拓建永續未來

Building for a Sustainable Future

葵涌邨
Kwai Chung Estate

The availability of secure, affordable housing is widely acknowledged to be one of the essential cornerstones of stable and prosperous societies. In 2010/11, the Housing Authority (HA) continued to provide a steady supply of affordable quality public housing, in line with its established practice of sustainable development adopted in the last decade. During the year, we completed construction of a total of 13 700 flats at seven estates: Choi Tak and Choi Fook at Kwun Tong, Yan On at Ma On Shan, Shin Ming at Tseung Kwan O, Kwai Luen at Kwai Chung, Shatin Pass at Tsz Wan Shan, and Hung Hom Estate. These completions brought our housing portfolio as at the end of March 2011 to about 708 000 public rental housing (PRH) flats on 200 estates and courts across Hong Kong.

All our projects are subject to stringent quality standards. On the left is the newly completed Shatin Pass Estate at Tsz Wan Shan.

Besides striving to meet our quantitative flat production goal, we have continued to pursue a set of qualitative goals. Such goals include providing homes that are environmentally friendly and people-oriented, in the process optimising quality and enhancing construction safety. Based on our experience over the past decade of building with green principles, and our review and verification of occupied estates, we have been progressively implementing a series of initiatives for achieving environmental, social and economic sustainability. The record number of awards we received over the past year provides some indication that our achievements in the provision of sustainable housing have been widely recognised.

Green Initiatives for Environmental Sustainability

During 2010/11, we continued to adopt green initiatives that aim to save energy and conserve resources, protect the natural environment and cultivate a greener mindset among PRH residents, our staff and business partners. Our persistent efforts in this direction across our operations have led to major advances in environmental sustainability.

Planning for Environmental Harmony

Environmental sustainability starts with the application of environment-friendly principles at the planning and design stages of any development. Since 2004, we have been using micro-climate studies to refine the way buildings are placed and external spaces are designed. Findings from these studies enable us to exploit natural features of specific sites, such as their prevailing air flow, and their patterns of sun and shade. High satisfaction levels have been reported following our on-site validation of the effectiveness of earlier micro-climate studies at completed estates. In 2010/11 we continued to carry out such studies at 20 of our ongoing projects.

Another environmental initiative we undertook in the year to facilitate project design was the use of a tailor-made “carbon emission estimation methodology” which enables us to gauge, at the design stage, the probable total carbon emissions of new PRH developments throughout every phase of their life span, including construction, operation, maintenance and demolition. We use this data to compare design alternatives and develop suitable measures for keeping carbon emissions at our target level.

Assessment for Green Buildings

In addition to the efforts we make internally, we use external standards to gauge the effectiveness of our work. BEAM Plus, the latest version of the Hong Kong Building Environmental Assessment Method (HK-BEAM), is a mechanism used by the Hong Kong Green Building Council for assessing and certifying green buildings in Hong Kong. As an institutional member of the Council, we have actively contributed to the development review of BEAM Plus. We are committed to the concept of "passive design", including the belief that green buildings are not necessarily those that "save the most" but rather those that "use the least". To date, 15 of our projects have been assessed under the original HK-BEAM, under which three Platinum awards were obtained. Since the launch of BEAM Plus on 1 April 2010, we have made a pilot submission of the ex-Yuen Long Estate project for assessment, and will continue to incorporate the new standards into our future projects.

We benchmark our projects against the BEAM Plus assessment criteria.

The HA's Client Brief and Specifications documents already include many of the BEAM Plus requirements, such as those for conducting micro-climate studies, incorporating standardised and modular components into building design, using recycled building materials, adopting pre-fabrication, enhancing energy efficiency, reducing energy and water consumption, introducing higher levels of green coverage, and adopting two-level lighting. On top of these, we have been piloting more advanced technology, such as technology for renewable energy and for rainwater harvesting. Having recently completed the installation of rainwater harvesting systems in two of our new shopping centres, we plan to introduce at least 10 more similar systems in upcoming PRH developments. We are benchmarking our projects against the BEAM Plus assessment methodology, and will adjust our Client Brief and Specifications documents in the light of the new requirements.

Greening the Landscape

Greening is another important aspect of our commitment to environmental sustainability. Our goal is to plan all new PRH estates in such a way that there is a ratio of at least 20% of green area to the total site area, and that there is at least one tree planted for every 15 flats built. We are happy to report that these ratios were achieved in all the estates constructed during 2010/11. We have also continued with our Action Seedling programme, an initiative that provides building contractors with the chance to exercise their corporate social responsibility by giving PRH residents or schools in the neighbourhood seedlings to nurture while new estates are under construction. The plants should be large enough to be planted out once the new estates are ready for occupation. This programme promotes an awareness of the value of greening, while showing a commitment to caring for the community and the environment.

Reducing electricity consumption in PRH operation is our prime concern.

Conserving Energy

In our efforts to conserve energy we have adopted many different initiatives for reducing electricity consumption, and sought alternative, renewable energy sources for our PRH estates by trying out new technology. For instance, we have explored the use of wind-solar hybrid energy lighting at Sau Mau Ping South Estate, and the use of motion-sensor lighting controls in the common areas of various estates. In 2009 we tried out solar energy options by installing a pilot grid-connected photovoltaic system using mono-crystalline silicon modules in Lam Tin Estate; a recent review concluded that it has performed satisfactorily. A second pilot project at the Eastern Harbour Crossing Site Phase 5, using poly-crystalline silicon and amorphous silicon thin film modules, will be completed in mid-2011. We also plan to test the viability of other types of renewable energy, such as harnessing solar energy to produce thermal energy.

At the same time we are incorporating methods for reducing electricity consumption into the design of new PRH estates. For instance, we have initiated a two-level lighting system with energy saving features that still meets mandatory illumination levels for users in need, as prescribed in the Buildings Department's *Design Manual: Barrier Free Access 2008*. This innovative and environment-friendly lighting design provides moderate illumination levels for the public areas of domestic blocks, such as lift lobbies and staircases, and also includes manual switches for raising the illumination level when required. The two-level lighting system is expected to deliver annual energy savings of around 121 000 kWh for the public areas of a typical 41-storey domestic block with 800 flats. This is equivalent to a reduction of 85 tonnes of carbon dioxide emissions every year for each block. The first batch of new estates equipped with this new lighting design should be completed in early 2012.

Another energy-saving initiative is our variable speed drive control for fresh water booster pumping systems which, following successful trials at Ho Man Tin Estate, is now being introduced in all our new PRH projects. We have also adopted the use of smaller stainless steel pneumatic pressure vessels and stamped stainless steel multi-stage pumps, which help extend the working life of the pumping equipment, achieve higher levels of energy efficiency and require less plant room space.

Air conditioning consumes a great deal of energy, so we have introduced a hybrid ventilation system at three of our new shopping centres – Choi Tak, Yau Lai, and the forthcoming Domain at Yau Tong. The system combines natural ventilation and mechanical air conditioning, switching between the two modes as required so as to cut down energy consumption and carbon emissions.

In a similar initiative, our use of permanent magnet synchronous motor machines in lift installations in place of more conventional types of induction motor machines has saved energy. We have also installed lifts without machine rooms for lift towers and low rise buildings. These have the advantages of being compact and lightweight, and of using less energy. For high speed lifts, we have piloted the use of regenerative drives, which generate electricity for the communal installation when the lifts are operating.

To measure our progress in reducing energy consumption, improving energy efficiency and utilising renewable energy, we conducted pilot energy audits in six existing PRH blocks in 2010/11. These audits reviewed the energy performance of the premises and identified methods for improving energy efficiency in them. During the year, we received a total of 59 building energy certificates for newly installed building services systems, attesting to their energy efficiency under the voluntary building energy codes to which we have adhered since 2002.

Responsible Waste Management

Reducing the amount of waste generated at our PRH estates is another key to minimising damage to the environment and boosting sustainability. Responsible waste handling also helps create a healthier and safer environment for our tenants. We have introduced mechanised refuse handling systems at all new PRH estates. New storage devices at the bottom of refuse chutes ensure that all refuse is delivered to properly sealed storage bins, reducing the need for workers to come into direct contact with refuse. Bin cleansing machines also avoid the need for workers to handle and clean the refuse storage bins, significantly reducing spillage and other nuisances during the cleaning process. At selected new blocks we are constructing post-box type waste collection inlets in the corridors, allowing tenants on each floor to separate their waste at source and dispose of different types of waste through different inlets.

Demolition debris is used for backfilling at building sites.

Our construction activities are also incorporating more eco-friendly building methods and materials that are reducing the amount of waste generated. We now use recycled materials wherever possible at our building sites, for example. During the year, demolition debris was used for backfilling at six sites, and cement-stabilised marine mud at a further three. We have also incorporated recycled glass and recycled aggregates into paving blocks, roof tiles and other masonry items. Pulverised fuel ash was also used at three sites in vertical structural elements. In a pilot project, we tested the use of ground granular blast-furnace slag as a replacement for cement in precast concrete façades. In all these cases, we saved costs while also recycling waste that would otherwise have been disposed of in landfills.

In a move to reduce emissions and to support the government's initiative to improve roadside air quality by promoting the use of electric vehicles (EV), we plan to introduce standard EV charging facilities to the car parks of all new PRH estates and shopping centres.

People-oriented Design for Social Sustainability

Our goal goes beyond just providing the shelter that millions of Hong Kong people need. In addition, we aim to lay the cornerstone for a sustainable society in which our tenants can establish their roots, grow, and thrive. To do this, we go well beyond the minimum requirements and design our estates with people in mind, aiming to foster a strong sense of community among our tenants.

Above: We build homes in which people can establish their roots, grow, and thrive.
Right: Residents and students are engaged in beautifying Sau Mau Ping South Estate.

Engaging the Local Community

The layout of our estates is a key focus for us. The relationship between domestic buildings, communal areas and estate facilities is particularly crucial for creating a community feel and fostering a vibrant lifestyle. Striking the right balance between the needs and expectations of multiple stakeholders is crucial to success. One of the ways we approach this is to listen to different voices from the community. In 2010/11, we organised a number of community engagement workshops and forums at the planning, design and construction stages for stakeholders affected by PRH developments at Anderson Road, Shek Kip Mei, Kwai Shing Circuit, Po Heung Street and Tseung Kwan O Area 65B.

Our community engagement can be very creative. During the year, for instance, we teamed up with a group of young local artists and organised a stone-painting activity at Sau Mau Ping South to mark the completion of the mass intake at the estate. Supported by over 100 residents and students from neighbouring schools, the event resulted in 20 indigenous boulders being painted with fascinating images, many with an environmental message. Besides engaging the community in beautifying the environment, the event also helped create a unique identity for the estate.

Universal and Site-specific Designs

We continue adopting the latest proven design principles and adapting them to local conditions. Universal Design principles are now widely applied when we design our PRH flats, as well as common areas, open spaces and estate facilities for people of different ages and abilities. We also encourage community interaction by maximising usable community spaces at our estates and providing shared amenities that bring residents together. To do this effectively, we take into consideration the site configuration of individual PRH projects. At Kwai Luen Estate, for instance, we have constructed a communal terrace for every three floors of the domestic blocks to provide extra amenity areas.

We believe it is important to obtain feedback from the residents living on our estates. During the year we completed resident surveys at eight newly completed projects, and found satisfaction levels standing at 91.9%, indicating that our developments have met residents' expectations in general.

Optimising Quality for Economic Sustainability

To sustain Hong Kong's public housing programme, we must make sure that the limited resources available to us are optimally utilised, and that our PRH developments are built with quality and are fit for long-term use.

We adopt the latest technology as well as proven systems and processes to ensure quality.

Building Long-lasting Quality Homes

Quality is our ongoing priority at every level. We embrace high standards of quality in order to create homes that residents can live in comfortably, safely and securely, while also ensuring our PRH stock is sound and durable. Built quality is a multi-faceted topic, and includes planning and design, choice of materials, construction methods, procurement and monitoring systems, and much more. At its heart is the issue of standards – we must have proven systems and processes in place that provide an assurance of quality.

Our long experience in the industry has helped us develop a "lean and green" approach to developing new PRH projects. Our policies and practices regarding procurement, materials, and building processes have helped us pin our overall construction costs, on average, around 32% lower than those for buildings of ordinary quality in the private sector; while at the same time achieving specified quality standards in functionality and cost effectiveness. We achieve this by using modular designs, prefabricated components and precast elements wherever possible. We also save costs by avoiding unnecessary work processes and materials. For instance, a high quality of finish is specified for both in-situ and precast concrete; this makes further plastering of internal walls unnecessary, saving us significant materials and labour costs in the finishing process. Other cost-effective construction methods include the use of large-panel metal formwork rather than timber formwork, and the use of metal scaffolds instead of the more traditional bamboo ones. During the year, we also adopted a new type of pile called "shaft grouted barrettes" for the foundation work at the ex-Yuen Long Estate site. This has proved to be a more cost-effective piling when it comes to dealing with the problems posed by the complex geology of the site.

We also employ independent quality assurance systems to ensure quality. In 2010/11, we added product certification requirements for six selected building products into our tender specifications. At the same time, we required ISO 14001 certification for 10 major types of building material.

Driving Quality through Procurement Practices

The quality of our PRH hinges on the work of our contractors and service providers, so it is very important for us to have sound systems in place for selecting the best works contractors and services providers. The admission and retention requirements for the HA lists of contractors are very stringent, with a high emphasis on integrity and ethical practice, as well as the usual technical and financial capabilities. In addition, all contractors must hold ISO 9000 quality management certification and ISO 14001 environmental certification, along with OHSAS 18001 safety accreditation.

As a result of these requirements, we have been partnering with some of Hong Kong's best works

contractors and service providers. To maintain strong partnering relationships, each year we hold our Quality Public Housing Construction and Maintenance Awards, at which we recognise the best of our contractors in different fields and acknowledge those industry practitioners who have performed outstandingly in areas such as works quality, environmental protection, occupational safety and health, ethics and integrity, partnering and customer service. In 2010, a total of 39 contractors and subcontractors received recognitions, while other awards went to 48 outstanding individuals, and others still were awarded to project teams and specific site safety projects.

Leading Safety Practices

Our people-oriented principles require us to place emphasis equally on the safety and wellbeing of our PRH tenants and those who work for us. As such, we have been leading the local construction industry in safety standards and practices. For our new works contracts, we have set a goal of achieving an accident rate of no more than 15 accidents per 1 000 workers. In 2010, this goal was comfortably met, with accident rates of 9.9 per 1 000 for new works contracts (9.4 in 2009 and 16.1 in 2008), and 7.4 per 1 000 for maintenance contracts (12.3 in 2009 and 14.6 in 2008). When set against the average industry accident rate of 52.1 per 1 000 workers, it is clear that our safety initiatives are highly effective. This is partly because we have been proactive in introducing new safety measures that have brought about significant health and safety enhancements. For example, our increasing use of hard-paved construction sites has created cleaner, safer working environments and fostered better habits among construction workers. A further benefit of such best practices is that premiums for our "contractors' all risk" insurance tend to be lower than those in the private sector, boosting the cost-effectiveness of our measures. In a further drive for better site safety performance, we have revised our accident rate goal from 2011 onwards to not more than 12 accidents per 1 000 workers.

Still, even one accident is too many, and we believe we can reduce our accident rate even further – hence our performance goal of "ZERO incidents". To do that, "Safety First" must be deeply embedded in our mindset at every level, becoming a part of our corporate DNA, and must also be effectively communicated to our contractors. We also continue to embrace new technology to make safety easier to implement. For instance, our use of Building Information Modelling, apart from its many other benefits, has enabled us to simulate the sequence of construction work and thus plan ahead for risk assessment and the development of site-specific safety measures.

The Site Safety Forum is organised annually to foster a safety culture.

Training and publicity are two other crucial tools for raising awareness about safety issues. During the year, we held training programmes for a range of personnel including professionals, technical personnel and resident site staff. Contract specifications were also enhanced with the addition of new safety measures for high risk areas of operations and general site safety relating to tower crane operation and lifting, along with more stringent non-smoking policies and new rules regarding safety in site vehicles and mobile plants. We also collaborated with industry safety experts to publish

In 2010, our accident rates were 9.9 per 1 000 workers for new works contracts, much lower than the industry's average accident rate of 52.1 per 1 000 workers.

two safety-focused booklets: *A Pictorial Guide to Planning and Design for Safety*, and *Good Practice Promotion Kit – Lifting Operation of Tower Cranes*. We also continued to organise the Site Safety Forum for Works Contracts and Property Services Contracts in 2010, inviting professionals from the construction, maintenance, property management and cleansing services sectors to share their insights for improving safety in the workplace. Site safety workshops and seminars on topical safety issues were also held to boost safety awareness and foster a safety culture among all stakeholders. Around 1 500 people attended the forum and workshops that were held in 2010/11.

Last year we were very pleased to receive the First Runners-up prize (Client-Developer Category) in the Safety Leadership Award 2010 organised by the Lighthouse Club and the Construction Industry Council. Going a step further, this year we received the Champion prize from the same source, a powerful testimony of our ongoing efforts to lift our safety regime to new heights, to provide a model of leadership for the industry, and to motivate and inspire all those who work with and alongside us.

We put safety first in all our construction activities.

Ma Hang Park

an Ecological Delight

Ma Hang Park boasts a splendid sea view and is family friendly.

Ma Hang Park, situated on the picturesque headland adjacent to Ma Hang Estate in Stanley, was officially opened in January 2011. Developed by the HA with input from the local community, the Southern District Council, environmental groups, professionals and other government departments, the five-hectare community park was designed around a theme of "conservation, education and recreation".

The park features eight thematic zones: Butterfly Garden, Heritage Corner, Sea View Terrace, Sea Breeze Patio, Hill Top Plaza, Educational Trail, Fitness Deck, and Bird Watching Corner. Their names indicate the wide array of recreational, educational and conservation activities that the park can offer visitors. The area is home to a wide variety of local flora and fauna, but we are continuing to improve the vegetation in order to encourage more birds and butterflies to take up residence, helping increase the biodiversity of the area.

Though its emphasis is on wildlife, the park is well-suited to people too, of all ages and abilities. It is equipped with good pathways, railings and seating, and is well-lit and monitored by CCTV for greater security. The park is very popular among the local community and the general public, and has even become a regular sightseeing destination for some local tours.

Tin Ching Estate comprises seven residential blocks and the ACB, which has become a social hub for residents of Tin Shui Wai.

Tin Ching Estate

a Focal Point of Community Care

When the Chief Executive announced in his 2006/07 Policy Address that the government would commit more resources to developing community facilities in the Tin Shui Wai area, we lost no time in embracing the initiative. At that time, Tin Ching Estate was the only PRH site in Tin Shui Wai still at the planning or construction stage. We immediately revisited the overall development to identify possible scope for improving community facilities. Given the estate's proximity to public transport links, we decided that the car park in the original plan could be replaced with a six-storey Amenity and Community Building (ACB) with a gross floor area of 10 000 square metres. Focused firmly on community support, the building was designed to house 19 non-governmental organisations (NGOs) that would provide residents in the neighbourhood with a wide range of community services and support networks.

The next challenge for us was to get the new ACB up and running in the least possible time, while not compromising our stringent requirements for building quality and site safety. We managed to accomplish the project in just three years; thanks to the hard work of all involved, flexibility on the part of our contractors, and the application of some innovative techniques. We designed a new foundation system for this project which not only shortened the construction period but also reduced the environmental nuisance to nearby residents and schools. The project also provided jobs to around 200 workers each month during the construction period.

The new ACB is now gathering momentum in serving the Tin Shui Wai community. Over 10 NGOs have already moved in, and there are more to come. We are delighted to have helped create a social hub of genuine value for the residents of Tin Shui Wai, one which will foster strong social bonds and a caring community.

Choi Wan Road Project

from Barren Rocks to Rosy Clouds

Turning an abandoned quarry into a vibrant community in just six years, where more than 35 000 people would be housed in over 13 000 PRH flats, was the challenge we faced when planning for the last phases of the Choi Wan Road PRH project, situated in an old quarry site in Jordan Valley, Kwun Tong. We decided to build three estates in a cascading pattern on the sloping site: Choi Ying Estate would occupy the lowest platform, while Choi Tak and Choi Fook would be situated on the middle and top platforms. The scheme aimed to create a strong sense of community set within a natural green environment with excellent links between all parts.

Extensive environmental studies were undertaken to ensure that the estates would be built in harmony with the natural slopes, wind direction, and sun shadowing. It was also important to maintain view corridors and wind passages, and we did all we could to accommodate all these factors. For instance, the buildings were designed wide apart for good air circulation, and building heights were varied to create view corridors. Furthermore, we adopted natural colour schemes for the three estates based on the themes of sky, earth and trees. The colours have blended in well with the surroundings while also helping create a distinctive identity for each estate.

Much of the original site was bare rock, so we carried out a massive greening programme. The surroundings were rehabilitated, and green features such as green roofs were incorporated on walkways, canopies and the multi-storey shopping centre. To provide good connections between the estates, the public facilities and the green areas, we developed a comprehensive pedestrian pathway network. The pedestrian routes help integrate estate life with the surrounding district and local open spaces, while bringing together the estates on all three platforms. The site's history as a quarry has not been forgotten. In the open spaces we have placed large boulders, feature stones and gabion walls made from local rock as a reminder of the area's earlier days. With the whole Choi Wan Road PRH project completed in 2011, a once barren and devastated landscape has been transformed into a community full of vitality and vibrant colour, as the name Choi Wan (literally meaning colourful clouds) suggests.

Left: The abandoned quarry in the late 1990s.
Above: The vibrant community today.