

HOMES IN THE PARK—A SUSTAINABLE PUBLIC HOUSING ESTATE CONSERVED FROM AN OLD AIRPORT AT KAI TAK IN HONG KONG

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ABSTRACT

The Hong Kong Housing Authority (HKHA), being one of the biggest public sector developers and flat owners in the Hong, is committed to green design and reducing carbon emission. The public rental housing developments at the Kai Tak Airport comprise Sites 1A and 1B. The two development projects involve the construction of 15 high-rise domestic blocks providing over 13,300 flats for about 34,000 residents. HKHA has adopted the theme of “Homes in the Park” with supporting “Heritage Trail” and “Neighbourhood Gardens” to harmonize and echo with the entire Kai Tak development. The design is people-oriented, functional and cost-effective. We developed a Carbon Emission Estimation (CEE) Model to gauge the holistic carbon emission of newly designed public rental housing developments. The model focuses the major aspects of construction, building operation and demolition which have implications for carbon emission, reduction and absorption during the whole building life cycle of 100 years. We also conserved site excavated marine mud into recycled backfilling and paving materials, and adopted new initiatives such as electric vehicle charging facilities, lift regenerative power installations, district cooling system, rainwater harvesting cum root zone irrigation system and fully fitted volumetric precast kitchens and bathrooms etc.

Keywords: Public Rental Housing, Homes in the Park, Carbon Emission Estimation

1. INTRODUCTION

Being part of the old Airport at Kai Tak, the public rental housing (PRH) developments at Kai Tak Site 1A (3.47 hectares) and Site 1B (5.7 hectares) have distinguished historical background on the aviation development of Hong Kong. Imageries of low flying airplanes over the Kowloon City and the old airport at Kai Tak have become the collective memories of the people of Hong Kong.

The two PRH developments provide about 13 300 flats for 34 000 residents in 15 domestic blocks, and ancillary retail facilities including a wet market, car parking facilities, kindergartens, neighbourhood elderly centre, integrated children and youth centre and recreational facilities. The construction works started at the end of 2009 with completion scheduled in end 2013. Schools and public parks are planned within the vicinity of the developments.

2. BACKGROUND OF KAI TAK DEVELOPMENT

The old Kai Tak Airport was an icon of Hong Kong for 77 years before its closure on 6 July 1998. After several rounds of public consultation and with the guidance of the Town Planning Board, the statutory Kai Tak Outline Zoning Plan (Kai Tak OZP) was formulated.

Kai Tak Development (Figure 1) is a huge and highly complex development project spanning over 320 hectares with the largest available land fronting Victoria Harbour. It offers opportunities to bring the harbour to the people, provide quality living

environment for around 86 000 residents, and revitalise the surrounding districts such as Kowloon City, Wong Tai Sin and Kwun Tong. It embraces sustainability and cultivates a comprehensive network of parks and gardens for the enjoyment by all.

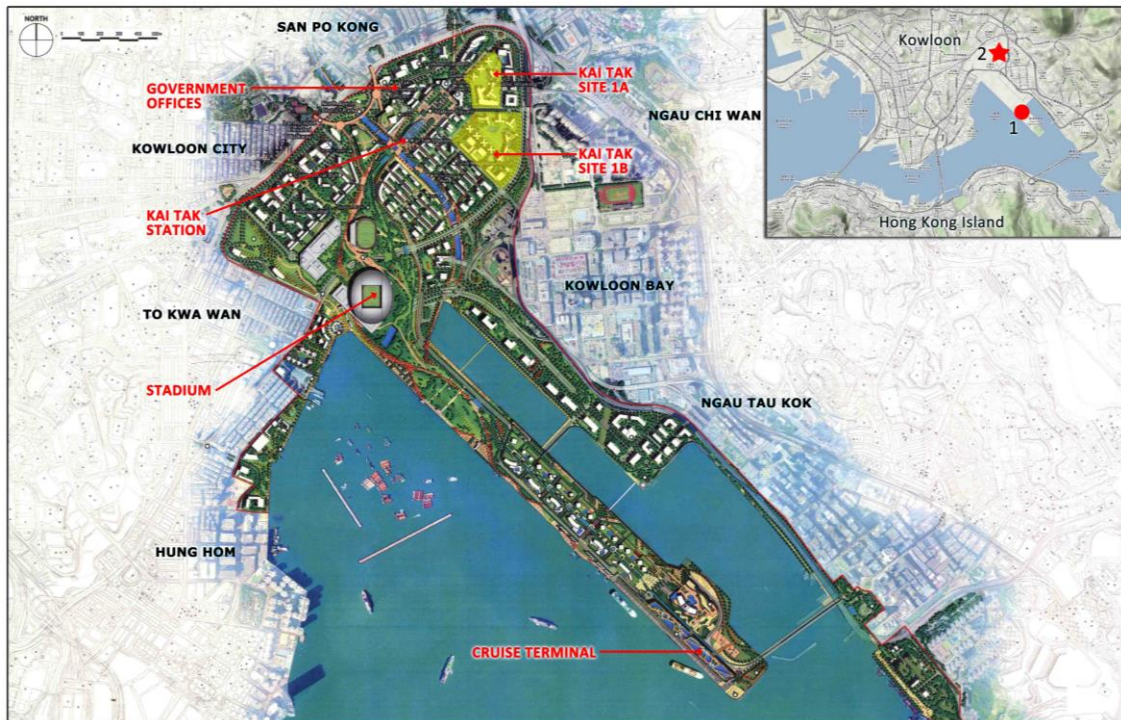


Figure 1: Master Layout Plan for Kai Tak Development

3. HOMES IN THE PARK

We adopted the design theme of “Homes in the Park” in the two PRH developments, with supporting “Park Centre” and “Neighbourhood Gardens” to harmonize and echo with the overall park-like concept of the entire Kai Tak development. The design provides clearly identifiable “gateways” and connects the estate with existing urban fabric. The idea of “Park Centre” idea is to achieve complete segregation of vehicular and pedestrian traffic. The central open space is designed as a Park, with tree-lined paths leading from the west entrance plaza and east entrance plaza. These plazas are linked with intimate Neighbourhood Gardens next to the domestic blocks. It encourages social interaction among the residents and enhances the sense of local community. Master layout and rendering of the PRH developments are shown in Figure 2 and 3.



Figure 2: Master Layout Plan for Kai Tak Site 1A and Site 1B



Figure 3: Rendering for Kai Tak Site 1A and 1B

The green features of the PRH developments include -

- passive design
- heritage environment
- green initiatives
- green construction techniques

3.1. PASSIVE DESIGN

In refining the estate layout and building design for green and healthy living, we adopted passive building design approach, through air ventilation assessment and micro-climate studies, to optimize the planning and design of buildings and open spaces. This provides healthy and quality living environment for tenants through optimal use of the natural environment such as wind environment, ventilation, daylight and solar radiation as well as energy consumption.

We configured and orientated the domestic blocks to capture the prevailing south-easterly wind to maximize natural ventilation; and we designed floor layout to secure good air circulation with ample natural light penetrating into the buildings, including

both semi-private areas at lift lobbies and corridors, and the private domain in each domestic flat.

We bring life to the street level by providing retail facilities primarily in the form of street front shops in pedestrian precincts. The arcades on the first floor are designed to be naturally ventilated to provide an open and welcoming atmosphere while reducing the use of air-conditioning as far as possible.

3.2. HERITAGE ENVIRONMENT

We design a central park integrating with the local open spaces of the public rental housing estates. A “Heritage Trail”, leading from the West Entrance Plaza, meanders through the park, offering interesting and different visual experiences along the trail. The central position of the Park is the Exhibition Gallery including “Time line Exhibition”, “Centennial Wall” & “Heritage Court” as a permanent exhibition - “100 Years of Kai Tak”. The heritage features include -

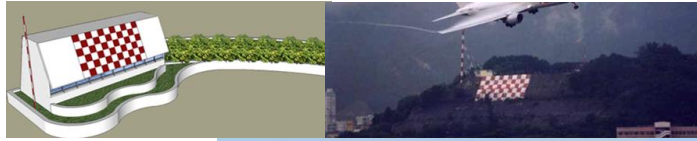
- Time Line Exhibition - 6 milestone years before 1920, 1920, 1940, 1960, 1980, and after 2000
- Centennial Wall - symbolically representing the back-drop to the first Kai Tak aircraft runway built during the Second World War
- Heritage Court - the Centre Piece and Feature of the permanent Kai Tak Historical and Cultural Exhibition to showcase recollections and unique memories of Kai Tak to enhance a sense of belonging amongst the residents

Aviation elements such as the Signal Hill and runway axis were adopted and we incorporated a specially designed aircraft icon in landscaping, graphic design and signage.



Figure 4: Central Park

Signal Hill 信號山



Aircraft Icon
飛機標誌



Exhibition Gallery
展覽廊

Figure 5: Aviation Heritage

3.3. GREEN INITIATIVES

Throughout the estate, we put in place green design features to reduce environmental impact. Major features include -

3.3.1 DISTRICT COOLING SYSTEM

We have adopted the centralized and energy-efficient chilled water supply system implemented by the Electrical and Mechanical Services Department to provide chilled water to the air-conditioning systems of the non-domestic facilities such as retail facilities, kindergarten and estate management offices.

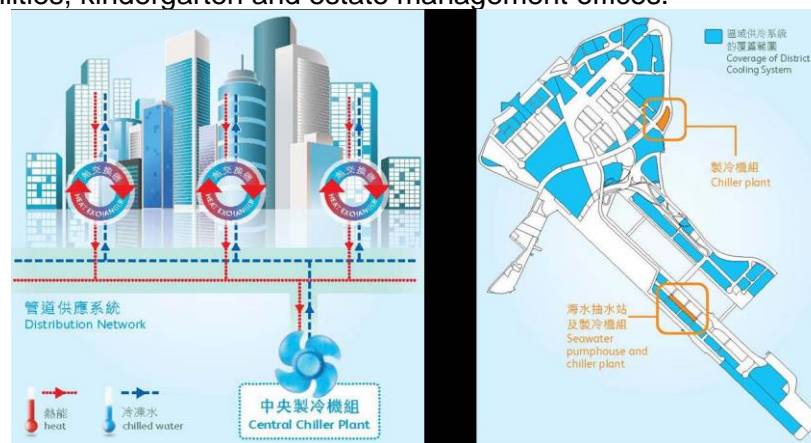


Figure 6: District Cooling System

3.3.2 ELECTRIC VEHICLE CHARGING FACILITIES

We provide conduit and cable containment to all of the car parking spaces and wiring up to 30% of car parking spaces in the car parks to enable electric vehicle charging, in anticipation of a wider use of electric vehicles in future.



Figure 7: Charging Facilities for Electric Vehicles

3.3.3 LIFT REGENERATIVE POWER

A lift motor can work as a generator to produce electrical energy if it operates under heavy load down, light load up or braking conditions. By deploying the latest technology in the lift systems for domestic blocks, we feed regenerated power into the power supply system for use after conditioning by a state-of-the-art regenerative power technology, so as to achieve electricity savings.

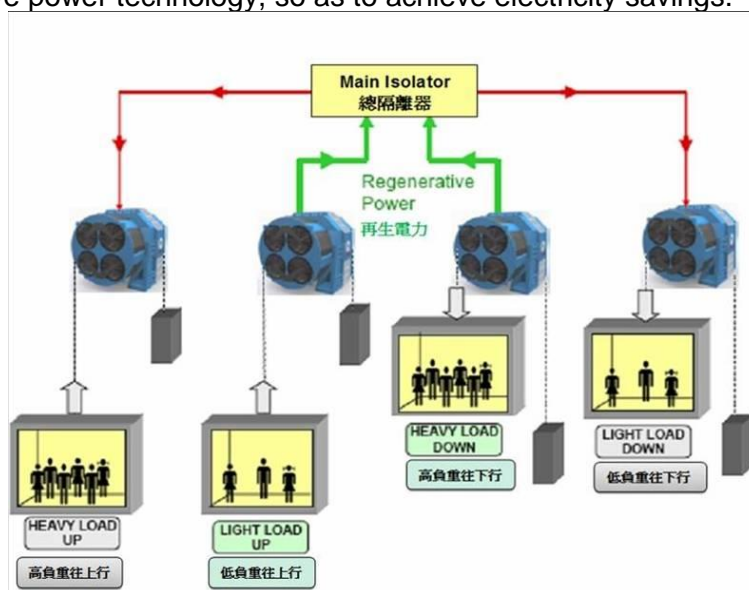


Figure 8: Lift Regenerative Power

3.3.4 RAINWATER HARVESTING CUM ROOT ZONE IRRIGATION SYSTEM

We earmarked a portion of the planting area to implement a rainwater harvesting cum root zone irrigation system. The former helps to reduce fresh water consumption by providing filtered rainwater for irrigation while the latter makes use of a mat laid under the soil to store and supply water directly to the plant roots where it is needed most. Evaporation of water can thus be minimized and the amount of irrigation water can be reduced.

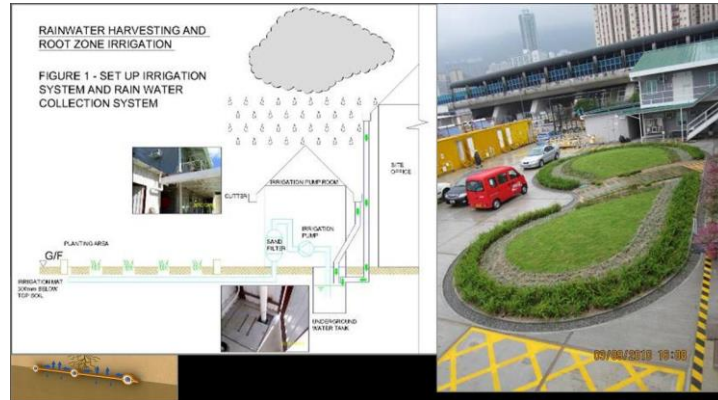


Figure 9: Rootzone Irrigation System

3.4. GREEN CONSTRUCTION TECHNIQUES

We are collaborating with contractors and stakeholders in the industry to explore and implement green construction to enhance productivity and efficiency, as well as reducing environmental impact to the neighbourhood -

3.4.1 MARINE MUD CEMENT-STABILIZATION METHOD FOR BACKFILLING

The site was reclaimed from foreshore of Kowloon Bay in the early 1920s that the marine mud on the seabed was not dredged away during the reclamation works in those years. Approximately 15,000 cubic meters of marine mud waste are generated in the excavations for the construction works. The normal practice in the construction industry of disposing the marine mud to either landfills or marine dumping sites is very harmful to the environment. Housing Department (HD) has developed a practical and cost-effective green treatment technology to make use of the “original” waste and reform it to useful building materials – namely Marine Mud Made Materials (MMMM). The technology is well received by the industry² as another sustainable solution that resolves the marine mud waste issue in building works yet enables the industry to make another step forward on environmental protection for a sustainable community.



Figure 10: Marine Mud Stabilization for Back-filling and building materials including paver blocks, planter curbs and roof tiles

² The initiative won the 2011 Environmental Paper Award from the Environmental Division of the Hong Kong Institution of Engineers and the Gold Prize of the General Public Service Award from the Civil Service Outstanding Award Scheme 2011.

3.4.2 MODULAR DESIGN AND COMPONENT PREFABRICATION TECHNIQUES

Besides prefabricated components and precast elements such as fabric reinforcement, semi-precast slab, precast façade and staircase, we also use volumetric precast kitchen and volumetric precast bathroom. Their implementation will reduce wastage and falsework and also improve the quality of the development as a whole.



Figure 11: Precast Construction Techniques

4. CARBON EMISSION ESTIMATION

We have developed a Carbon Emission Estimation (CEE) model to gauge the holistic carbon emission of new public housing developments, and we have chosen Kai Tak Site 1A as a benchmarking estate, with the standard New Harmony Block as a benchmark block. The model focuses on the major aspects of construction materials and building operations which have implications for carbon emissions, reduction and absorption during the whole building life from cradle to grave. We have identified six major aspects in the model –

- materials consumed during construction;
- building structure;
- communal building services systems;
- renewable energy;
- planting; and
- demolition.

Category 類別	Carbon Effect 碳效應	Aspects 範疇	
I	Carbon Emission 碳排放量	I	Materials Consumed During Construction 施工中的材料使用
		II	Building Structure 結構材料
		III	Communal Building Services Systems 公共建築設備安裝
		IV	Demolition 拆除
II	Carbon Reduction 碳減少量	V	Renewable Energy 可再生能源設施
III	Carbon Absorption 碳吸收量	VI	Planting 綠化

Figure 12: Carbon Emission Estimation

5. WAY FORWARD

We will monitor the implementation of those pilot green features in the two PRH estates, and extend the application of these features to other new projects in the pipeline.