# ENVIRONMENTAL PERFORMANCE

- Initiatives in Planning and Construction of New Housing Estates
- Initiatives in Existing Housing Estates
- Initiatives in Office at Work

BRARRES

🝰 Case Study – Linking the Community to the Nature – Shui Chuen O Estate

The Hong Kong Housing Authority (HA) strives to provide quality, sustainable and environmentally friendly public housing. We are actively improving our environmental performance, including energy conservation, resource conservation, air quality, and green estate and office operations.

### Initiatives in Planning and Construction of New Housing Estates

#### Green Design and Construction

#### **Conducting Micro-climate Studies and Air Ventilation Assessment**

The HA conducts micro-climatic studies and Air Ventilation Assessment at the planning and design stage to optimise natural ventilation and use of daylight. Taking into account the characteristics of winds, pollution dispersion, natural daylight, solar energy balance and many other environmental factors, the study provides us with a holistic view on the development projects' environmental impact to the surrounding area. During the year, micro-climatic studies were conducted in 22 on-going public housing projects and 18 projects were analysed under the Air Ventilation Assessment.



 Air Ventilation Assessment of development proposal at Queen's Hill



\lambda Sun shading study for design of open space



Study on wind enhancement features and solar heat gain during design stage



Ventilation study at main entrance lobbies at different times of the year

#### Adopting Low Carbon Building Design

In alignment with the Government's Hong Kong Climate Action Plan 2030+, our goal is set to reduce carbon intensity by 65% to 70% by 2030, with 2005 as the base year. To this end, our public housing projects applied green building strategies during the design and construction stages to limit GHG emissions.

For continuous improvements, we have compared the level of GHG emissions between projects. Since 2011, the Carbon Emission Estimation (CEE) were carried out in the planning and design phases of all new development projects. CEE predicts the amount of GHG emissions from the public housing stock during its lifecycle as equivalent to carbon dioxide. During the year, CEE was performed for two projects. The level of GHG emissions of the blocks are compared to the standard block of New Harmony 1 Option 6 and Kai Ching Estate, which served as the baseline. Since the implementation of CEE, the average reduction of GHG emissions is about 15%.



Amount of CO<sub>2</sub> saved per year equivalent to **41,000** trees planted for six domestic blocks designed in 2017/18

#### **Utilising Green Materials and Products**

To reduce cement consumption and promote recycled materials applications, part of the cement in precast facades and stairs are mandatorily substituted with Ground Granulated Blast Furnace Slag (GGBS) for all our new projects. We have also studied the application of GGBS in the production of semi-precast slab. Wherever applicable, we will deploy synthetic macro-fibre reinforcement on-grade slabs in new projects.

Apart from concrete, we continue to uncover sustainable materials and resources-saving applications to conserve resources. For instance, timber from certified sustainable origins are selected for door manufacturing. Manufacturers and suppliers are both required to provide a Certificate of Registration with the Chain of Custody (COC) standard issued by an independent certification body to certify its sustainable timber source.

In addition to the above measures, adoption of the following environmentally friendly alternatives are also specified in contracts of all new projects:

- pulverised fuel ash (PFA) as cement replacement material in structural concrete with mass concrete pouring;
- recycled rock-fill in earthworks and recycled sub-base materials in roadworks;
- recycled rock cores retrieved at ground investigation work for landscape and associated external work;
- recycled concrete paving blocks with recycled glass aggregates and replacement of concrete paving blocks for new building and civil engineering contracts;
- marine mud excavated at site stabilised by cement treatment as useful backfilling material;
- timber from sustainable sources for temporary works; and
- modular hoarding using bolt-and-nut connections for re-use in projects.



Use of Recycled Material

About **6,000** tonnes of GGBS used

In order to improve the quality of building materials and components, we have implemented product certification for 11 buildings and building services materials as a measure of effective upstream control. During the year, the new certification for multi-layer acrylic paint was introduced.

As part of our continuous efforts, we study the inclusion of more environmentally friendly design features and new specification of the maintenance work. During the year, we announced the mandatory use of B5 bio-diesel as a fuel for all off-road construction machinery on site after consulting the Hong Kong Construction Association and contractors. We have also explored the trial use of manufactured sand in screeding works, where tests proved satisfactory physical performance for potential adoption in future projects. In addition, we seek to apply innovative materials such as structural soil. It not only complies with load-bearing requirements, but also promotes vegetation growth. The installation was tested in laboratories with a mixture of soil, and we conducted tests on the Anderson Road project where two trees were planted in the structural soil.

This year, we continued to liaise with Hong Kong Green Building Council (HKGBC) and Construction Industry Council (CIC) on the integration of HKGBC Green Building Product Labelling Scheme and CIC Carbon Labelling Scheme, and the HA's product certification scheme. In addition, HKGBC includes product certification into their Consultancy Study for BEAM Plus for New Buildings (BEAM Plus NB) Major Revision. With regard to the environmental labelling system, new clauses on specification will be prepared and carried out for coordinated implementation. We will also monitor the HKGBC Green Product Accreditation & Standards Scheme and accordingly update our descriptions on green materials and products for maintenance and improvement work, if applicable.

#### **Environmentally Friendly Construction Practices**

Our construction contractors are required to implement eco-friendly construction methods that exceed statutory requirements. During the project construction phase, we ask the contractors to follow various aspects of the site to improve site performance, such as site formation, demolition, foundation, superstructure building and civil engineering works. For example:

- submitting and implementing environmental management plans;
- implementing ISO 9001 Quality Management System (QMS) and ISO 14001 Environmental Management System (EMS);
- requiring Building (New Works Category) and Piling Contractors to be certified with ISO 50001 Energy Management System (EnMS);
- using generators with Quality Powered Mechanical Equipment (QPME) labels;
- limiting vehicle speed on site;
- practicing hard paved construction;
- using single board hoarding;
- offering solar hot water heaters in workers' shower areas;
- providing food waste composting facilities in remote sites with canteens or catering services; and
- recovering undamaged timber pallets for locally manufactured pavers for reuse or recycling.

Pro inc lig

Prohibit the use of incandescent light bulbs



Install water recycling facilities



Adopt precast concrete components



Use electric vehicles (EVs) as contract cars within a specified round-trip distance



Greening on site

The process of constructing new estates, redeveloping old ones starts with extensive planning and design to ensure that the actual work done achieves very well-defined goals and standards. Nowadays, our designers and planners rely on very advanced and sophisticated computerised tools to optimise their work. At the HA, one of the most important tools we use for this purpose is BIM, an acronym for Building Information Modelling (BIM). Put simply, BIM is an intelligent 3D model-based process that enables architectural, engineering, and construction professionals to plan, design, construct, and manage buildings and infrastructure more efficiently.

The HA first adopted BIM in 2006, and today all new HA development projects utilise BIM as part of the planning and design process. It is applied at many different stages of projects, from conducting feasibility studies through to developing the scheme design, and is also used as a value management and design optimisation tool, and during construction. By adding on considerations of both time and cost, we are piloting the innovative 5D BIM which enables even more accurate forecasting and better planning of resources.

We also utilise the radio frequency identification (RFID) which is one of the most-cost effective technologies designed for tracking purposes. The HA continues to apply RFID in the tracking delivery of selected building components and tracking disposal of construction waste from construction sites.



\lambda 5D BIM

As we adopt other innovative and environmentally friendly practices in our housing projects, we have developed standards for their application. We applied standardised-designed precast segment roof water tanks in new projects if applicable. We published guidelines for "Implementation of Precast Construction at Roof of Domestic Block" in January 2018. We also implemented the precast acoustic balcony in the latest Modular Flat Design (2018 version) in August 2018. We commit to continuously explore the application of precast concrete components, including volumetric precast components as well as other facilities.

To facilitate construction site waste recycling, an online database "Information Platform on Recyclable Non-inert Construction and Demolition Waste" was established to collect monthly information on non-inert, recyclable construction and demolition materials in construction sites. This is available on the HA/HD website for recycler's reference and public review.



Modular Design, Precasting and Prefabrication Cost **40%** less than private sector



About **124,100** trucks of C&D materials in the HA sites were transferred for reuse

37

#### Geographic Information System (GIS) for Site Potential and Feasibility Studies

3D GIS is currently widely applied at the feasibility stage in the planning and design of our estates. We collected 3D spatial data of the whole of Hong Kong from Lands Department, including 3D terrain, buildings and infrastructure, accordingly, to facilitate our Architects and Planners to get familiar with the site and its surrounding in a 3D environment. Subsequent visual assessment of our estates, such as ridgeline analysis, vantage point analysis, shadow analysis in site potential and feasibility studies can also be performed smoothly.

#### **Green Building Recognition**

We strive to embody the environmentally friendly features into applicable projects, and require all projects to readily achieve the "Gold" rating standard in the HKGBC's BEAM Plus certification scheme. In 2017/18, the following projects received "Provisional Gold" ratings under BEAM Plus NB.

	Project
	PRH Development at Choi Fook Estate Phase 3 and Sports Centre
	PRH Development at Diamond Hill Comprehensive Development Area Phases 1 & 2
	PRH Development at Tung Chung Area 39
	SSF Development at Au Pui Wan Street, Fo Tan
	SSF Development at Hang Kin Street, Ma On Shan Area 90B
	SSF Development at Tseung Kwan O Area 65C2 Phases 1 & 2
	SSF Development at Tung Chung Area 27

#### BEAM Assessed Projects

7 projects awarded &6 projects registered during the reporting year

#### **Resource Conservation**

#### **Holistic Energy Management**

Acknowledged the significance of energy efficiency enhancement from an effective Energy Management System (EnMS), we have implemented the EnMS in accordance with ISO 50001 for our projects since 2011. With the system, we can estimate communal energy consumption of the completed and occupied buildings during the design stage, and thus identify and enforce energy performance measures. During the year, we carried out internal audits for 11 estates.

Application of ISO 50001 also extends to the HA's contractors. We require our contractors applying for admission to the HA Lists of Building (New Works Category) and Piling Contractors to closely monitor their energy performance, collect energy consumption data and conduct analysis in accordance to the standard's requirements.

#### **Renewable Energy**

We stand at the forefront of integrating green technology into projects and strive to apply renewable energy technologies to housing development. New building blocks, where applicable, are equipped with grid-connected photovoltaic (PV) system capable of producing over 1.5% of the power consumed in the communal area. Since March 2009, a total of 81 PV systems have been installed in housing

estates up to March 2018. We also install one to two solar-powered lamps in every suitable new project to promote the use of renewable energy and educational purpose.

#### **Promoting Electric Vehicles**

In response to the Government's policy to promote the use of electric vehicles (EVs), EV chargingenabling facilities are provided in car parking spaces for private cars in new car parking buildings. In addition, we continued to provide EV charging facilities in new and existing carparks. As at the end of March 2018, 25 standard EV charging facilities at nine existing carparks had also been installed for monthly users on need basis. To incentivise the use of EVs, we offer up to two hours of free parking for EV users during charging. Provision of EVs as contract cars is adopted in the specification for our development projects within a specified round-trip distance.



EV charging facilities

#### **Energy Efficiency in Buildings**

The design of our new projects follows the Buildings Department's "Guidelines on the Design and Construction Requirements for Energy Efficiency of Residential Buildings" (the Guidelines) issued in 2014. According to the Guidelines, we will continue to incorporate green designs into housing blocks to enhance environmental performance and natural ventilation. We are also in compliance with the Building Energy Codes issued by the Electrical and Mechanical Services Department (EMSD).



Hybrid ventilation system: opened (left) and closed (right)

We commit to satisfy the energy efficiency requirements in various building installations. Since August 2015, we have received 80 Certificates of Compliance Registration issued under the Building Energy Efficiency Ordinance from the EMSD. Based on the results of the evaluation of three pilot systems of the Yau Lai Shopping Centre, Choi Tak Shopping Centre and Domain, we have prepared a list of relevant standards and guidelines for air-conditioning systems. These facilitate the implementation of hybrid ventilation systems in appropriate projects that reduce energy consumption in air-conditioning and mechanical ventilation systems.

For a few years, we have been adopting regenerative power for lift systems using motors with power rating of 18kW or above in new work projects. The data collection and analysis on the Kai Ching Estate and Tak Long Estate lift system have been completed, and the performance evaluation results were satisfactory. To further enhance the energy saving of lift installation, we extended the implementation

of lift regenerative power feature for lift motors from "18 kW or above" to "8 kW or above". We have also applied permanent magnet synchronous motors (PMSM) in some of our projects to increase energy efficiency.

Since the beginning of 2016, all our new project designs have applied LED bulkhead lights as standard lighting in communal areas of domestic blocks. In addition, in order to meet the illumination requirements stipulated for barrier-free access in new residential projects, two-level lighting control system has been deployed. Proper lighting control with the aid of motion sensors, photocell sensors, timer control switches and on-demand switches have also been adopted to reduce energy use.







LED bulkhead lights



Two-level lighting control system: before (left) and after (right)

We endeavour to review other measures to enhance energy efficiency. Our new projects generally fulfil the mandatory requirements on Residential Thermal Transfer Values promulgated in the Buildings Department's Practice Notes.

#### **Smart Meter**

To help tenants understand their environmental footprint, monthly energy consumption information generated by smart meter monitoring system is displayed in the main entrance lobbies of all new housing blocks. The presentation of peer comparison data on the use of electricity, gas and fresh water by communities and tenants aims to enhance the environmental awareness among tenants. A new standard specification is ready for implementation.



ightarrow Display of the smart meter monitoring system at main entrance lobby of Yan On Estate

#### Water Conservation

Freshwater is mainly consumed in construction processes at the HA's sites, as well as washing, flushing and irrigation in the HA's housing estates and managed commercial premises. We have undertaken various water conservation initiatives to save water on new projects. For instance, we applied the Zero Irrigation System (ZIS), which makes use of Sustainable Urban Drainage System and Sub-irrigation Planting System, to minimise irrigation water consumption in suitable housing estates. Trials in new public housing projects have been proven to be effective. ZIS would be adopted on new projects to replace the Rainwater Harvesting System and Root Zone Irrigation.



Zero Irrigation System Planter

Under construction in **27** projects







Completed ZIS

We also deployed an integrated water-sensitive urban design to collect rainwater in the high elevations and green slopes of Shui Chuen O Estate. Rainwater is treated by bio-retention, stored and used for irrigation. In the case of housing flat fixtures, we encouraged the use of six-litre single or dual flush water-closet suites, plumbing fixtures registered under WELS of the Water Supplies Department and other water-saving facilities.

#### Mitigating Environmental Impacts

#### Estate Ecology

The HA maintains ecological values in close proximity to all applicable housing projects by implementing balanced environmental planning and design principles. Balanced ecological planning and design principles have been applied to the appropriate projects, and briefing and debriefing sessions and site visits were conducted for contractors. At Long Shin Estate, a plantation improvement study was carried out in collaboration with the University of Hong Kong to revitalise existing vegetation on the slopes, and cultivate native saplings. Since then, we continuously kept track of their growth. In addition to conserving and managing trees in cooperation with the Development Bureau, we are developing guidelines and provisions to engage contractors on a regular basis.

We have established green design guidelines which emphasises on greening of housing projects. It is aimed to allocate more than 20% of new estate area for greening and 30% for sites over two hectares. The tree planting ratio is set to be one tree or more per 15 flats. Our cost effectiveness in greenery works is closely monitored.

At Hung Fuk Estate, we have experimented with sustainable gardening by recycling felled trees and turning them into compost. The results have shed light on the development of an optimal ratio of wood and garden waste for compost production and criteria for composting conditions. Recycling trees for landscape mulch will be done in other appropriate projects in the future.



Wood chips are used as bulking agent to mix with food or garden waste and decomposed into soil conditioner

42

During the year, we continued to engage our tenants in greening of our new housing estates through the Action Seedling programme. To further nurture tenants' interests in gardening and greening, we have designated planting areas in development projects where residents can participate in gardening and planting for leisure and education.



Action Seedling programme at Po Heung Estate



Soil nail stabilisation works and greening measure at Lin Tsui Estate

To enhance aesthetics of slopes in close proximity to our housing estates, we actively deploy hydroseeding, planting and other measures on newly formed slopes. As of the end of March 2018, three projects including Lin Shing Road, Shatin Area 52 Phase 2 and Choi Yuen Road have undergone these green treatments.

#### **Noise Control**

To minimise noise impact on our developments and nuisance to our residents, we have built-in various noise mitigation features in our projects. Depending on the site-specific characteristics, features adopted include acoustic windows, acoustic balconies, architectural fins, noise barriers, etc.

The design of second generation acoustic precast balconies design featuring sliding screens in front of the balcony doors, noise absorptive material in the balcony wall and ceiling, and inclined panels along the parapet has been adopted in eight new housing estates under development. With the function of reducing traffic noise, the precast acoustic balcony will be included in new projects as appropriate to improve living experience of our tenants.



7 completed projects adopted **Noise Mitigation Measures** (Including barrier, fin, acoustic window and/or balcony etc.)



🗼 Architectural fin in Kwai Luen Estate



\lambda Second generation acoustic balcony

#### **Air Quality Management**

Adopting the Development Bureau's implementation plan, we have phased out the use of four types of Exempted Non-Road Machinery with an estimated value of more than \$200 million. Our foundation contractors have agreed to add filters to plants and machinery to reduce air pollution.

#### **Asbestos Abatement**

Asbestos removal work for a school block at Public Housing Development site at Lai King Estate, Kwai Tsing, was completed in April 2017.

#### **Risk Assessment**

Following the guidelines of ISO 31000, we have carried out a risk assessment on about 2,300 building materials used in architectural, building services, geotechnical engineering, landscaping works and structural materials. Assessment results were incorporated into the enhanced quality control system on material compliance checking and monitoring, where all enhancement measures were fully implemented by the end of 2017.



### Initiatives in Existing Housing Estates

#### Environmental Responsible Management and Maintenance

#### ISO 14001 Environmental Management System (EMS)

Since 2010, we have integrated EMS into our housing estate management that meets the internationally recognised ISO 14001 standard. In 2011 and 2013, all of our PRH estates have achieved ISO 14001 certification for maintenance and property management. In May 2017, we completed the transition to ISO 14001:2015 edition. An annual internal audit to maintain ISO 14001 was completed in 2018.

We continue to implement ISO 14001 together with ISO 9001 in the planning, design, project management, and contract administration for planned Maintenance and Improvement (M&I) to ensure continual improvement in our environmental performance. The ISO 19011 Audit Management System is still used for M&I works.

#### **Energy Conservation and Carbon Management**

#### ISO 50001 Energy Management System (EnMS)

We have maintained EnMS in all existing PRH estates since we obtained the full certification of ISO 50001 in April 2015. Nevertheless, as the three-year validity period that began with the initial certification of Kwai Shing West Estate expired in June 2016, a large re-certification examination was completed in April 2016. This means our certification for all existing PRH properties has been renewed for another three-year validity period (i.e. until June 2019).

Resulting from the effective use of EnMS, electricity consumption in the estates' communal areas in 2017/18 was 50.9 kWh per flat per month. This represents a 0.6% decrease compared to the previous year, securing a year-on-year reduction for the 10<sup>th</sup> year.



#### **Electricity Consumption in the Public Areas of Estates**

#### Adoption of Energy and Carbon Reduction Measures

In addition to closely monitoring and periodically reviewing the energy consumption of our buildings, we have introduced various energy-saving measures. Under the Lift Modernisation Programme, 55 old lifts were replaced during the year. Compared with the old models, the new model typically reduces over 30% of energy usage. On the other hand, we provide standard EV charging facilities for monthly EV parking in existing car parks with the consideration of technical feasibility and on need basis.



New lift models typically reduces over **30%** of energy usage

Also, we continue to monitor and benchmark the carbon footprint of 14 typical housing blocks representing the majority of PRH block types through carbon audits. With the completion of the fifth carbon audit report, the total carbon footprint of the 14 blocks of 2016/17 decreased when compared to the 2011/12 baseline data, in average of about 17%. The findings have been used for formulating corresponding carbon reduction measures that yield positive energy efficiency.

Subsequent to the identification of potential enhancement areas, we have undertaken various energysaving measures in our commercial premises. For instance, the indoor temperature of public area in central air-conditioned shopping centres is regulated at 24-26°C in summer. During non-peak hours, some of the lightings are switched off. We also set timers for advertising panels and decorative lighting, and install oil-free chillers. Over the years, we have participated in the Government's Energy Saving Charter to demonstrate our energy conservation efforts.

#### Noise Control

With appropriate maintenance and improvement works of building services facilities and proper management of estates, we comply with requirements of the Noise Control Ordinance in estates.

#### Waste Management

The Source Separation of Domestic Waste Programme has been introduced in all housing estates to encourage waste separation at source and foster a waste reduction culture. Different video broadcasting and promotional activities have been carried out to raise residents' awareness and encourage participation. To encourage and appreciate environmentally friendly act, recyclable collection counters have also been set up in all housing estates to provide cash or household groceries to residents in return for their contribution of recyclables.



29,204 tonnes of paper recycled



**2,042** tonnes of plastic bottles recycled



**1,541** tonnes of aluminium cans recycled



**892** tonnes of used clothes recycled

With the waste reduction initiatives, the average domestic waste production of our residents was 0.56 kg per person per day.

With regard to our commercial premises, we support restaurants, supermarkets and market stall tenants to practise food waste management, including donating surplus food to non-government organisations (NGOs). Besides, we collaborate with NGOs or other government departments for environmental causes by providing venues in our shopping malls free of charge. During the year, we supported the Lai See Reuse and Recycling Programme organised by the Greeners' Action, where a total of six HA shopping centres participated in collecting used red packet envelopes and redistributing reusable envelopes.

#### Water Conservation

The HA has also strived to conserve water resources in its managed commercial properties. For instance, a reclaimed air-conditioning condensate water recovery system has been implemented in Domain as a new measure. Condensate water from air-conditioning system will be reclaimed, filtered and reused everyday for landscape irrigation.

#### Greening and Tree Management

#### Greening

Roof greening is one of the environmental initiatives for providing a healthy and sustainable living environment. Green roofs have been retrofitted in some existing estates and also been incorporated in newly-constructed lift towers and covered walkways. To save water for irrigation, automatic irrigation systems with rainwater sensor have been installed in some green roofs and the irrigation volume can be adjusted automatically according to weather condition.

The HA continuously improves the living environment of the housing estates through greening. Several works have been done including greening rooftop of Kwai Shing West Estate, which was welcomed by residents. When improving the landscape, we introduced different plants that are suitable to the local landscape and conditions. Landscape improvement work had been carried out in a total of 20 estates. To strengthen tenants' awareness and involvement in greening, we organised community garden programmes in 10 estates.



👃 Landscape Improvement Programme at Kai Ching Estate



lacktriangleright Community Garden Programme at Nam Shan Estate

47

#### **Strengthening Tree Management**

The Enterprise Tree Management System (ETrMS) has been developed and implemented to effectively assess and manage approximately 101,000 trees on the premises in around 200 housing estates in Hong Kong. ETrMS serves as a database for systematically monitoring the work on tree management and risk assessment through web and mobile applications. After each assessment, the findings will be stored in a comprehensive Geographic Information System (GIS). By logging onto the ETrMS for on-site inspection, it assists us to identify trees that need prompt remedial treatment. Ad-hoc risk assessments and maintenance can also be conducted when required.



ETrMS as a computerised database for effective tree management

To support our work on tree management and preservation, we have recruited Estate Tree Ambassadors (ETAs) in our estates. As at March 2018, about 710 people have been engaged as ETAs. Refresher and training courses were organised for ETAs during the year to equip them with basic knowledge on tree management.

We organise meetings with the Development Bureau regularly to update our tree preservation and management guidelines and clauses in contracts for good practice. In addition, the public can access our mini-website for general information and characteristics of trees commonly found in our housing estates.

#### Asbestos Abatement

Although asbestos is present in some of our old housing blocks and buildings, no threats will be posed to human health if the substance is left intact and undisturbed. We have promulgated and enhanced publicity of locations and proper handling of Asbestos Containing Material (ACM) by distributing pamphlets, posting notices, updating ACM record in the HA/HD website, etc. We have arranged regular training seminars and briefings to alert and remind our staff on the proper procedures in handling ACM. We have also enhanced regular monitoring system on ACM including half-yearly condition survey and annual in-flat condition survey by our staff, biennial condition survey by Registered Asbestos Consultant, and arranged necessary repair and follow up action.

#### Organising Green Activities

Since its inception in 2005, we have been partnering with local green groups to plan and implement a long-term estate-wide environmental education programme, namely the "Green Delight in Estates" (GDE), to raise environmental awareness among residents in our housing estates. During the year, GDE Phase 10 has been concluded and Phase 11 has been commenced. "Reduction of Municipal Solid Waste" continued to be the over-arching goal of the programme, so as to echo the Government's current waste management policy. In the past 10 phases, around 25,000 residents and students were trained as Green Estate Ambassadors to promote green messages to other residents to create a green and healthy residential environment for their communities.

Phase 11 of GDE adopted the theme of "Green Junior's Academy on Waste Reduction". The highlight activity of the year, "Finding Green Junior", was commenced in December 2017. The HA's Mascot

Green Junior has taken a proactive role in engaging residents in waste reduction and recycling messages through year-round activities such as greeting residents of public rental housing estates and teaching fans on proper and clean recycling. Since December 2017, Green Junior has completed visits to over 100 public housing estates. A series of in-depth educational programme were also conducted in about 30 PRH estates.





Launching ceremony of GDE Phase 11

"Finding Green Junior" activity

In support of the Government's efforts to reduce municipal solid waste, we have rolled out the campaign "Let's join hands to reduce waste in our estates" since 2014 to encourage PRH tenants to take part in waste reduction, recycling and reuse. To highlight the theme of the campaign in a lively way, we have used a honeybee and a "slimmed-down" litter bin as mascots to encourage tenants' participation.

The Estate Management Advisory Committees (EMACs) play a significant role in promoting green living environment to our tenants. In collaboration with EMACs, a wide variety of programmes have been organised to engage residents in environmental works. During the year, we organised greening activities for residents in 20 estates and tree planting days in 10 estates.



🗼 Tree planting day at Choi Yuen Estate

We also continued to promote green practices in the HA's retail facilities. To demonstrate the support to environmental protection and energy saving, nine shopping centres have pledged to the Energy Saving Charter and 10 shopping centres to the Charter on External Lighting. To encourage our shop tenants to adopt green measures for improving the overall environmental performance of the malls, we have signed up retail facilities in 20 shopping centres or estates to join the Hong Kong Green Shop Alliance.

### Initiatives in Office at Work

#### Implementation of Environmental Management System

Since December 2013, our Corporate Services Division (CSD) was certified with ISO 14001 EMS on the property management at the HA Headquarters (HAHQ). The Independent Checking Unit (ICU) was awarded the same certification as well as ISO 9001 QMS standards in May 2014. Receiving the qualifications in relation to building control as the first regulatory body in Hong Kong marks a significant point in the commitment to excellence in monitoring and management. ICU has successfully expanded the scope of the Quality and Environmental Management System (QEMS) and upgraded it to ISO 9001:2015 and ISO 14001:2015 standards respectively. The upgraded QEMS has been fully implemented to cover all building control teams of ICU since June 2017.

In order to enhance the holistic environmental performance in the offices, environmental audits were carried out in 2017. With effective management and monitoring, a steady decline in our resource consumptions, including paper and electricity in our offices as well as water consumption in the HAHQ, and a rise in the amount of waste paper collected have been achieved. In addition, EMS and environmental audit training were provided to the staff to ensure the management approach can be implemented effectively.

#### Energy Saving and Carbon Management

On top of the aforementioned EMS and environmental audits, we are committed to reducing our energy consumption and GHG emissions at work through various initiatives, including controlling the use of refrigerants, installing motion sensors for lighting, optimising the chiller system control, and changing the operating hours of lifts, escalators and air-conditioning equipment.

To help achieve the Government's latest electricity saving target, we target at reducing our electricity consumption by 5% from 2015/16 to 2019/20 as compared to the 2013/14 baseline consumption under comparable operating conditions. Hence, our interim target is to achieve 3% consumption reduction in 2017/18 compared to the baseline. During the year, electricity consumption of our office premises decreased by 9.7%, exceeding our target.

Since 2008/09, a carbon audit has been carried out for the HAHQ Block 3 and Lok Fu Customer Service Centre. The ninth carbon audit report covering period from 1 August 2016 to 31 July 2017 has been finalised during the year. Owing to our carbon management programme, the amount of emissions for our offices remained stable in the previous few years. We will keep on improving our carbon footprint by identifying enhancement measures through such audits.



Electricity saving target: **5%** from 2015/16 to 2019/20



Saved **9.7%** in 2017/18

#### Waste Management

A variety of waste management initiatives was carried out to reduce the amount of solid waste produced by our office operation.

Waste paper is a major type of waste generated from our offices. Thus, we have set a paper consumption reduction target of 1.5% under comparable operating conditions of the consumption in 2013/14 as baseline, to minimise waste generation at source. To further reduce the environmental impact of paper use, we are using environmentally friendly paper as a prerequisite in printing all our publicity materials.

Paper consumption reduced by **4.4%** compared to baseline year

With regard to defective mercury-containing lamps, the major hazardous materials at the HAHQ, all the lamps collected are handled by special waste treatment to ensure responsible disposal of waste and lessen the impact to the environment.

#### Water Conservation

To monitor the water consumption at the HAHQ constantly, we conduct regular inspections to avoid pipe breakage and leakage and provide water conservation tips to our staff. Despite the absence of a government-wide water-saving target currently, we have set our own target which is to achieve a further 2% reduction in 2017/18 compared with that in 2016/17 to demonstrate our commitment to protecting our water resources. During the year, the HAHQ successfully achieved a reduction of 27.8% reduction compared with the consumption in 2007/08.

#### Green Culture and Activities

The HA takes the lead in promoting green culture in the offices, with the help of multimedia platforms. The HA Environmental Corporate Video, which highlights our environmental programmes and activities, is available on the HA/HD website, social media channels and e-Learning Portal, and is played at the induction course for all new staff. During the year, we also organised 18 seminars for raising our staff's awareness on environmental issues, as well as arranged green display panels at the HAHQ and Lung Cheung Office Block for showcasing our latest environmental work and achievements. We set up Green Corner in prominent area in the HA offices for year-round exhibition on the HA's policy and achievements, as well as environmental education for the staff.

Our offices have implemented a series of green measures on waste minimisation, waste recovery for recycling and reuse, and energy conservation. In addition to ordinary green office practices, including paper-saving measures, segregation of recyclables and energy-saving initiatives, routine Office Security cum Energy Conservation Check is conducted every day after office hours to ensure unnecessary lighting and office equipment are being switched off.

Since the end of 2017, the HA has set guideline for procurement and disposal of safety helmets. Each year, we will remind our staff to collect expired safety helmets for disposal by suitable recyclers who would destruct the expired helmets for recycling and produce other products.



Environmental Collection and Recycling Campaign at the HA office

Joined hands with a non-profit making charity organisation, we have organised two "Environmental Collection and Recycling Campaigns" in the HAHQ, Lok Fu Customer Service Centre and Lung Cheung Office Block in June 2017 and January 2018 respectively. Thanks to the wholehearted support from our staff, over 4.7 tonnes of reusable items were collected, including shoes, handbags, books, stationeries, household items, beddings and decorations, etc.

We also strongly encourage our staff to participate in environmental activities organised by external parties. During the year, more than 120 staff and their family members participated in the Hong Kong Tree Planting Day. The HA also participated in other environmental sustainability activities such as Eco Expo Asia 2017 and the Community Chest's Green Day to showcase our green performance and spread green messages to the community. This year, we also joined the Green Carnival organised by Green Council. Through game booth and display, we aimed to raise public's awareness on waste reduction and recycling, as well as encouraging them to save resources.



 $\sim$  Over 120 staff and their family members showed support for the Hong Kong Tree Planting Day.

#### Green Manager Scheme

The HA has actively supported the Government-wide Green Manager Scheme launched by the Environmental Protection Department in the same way as other bureaux and departments, by appointing staff members as Green Manager and Green Executives. Their responsibilities include promoting environmental protection principles in the offices, and monitoring the HA's environmental performance and effectiveness of the measures.

### **Case Study**

### Linking the Community to the Nature – Shui Chuen O Estate

We strive to improve residents' quality of life and environmental sustainability at each housing development project. Shui Chuen O Estate is one of the best showcases of how we achieve environmental excellence. Located on a hilly terrain, the estate comprises 18 blocks, offering accommodation to around 11,100 households.



#### Linking with Nature

We introduced the "green fingers" concept into Shui Chuen O design to maximise its connection with the surrounding country parks. This design concept aims to extend the country park's greeneries into the estate through intensive planting and greening, seamlessly merging the natural and artificial environments. Regardless of a high-rise urban setting, the "green fingers" design offers an intimacy between residents and the natural environment.

We have adopted various water conservation design for the extensive greeneries including Zero Irrigation System (ZIS) and Rainwater Harvesting System. In addition, special plant species and sub-soil were selected for the bio retention process.

To reinforce the linkages between natural surroundings and the residents, the team launched a green and distinctive hiking trail - "eco-trail" across the estate and the adjoining country parks. The trail connects the east and west platforms of the estate with the commercial centre and directly links with the Tsz Sha Ancient Trail, once a major link between Sha Tin and Kowloon back in the Qing Dynasty. These trails allow hiking-lovers to walk from Tsz Wan Shan to Sha Tin Pass and then head to Shui Chuen O Estate via the Wilson Trail. Commercial centre linking to eco-trail can act as goods stock-up or dining place for hikers before or after a hike.





## Linking with the Environment for Sustainability

To maintain a strong connection between the natural environment and Shui Chuen O Estate, we consciously adopt a wide range of design ideas. Three major wind and view corridors were developed to provide pleasant visual connections between the Sha Tin town below and the surrounding mountains and to maintain the air ventilation paths through the site. These buildings were designed and grouped in a cascading profile with Visual Impact Assessment Studies and Microclimate Studies and blend with the profile of the mountain behind.





Weather-protected connections between different platforms

### While the pedestrian network is filled with "activity nodes" at Shui Chuen O Estate such as open plaza for community activities and festive events as well as leisure areas, scenic routes for walking and jogging, and playgrounds for all ages, the natural habitats and landscapes were taken into account in the landscape design for these nodes in order to enhance seasonal colours and attract birds and butterflies.

The three elements - nature, environment and people - are crucial in establishing a harmonious and sustainable community.

#### Linking to People

We place great importance to provide links for people in this site, and therefore created "tapestry" of weather-protected walkways, footbridges, lift towers, escalators and access ramps to facilitate the hassle-free movement of pedestrians.



Lift tower and mega pedestrian footbridge



