

# ENVIRONMENTAL PERFORMANCE

- Initiatives in Planning and Construction of New Housing Estates
- Initiatives in Existing Housing Estates
- Initiatives in Office at Work
- Case Study Increased Use of Precast Concrete Components

It has been a longstanding commitment of the Hong Kong Housing Authority (HA) to provide quality, sustainable and environmentally friendly housing to the public. We have been taking an active role in improving our environmental performance with regards to 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 applies micro-climate studies and Air Ventilation Assessments in the planning and design of new estates. Taking an array of environmental factors such as wind availability, natural ventilation, daylighting and shading, thermal comfort, as well as pollutant dispersion into consideration, the studies allow us to have a more comprehensive understanding over the projects' impacts on the surrounding environment. This year, micro-climate studies were conducted in 31 on-going projects and Air Ventilation Assessments were carried out in 19 projects.



Micro-climate studies and Air Ventilation Assessment

#### Adopting Low Carbon Building Design

In alignment with the Government's Hong Kong Climate Action Plan 2030+, we have adopted various green building strategies during the design and construction of our public housing projects to minimise our carbon footprint.



# Carbon Emission Estimation

Avoided annual CO<sub>2</sub> emissions equivalent to **155,000** trees planted for 30 domestic blocks designed in 2018/19

To ensure the target could be met, we have continued to apply the Carbon Emission Estimation (CEE) in all new development projects under-design. During the year, CEE has been adopted in nine projects, which allowed us to estimate the amount of GHG emissions occurring throughout the whole building lifecycle. Comparing that against the standard block of New Harmony 1 Option 6 and Kai Ching Estate, the average reduction of GHG emissions is about 16% since the implementation of CEE.

24

## **Utilising Green Materials and Products**

Greener alternatives of construction materials have been adopted in new works projects, and multiple initiatives have been in place to reduce the use of cement. For example, part of the cement in precast facades and stairs are mandatorily substituted with Ground Granulated Blast Furnace Slag (GGBS) for all our new projects, so as to minimise the use of cement and facilitate the popularisation of recycled materials application. Its application in other precast structural elements is also currently underway. Synthetic macro-fibre reinforcement will also be used in on-grade slabs in new projects where applicable.



Ground Granulated Blast Furnace Slag

In addition to concrete, we keep exploring the possibility of incorporating other sustainable materials and energy-efficient equipment into the buildings. For instance, timber from certified sustainable origins are selected for door manufacturing, and plumbing fixtures registered under the Water Efficiency Labelling Scheme (WELS) are used.

The HA also promotes the use of innovative materials and products which yields environmental benefits. In 2017/18, we announced the mandatory use of B5 bio-diesel as a fuel for all off-road construction machinery on site. We are also investigating the future use of manufactured sand in replacement for river sand. By carrying out trial on applying mortar consisting manufactured sand to vertical surfaces, the workability and performance of the proposed specification achieved satisfactory performance. Moreover, we have formulated the structural soil chemical mix to promote vegetation growth and comply with load-bearing requirements simultaneously. It has been adopted in the housing development at Anderson Road Sites A and B Phases 1 and 2 during the year.

Furthermore, 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. During the year, HKGBC has incorporated the three schemes to the BEAM Plus credits, and hence, the updated specification clauses of BEAM Plus for New Building version 2.0 will be implemented in all our new works projects accordingly. We will also monitor the HKGBC Green Product Accreditation & Standards Scheme and update our guide on green materials and products for maintenance and improvement work, where applicable.

# **Environmentally Friendly Construction Practices**

In our pursuit of going beyond legal requirements, we require our contractors to adopt various green construction methods from the aspects of site formation, demolition, foundation, building and civil engineering works. For example:

- implementing ISO 9001 Quality Management System (QMS) and ISO 14001 Environment 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;
- practicing hard paved construction;
- offering solar hot water heaters in workers' shower areas;
- providing food waste composting facilities in remote sites with canteens or catering services;
- recovering undamaged timber pallets for locally manufactured pavers for reuse or recycling; and
- maintaining online database "Information Platform on Recyclable Non-inert Construction and Demolition Waste".



Adopt precast concrete components



Use electric vehicles (EVs) as contract cars



Use RFID to track construction waste disposal



# **Greening on site**

To manage the environmental impacts and enhance the coordination of work along the building lifecycle, we integrate innovative and advanced technologies into our green practices. An intelligent 3D model-based Building Information Modelling (BIM) is one of the most important tools which enables effective work during the planning, design, construction and management stages. First adopted in 2005, BIM is now widely used in our new projects for design, coordination, environmental analyses and construction planning.



Building Information Modelling

Adopted in over **90** projects since 2005

Adding on considerations of time and cost to the existing 3D BIM, we have introduced a customised 5D BIM to allow more accurate forecasting and planning of resources. The tool has been applied in the housing development at Anderson Road Sites A and B Phases 1 and 2. During the year, we have also explored the feasibility of using the BIM system for the processing of new development works submissions. User requirements are being collected and a study report is being prepared in the initial stage.



In addition to adopting various creative and environmentally friendly practices in our development projects, we have also developed standards for their applications. Standardised-designed precast segment roof water tanks are applied in new projects if applicable. Also, we published guidelines for "Implementation of Precast Construction at Roof of Domestic Block" and implemented the precast acoustic balcony in the latest Modular Flat Design in 2018. We will continuously explore the wider use of precast concrete components such as volumetric precast components, precast structural walls with concealed conduits, as well as precast lift shafts with pre-installed lift guide rails.

# Integrated Use of BIM and Geographic Information System (GIS) for Site Potential and Feasibility Studies

The integrated use of BIM and GIS is instrumental to our planning and design of housing development in particular at feasibility stage to perform a number of visual impact assessments, including ridgeline, vantage point and shadow analysis.

#### **Green Building Recognition**

Incorporating green building features into the development projects are our top priority, and all our projects are required to achieve the "Gold" rating standard or above in the HKGBC's BEAM Plus NB certification scheme. In 2018/19, the results are summarised as follows:



# **BEAM Assessed Projects**

7 projects registered &4 projects awarded during the year

Project	Rating
Public Rental Housing (PRH) Development at Queen's Hill Site 1 Phase 1 & 5, Fanling	Provisional Platinum
Community Hall cum Social Welfare Facilities at Queen's Hill, Fanling	Provisional Gold
PRH Development at Near Lai King Hill Road, Kwai Chung	Provisional Gold
Subsidised Sale Flat (SSF) Development at Tung Chung Area 54	Provisional Gold

# **Resource Conservation**

#### **Holistic Energy Management**

To enhance the overall energy efficiency, we have implemented the Energy Management System in accordance with ISO 50001 since 2011. Through the system, communal energy consumption of the completed and occupied buildings can be estimated during the design stage, helping us to identify and enforce the energy performance measures. During the year, we have applied the energy estimations to nine new public housing developments. We have also required our contractors to monitor their energy performance and submit energy consumption data in accordance to the standard's requirements.



# Average Energy Consumption

of building services installations in communal areas of domestic blocks designed in 2018/19 was **22.26 kWh/m<sup>2</sup>/annum** 

#### **Renewable Energy**

We strive to maximise the use of renewable energy technologies. Grid-connected photovoltaic (PV) systems are installed in new building blocks where applicable, which is designed to generate about 1.5% to 2.5% of the electricity demand of the communal area.



# PV systems (as of March 2019)

Installed in **98** domestic blocks, with a total system capacity of **930 kW** 

#### **Promoting Electric Vehicles**

We actively support the Government's policy in promoting the use of electric vehicles (EVs). We follow the requirement of Planning Department's "Hong Kong Planning Standards and Guidelines" and have provided EV charging facilities for 30% indoor private car parking spaces at of new public housing developments. For the remaining 70% indoor private car parking spaces, we have installed EV charging-enabling facilities (including electricity distribution boards, cables, conduit and trunking) and have reserved space for future installation of EV chargers.



EV charging facilities

Environmental Performance

28

# **Energy Efficiency in Buildings**

During the development of estates, we observe the Building Department's "Guidelines on the Design and Construction Requirements for Energy Efficiency of Residential Buildings" issued in 2014. In line with the Guidelines, we continue to make efforts in exploring the potentials of natural ventilation and the integration of sustainable designs. On the other hand, we have developed a list of relevant standards and guidelines for air-conditioning systems to identify the appropriate projects in applying hybrid ventilation systems, thereby reducing energy



Hybrid ventilation system

consumption in air-conditioning and mechanical ventilation systems.

We comply with the Building Energy Codes issued by the Electrical and Mechanical Services Department (EMSD). We have received 135 Certificates of Compliance Registration from the EMSD for the completed developments in compliance with the Building Energy Efficiency Ordinance.

For a few years, the lift systems using motors with power rating of 18kW or above are required to use regenerative power in new works projects. Due to the satisfactory piloting results, we have further extended the implementation of lift regenerative power feature for lift motors from "18 kW or above" to "8 kW or above" and used permanent magnet synchronous motors (PMSM) in some of our projects to further improve the energy efficiency.

All our new project designs have applied LED bulkhead lights as standard lighting in communal areas of domestic blocks to strive for energy saving in lighting systems. 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. From 2019 onwards, we will further adopt LED exit signs and directional signs in the design of new developments.



PMSM for lift installation



LED bulkhead lights



LED exit signs and directional signs

We are committed to regularly reviewing and exploring alternative measures to improve energy efficiency. We have continued to align the design of our new projects with the mandatory requirements on Residential Thermal Transfer Values promulgated in the Buildings Department's Practice Note.

# **Smart Meter**

In pursuance of enhancing the environmental awareness among tenants, all new housing blocks are equipped with smart meter monitoring system which displays the monthly energy consumption information in the lobbies of the main entrance. Peer comparison data on the consumption of electricity, gas and fresh water are also provided for the communities and tenants to benchmark their environmental footprint.



Display of the smart meter monitoring system at main entrance lobby of Hoi Ying Estate

30

# Water Conservation

Apart from construction processes, freshwater is dominantly consumed in daily washing, flushing and irrigation. We have thus implemented different measures in new project designs to achieve the goal of preserving water resources. For example, integrated water-sensitive urban design is introduced in Shui Chuen O Estate to collect rainwater in the high elevations and green slopes. After being treated by bio-retention, collected rainwater can be stored and used for irrigation.



Zero Irrigation System Planter Under construction in 22 projects & completed in 11 projects

We have also successfully trialled the installation of Zero Irrigation System (ZIS), which has proved to be effective in reusing rainwater and reducing potable water for irrigation. The system has been adopted in planters of appropriate location and size in all PRH and SSF projects since 2016.



Completed ZIS retaining rainwater and drawing up water for irrigation in a self-sustaining cycle: before (left) & after (right)

# Mitigating Environmental Impacts Estate Ecology

In alignment with the balanced ecological planning and design principles, we are committed to maintaining the ecological value in the vicinity of our housing projects. Accordingly, we have developed green design guidelines that require new estate area and sites over two hectares to have the greening ratio of at least 20% and 30% respectively. The tree planting ratio is set to be one tree or more per 15 flats. Other measures such as hydroseeding and planting on the newly formed slopes were also deployed to



Hydroseeding at slope at So Uk Estate Phase 2

further expand greenery coverage and improve the aesthetics around the estate area. As of the end of March 2019, four projects including eight slopes have undergone these green treatments, e.g. So Uk Estate Phase 2.

At the same time, we are developing a prefabricated modular system to make the planting of trees at ground level and on the podiums of estate blocks simpler and more efficient. We are also looking to use more pre-grown vertical green panels at appropriate projects, as these are very effective in increasing the amount of green coverage and achieving "instant greening".



Prefabricated modular planting system at Shek Kip Mei Estate Phase 3

To better integrate these principles into practice, we hold briefing and debriefing sessions, as well as site visits for our contractors. We have also coordinated with the Development Bureau to establish guidelines and provisions for facilitating our liaison with contractors.

In support of sustainable gardening, we have conducted trials of felled trees recycling at some of our developments. On-site shredding and composting facilities are set up to recycle felled trees to mulch and compost for landscaping use. The results have helped us to devise an optimal ratio of wood and garden waste for compost production and set out criteria for composting conditions, of which a relevant guideline is currently under development.



Felled trees are cut and shredded into wood chips for composting with food or garden waste

The continuous involvement of our tenants also contributes to our greenery work. Through the Action Seedling programme, tenants are invited to participate in gardening and planting at our designated planting area, gradually developing their interest and concern in nature conservation.

#### **Noise Control**

Considering the noise impacts associated with road traffic noise, we have embedded a variety of noise mitigation features, including acoustic windows, architectural fins and noise barriers, into our projects based on the site-specific characteristics. To explore further enhancement opportunities, we developed the second-generation acoustic precast balconies design which features an additional sliding screen in front of the balcony doors, noise absorptive material in the balcony wall and ceiling, and inclined panels along the parapet. Where appropriate, this type of acoustic balcony will be included in new projects to reduce traffic noise nuisance and improve living experience of our tenants.



Action Seedling programme at Mun Tung Estate



Second-generation acoustic balcony

#### **Air Quality Management**

In accordance with the Development Bureau's implementation plan, the use of four types of Exempted Non-Road Machinery with an estimated value of more than \$200 million have been phased out. With the consent of our foundation contractors, filters have been installed in their plants and machinery for removing air pollutants.

#### **Asbestos Abatement**

We have conducted asbestos removal work for Public Housing Development site at Redevelopment of Pak Tin Estate, Phase 10 during the year.

#### **Risk Assessment**

By referencing to ISO 31000 Risk Management System, a risk assessment on about 2,300 building materials used in architectural, building services, geotechnical engineering, landscaping works and structural materials was conducted. We have continued to implement the enhanced quality control system on material compliance checking and monitoring during the year.



# Initiatives in Existing Housing Estates

# **Energy Conservation and Carbon Management**

## Adoption of Energy and Carbon Reduction Measures

The HA is keen on adopting various energy-saving strategies. In addition to the adoption of energyefficient built-in fixtures in new developments, we have been continuously reviewing and enhancing the energy efficiencies of our existing installations.



Example of Latest Energy-saving Technologies Replaced 56 old lifts under Lift Modernisation Programme Reduced around 30% of its energy consumption

As in previous years, we have closely monitored our energy consumption to facilitate better management and control. Owing to our continuous effort, electricity consumption in existing estates' communal areas has decreased to 49.9 kWh per flat per month. This represents a 2% decrease compared to the previous year, securing a year-on-year reduction for the 11<sup>th</sup> year.



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

On the other hand, we have continued to monitor the overall carbon footprint of our housing blocks. The sixth carbon audit report was completed this year for 14 typical housing blocks which cover the majority of PRH block types. Based on the findings, the overall carbon footprint of the 14 blocks has been decreased by the average of about 17%, against the baseline data in 2011/12. The results help us to examine and formulate appropriate measures for carbon reduction.

As an initiative to reduce overall carbon footprint of our tenants and mall visitors, we offer EV charging facilities for monthly EV parking in car parks on need basis where technically feasible, in addition to those EV charging facilities provided for users of hourly parking spaces in new and existing car parks. To further expand our EV charging network, we had conducted feasibility study and planned to provide additional medium chargers at hourly car parking spaces in Domain, Tak Long and On Tat Estates in the coming year. As at the end of the reporting year, 31 EV charging facilities at ten existing carparks have been installed for monthly users on need basis. To encourage the use of EVs, we offer a maximum of two hours of free parking during charging of EVs at our hourly parking spaces.

# Waste Management

In preparation for Environmental Protection Department (EPD)'s upcoming implementation of Municipal Solid Waste (MSW) Charging Scheme, we jointly organised a trial implementation programme with the EPD. Phase 1 of the programme was conducted in Ka Fuk, Tai Hang Tung and Yue Wan Estates. In the programme, EPD provided free "dummy" garbage bags to our tenants in the three selected estates for a three-month period starting from January 2019. We are reviewing its effectiveness with the EPD, before launching another round of trial.



Trial of MSW Charging Scheme in selected estates

Synergising with our continued promotion of the Source Separation of Domestic Waste Programme in all housing estates, the community's awareness on waste reduction and waste separation at source has been raised. The average domestic waste production of our residents was 0.58 kg/person/day which is lower than our target of less than 0.7kg/person/day, and a considerable amount of recyclables have been received during the year.



34

With respect to our commercial premises, our focus is placed on reducing food waste and the use of plastic tableware. Apart from encouraging restaurants, supermarkets and market stall tenants to donate surplus food to non-government organisations, we collaborated with the EPD and Food and Environmental Hygiene Department during the year to launch a two-year pilot scheme for collecting source-separated food waste from nine HA wet markets and shopping centres. Collected food waste is sent for off-site recycling at the Organic Resources Recovery Centre. On the other hand, a scheme named "Plastic-Free Redemption Programme in Domain" was organised to spread a plastic-and-disposable-free culture through gift redemption and promotion schemes.

## **Water Conservation**

We are committed to conserving water resources in our managed commercial properties. For instance, a reclaimed air-conditioning condensate water recovery system has been introduced in Domain to filter and reuse condensate water for landscape irrigation.

# **Greening and Tree Management**

#### Greening

To create a healthy and green living environment, we have adopted roof greening as one of our landscape improvement initiatives. Green roofs, together with auto-adjusting irrigation systems wherever feasible, have been retrofitted in some existing estates. Throughout these landscape improvement works, we introduce various plants that are suitable for the local landscape and conditions. During the year, such works have been conducted in 20 estates.



Landscape Improvement Programme in Ping Shek Estate (Left) and Tsz Ching Estate (Right)

## **Strengthening Tree Management**

To ensure effective assessment and management of approximately 93,000 trees on the premises of around 200 housing estates, the Enterprise Tree Management System (ETrMS) has been developed and applied. Serving as a database, ETrMS allows us to monitor tree management work and conduct risk assessment via web and mobile applications. The findings are stored in a comprehensive GIS after each assessment. During on-site inspection, we can log onto the ETrMS to identify trees in need of remedial work or carry out tree risk assessments in the field.

In support of our work on tree management and preservation, we have recruited Estate Tree Ambassadors (ETAs) in our estates. As at March 2019, about 720 residents have participated as ETAs. To equip the ETAs with basic knowledge in the areas of tree care, we have organised refresher and training courses for them during the year.



ETrMS as a computerised database for effective tree management

We also meet with the Tree Management Office under the Development Bureau and other relevant government departments periodically to discuss issues of concern on tree. General information of common trees found in our housing estates are available on our mini-website for public access.

#### **Asbestos Abatement**

Asbestos are present in some of our old housing blocks and buildings, but they pose little to no threats to human health if the substance is left intact and undisturbed. Through a series of initiatives such as distributing pamphlets, posting notices, updating Asbestos Containing Material (ACM) record in the HA/HD website, we have promulgated and enhanced publicity of locations and proper handling of ACM. Regular training seminars and briefings have been held 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 carry out necessary repair and follow up action.

# **Organising Green Activities**

We keep strengthening our efforts in raising environmental awareness among residents in our housing estates. In this regard, we have launched a long-term estate-wide environmental education programme, named "Green Delight in Estates" (GDE), in partnership with local green groups since its inception in 2005. During the year, GDE Phase 11 has been completed with a total of 2,647 residents and students being trained as Green Estate Ambassadors, spreading green messages to other residents and fostering a sustainable community environment.

In 2019, Phase 12 has been commenced with a two-year theme of "Waste Reduction and Recycling", echoing the Government's waste management policy. In partnership with Greeners Action, Business Environment Council and World Green Organisation, we organised a variety of comprehensive educational and promotional programmes for 40 selected estates each year to encourage waste reduction and recycling. During the launching ceremony-cum-green carnival at Oi Man Estate, various activities like second-hand barter markets, upcycling and eco-detergent workshops were held.

In order to reduce different types of waste, HA has stepped up action to boost tenants' participation in waste reduction campaign - "Let's Join Hands to Reduce Waste in Our Estates". The recognisable mascots, namely honeybee and a "slimmed-down" litter bin, have been used to connect with people in a lively way.







Upcycling and eco-detergent workshops

The Estate Management Advisory Committees (EMACs) contribute significantly to the promotion of green living environment as well. We have organised a wide array of programmes, including green carnivals, green talks, guided tours of plants and planting activities, in collaboration with EMACs to engage residents in environmental works. For example, green carnivals were held at Hing Man Estate and Hing Tung Estate to enrich tenants' knowledge on horticulture. Throughout the year, such greening activities were organised for residents in 20 estates. Community gardening events were also organised in 14 estates, which allowed residents of all ages to experience the joy of harvesting their own home-grown food.



Green Carnival at Hing Man Estate



Community Garden Day in Yue Wan Estate

Green initiatives are also introduced to our retail facilities on a continuous basis. Ten shopping centres have pledged to the Energy Saving Charter and the Charter on External Lighting respectively, demonstrating our efforts in environmental protection and energy saving. The retail facilities under our 20 shopping centres and estates had signed up to join the Hong Kong Green Shop Alliance and were encouraged to adopt various green measures.



# Initiatives in Office at Work

# **Energy Saving and Carbon Management**

We are always devoted to minimising our electricity consumption and GHG emissions at work. To demonstrate our commitment, we have introduced an electricity saving target in alignment with the Government's latest target.



#### **Electricity Saving**

Target to reduce 4% vs. 2013/14 Saved **11.9%** in 2018/19

For 2018/19, the interim goal is to achieve a 4% consumption reduction against the base year. During the year, we have achieved significant reduction in electricity consumption, far exceeding our target.

We have achieved such reduction through different initiatives, including installing motion sensors for lighting, optimising the chiller system control, changing the operating hours of lifts, escalators and air-conditioning equipment, etc.

To better understand our environmental footprint in carbon terms, we have continued to conduct carbon audits for HAHQ Block 3 and Lok Fu Customer Service Centre for 10 consecutive years. Under our effective management, the amount of GHG emissions from our offices remained constant in the previous few years.

#### Waste Management

We have carried out different waste management measures to reduce solid waste generated by our offices. Waste paper accounts for a significant portion of total waste generation. To this end, we have introduced various IT-enabled

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# Paper Consumption

Target to reduce by 2.5% vs. 2013/14 Saved **7.9%** in 2018/19

solutions to reduce the use of paper at source. In addition, we have adopted environmentally friendly paper in printing all our publicity materials to further reduce the environmental footprint.

 Enterprise Resources Planning (ERP) application in procurement procedures



- Housing Electronic Plan Submission System (HePlan) & Housing Electronic Building Records Online System (HeBROS) for e-submissions and handling of documents
- HePlan for e-transfer of submissions to the Independent Checking Unit

We acknowledge that defective mercury-containing lamps is the major hazardous materials at HAHQ. To lessen their impacts to the environment, we have ensured responsible disposal of waste by handling all the lamps collected with special waste treatment.

Besides, we have set guidelines for procurement and disposal of safety helmets since 2017. Each year, we will remind our staff to collect expired safety helmets which would be destructed for recycling and utilised to produce other products.

# Water Conservation

Whilst providing water conservation tips to our staff, water consumption is regularly monitored and reviewed through inspections to avoid pipe breakage and leakage. Hence,



Water Consumption Target to reduce by 1% vs. 2015/16 Saved **6.1%** in 2018/19

we target at lowering the water consumption by 1% when compared to the 2015/2016 baseline data. During the year, we have achieved a 6.1% reduction against the baseline.

# **Green Culture and Activities**

We take the initiative in encouraging green culture in the offices on 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 broadcasted at the induction course for all new staff. Also, we arranged green display panels at HAHQ and Lung Cheung Office Block for showcasing our latest environmental work and achievements.

39

A wide array of green initiatives regarding paper saving, waste minimisation, waste recovery for recycling and reuse, and energy conservation have been carried out. 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. During the year, we have organised a total of 13 seminars to raise the environmental awareness of our staff.

In June 2018 and January 2019, we have also cooperated with a non-profit organisation to organise "Environmental Collection and Recycling Campaigns" in the HAHQ and two other offices. With overwhelming support from our staff, we collected about three tonnes of reusable items, including clothes, shoes, handbags, books, stationeries, household items, beddings and sports items, etc.



Environmental Collection and Recycling Campaign at (from left) the HAHQ, Lung Cheung Office Block and Lok Fu Customer Centre

Meanwhile, we strongly encourage our staff to participate in the environmental events organised by external parties. During the year, we have participated in activities such as the Hong Kong Tree Planting Day and the Community Chest's Green Day to promote green messages to the community.



Over 120 staff and their family members participated the Hong Kong Tree Planting Day

## **Green Manager Scheme**

Supporting the Government-wide Green Manager Scheme launched by the EPD, we appointed staff members as Green Manager and Green Executives in the same way as other bureaux and departments. They help to disseminate environmental protection principles in the offices, whilst monitoring the HA's environmental performance and effectiveness of the measures.

# **CASE STUDY**

# INCREASED USE OF PRECAST CONCRETE COMPONENTS

The HA always seeks opportunities to enhance environmental sustainability in housing development projects. Public housing development is large scale development with extensive use of construction materials and resources. To promote resource efficiency in construction work, we have been actively using precast concrete components (PCCs) with Modular Flat Design when developing public housing.

#### Adoption since 1990s

The HA has been using PCCs in its public housing development for over 25 years. Building components such as facades and staircases are prefabricated in off-site factories to enhance on-site construction efficiency and reduce resource consumption. With mechanised construction, building components are lifted to the working floor to fabricate the building with in-situ concrete by large panel metal formwork and fabric mesh reinforcement. PCCs can also reduce the construction waste generated from excessive concrete on-site. By applying different standardised PCCs to our housing projects, the construction productivity is maintained at a high level with 6-day construction cycle for a typical floor.



#### **Current Use of Various PCCs**

We strive to extend the use of PCCs. The technology is currently adopted in precast facades, precast staircases, precast partition walls, precast water tanks, semi-precast slabs, precast balcony and precast refuse chute. In addition, we have adopted mesh reinforcement for wall & slab construction and off-site "cut & bent" steel reinforcement. To extend the use of volumetric precast elements, the bathroom and the kitchen are made off-site as volumetric units where conditions permit.



Precast facade



Volumetric precast bathroom





Precast staircases

Semi-precast slab

#### **Continuous Exploration on PCCs Applicability**

Currently, the use of PCCs has reached 35% of concrete volume and 70% precast rate on plan at typical floor of the housing development. To improve resource efficiency, we are exploring the enhanced versions of PCCs, including the adoption of semi-precast slab with pre-installed service conduits in common area at typical floor. Some trials have been successfully conducted in precast component factories. In addition, we attempt to use precast structural walls with concealed conduits and precast lift shafts with pre-installed lift guide rails. The pilot project was commenced in 2019. With all the new initiatives, we expect the precast rate can be raised from about 70% to 90% on plan.



The extended version of PCCs (indicated in green) can raise the precast rate to around 90% on plan

To further promote environmental sustainability in developing public housing, the HA will continue exploring the latest development on adopting PCCs and relevant environmentally-sound technologies whenever viable.