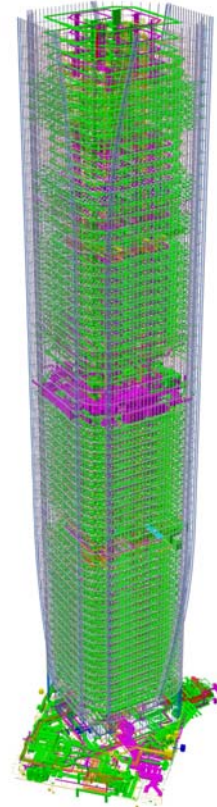
The relative success of a building construction project is largely influenced by the quality of the information or design clarity provided to the contractors both for bidding and for construction. A design software is adopted at the start of the schematic design stage. Evolving from the conventional 2-dimensional Autocad design software, a digital building information model (BIM) is built up as the base tool for design, design coordination checking, tender document generation, when the building is fully commissioned, a final as-built design file will be delivered to the estate management office during handover. Facility managers can utilize this model to improve efficiency and safety of the building in use. This 3-D design software has radically improved the design process and enhances coordination, component identification, cost estimation and material procurement. During design, clashes are detected and managed by the software. This early transparency significantly reduced clashes and reworks, thereby reducing wastes. This enables the potential main contractors to provide more accurate bids for the construction. Using the virtual construction function in the software, buildability and work sequence can be tested by contractors to best suit their own equipment and method of construction. Therefore, it is expected that with such a tool, the tenderer's mark-up for risk will be reduced and will lead to lower tender sums being offered. The successful contractor and major subcontractors are required to use the BIM model to implement all aspects of the actual construction. The consultants are required to use this model to track record and manage design changes throughout the project delivery process. Swire Properties, Henderson Land Development, New World Development and the Hong Kong Science and Technology Parks Corporation have all used BIM successfully in their projects in the past

Objectives of BIM

Building Information Modelling (BIM) is a term collectively used by Computer-Aided Design (CAD) vendors in recent years. In essence, it is a three-dimensional virtual space for modelling real-world buildings, while generating a set of coordinated two-dimensional drawings for construction and other purposes.

Implementations of a digital model are to bring about the following improvement:

1. Comprehensive 3-dimensional geometric coordination of all building elements prior to tender
2. Enhanced quantity take off from the BIM to improve speed and accuracy of preparation of bill of quantities in Hong Kong Institute of Surveyors format prior to tender
3. Lower, more accurate tender pricing resulting from reduced unknowns and risks
4. Automation and interoperability of 2-dimensional drawings with 3-dimensional building information model
5. Creation of reusable catalogue of intelligent parametric building parts (knowledge capture)
6. Management of construction sequence and process modeling using the BIM elements
7. Reduction of waste in the construction throughout the entire process
8. Reduction of claims on site resulting from incomplete design coordination
9. Quicker construction
10. Lower Construction cost
11. Continue to maximize safety
12. Better build quality
13. Facilities maintenance and management using the BIM elements



5.3 Research Institutes

5.3.1 Chinese University of Hong Kong: Air Ventilation Assessment & UCMAP

In 2003, the Planning Department of the Government of HKSAR to initiate a study titled: "Feasibility Study for Establishment of Air Ventilation Assessment (AVA) System" for designing and planning future building developments. The study was completed in Dec 2005. The Hong Kong Government has taken up the recommendations, and in July 2006 implemented AVA through two policy mechanisms: Firstly, a high level Joint Bureau Technical Circular (Housing, Planning and Lands Bureau [HPLB] and Environment, Transport and Works Bureau [ETWB] TC 1/06) was issued. Secondly, a new chapter on urban air ventilation has been added to the Hong Kong Planning Standards and Guidelines (HKPSG).

A number of sites in Hong Kong have gone through AVA. The most important of all has been the old Kai Tak Airport site at South East Kowloon (diagram below). The site is some 300 hectare in size and is located at the prevailing wind end of Kowloon. Getting it right is very important. By October 2006, some initial studies using CFD have been carried out. Wind tunnel tests will follow during the engineering stages.

Another important project that has gone through AVA was the new Hong Kong Government headquarters building at Tamar (diagram below). Based on results of wind tunnel tests, the design incorporates a large "hole" in the middle so as to minimise its air ventilation impact to the buildings behind.

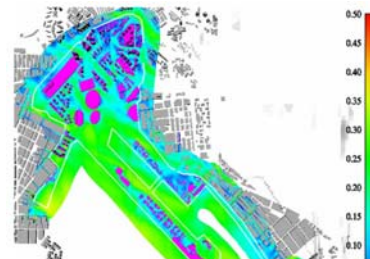
In 2 July 2007, the Government of Hong Kong commissioned further studies titled Urban Climatic Map and Standards for Wind Environment.

To help planners to understand and evaluate the effect of ventilation and thermal comfort, an urban climate map can be considered a tool for translating climate knowledge to the planning process. Urban climate maps (UCMap) have to cover the whole city area and give help to planning decisions. The maps help to fix the investigation depth in order to avoid unneeded experiments. The map also helps draw attention to crucial places. The urban climate map fundamentally describes the atmosphere near the ground within the Urban Canopy Layer (surface to mean roof level).

An embryonic Urban Climatic Map for Hong Kong has been generated (diagram below). Further data and interpretations will be needed to finalise it. Once the UCMAP is developed, the information could be worked on with planners to resolve the climatic classification into planning functions (Planning Function Map [PlanFMap]). This map could be used to guide planning and strategic urban developments.

In tandem, another task of the above mentioned study is to establish a wind standard for pedestrian comfort in Hong Kong. The work will include wind tunnel testing of selected and to be benchmarked sites, CFD studies, field measurements, and a territory wide user survey.

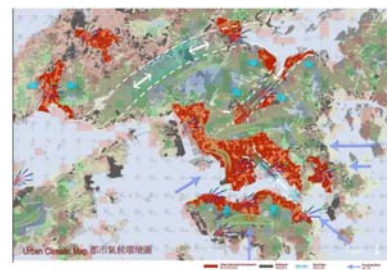
Apart from air ventilation studies, Planning Department of the Hong Kong Government also commissioned a study titled Application of Sunlight and Shadow Analysis for Layout and Site Planning. The study hopes to establish some initial guidelines on how to design for solar access in high density Hong Kong. A GIS based software (diagram below) and a set of recommended rules of thumb and best practices have been developed



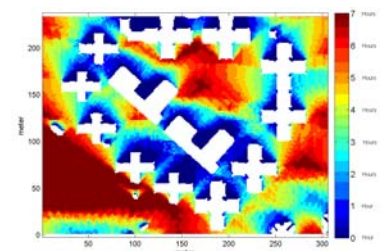
Courtesy Ove Arup and partners (HK) Ltd.



Courtesy HK Government SAR



Courtesy CUHK

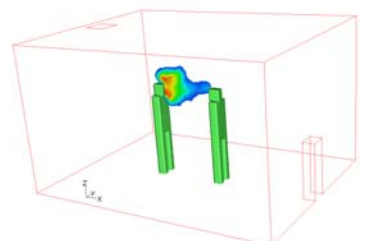


5.3.2 The City University of Hong Kong

Department of Building and Construction (BC)

BC is a leading research institute in the area of building and construction. In particular, BC's area of expertise in sustainable building under four major research areas are: Construction Management and Surveying (management in construction, technology and materials, construction information technology, education and training), Intelligent Built Environment (intelligent building systems, computation fluid dynamics), Environment and Services (sustainable development, indoor air quality, air pollution, wind engineering, noise, vibration, daylighting, acoustics, energy saving) and Structure and Materials (structural analysis in design, smart materials, structural model updating and health monitoring, structural safety).

Major research projects currently conducted by BC staff include the following: Topographic Effect on Wind Distribution in Hong Kong, Solar Maps and Radiation Modelling in China, Sky Classification and Performance Analysis of Transparent Building Integrated Photovoltaic (BIPV) facade Using Artificial Neural Networks (ANNs) Technology; A Study of Climatic Variables Atmospheric



Sneezing droplet cloud around a person

Elements and Standard Skies and the Implications to Building Energy, Comfort and Health Issues; Wind Effects on the World's Tallest Building; Study on Microbial Contaminant Behaviour and The Impact on Indoor Air Quality in Spaces with Central Ventilating and Air-Conditioning (VAC) System; Hands-on Experiences of Wind Tunnel Tests and Computer Program for Wind Design. Other recent major funded projects: Hong Kong Housing Authority Research Fund – Developing Innovation Precast Systems: Application of Structural Lightweight Aggregate and Rapid Hardening PFA Concrete, for Economic Production; Study on the Re-use of Construction and Demolition Waste in Public Housing Development including the Use of Recycled Aggregates in Structural Concrete Construction and Applications of Self-compacting Concrete to Enhance Quality, Cost Effectiveness, Buildability and to Reduce Noise Nuisance in Public Housing Construction; Innovation and Technology Fund - Development of Radon-proof Composite Emulsion Paint, etc. To further strengthen sustainable building research, BC has recently added a number of new research facilities. Various atmospheric environmental conditions can be simulated by the close-circuit wind tunnel with a 2.5m x 2.0m test section and operating range of 0.5m/s to 20m/s. It will be useful for studies on wind environment, wind loading on building and structures, air pollution, dispersion and dynamics of buildings and bridges. Besides the wind tunnel, BC also houses the indoor air quality lab and environmental control chamber

Division of Building Science and Technology (BST)

Applied and contracted research activities play an important role in the promotion of sustainability in the Division. One of the key areas of research is in building energy use and environmental control undertaken by the Building Energy & Environmental Technology Research Unit (BEETRU). The major areas of interests of BEETRU are: Building sustainability and renewable energy, Building energy use and power quality analysis, Environmental control: HVAC&R technology, Indoor air quality, health and fire science, Human comfort: thermal, visual and audio, and Building simulation and optimization techniques. The following are some selected examples of sustainable building related projects conducted by BEETRU:

District cooling system

At a central refrigeration plant, chilled water is generated and supplied to a district to support the air-conditioning systems in buildings. Because of the large-scale production, together with the convenience of bringing in seawater for condenser cooling, the chiller plant is higher in efficiency than those in individual buildings. The customers can also use the building space of their own more effectively. Energy modelling methodology and decision approach were derived for determining the most desirable scheme for a given project. The process involves a series of building design load computation, dynamic simulation, and plant energy consumption analyses for different phases of development. Various optimization techniques were used.

Hybrid photovoltaic/thermal technology

A photovoltaic-thermal (PV/T) system refers to the integration of photovoltaic and solar thermal technologies into one single system, through which both useful heat energy and electricity are generated. For a given collector surface area, the overall system energy performance is higher than the conventional "side-by-side" PV and solar thermal systems. Fin performance of the thermal absorber has been identified as one crucial factor that affects the overall energy performance of the hybrid collector. We introduced the aluminium-alloy flat-box PV/T collector design that eliminates this thermal bottle-neck. Building-integrated options were also evaluated.

Solar glazing

Ventilated glazing systems which consist of two glass panes: an outer absorptive glazing and an inner clear float glazing, both having top and bottom vent openings for airflow that may be natural or mechanically-driven. When the window system is integrated with photovoltaics, an additional function of electricity generation can be achieved. Based on experimental measurements and a validated energy model together with the TMY weather data of Hong Kong, the overall system performance were analyzed.

Typical weather year

Building simulation software can be used to predict the energy consumptions in buildings and to perform dynamic thermal analysis of HVAC systems. An accurate estimation requires the precise representation of the periodic change in local weather conditions. Taking the fact that there are long-term changes in average weather conditions in the South China region, the practices of developing typical weather year files were reviewed and discussed based on two neighbouring cities: Hong Kong and Macau. Through the statistical analysis of the 25-year hourly weather data (1979-2003) of Hong Kong, the Typical Meteorological Year (TMY) file for Hong Kong was produced. This is publicly available at the US Department of Energy website: http://www.eere.energy.gov/buildings/energyplus/cfm/weather_data.cfm.



Scaled environmental control chamber



South East Kowloon Development district cooling system project



Flat-box hybrid photovoltaic/thermal solar collector



PV ventilated glazing in test at environmental chamber

6. Status of Adopting SB Whole-Building Rating System

6.1 BEAM: The Way Forward

The Hong Kong **Building Environmental Assessment Method** (BEAM) was launched in 1996 to measure, improve, certify and label the whole-life environmental sustainability of buildings. The assessment is owned by the **BEAM Society** a non-profit, member based organization with over 250 members from across the industry (including clients, designers, authorities, contractors, managers, occupiers and product / service providers) in both the private and public sectors. Recent developments in the implementation of BEAM comprise the following:

- **BEAM**

At its meeting in December 2006, the former Provisional Construction Industry Co-ordination Board (PCICB) reached the conclusion that BEAM be recommended as the way forward for achieving an integrated assessment scheme for the local construction industry subject to various improvements including (i) broader industry engagement in the governance of the BEAM Society, (ii) incorporation of the desirable features of the Comprehensive Environmental Performance Assessment Scheme (CEPAS) developed through a consultancy commissioned by the Buildings Department of Hong Kong Government; (iii) introduction of a wider network of recognized BEAM assessors to allow other members of the industry to provide assessment service; and (iv) making efforts to raise the awareness of the industry and the public on the benefits of undertaking environmental performance assessment.

(PCICB's functions were taken over by the Construction Industry Council (CIC) in 2007. CIC is a statutory body formed in accordance with the CIC Ordinance for the functions of forging consensus on strategic industry issues, conveying industry's needs & aspirations to Government, and providing a channel to advise Government on construction-related matters.)

- **Industry-wide BEAM Engagement**

The BEAM Society has reached out to solicit further representation from key industry stakeholders on its Executive Committee that governs all aspects of BEAM. The BEAM ExCo now comprises 15 elected members plus 10 leading industry associations and institutions to steer BEAM's direction. Industry representation on the BEAM ExCo now includes:

- Building Services O&M Executives Society
- Business Environment Council
- Construction Industry Council
- Construction Industry Institute HK
- HK Association of Property Management Cos
- HK Construction Association
- HK Federation of E&M Contractors
- International Facility Management Association (HK Chapter)
- Professional Green Building Council
- Real Estate Developers Association of HK

- **Evolution of the BEAM Green Building Labeling Framework**

The BEAM Society is set to initiate the training and registration of qualified professionals before the end of 2008 in parallel to undertaking a review of its assessment standards. In addition to keeping pace with international green building trends, the review will also seek to embrace important Hong Kong initiatives including Government's research into CEPAS, improved *Urban Air Ventilation Assessment*, and proposed *Mandatory Implementation of Building Energy Codes*, to name but few. A new set of BEAM standards to assess building interiors is to be piloted by end 2008.

- **Discussions on Creating a Hong Kong Green Building Council**

The BEAM Society is currently engaged with other industry organizations (including the PGBC) in detailed discussions on co-founding a **Hong Kong Green Building Council**. The aim is to provide a cross-industry platform to foster a rapid transformation of the property and construction sectors towards sustainability in Hong Kong as part of the global movement being championed by the *World Green Building Council*.

- **Continued Adoption of the BEAM Green Building Label**

As at May 2008, almost 150 new & existing developments have been submitted voluntarily to undergo the BEAM whole-life assessment, encompassing about 7 million s.m. of space and including 35,000 residential units. As such, Hong Kong is a leading city in term of the no. of voluntary green building assessments undertaken, although much remains to be done to extend this drive towards the wider building stock, especially

in existing buildings. Several BEAM assessments have also been commissioned in Mainland China, e.g. Beijing, Shenzhen.

6.2 BEAM: The Background

The BEAM assessment embraces a range of good practices into a pool of criteria using a life cycle approach. Voluntary schemes and environmental guidelines from authorities are included in BEAM such as indoor air quality, fresh water quality and electrical installations. The comprehensive assessment framework encompasses exemplary environmental practices in planning, design, construction, commissioning, operation, maintenance, and management. This approach encourages buildings that fulfill their intended functions whilst minimizing the resulting impacts on the environment. Finally, the scheme provides a benchmark for sustainable buildings and third party recognition to building performance excellence. The results are labelled as *Platinum*, *Gold*, *Silver*, *Bronze* or *Unclassified* accordingly.

Developers, architects, engineers and contractors may use BEAM to appraise the planning, design, construction, refurbishment and commissioning of their new developments. Owners, occupiers and managers of existing buildings may use BEAM to benchmark and improve their performance in operation, maintenance and management.

BEAM has been evolved in the past years and the latest BEAM criteria (the 2004 version) are divided into six aspects, similar to other overseas environmental building assessment schemes including:

- **Site aspects**
Land use and location, site layout optimisation, transportation, accessibility, ecology, amenity, site and neighbourhood interfaces, site emissions and management, etc
- **Materials aspects**
Optimisation in design and operation, innovative construction methods, building flexibility and durability, avoidance of environment-damaging materials, waste minimisation, etc
- **Energy aspects**
Passive / low-energy design, microclimate, plant/equipment efficiency, renewable energy, annual energy consumption reduction, etc
- **Water aspects**
Potable water quality, water economy and recycling, effluent management, etc
- **Indoor environmental quality**
Safety, security, hygiene, amenities, thermal comfort, ventilation effectiveness, indoor air quality (internal and external pollutants), natural/artificial lighting, acoustics and vibration, etc
- **Innovative and performance enhancement**
Innovative techniques or outstanding environmental performance beyond those stipulated in the BEAM criteria indicated above

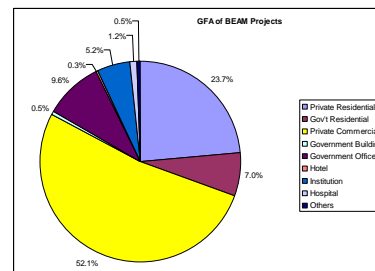
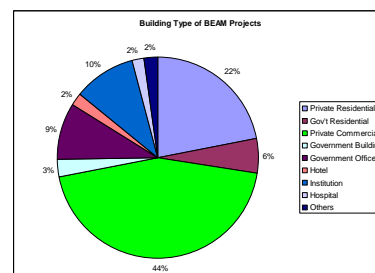
BEAM assesses performance across the whole life-cycle using two standards:

- BEAM version 4/04 for new buildings, which covers planning, design, construction, commissioning and refurbishment; and
- BEAM version 5/04 for existing buildings, focusing on management, operation and maintenance.

Assessments encourage detailed design analysis, using computer-aided tools including computational fluid dynamics to predict project aspects such as the anticipated microclimate. Design is just one stage of the development process, however. BEAM also helps to focus attention during construction and operation so that the design intent can be fulfilled, and also provides feedback so that plans meet construction and operational needs.

All buildings under single ownership can be assessed using BEAM, including commercial, residential, retail, catering, industrial, educational, institutional, and hotel buildings. Any mix of central cooling, mechanical or natural ventilation is catered for, whether to the shell or fitted out. In all cases, BEAM focuses on what the designer, builder and commissioning agent can achieve.

More than half of the assessments are for commercial premises such as offices and retails. Over 70% of the BEAM projects are assessed under “new development scheme”. Developers in Hong Kong are the main supporters on BEAM. In addition, the Hong Kong Government is the biggest single client for the past 12 years.



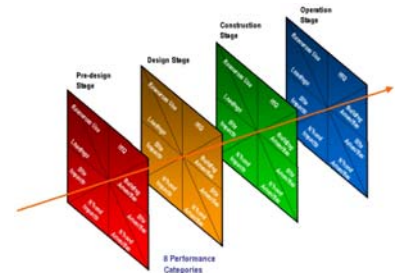
6.3 CEPAS: The Background

The Buildings Department of Hong Kong Government commissioned a consultancy study to devise a system for assessing environmental design and performance of buildings known as CEPAS (Comprehensive Environmental Performance Assessment Scheme for Buildings).

The CEPAS framework addresses various building types with clear demarcation of the pre-design, design, construction & demolition and operation stages of the building life-cycle. Issues of a broader sense of sustainability as well as extending environmental sustainability to social and economic aspects were also integrated into CEPAS categories and indicators.

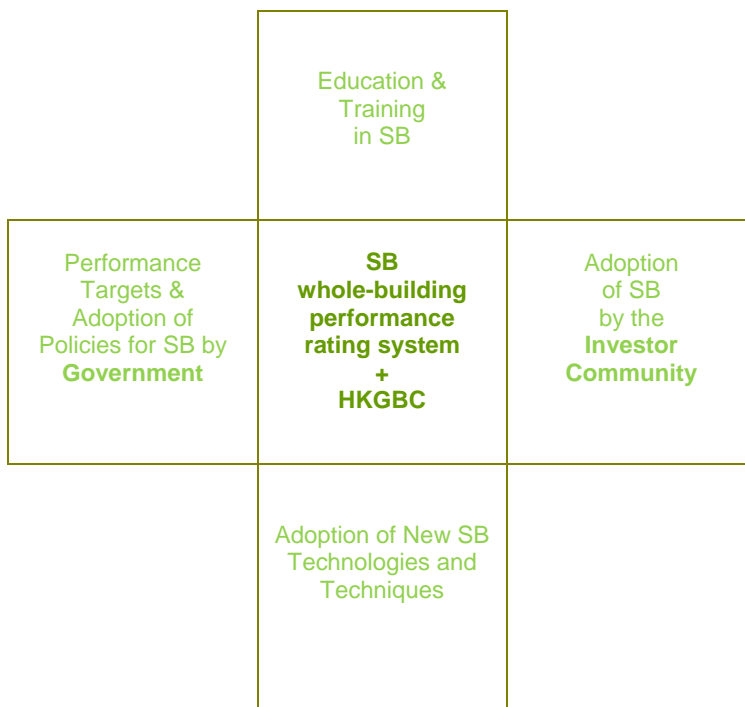
The CEPAS reports and guidelines are available on the Buildings Department website for download by stakeholders and organizations in the building industry.

At its meeting on 19 December 2006, the PCICB reached the conclusion that BEAM be recommended as the way forward for achieving an integrated assessment scheme for the local construction industry subject to various improvements mentioned above including incorporation of the desirable features of CEPAS.



6.4 Adopting SB Whole-Building Rating System: The Future

In view of the strengthening of the BEAM and the on-going formation of the Hong Kong Green Building Council, Hong Kong will move into a new era of adopting SB whole-building rating system.



The next step will also hinge on the question of voluntary adoption or mandatory implementation of SB whole-building rating system. Much would be in the hand of the Government as well as the professionals.

Nonetheless, the future of SB whole-building rating system in Hong Kong, and similarly in other high density tropical cities, has to embrace closer to the key challenge: **lighter eco-footprint and higher livability**.

7. Acknowledgements

The Hong Kong Report Contributors:

Public Sector:

Architectural Services Department

Buildings Department

Joey Ho
Michael Li
Clarice Yu

Development Bureau

Carrie Yuet Ngor Lam Cheng
Jonathan Leung

Electrical and Mechanical Services Department

Siu Kuen Lo

Hong Kong Housing Authority

Stephen Yim

Hong Kong Housing Society

Planning Department

P. Y Tam

Urban Renewal Authority

Private Sector:

Business Environment Council

Benny Au

Henderson Land Development Co. Ltd.

David Yau

The Hongkong Land Co. Ltd.

Clement Lau

Hong Kong Science and Technology Parks Corporation

Man Wai Chan

Hysan Development Co. Ltd

Lai Kiu Chan

Hong Kong Professional Green Building Council

Kenneth Chan (HKIS)
Stephen Lau (HKIA)
Grace Tang
Joseph Wong (HKIA)
Kam Sing Wong (HKIA)

Swire Properties Ltd.

YM Leung
Diane Kolaritsch

Institutions:

The Hong Kong Institution of Engineers

The University of Hong Kong

Yuguo Li
Sam Hui

The City University of Hong Kong

Andrew Leung

The Chinese University of Hong Kong

Jin-yeu Tsou

Chu Hai College

Paul Chu

SB08 Hong Kong Delegation Organising Committee:

Public Sector:

Architectural Services Department

Terence Wong

Buildings Department

Joey Ho
Michael Li
Clarice Yu

Development Bureau

Jonathan Leung

Electrical and Mechanical Services Department

Siu Kuen Lo

Environment Bureau

Katherine Choi
Joceline Chui

Hong Kong Housing Authority

Stephen Yim

Private Sector:

Asian Institute of Intelligent Buildings

Harvey Liu

Business Environment Council

Benny Au

Construction Industry Council

Ivan Wong

Henderson Land Development Co. Ltd.

David Yau

Hong Kong Construction Association

Thomas Tse

The Hong Kong Institution of Engineers

M F Hui

The Hongkong Land Co. Ltd.

Clement Lau

Hong Kong Science and Technology Parks Corporation

Man Wai Chan

Hysan Development Co. Ltd

Lai Kiu Chan

KC Surveyors Ltd

Kitman Leung

Hong Kong Professional Green Building Council

Kenneth Chan (HKIS)
Sam Cheng (HKIS)
Reuben Chu (HKIE)
Evans Iu (HKILA)
Stephen Lau (HKIA)
Martin Tam (HKIA)
Grace Tang
Joseph Wong (HKIA)
Kam Sing Wong (HKIA)

Swire Properties Ltd.

YM Leung

The Hong Kong Professional Green Building Council



1. The Hong Kong Professional Green Building Council (hereinafter called "the PGBC") is constituted as a company by guarantee. It was formed in 2002 by the Founding Members (The Hong Kong Institute of Architects (HKIA), The Hong Kong Institution of Engineers (HKIE), The Hong Kong Institute of Landscape Architects (HKILA) and The Hong Kong Institute of Surveyors (HKIS). The Hong Kong Institute of Planners (HKIP) joined the PGBC in 2005. The Registered Office of the PGBC shall be situated in Hong Kong (19/F., One Hysan Avenue, Causeway Bay, Hong Kong).

The PGBC is a non-profit making research and education institute to promote a better sustainable built environment through professional involvement. Its objectives are:

- a) to conduct collaborative research and publish research results on local and global developments of green buildings;
 - b) to organize researches seminars and training courses in green building design and technology; and
 - c) to advise the government on the formulation, setting up and monitoring of a local green building labeling scheme.
2. Members include the Founding Members (HKIA, HKIE, HKILA, HKIS), or any professional institute and organisation which is willing to abide by the Memorandum and Articles of Association of the PGBC, the resolutions passed by the Members or the Board of Directors and any rules and regulations applicable to them.
3. There will be Sponsoring Members who shall be any person or any institute and organisation which support the objects in the Memorandum and Articles of Association of the PGBC, the resolutions passed by the Members or the Board of Directors and any rules and regulations applicable, and is willing to provide support in financial terms or in kinds for the furtherance of the objects of the PGBC.

Website: www.hkpgbc.org