

Green and Healthy Living in a High-rise, High Density Urban Environment: The Hong Kong Housing Authority's Experience

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ABSTRACT

The Hong Kong Housing Authority (HKHA) develops and implements a public housing programme to meet the housing needs of people who cannot afford private rental housing. The HKHA has an existing stock of about 740,000 public rental flats (PRH). According to the 2014 Policy Address, the Government aims to provide an average of about 20,000 PRH units and about 8,000 Home Ownership Scheme (HOS) units per year. We care for the environment. In developing new housing estates, we conduct thorough environmental studies such as microclimate studies and air ventilation assessment, and use passive design to harness the natural characteristics of our sites. We employ environment-friendly design and construction methods, using modular flat design, pre-cast and pre-fabricated construction techniques as well as recycled, green construction materials. We conduct Carbon Emission Estimation for all our projects, conserve the use of natural resources and reduce wastes throughout the life cycle of buildings. We care for people. We adopt the principles of Universal Design and Barrier Free Access for the convenience and welfare of people of all ages and abilities. We carry out Community Engagement to collect stakeholders' views and aspirations, and incorporate them in the design of our projects. We also carry out surveys of residents' views after the occupation of new estates to gauge our success and identify areas for improvement.

Key words: Hong Kong Housing Authority, High-rise, High Density, Urban, Green Building

1. Introduction

Public housing in Hong Kong initially emerged in the form of emergency housing following the disastrous fire at Shek Kip Mei on Christmas Eve 1953 to resettle over 53,000 people who were left homeless overnight. With the influx of immigrants in the 1950's and 1960's, the demand for public housing increased and this transit housing gradually turned into a form of permanent



Fig. 1. Shek Kip Mei Fire in 1953

housing.

In 1972, the Government announced the Ten-year Housing Programme to provide permanent, self-contained flats in a reasonable environment by building new public housing estates. In April 1973, the Hong Kong Housing Authority (HKHA) was formally established under the Housing Ordinance. HKHA develops and implements a public housing programme to meet the housing needs of low and middle-income families.

This paper describes how we make use of sustainable planning and design approaches to keep pace with the rising public aspiration for a quality living environment.

2. Community Need for Quality Public Housing

At present, about 2.1 million, some 30% of the 7.1 million people in Hong Kong, live in about 781,000 public rental housing (PRH) flats. Another 1.2 million, some 17%, live in about 393,000 subsidized sale flats. The demands for these two types of housing are on the increase.

We will build 79,000 PRH units in the five years starting from 2012/13 and will increase our production target to

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100,000 units in the five years starting from 2018. We will build 17,000 Home Ownership Scheme (HOS) flats over the four years from 2016/17 and 5,000 flats a year thereafter. In the 2014 Policy Address, the Chief Executive of the Hong Kong Special Administrative Region announced that the Government will continue to increase housing supply, enhance the role of public housing and aim to provide an average of about 20,000 PRH units and about 8,000 HOS units per year.

With this target in mind, we aim to build public housing in a very sustainable and efficient manner, catering and caring for the needs of residents by providing a safe, green, friendly and quality living environment.

3. Qualitative Goal and Caring Culture

We strive to meet our flat production target at our well established qualitative standards. At the same time, we are committed to developing housing in a sustainable manner.

3.1 Our Vision, Mission and Core Values

Vision

- Help low-income families with housing need gain access to affordable housing.

Mission

- Provide affordable quality housing, management, maintenance and other housing related services to meet the needs of our customers in a proactive and caring manner,
- Ensure cost-effective and rational use of public resources in service delivery and allocation of housing assistance in an open and equitable manner, and
- Maintain a competent, dedicated and performance-oriented team.

Core Values - “4Cs”

- Caring
- Customer-focused
- Creative
- Committed



Fig. 2. HKHA Core Values

3.2 Building a Sustainable Community

We have been proactive in building sustainable and harmonious communities that are functional, cost-effective and environment-friendly. To create a sound basis for a sustainable public housing programme, we have been striving to improve quality of life, while reduce pollution, waste, environmental impact, and preserve resources.

4. Sustainable Planning in Harmony with the Environment

Over the past decade, we have been progressively developing and implementing a series of new initiatives and tools in the feasibility, planning and design stages so as to foster a quality living environment.

4.1 Identifying Housing Sites under the Principle of Optimal Utilization of Land Resources

Finding sufficient housing sites is a major challenge because most parts of Hong Kong are already well developed. We liaise closely with relevant Government departments to consider all sites. We develop all suitable sites using the principle of optimal utilisation of land resources to achieve the most cost-effective and sustainable development.

We prefer land that is already formed and planned for residential use. However, as supply is limited, we also consider rezoning sites designated for other uses, such as open space, obsolete industrial areas, green belt, etc. Although sites in these built-up areas are relatively small, we can make use of existing infrastructure and community facilities, thereby optimising the use of resources in a shorter lead time.

Large public housing sites are normally secured through Government studies. Therefore, we actively participate in Government strategic and regional studies to identify land for public housing. However, these studies take time and the sites identified are generally for development in the long term.

4.2 Carrying out Technical Studies to Identify Suitable Housing Sites

From the initial site potential assessment to the subsequent planning and design stages, each project is subject to a series of technical assessments to ascertain how it would be affected by the existing environment and how it might impact on the surroundings when built. Up to 25 different studies may be relevant. Typically, microclimate, air ventilation, visual impact, tree preservation, environmental impact, noise mitigation, and traffic impact studies, etc., are required for most sites. Others, such as retail viability, odour impact, and land decontamination studies, etc., are applicable on a case by case basis.

4.3 Engaging the Local Community in New Housing Developments

We are a people-oriented organisation. At planning and design stage, we work closely with the local community to foster a sustainable and harmonious relationship. We carry out consultation with District Councils on all our projects. We also hold community engagement workshops and forum to gather views, exchange ideas, resolve issues and build trust and consensus.

4.4 Geographic Information System as a Tool for Site Searching

We use Geographic Information System (GIS) to capture, synthesise and manage land information to facilitate efficient site search and site potential studies. GIS captures such data as zoning, census, aerial photos, transport, recreational, educational, welfare facilities, lot boundaries, trees, terrain, drainage, water supply, utilities, etc. It also includes 3D applications for performing a range of spatial analysis, such as ridgeline, sightline, daylight, shading and visual impact studies. Thus, enhancing the planning and design process.

4.5 Planning the Estates with Suitable Community Facilities

In planning and designing public housing sites, we ascertain the appropriate level of provision of community facilities. We make reference to the Hong Kong Planning Standards and Guidelines, and liaise with Government departments and local community to plan such facilities as open space, shops, car park, public transport interchange and schools, etc., taking into consideration any already in existence. Having ascertained the requirements, we then consolidate the development parameters into a Planning Brief.



Fig. 3. 3-D Visualisation Using Geographic Information System

4.6 Urban Design Requirements

Urban design is important for a compact and dynamic city like Hong Kong. We aim to shape a better physical environment in aesthetic and functional terms, at both the macro and micro levels, taking into consideration the total visual effect of building masses, connections with people and places, creation of spaces for movement, and urban amenities. It is a process for improving the overall townscape.

For housing sites requiring planning applications, we carry out Visual Impact Assessment (VIA) to visualise the three-dimensional relationship of our proposed developments with the surroundings, exploring different options of location, setting, nature, building size, height, colour and scale, etc., with the aim of minimising impact and enhancing overall visual quality.

For large sites, we conduct Air Ventilation Assessment (AVA) to assess the built form's capability to optimise the wind environment within and around the development. Wind velocity ratio is used as an indicator of how much of the wind available at a certain location could be experienced and enjoyed by pedestrians, taking into account the topography, existing and proposed buildings. Given the generally weak wind conditions in Hong Kong, a higher wind velocity ratio would indicate a smaller impact on wind availability. By assessing different building forms and disposition, we are able to find the optimal design solution in terms of ventilation.

Since 2004, we have been making use of microclimate studies in all projects proactively to facilitate spatial planning. The studies include natural ventilation performance using computational fluid dynamics, interior daylight adequacy using sun paths and daylight factor calculations, the design of external activity areas by studying sun shading patterns, comfort levels by solar heat gain calculation, etc.. After project completion, we conduct verification checks on site to ascertain if the physical results tally with the simulation studies conducted at design stage.

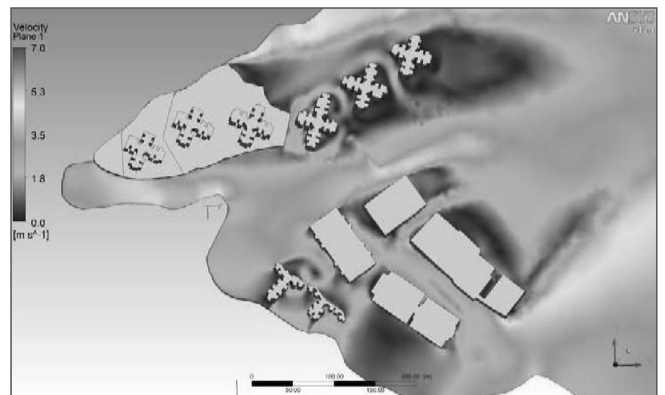


Fig. 4. Air Ventilation Assessment

5. People-Oriented Design

In addition to caring for the environment, we care for people. We aim to foster a safe, healthy and green living environment.

5.1 Sustainable Building Design Guidelines

In 2009, the Council for Sustainable Development (SDC) launched a public engagement process in collaboration with the Government. The exercise pointed to a need for new measures to foster a quality and sustainable built environment. As a result, the Government promulgated a set of practice notes, covering building separation, set back, greenery coverage, gross floor area concessions and energy efficiency of buildings. We have applied the relevant principles to our developments where appropriate.

5.2 Adopting Site-Specific Design

For many years, HKHA had developed its estates based on a high degree of standardisation and mass production of building blocks. The advantages include economies of scale, maximisation of land resources, consistent provision standards, mechanised building processes and programming expediency, leading to overall efficiencies in construction.

Moving into the new century, there has been a higher expectation on the built and visual environment of Hong Kong. Since August 2000, we have been implementing a site-specific design approach to optimise site potential, enhance estate identity, improve diversity and lessen the impact of territory-wide standardisation. This new production strategy, using building blocks of site-specific (non-standard) design, enables us to more effectively address site constraints and optimise development potential. Kwai Luen Estate, developed on a narrow linear site, demonstrates the usefulness of this strategy.



Fig. 5. Kwai Luen Estate

5.3 Adopting Model Client Brief

We have been implementing the “functional and cost effective” design approach since 2003. In recent years, we have given a higher priority to environment-friendly initiatives for healthy living, components or systems developed from research and development studies, as well as other improvements in response to user feedback. We incorporate all these into the Model Client Brief as the major design parameters for our developments. One important aspect of the Model Client Brief is Modular Flat Design (MFD), which enables mass customisation in our developments. MFD strikes a better balance amongst various factors, including buildability, user-friendliness, economies of scale, cost effectiveness, and flexibility for adoption in site-specific blocks to optimise valuable land resources, etc.

5.4 Adopting Universal Design Concept

To build a community in which people of different abilities and ages can live in harmony, and to encourage “ageing in place” for the rapidly increasing elderly population, we have been implementing the Universal Design concept in new public housing estates since 2002. All domestic flats and common areas are designed to provide barrier free access, taking safety and convenience into consideration, to enable all residents to enjoy greater independence.

In 2006, we developed a first-of-its-kind multi-sensory map

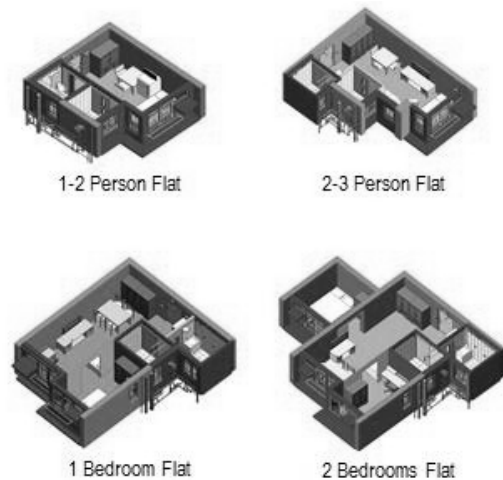


Fig. 6. Modular Flat Design

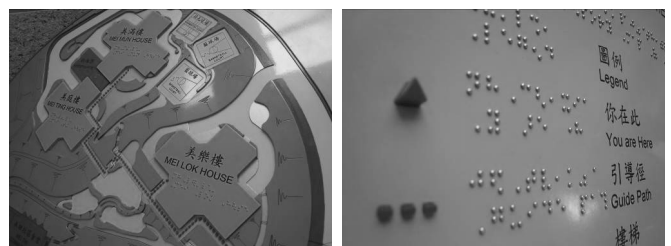


Fig. 7. Multi-sensory Map

in collaboration with organisations concerned for the welfare of the visually-impaired. This multi-sensory map combines a conventional map layout which can easily be read by those with normal vision, high contrast colours for those with low vision, and tactile, braille and voice messages for those with limited or no vision. The map thus serves everyone regardless of visual ability.

5.5 Providing More Greening

Greening helps foster a healthy and sustainable environment. We plan all new estates with a greening ratio (green area to total site area) of at least 20%, and plant at least one tree for every 15 flats. We also supplement on-grade planting with roof, vertical and slope greening.

Roof greening enhances the environment by improving thermal insulation, reducing glare and heat radiation, counteracting the heat island effect in urban areas. It also boosts biodiversity and aesthetic value. We use green roofs in low-rise structures, such as commercial centres, car parks and refuse collection compounds wherever feasible.

Vertical Greening, though a traditional greening method, opens up new frontiers in the greening of our estates. Using this technique, we can use both traditional climbing plants and creepers on a climbing frame as well as unconventional plants on vertically placed growth materials, such as proprietary green wall system and vertical green panels.

5.6 Customer Satisfaction Level

It is important to know our residents' feedback on our products. Since 2004, we have been employing independent consultants to conduct surveys of residents' views for all newly completed projects about 10 months after the majority of tenants have moved in, to gauge residents' satisfaction levels and collect suggestions for improvement. In general, high satisfaction levels are revealed by these surveys.



Fig. 8. Redevelopment of Upper Ngau Tau Kok Estate

5.7 Case Study 1: Sustainable Community Upper Ngau Tau Kok Estate

In the Redevelopment of Upper Ngau Tau Kok Estate, we built new homes to house people who had been living in Lower Ngau Tau Kok Estate for over 40 years. Our theme was to enhance sustainability for the community of around 12,000 people.

We adopted a people-oriented approach and addressed the aspiration of the residents for a better living environment right from inception of the project in 2002. In this project, we pioneered the microclimate studies covering wind environment and natural ventilation, sun shading and daylight, solar heat gain and thermal comfort, etc.. The domestic blocks were planned in two arrays to guide the eastern prevailing wind into the central wind corridor. We provided windows at common corridors, re-entrant areas and lift lobbies on typical floors to facilitate cross-ventilation and enhance daylight penetration. The passive design approach contributed significantly to savings in electricity consumption by reducing reliance on air conditioning and artificial lighting.

In the pursuit of social sustainability, we sought not only to build flats for the residents, but also maintain the social ties and uniqueness of the community. We engaged the stakeholders, including residents, concern groups, non-government organizations, social workers and district councillors, throughout the planning, design and construction stages. The community engagement process enhanced the sense of belonging and strengthened the social cohesion among the tenants, resulting in a harmonious and sustainable living community.

5.8 Case Study 2: Preserving Heritage Elements in the Redevelopment of So Uk Estate

In redevelopment projects, we make great effort to gather local views and preserve the heritage and cultural elements to recapture the history and memory of the old estates for their social benefits.

The old So Uk Estate was completed in the 1960s with strong social and cultural characteristics. To create a sustainable and healthy living environment, our redevelopment scheme tries to preserve the existing vegetation, revitalise historic artefacts and promote its cultural heritage. Selected structures

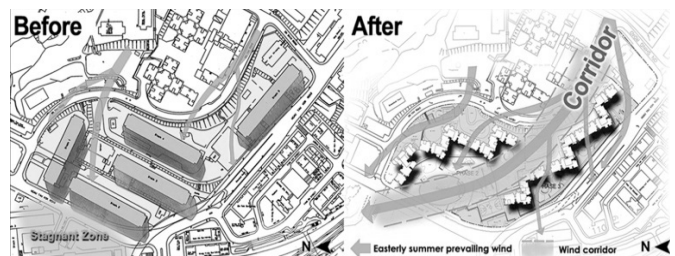


Fig. 9. Improved Wind Environment in the New Estate

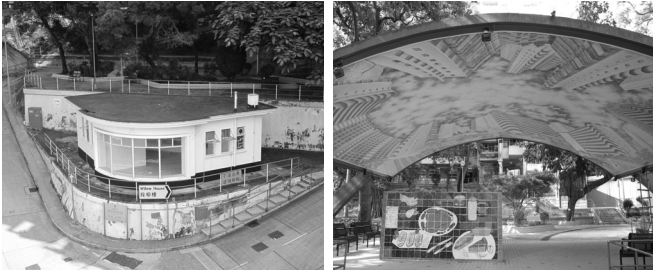


Fig. 10. Preserved Elements from the Old Estate

from the old estate, including the little white shed, ground level structures of Maple House, the existing estate office, shell pavilion structures along Lilac Street, entrance portal and associated areas, will be revitalised as a heritage trail in the new, redeveloped estate.

6. Conclusion

HKHA, the main provider of affordable public housing in Hong Kong, takes great pride in meeting the community's housing needs and in providing good quality, harmonious and environment-friendly homes which people are happy to live

in. We will continue to develop and implement new initiatives and tools throughout the development process, from site search, planning, design, construction to obtaining residents' feedback, and meet changing needs and rising expectations in a sustainable manner.

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