

# Environmental Performance

- Energy and Greenhouse Gas Emissions
- Air Quality
- Noise Control
- Waste Management
- Water
- Estate Greening and Landscaping
- Material Usage and Control of Hazardous Materials
- Micro-climate Studies
- Biodiversity

In the environmental aspect of providing sustainable housing, we achieved it through formulation of environmental policy, adoption of green construction practices, conservation of resources, reduction of waste, creation of green environments and promotion of a green lifestyle to our residents.

During the year, we complied with all applicable environmental legislation. However, there were 2 conviction cases in environmental offences regarding our contractors' operations. One case was related to air, while the other one was related to noise.

## Energy and Greenhouse Gas Emissions

Climate change is the most controversial environmental issue having global concerns in recent years. We are diving headlong into climate chaos causing by uncontrolled anthropogenic emissions of greenhouse gases. There are a lot of worldwide discussions on combating climate change. According to the Copenhagen Accord<sup>(1)</sup>, 194 Nations, including China, agreed that each country should come up with reduction targets to reduce carbon intensity to avoid catastrophic impacts on people and the environment caused by climate change.

The major contributor of carbon emission in Hong Kong is from power generation. Hong Kong is a service-based city and does not have energy-intensive industries. Among all, buildings account for about 89% of the total electricity consumption at end-use level in Hong Kong. Managing a massive local housing programme, the Housing Authority (HA) looks for various possible opportunities to conserve energy in our managed housing blocks.

Apart from energy conservation, we also improve our service quality by implementing dual supply of electricity to lifts to enable uninterrupted lift service when one of the lifts are being maintained and tested.

To better plan for our carbon abatement initiatives, we are studying the management and reduction of carbon emissions in the life-cycle of our developments through establishing and implementing a Carbon Audit programme.

(1) The Copenhagen Accord is a document that delegates at the 15th session of the Conference of Parties (COP 15) to the United Kingdom Framework Convention on Climate Change agreed to "take note of" at the final plenary on 18 December 2009.

Energy Targets for period 2009/10	Progress
Reduce electricity consumption of landlord services installation in new domestic blocks by adopting Energy Codes and obtaining energy certificates for completed projects.	Fully Met
Explore and study application of more energy efficient equipment by completing trial installation of light-emitting diode (LED) lighting installation at Lam Tin Phase 7 & 8.	Fully Met
Reduce energy consumption of office premises by performing various energy saving initiatives.	Fully Met
Explore and study application of green design for building services equipment by completing the first trial photovoltaic (PV) Panel system at Lam Tin Phase 7 & 8.	Fully Met

### Energy Saving in Buildings

The Electrical and Mechanical Services Department issued a series of Building Energy Codes (BECs) to promote and encourage improvement in energy efficiency in local buildings. To support this government's initiative, all our new buildings have met energy efficient requirements of the Building Energy Codes and are classified as energy-efficient buildings.



Energy certificates for buildings

To further improve energy efficiency in our buildings, we implemented various energy-saving initiatives such as making the best use of energy efficient lighting, installing motion-detecting sensors to heighten illumination in appropriate public areas and introducing advanced lift control systems that require lesser energy for their operation.

Among all, lighting accounts for half of the total electricity consumption on a public rental housing (PRH) block. During the year, our lighting improvement initiatives include the modification of lighting circuits in 38 housing blocks to maximise the use of daylight, the optimisation and modification of lighting in 26 car parks, as well as the replacement of T8 fluorescent tubes with the more energy efficient T5 model in 31 000 exits signs. These initiatives resulted in a total saving of almost HK\$6 million in 2009/10. We anticipate that our energy consumption will be further reduced by progressively adopting various lighting management devices in PRH estates such as timers, motion detectors, light-emitting diode (LED) light fittings, the removal of excessive lighting as well as seasonal timers that trace daylight hours with the change of the seasons.



Lighting improvement in estate

The lift modernisation programme also contributes to our energy reduction. During the year, we replaced about 70 lifts with models using more energy efficient motor drives. It resulted in a saving of around HK\$1.1 million.



Replacement of T8 fluorescent tubes with more energy efficient T5 model in exit signs

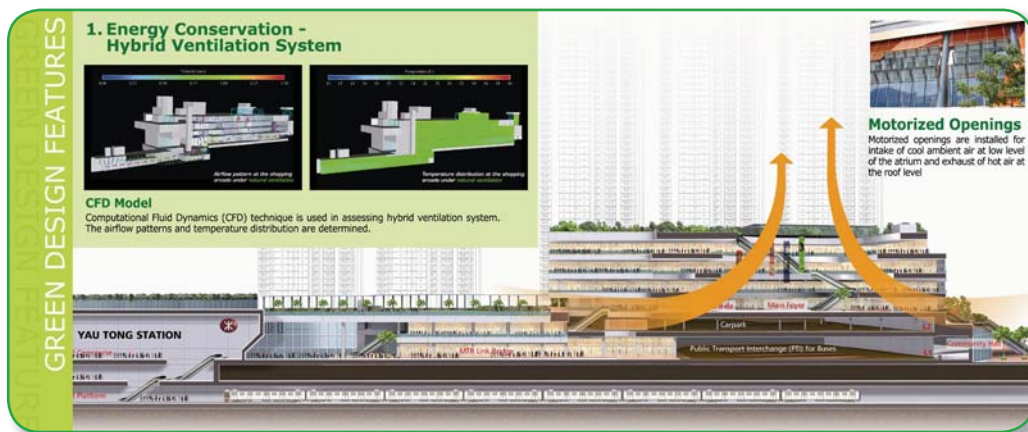
We also use renewable energy in our estates where appropriate. For instance, we adopted wind and solar hybrid powered outdoor lighting system in Sau Mau Ping South Estate and installed grid-connect solar panels in [Lam Tin Estate](#). Energy-saving installations also include hybrid ventilation systems installed in our new shopping centres at the “Domain” in Yau Tong and our new malls at Choi Tak and Yau Lai that using both natural and artificial cooling mechanisms.



Wind and solar hybrid powered outdoor lighting system in Sau Mau Ping South Estate



Grid-connect solar panels in Lam Tin Estate



Schematic of hybrid ventilation systems installed in our new shopping centres at the "Domain" in Yau Tong and at Choi Tak



Perspective of hybrid ventilation systems installed in our new shopping centres at the "Domain" in Yau Tong and at Choi Tak

With our continual effort on the adoption of various energy saving initiatives, we record a downward trend in the total electricity consumption in relation to the operation of the PRH estates. In 2001/02, total electricity consumption in the management and maintenance of around 584 000 domestic flats in 1 040 blocks was 512 million kWh. The consumption reduced to 485 million kWh in 2009/10 even though the number of flats had increased to over 624 000 units in 1 085 housing blocks, i.e. electricity consumption decreased by 27 million kWh despite there was an increase in 45 housing blocks in our service profile. This resulted in a saving of about 27 million dollars<sup>(2)</sup> and accounted for the reduction of 18 900 tonnes of carbon dioxide equivalent (CO<sub>2</sub>-e)<sup>(3)</sup> in our operations.

### Do you know - 18 900 tonnes of CO<sub>2</sub>-e is equivalent to

- carbon sequestered by 439 636 tree seedlings grown for 10 years; or
- greenhouse gas emissions avoided by recycling 5 773 tonnes of waste instead of sending it to the landfill; or
- annual greenhouse gas emissions from 3 278 passenger vehicles.

Source: United States Environmental Protection Agency

(2) A default value of HK\$1 is used to account for the charge of 1kWh electricity consumed.

(3) A default value for the emission factor of 0.7kg/kWh is employed to account for Greenhouse Gas (GHG) emission associated generation of electricity to supply customers in Hong Kong.

## Carbon Reduction in Construction Works

Production of cement generates a large amount of carbon dioxide. The production of one tonne of cement generates almost a similar amount of carbon dioxide. By replacing cement with pulverised fuel ash (PFA) in the concrete mixes, we saved 55 000 tonnes of cement in 2009/10 which is equal to a reduction of around 55 000 tonnes of carbon dioxide emitted from our construction sites. In addition, we tried out the use of ground granulated blastfurnace slag (GGBS), a by-product of steel mills, to replace partially the use of cement for the production of precast facades and will implement it in a pilot project in 2010/11.

## Other Energy and Carbon Initiatives

To better identify and plan for energy improvement and management opportunities, we carried out energy audits in six PRH blocks during the year. We will conduct similar audits to 28 domestic blocks and two shopping centres in 2010/11 to identify opportunities for further energy reduction. Apart from energy, we are currently conducting carbon audits in five buildings to calculate their carbon footprint and identify the extent of greenhouse gas emissions. These buildings include a mix of different types of buildings covering office tower, housing block, shopping centre and customer service centre. Some improvement areas have been identified according to the observation of the Carbon Audit Report, improvement measures have been arranged or under planning for further reduction in carbon emission in the selected blocks. The study will be continued in 2010/11 and the result will be used to facilitate the establishment and introduction of carbon management and reduction programmes to be implemented in PRH estates. We are currently developing a pioneer methodology to estimate carbon emission by new buildings in the planning and design phase, namely the "Carbon Emission Estimation". The methodology covers the following six aspects:

- Carbon emission due to materials consumed during construction;
- Carbon emission due to materials for structure;
- Carbon emission due to electricity consumption by communal building service installations such as lighting, lift, water pump, etc. in building life;
- Carbon reduction due to electricity generation by renewable energy system such as PV panel, wind turbine, etc. in building life;
- Carbon absorption by trees in building life; and
- Carbon emission due to demolition.

Carbon emission from Kai Tak Site 1A is currently being calculated as a trial for the Carbon Emission Estimation. Once the methodology is finalised, it will be applied in all new projects in planning and design phase.

In addition, we are also exploring the possibility of using renewable energy such as solar panels and wind turbines in PRH estates to further reduce electricity consumption and our carbon footprint.



Kai Tak Site 1A

### Overall Energy Consumption

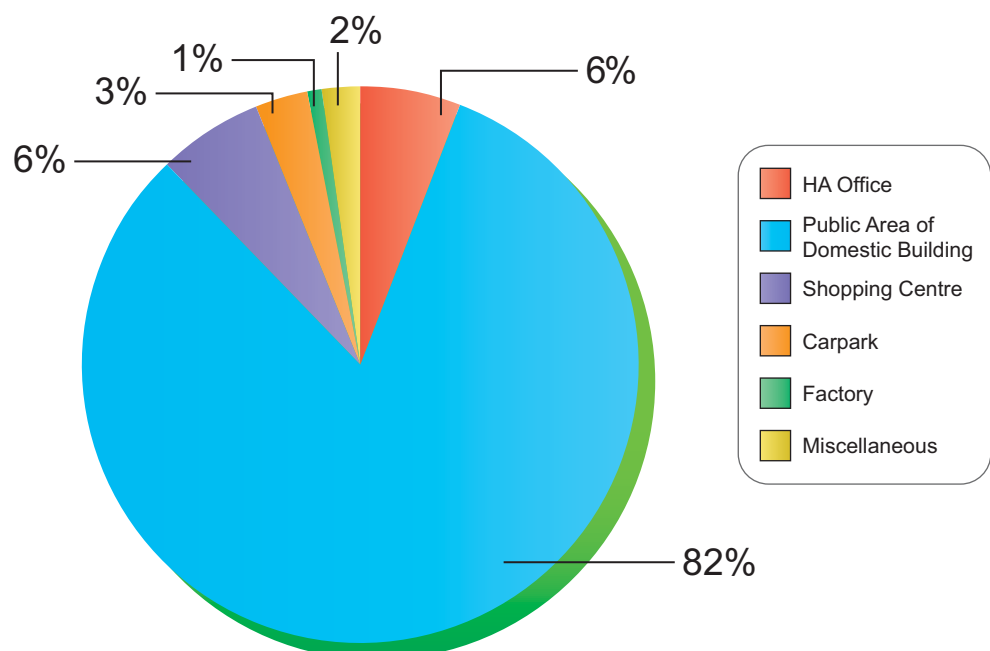
In 2009/10, electricity consumption for our headquarters, offices and other premises was 593 920 289 kWh, a reduction of 3.45% from the electricity consumed in 2008/09. This accounts for a reduction of over 14 870 tonnes of CO<sub>2</sub>-e and monetary savings of over HK\$ 21 million.

#### Do you know – 14 870 tonnes of CO<sub>2</sub>-e is equivalent to

- carbon sequestered by 345 893 tree seedlings grown for 10 years; or
- greenhouse gas emissions avoided by recycling 4 542 tonnes of waste instead of sending it to the landfill; or
- annual greenhouse gas emissions from 2 579 passenger vehicles.

Source: United States Environmental Protection Agency

#### Distribution of Electricity Consumption in 2009/10



Domestic flats represent the highest portion (about 82%) of the HA's annual electricity consumption. In 2009/10, the total electricity consumption of domestic flats was 485 405 931 kWh, about 1.68 % less than the electricity consumption of domestic flats in 2008/09. This contributes to a reduction of over 5 800 tonnes of CO<sub>2</sub>-e and savings of about HK\$ 8 million.

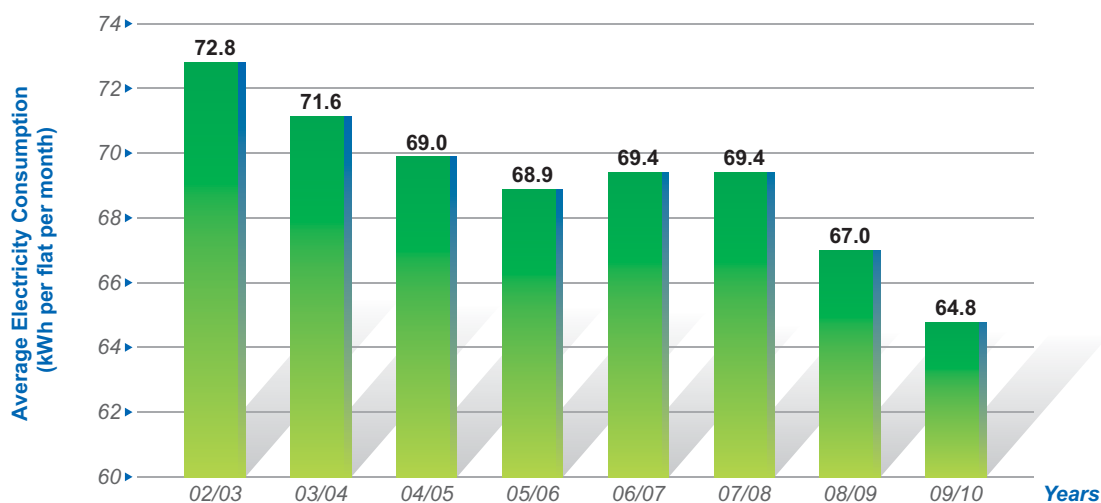
### Do you know – 5 800 tonnes of CO<sub>2</sub>-e is equivalent to

- carbon sequestered by 134 915 tree seedlings grown for 10 years; or
- greenhouse gas emissions avoided by recycling 1 772 tonnes of waste instead of sending it to the landfill; or
- annual greenhouse gas emissions from 1 006 passenger vehicles.

Source: United States Environmental Protection Agency

The electricity consumption of public areas in 2009/10 was 64.8 kWh per flat per month, 3.34% lower than that of 2008/09 levels.

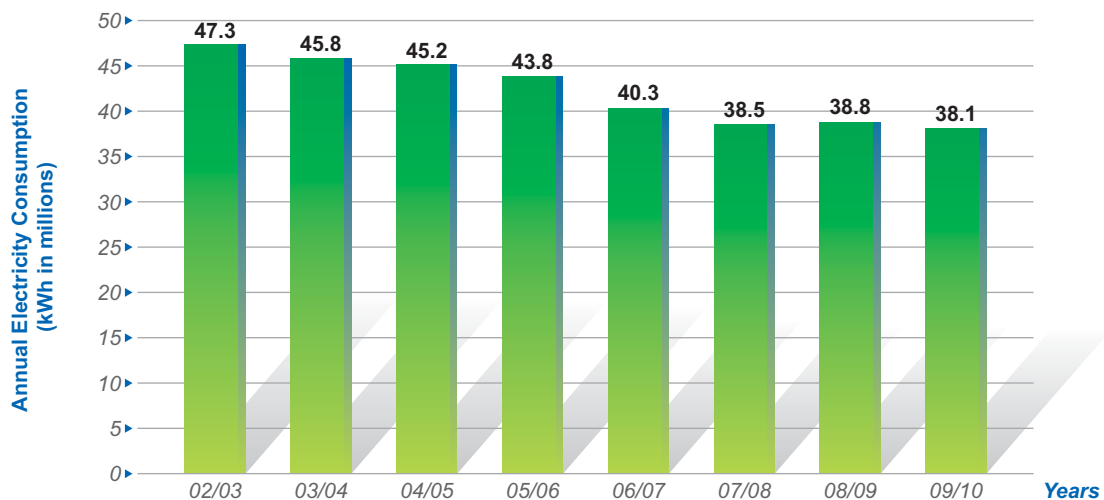
### Electricity Consumption in Public Area of Estates



## Internal Energy Consumption

Since 2003 we have achieved our annual electricity savings target within the HA offices. In 2009/10, we consumed 38 149 725 kWh of electricity which is about 1% reduction from 2007/08 and 1.6% reduction from 2008/09 in the total electricity use of our offices. This decrease of 602 646 kWh as compared with that of 2008/09 is equivalent to a reduction of over 420 tonnes of greenhouse gas emissions and monetary savings of around HK\$ 600 000.

**Annual Electricity Consumption in HA Offices**



Fuel consumption of the HA's vehicle fleet during the year was 93 222 litres, a reduction of 0.1% compared with the fuel consumed in 2008/09. This accounts for a reduction of about 276 kg of carbon dioxide emissions<sup>(4)</sup> to the atmosphere.

(4) Carbon dioxide emission is calculated using mobile combustion carbon dioxide emissions calculation tool version 1.3 developed by GHG Protocol Initiative. Assuming only gasoline is consumed by the HA's vehicle fleet, CO<sub>2</sub> emission = GJ energy (Gasoline used in litre x 0.0344 GJ/unit) x Emission Factor (69.250 kg CO<sub>2</sub>/GJ).



## Air Quality

In 2009/10, we received 8 air related complaint cases. Seven of them were related to construction sites including construction dust, dark smoke, malodour and air nuisance, while the rest was related to renovation works. The air complaints were recorded and properly addressed by the concerned contractors.

To avoid unpleasant smell from improper disposal of rubbish in PRH estates, we installed garbage compactor systems with sealed storage bins and bio-chemical deodorisers inside enclosed refuse rooms in all our new estates.



Garbage compactor system

To ensure the provision of a healthy working environment for our staff, we conducted indoor air quality assessment for our office building at Headquarters in 2009/10. These buildings including Block 1, 2 and 3 were awarded the “Good” class of the Indoor Air Quality Certificate issued by the Indoor Air Quality Information Centre of the Environmental Protection Department.

## Noise Control

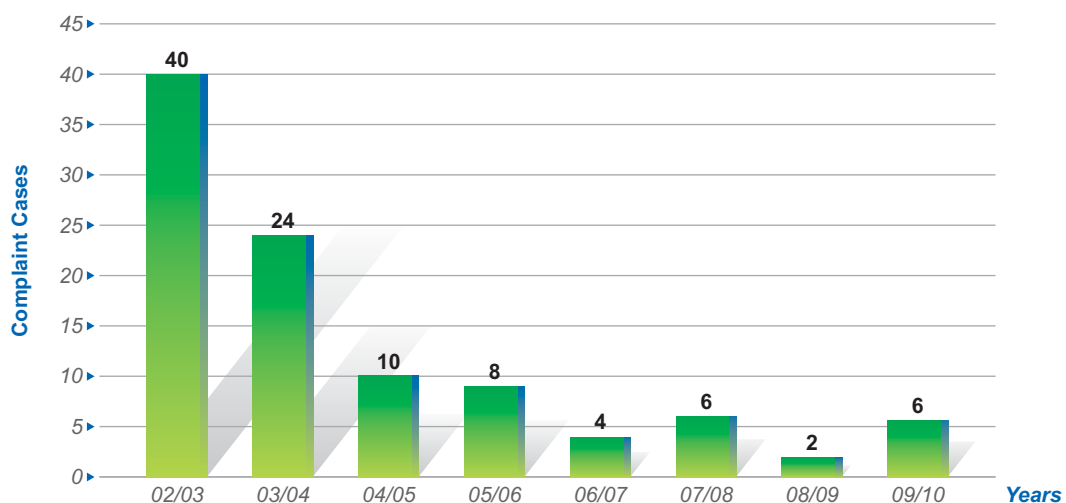
During the year, we continue our efforts to abate noise nuisance generated from operations. These include our on-going programme on replacement of noisy high-speed water pumps with quieter equipment in PRH estates and management of contractors to reduce noise complaints.

Noise Targets for period 2009/10	Progress
Reduce noise nuisance from water pumps in Public Rental Housing estates by replacing 3,000 rpm water pumps with 1,500 rpm water pumps.	Fully Met

### Noise Complaints and Abatement Notices

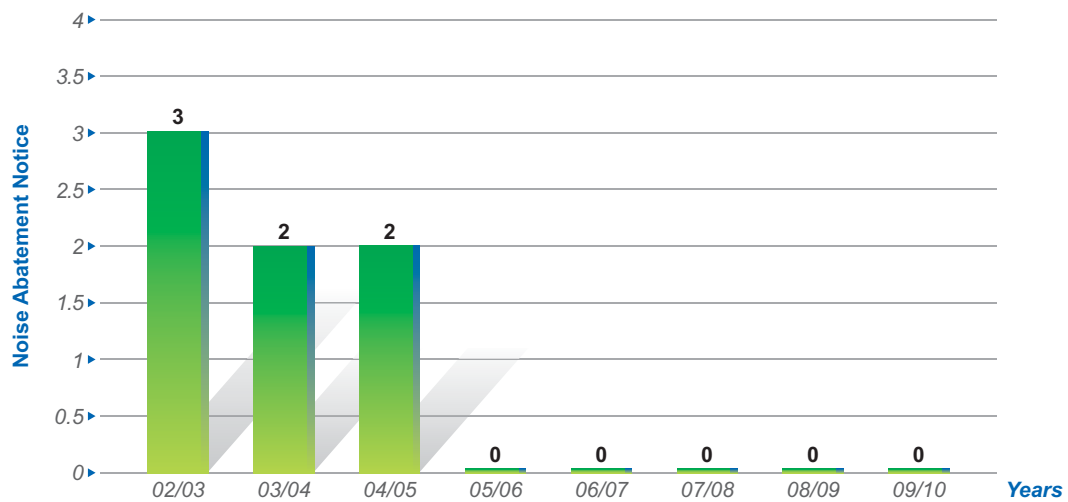
In 2009/10, we received 11 noise complaints. Six of them were related to construction sites, while the remaining cases were related to renovation works. The noise complaints were recorded and properly addressed by the concerned contractors.

**Number of Noise Complaint against Construction Sites**



The number of noise abatement notices issued to public housing estates by the Environmental Protection Department has been very low in past years. The HA did not receive any noise abatement notice in five consecutive year.

## Number of Noise Abatement Notice Received



In 2009/10, a total of 14 high speed water pumps were replaced with low noise, low speed pumps in PRH estates to reduce noise pollution. The entire water pump replacement programme was completed during the year.

## Waste Management

Hong Kong, like many developed countries, has seen its wasteloads growing with its economy. In 2009, the per capita disposal rate of municipal solid waste was 1.28 kilogrammes per day. The continued growth in wasteloads means Hong Kong is running out of landfill space far earlier than expected, and the existing landfills will be filled up, one by one, in mid to late 2010s if waste levels continue to increase at current levels.

In view of the pressing waste problem that the community is facing, we have implemented various waste reduction and recycling initiatives to minimise the generation of waste in PRH estates.

Waste Management Targets for period 2009/10	Progress
Increase domestic waste recovery rate for paper, aluminium cans, plastic bottles and used clothes by arranging publicity activities for all PRH estates.	Fully Met
Promote waste reduction through various publicity campaigns with the aim to reduce generation of domestic waste.	Fully Met
Implement Programme on Source Separation of Domestic Waste in all estates by phases.	Fully Met
Reduce A3 and A4 paper consumption in Housing Department offices by performing various initiatives to reduce paper consumption.	Fully Met
Collect waste paper in Housing Department offices and implement various initiatives to encourage paper recycling.	Fully Met
Use environmentally-friendly paper in printing of all publicity materials by implementing its use as a pre-requisite in all printing jobs.	Fully Met
Enhance community awareness on environmental protection by launching campaigns to promote waste reduction and recycling in PRH estates and joint programmes with green groups and Estate Management Advisory Committees, including distributing environmental publicity materials to tenants.	Fully Met

## Waste Reduction in Estates



Source Separation of Domestic Waste programme

According to 2009 data, domestic wastes account for 45% wastes disposed of to the landfill. To lessen the burden of our landfills we have pledged to reduce domestic waste by 1% a year despite the number of our estates and tenants continue to rise. To achieve our pledge, we have strong commitment to involving PRH tenants in waste recycling. We started our Source Separation of Domestic Waste programme to recycle domestic wastes in 2005. We collected 199 tonnes of plastic bottles and 128 tonnes of aluminium cans in the first year after the introduction of the programme in some of our estates. The programme has been fully implemented in all our estates in 2009/10 and we collected 1 218 tonnes of plastic bottles and 520 tonnes of aluminium cans during the year, i.e. there was an increase in collection of 6 times of plastic bottles and 4 times of aluminium cans compared with 2005/06. To facilitate separation of domestic wastes at source so as to encourage collection of more recyclables, we implemented various initiatives in our PRH estates. One of the examples is the installation of “mail-box” type rubbish bins on each floor of our pilot project Eastern Harbour Crossing site Phase 5 for easy segregation of recyclable household waste at source.



Poster of source Separation of Domestic Waste programme



View from the corridor of the mail-box type rubbish bins in Eastern Harbour Crossing site Phase 5



Mail-box type rubbish bins inside the refuse room in Eastern Harbour Crossing site Phase 5

In addition to collecting paper, plastic bottles and aluminium cans for recycling, we have recycled glass, rechargeable batteries, fluorescent lamps, computers and electrical appliances from PRH estates. We have also arranged collection of used clothing by charitable organisations. Through our various recycling initiatives, we will be able to continuously meet our waste management targets.



Collection bin for recycle used clothing



Collection bin for recycle rechargeable batteries



Collection bin for recycle fluorescent lamps

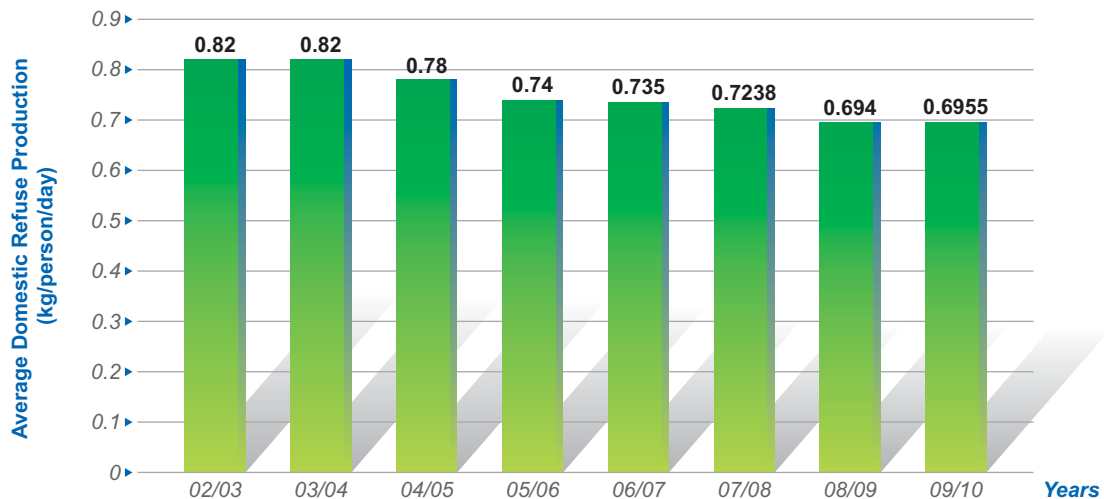
The amount of waste recovered for recycling in PRH estates from 2006/07 to 2009/10 are tabulated below.

Waste Type	Quantity of Waste Recovered (tonnes)				Recovery Rate (%) against Estimated Values			
	2006/07	2007/08	2008/09	2009/10	2006/07	2007/08	2008/09	2009/10
Paper	13 025.3	14 748.2	14 193.7	17 934.8	12.30%	14.30%	14.37%	16.08%
Aluminium Cans	267.7	309.6	495.9	520.0	28.30%	32.31%	44.40%	43.10%
Plastic bottles	503.3	764.6	939.3	1 218.0	6.20%	9.48%	11.85%	13.62%

During the year, we also worked with charity organisations to collect used clothing and we collected 775 tonnes of used clothes.

Through the implementation of various waste recycling and recovery initiatives in PRH estates, the average domestic waste production from our residents was 0.6955 kg/person/day in 2009/10. It was 2% lower than the set target of 0.71 kg/person/day, 15% reduction as compared with 2002/03 as well as 19% lower than the per capita disposal rate of domestic waste in Hong Kong in 2009.

### Average Domestic Refuse Production from Residents



### Reducing Construction Wastes

During the year, we focused on the recycling and re-use of materials in existing estates upon redevelopment to further reduce construction waste. For instance, we retained fence walls from old estates. We used benches made of recycled steel from the demolished hoarding and recycled concrete in the construction of Lam Tin Estate. We also preserved stone benches from the old garden in Sau Mau Ping for use in the redeveloped estate.



Benches made of recycled steel from the demolished hoarding and recycled concrete samples in Lam Tin Estate

In addition, we also recycle building waste for the use in construction projects. During the year, we used about 1 700 tonnes of recycled aggregates from the demolition of Wong Chuk Hang Estate as a backfill at Tung Tau Estate Phase 9, 180 cubic meters of rock core in the outdoor areas of Choi Wan Estate and recycled rock fill as backfill in Upper Ngau Tau Kok Estate. We will be using marine mud at Kai Tak construction site as backfill and the production of paving blocks. Meanwhile, we are studying the inclusion of recycled glass as aggregate in paving blocks.

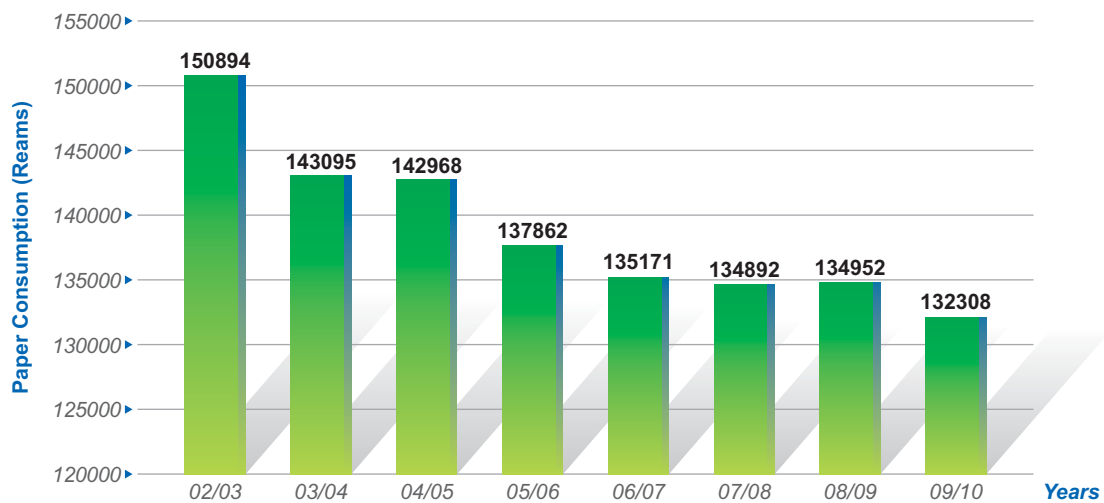


Recycled concrete used to fill up the void after the removal of a foundation.

## Internal Waste Reduction Initiatives

Paper is the major waste generated during our operations with recycled value. To this end, we have implemented various initiatives to reduce paper consumption and enhance our paper recycling in all our offices. In 2009/10, we consumed 132 308 reams of paper. It was decreased by 1.9% as compared with the consumption in 2007/08 and decreased by around 2% as compared with that in 2008/09. On the other hand, the quantity of waste paper collected in the HA offices in 2009/10 was 24.6 kg of waste paper per staff. It was 42% higher than the set target of not less than 17.3 kg per staff.

### Paper Consumption in HA Offices



The HA's Year End Environmental Collection and Recycling Campaign

To promote waste reduction and re-use of resources among the HA staff and to help the less privileged sector of the society, we held the Year End Environmental Collection and Recycling Campaign jointly with the Community Recycling Coop (CRC), a non-profit-making group, in January 2010 at the HA headquarters. Staff members were encouraged to donate reusable surplus household items to the Community Recycling Coop that would sell those household items at affordable prices to low-income

families in Sham Shui Po. The campaign received overwhelming support from our staff and about 3 300 items including household items, electrical appliances, computer peripherals, clothes, shoes, books and toys were collected.



## Wastewi\$e Label

The Wastewi\$e Label of the Hong Kong Awards for Environmental Excellence is a recognition scheme established to recognise the waste reduction efforts of organisations, and to encourage organisations in adopting measures to reduce the amount of waste generated within their establishments or generated through the services and products they provide. Each participating organisation is required to set and achieve a number of waste improvement targets with respect to waste avoidance and reduction, collection and recycling of recyclable materials as well as purchase or manufacture of recycled products.

During the year, the HA was awarded the “Class of Excellence” Wastewi\$e Label for the second consecutive year recognising its waste reduction efforts. Since we joined the Wastewi\$e Label scheme in 2000/01, we have achieved various waste reduction goals on paper, plastic, toner cartridge and construction materials.



“Class of Excellence” Wastewi\$e Label

## Water

Water is essential to our life. It is imperative to provide a high quality, reliable and safe water supply service to our tenants in PRH estates. Water is also a scarce resource that is worth our extra efforts to conserve. In 2009/10, we set various water conservation targets and used different initiatives to achieve continuous improvement in water consumption and water quality. We also continued our effort on the provision of reliable and uninterrupted water supply to tenants by using twin water tanks even when the roof tanks are being cleaned.

We are currently conducting trial run to explore the possibility of using other water conserving initiatives such as the use of dual flushing systems, water-saving faucets and rainwater harvesting systems in PRH estates.

Water Conservation Targets for period 2009/10	Progress
Reduce flushing water consumption by conducting trial schemes in new projects, i.e. pilot project at Shek Lei Phase 10 and conducting performance reviews.	Fully Met
Reduce potable water consumption for installations under landlord control in PRH estates by using self-stopping water taps and conducting re-plumbing programmes to minimise pipe bursting and leakage as well as studying the feasibility of using rain water for plant watering and general cleaning.	Fully Met
Continue to reduce water consumption at HA Headquarters by performing water saving initiatives as appropriate.	Fully Met

In 2009/10, the water consumption in our headquarters is 14 224 cubic metres. It was decreased by 5% as compared with the target consumption of 14 980 cubic metres.

### More Hygienic Drainage System

The severe acute respiratory syndrome (SARS) epidemic in 2003 alerts us on the importance of ensuring the hygiene of drainage systems in housing blocks. We worked with the City University of Hong Kong to develop and introduce a “common W-trap” drainage system for the discharge of wastewater. The new design prevents the problem of “dried-up” floor drains which was believed to be one of the causation of the spread of SARS. Phase 3 of Yau Lai Estate is the first development to use this new drainage design and this has been applied in all our new estates.



Application of a “common W-trap” drainage system in housing block



Design of a “common W-trap” drainage system

## Water Saving through Twin Tank System

The introduction of the “twin tank water supply system” in all new PRH estates since 2008 has resolved the water supply interruption problem during tank cleansing. The system adopts an “alternately operating” approach that ensures continual water supply and minimise disruption to residents. The first two PRH estates benefiting from this system are Shek Mun Estate and Yau Lai Estate. With the completion of more new estates, it is estimated that about 75 000 households will benefit from this system in the next five years and about 2 800 cubic metres of water can be saved every year.



Interior design of the twin tank water supply system



The twin tank water supply system at the roof of Yau Lai Estate in Yau Tong

### Do you know - 2 800 cubic metres of water is sufficient to

- support 12 700 people a day; or
- fill up an Olympic-size swimming pool.

The innovative design of the twin water tank system won a Special Citation (Cost effectiveness) Award under the category of General Public Service (Team) of the Civil Service Outstanding Service Award Scheme 2009.

## Estate Greening and Landscaping

Over the years, we have incorporated various greening and landscaping design into our housing development projects to promote green living style and provide a pleasant living environment with cleaner air and better heat dissipation for our tenants. Our efforts in 2009/10 included the installation of vertical greening panels and green rooftops in a number of PRH estates as well as continuing our community greening programmes such as Action Seedling programme including building contractors.

Greening and Landscaping Targets for period 2009/10	Progress
Provide green treatment (e.g. hydro-seeding and tree planting) to newly formed slopes.	Fully Met
Add new vegetation and promote greening in new housing estates to meet the minimum target of one tree per 15 PRH flats. Conduct tree surveys to ensure that this is met.	Fully Met
Upgrade the existing landscape in 18 selected PRH estates by improving soft landscaping through the Landscape Improvement Programme.	Fully Met
Promote local residents and the community to participate in early plant raising for new housing estates.	Fully Met
Promote a green environment at 20 estates with Estate Management Advisory Committee support through the provision of green activities in these estates.	Fully Met
Promote community involvement in greening of new PRH by introducing planting areas in master landscape layout plan in design stage.	Fully Met
Promote community participation in greening of existing PRH estates by developing community gardens in selected estates.	Fully Met
Improve the slope appearance in existing PRH estates by providing green treatment to hard surfaced slopes and improving on existing vegetated slopes. Also, chunam surfaces will be improved through hydro-seeding stone pitching and toe planters.	Fully Met
Enhance greening in PRH estates by allocating open areas in selected estates for setting up theme gardens.	Fully Met
Increase tenants' awareness and support of green by organising tree planting days in selected estates.	Fully Met

## Greening of Estates

We put substantial efforts to green our estates in order to protect the natural environment and the health and well-being of our tenants. We endeavour to provide a higher greening ratio in our estates by adding more vegetation and green surfaces following our internal guidelines which require the provision of at least one square metre of open space per resident, the planting of at least one tree for every 15 domestic units and allowing greening ratio of no less than 20% - 30% per development.

In addition to greening rooftops on low rise buildings and covered walkways, we also install vertical green panels in new estates. A recent evaluation study revealed that these panels can reduce the heat of the concrete wall behind it by up to 16 degrees Celsius. During the year, we extended our greening initiatives to use vertical green hoarding and green roofs on temporary offices in about nine construction sites. The species chosen for our green roofs mainly included turf, sedum and a combination of small shrubs and groundcovers.



The green roof at Ching Ho Estate



Vertical green panel



The roof top of the commercial centre in Choi Ying Estate blanketed with turf



Roof of Fu Shan Estate Wet Market with sedums in different colours planted in an auspicious fish pattern which implies 'affluence' and 'wealth'



The green roof of the covered walkways in Upper Ngau Kok Estate



Vertical green hoarding in construction sites

To further improve our green design, we are identifying the most attractive and easy-to-care-for plant species to be used on rooftops and green panels as well as exploring the greater use of open space. Up to now, we have already identified two plant species for rooftop greening that need minimal watering to survive the dry season. For open space, we completed [Sau Mau Ping South](#) with an additional hectare of open space. We are currently conducting a pilot-run to explore the possibility of including sky gardens and communal terraces at Kwai Luen Estates, which is expected to be completed at the end of 2010/11.



Open space at Sau Mau Ping South



The man-made slope at the Tung Tau Cottage East Site is covered with a grass surface.

In addition to greening our new development, we also improve landscape of our existing estates. During the year, we completed landscape improvement work in 18 estates. We are also carrying out the greening of roofs and implementation of vertical greening panels in existing estates.

In 2009/10, all the newly formed slopes with green treatment covered a total area of 6 470 square metre. In addition, we planted around 13 760 trees, 673 100 shrubs and 205 620 annuals in our PRH estates.

### Thematic and Community Gardens

To further enhance the landscaping of PRH estates, we establish thematic gardens to create unique characteristics in different estates. During the year, we completed a colourful Ixora Garden in Lung Hang Estate with Ixora Chinensis (commonly known as “dragon boat flower” in Chinese) chosen as the theme flower to form a legendary dragon and a Scented Plants Garden in Shek Pai Wan Estate. In addition to thematic gardens, we also established five more community gardens in different estates with the involvement of residents in the cultivation and irrigation of plants.



The Dragon Boat Garden at the concourse of Lung Hang Estate

## Greening with the Community

In addition to our own efforts in making the estate greener, we also involve the community to propagate the greening message. One of our community programmes is Action Seedling programme. Launched in 2007, the programme involves tenants, contractors as well as the local community in [the greening of our estates](#).

During the year, we also organised three estate-based tree planting days to engage tenants participating in the annual Hong Kong Tree Planting Day.



Hong Kong Tree Planting Day

## Greening Activities

Apart from greening our estates and new developments, we also participated in the Leisure and Cultural Services Department's Hong Kong Flower Show 2010 to show our expertise in the creation of green environments. We designed a "Dream Home" echoing the theme of the show "Fairy Tales of Flowers" and conveying the HA's vision of building ideal homes. We also put our universal design concept and people-oriented approach in the landscape design that enabled visitors of all ages, physical abilities and visually-impaired to visit our display. The landscape design has won the Gold Award for Unique Feature (Landscape Display) at the event.

In view of the fatal tree accidents in recent years, we have proactively introduced a new "tree management" initiative within our estates. We conduct tree survey to examine the health of trees in our outdoor areas and arrange to carry out remedial action for those with health problems.



The award winning "Dream Home" in the Hong Kong Flower Show 2010

## Material Usage and Control of Hazardous Materials

In addition to optimise the natural features in housing estates, we use eco-friendly and durable materials to maximize the quality and life-cycle of our developments.

Material Usage and Control of Hazardous Materials for period 2009/10	Progress
Further abate the remaining asbestos-containing materials in existing Housing Authority managed properties by implementing asbestos abatement programme through estate redevelopment programme and asbestos removal works.	Fully Met
Use of softwood timber doors in Public Rental Housing estates.	Fully Met

### Use Softwood Timber Door

We have completed in end 2009 a pilot project using softwood timber doors in the construction of Eastern Harbour Crossing Phase 4 (EHC4). These doors were made of timber from sustainably managed forests and with the certification from the Forestry Stewardship Council (FSC). The percentage of certified timber material from sustainable source in each Forestry Stewardship Council certified door is 86.6% while 16.2% of doorsets in EHC4 that are Forestry Stewardship Council certified doors. The softwood timber doors installed in EHC4 are now under a one-year monitoring period. Use of softwood from certified well-managed and sustainable sources for timber doors in PRH estates will be implemented in 2011/12 when results of the performance review is satisfactory.

### Materials Conservation

Throughout the years, we have encouraged our contractors to use reusable metal hoardings, metal formwork and prefabricated building elements as far as possible to save resources. We have estimated that approximately 20 000 tonnes of timber were conserved from our construction projects in 2009/10.

We also use pulverised fuel ash (PFA) and ground granulated blastfurnace slag (GGBS) to replace the use of cement in concrete structures and concrete precast façade.

### Asbestos Abatement Programme

In order to abate the remaining asbestos containing materials in existing HA managed properties, we have implemented an asbestos abatement programme through estate redevelopment programme and asbestos removal works. The Asbestos Abatement Programme continued in 2009/10 in the Comprehensive Redevelopment Programme. Altogether 15 building blocks with asbestos had been demolished, comprising 7 domestic blocks, 4 school blocks and 4 factory blocks. The key performance indicator (KPI) for demolishing not less than 8 building blocks which contain asbestos had been achieved in 2009/10.



## Micro-climate Studies

To optimise site-specific natural features in our development projects, we introduced the Micro-climate studies in the design and development of all our estates since 2004. By using computer simulations, micro-climate of the site including airflow, wind direction, levels of sunlight, general views and noise levels will be examined. These studies enable us to develop housing estates with better use of natural ventilation and sunlight, as well as favourable positioning in terms of views and noise nuisance. Up to now, these studies have been applied to about 36 new development projects. The first batch of these estates were completed in the past couple of years, which include [Sau Mau Ping South](#) that was completed during the year. We are now evaluating the effectiveness of the Micro-climate studies and checking the validity of our projections in these completed projects. The preliminary evaluation result shows that the performance of these buildings is in line with the projections of the Micro-climate studies.

## Biodiversity

We try our best to minimise the disturbance to the natural environment including biodiversity when planning and building PRH estates. One of the vivid examples is the newly-built Butterfly Garden in Hoi Lai Estate. The garden is planted with a wide range of flowers to attract butterflies of different species such as Bougainvillea glabra variegata and roses to attract larger butterflies and Catharanthus roseus for small butterflies. The garden also supports the ecosystem by attracting birds to come for food when the eggs laid by the butterflies turn into caterpillars.

As one of the initiatives to protect the biodiversity, we will conduct an ecological assessment at site feasibility stage to formulate a plan to identify the opportunities for enhancement and minimise the adverse ecological impact of the development.



*Catharanthus roseus* in Hoi Lai Estate to attract smaller butterflies