CDFO

香港城市大學
City University of Hong Kong

Campus Development and Facilities Office
校園發展及設施管理處

Environmental Report 2012

二零一二年拾荒者年報

May 2013

CONTENTS

Message from the Director

As the University is moving into a new and exciting growth phase after the transition to a four-year curriculum, increased campus populations, activities and facilities have impacted heavily on the carbon footprint of the campus which makes CDFO's efforts in realizing a sustainable campus for the University more challenging. Against such background, this Report presents a summary of the work done by CDFO on reducing environmental impacts in 2012.

With the Buildings Energy Efficiency Ordinance comes into full operation on 21 September 2012, the Office has started shifting its focus from carbon reduction to meeting new regulatory energy targets.

While acknowledging that we have to improve our environmental performance, CDFO is also mindful that everything must be affordable. When you read this Report, you would agree that most of our achievements were made through the adoption of good environmental protection practices rather than investing heavily in new systems or technology as CDFO has always included cost-optimization criteria in its works to avoid doing things that cost a fortune to deliver the intended low carbon campus.

Our achievement has extended to student learning. Due to success of the internship programme of last year, CDFO offered another programme for four students of the Department of Public and Social Administration (SA) majoring in environmental policy studies. Once again, the programme has been successfully conducted and for this, the efforts of my colleagues who have taken up the task must be recognized.

I hope you will find this Report informative, and as always, I appreciate and treasure your valuable feedback and suggestions that would help improving our environmental performance.

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Our Environmental Performance

Being an ISO14001 certified office for 11 consecutive years and several environmental awards receiver, CDFO has achieved the following in 2012 :

Waste Recycling

- Recycled over 249 tonnes of food waste into fish feed.
- Recycled over 7 tonnes of glass bottles for making bricks.
- Saved over 374 tonnes of solid wastes through recycling.
- Launched an 18-month "Zero Food Waste in CityU" programme.

Energy Efficiency

- Reduced roadside pollution (1,470 kg of CO_2-e) by using electric vehicle.
- Generated 51,200 kWh renewable energy.
- Consumed 4.6% less electrical energy or reduced carbon emission by 6.2%.

Water Conservation

- Saved 5,310m^3 potable water.
- Saved 12,215m^3 flushing water.
- Established the first rainwater harvesting system on campus.

Contribution to Teaching

- Provided 6-week internship programme for four CityU students.

Major Award Received

- 2nd runner up "Big Saver" award of the Power Smart Contest 2012.
- "Appreciation Certificate" under the Programme on Source Separation of Waste.
- "Gold Award"

Spotlight on Waste Management

1. Environmental Performance

1.1 Waste Management

1.1.1 Solid Waste

We promoted the reuse of used furniture and salvaged building materials and fixtures, recycling of recyclables (including food waste) and repairing of defective engineering parts / items to lessen the burden of our landfills and help save valuable resources of the University. The following are some examples :

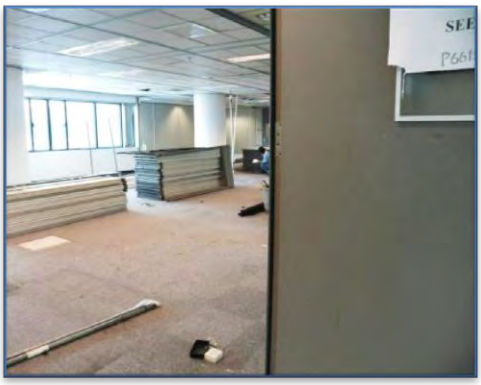
(a) Reuse

- **Used Furniture**

Used cabinets and corian counter tops were reused in pantries of NSB

An used table-set was re-used on Floor 5, Red Zone, AC1

- **Salvaged Building Materials and Fixtures**



Used metal panels and doors were reused on Floor 6, Purple Zone, AC1 for office partitioning project

Used partitions were reused on Floor 4, AC2 for offices

Used false ceiling tiles and carpet tiles of good condition were reused to replace the damaged or aged ones in the corridor on Floors 6 and 7, Yellow Zone, AC1 and on Floor 1, ACH

Used boilers, sinks and sump pump systems were reused in pantries of NSB

Used door locks were reused in NSB

Used alarm locks / panic bolts were reused in NSB

Used door locks were reused as replacement for the defective ones in classrooms

Used glass doors were reused at the entrance to the lift lobby of Lifts 5 and 6, LG2, AC2

Used glass doors were reused at entrance to U-Concourse on Floor 4, AC1 to replace the damaged ones

The awnings dismantled from the Improvement of Internal Circulation Project were reused on Floor 1, Purple Zone, AC1 outside Lift 16 to provide covered access

(b) Recycle

- **Recovery of Solid Wastes**

  CityU recycles paper, aluminium cans, plastic bottles, printer cartridges, plastic bags, rechargeable batteries, CDs, foams, mercury-containing fluorescent tubes and lamps, food waste and glass bottles.

  Recycling was expanded in the reporting period to Run Run Shaw Creative Media Centre (CMC), Academic 2 (AC2) and Nam Shan Building (NSB).

  We all know that in Hong Kong, even in tertiary institutions, some people do not care to put recyclables in recycle bins, but dump them in waste bins. Although it is well recognized that "Two-Bin" system – one for all recyclable materials and the other for "landfill" – will lead to substantial increase in the amount of waste correctly put in the recycle bin, the system does not work with Hong Kong recycle contractors who do not accept co-mingled recyclables. However, cleaners in CityU are required to separate recyclables from the waste produced in office areas to allow more recyclables to be recovered for recycling.

- **Recycling and Deferred Replacement of Lubrication Oil**

  Replacement of lubrication oil in chiller compressors is done subject to the analysis results of the condition of the oil and used lubrication oil is required to be taken away for recycling by the maintenance contractor.

  By adopting the condition-based oil replacement approach has avoided pre-mature replacement that would otherwise generate wastages.

- **Recycling / Reduction of Food Waste**

  Food waste generated from all the catering outlets at CityU continued to be collected and sorted to be converted to fish feed while those generated from staff residential quarters were put into three mini electric organic waste decomposers for recycling into fertilizer for landscaping use on campus.

  Since cutting food waste at source is the only way to solve the seriousness of the environmental problems posed by meaningless food wastage, an 18-month "Zero Food Waste in CityU" programme was launched in early 2012 on campus to encourage the University community to be more sensitive to food waste issues and to contribute to more sustainable ways of living.

"Zero Food Waste Week in CityU" Kick-off Ceremony

Mascot Design Competition

Save Food Day

"Food Waste. Where to go?" exhibition

Tongue Twister Competition
("急口令大賽")

Debate contest about policies for treating food waste

(“廚餘處理政策辯論比賽”)

Visits to Kowloon Bay Waste Recycling Centre

(c) Repair / Renew

During the reporting period, a number of pressure vessel diaphragms, ball valves, motor bearings, etc. were repaired / reconditioned and put back into service. An estimate of around HK$171,500 of material cost was saved.

300L pressure vessel of Floor 7, AC1 kitchen fresh water tank diaphragm repaired

2" water filling ball valve of Floor 3, AM Building fresh water tank reconditioned

3" water filling ball valve of CMC flushing water tank reconditioned

Defective water pump motor bearings renewed

Reduced
374
tonnes
solid wastes

Summary of Solid Wastes Recovered :

	Year 2010	Year 2011	Year 2012
Waste paper recycled (kg)	214,955	180,996	101,286
Aluminium cans recycled (kg)	798	822	678
Plastic bottles recycled (kg)	1,873	1,942	730
Printer cartridges recycled (kg)	696	864	1,011
Compact discs recycled (kg)	280	54	100
Batteries recycled (kg)	250	0	0▽
Expanded polystyrene (kg)	25	32	30
Mercury-containing fluorescent tubes and lamps recycled (kg)	11,300	10,400	13,200
Electronic ballasts repaired for reuse (pieces)	23^	10^	0+
Green waste and plant trimmings reused (kg)	190.5	208	208
Glass bottles recycled (kg)	Nil	3,043 (Aug – Dec)	7,482
Food waste collected and recycled for making fish feed (kg)	Nil	82,553 (Aug – Dec)	249,553

Remark : ^ *Less and less electronic ballasts are available for repair due to improvement in product reliability and life span.*

\+ *No repair was done due to unavailability of manpower.*

▽ *A large batch of rechargeable batteries are collected on campus but waiting for pick-up by contractor for recycling.*

1.1.2 Hazardous Wastes

Though hazardous wastes (including chemical, clinical and radioactive) are generated from daily and increasing teaching, research and operational activities on campus and off-campus, there were no significant spills in the past year.

The CDFO continues to manage, on behalf of the University, the disposal of hazardous wastes responsibly and according to established management procedures and relevant statutory regulations and requirements.

Listed in the table below are the quantities of hazardous wastes disposed of in Year 2010, Year 2011 and Year 2012 :

	Year 2010	Year 2011	Year 2012
Liquid Chemical Waste [#] (L)	9,710	11,685	12,974
Solid Chemical Waste [#] (kg)	11,309	10,990	13,572
Clinical Waste * (kg)	2,015	1,734	1,860
Liquid Radioactive Waste [+] (L)	8	8	2.5
Solid Radioactive Waste [+] (kg)	4	4	2.5

Remark : [#] *As defined under the Waste Disposal Ordinance (Cap. 354). These wastes include fluorescent tubes, lamps, batteries, oily rags, paint pails, etc.*

* *Mainly blood contaminated waste from Young Chung-Yee Health Centre of the University.*

[+] *Disposal strategy of storage / decay being used for radioactive waste with very long half-life.*

1.1.3 Construction and Demolition Wastes

The "Trip Ticket System" laid down by the Development Bureau is required to be complied with strictly by all our contractors carrying out renovation and construction works on campus for disposal of construction wastes and debris.

Spotlight on Pollution Control on Campus

1.2 Pollution Control on Campus

We have continued maintaining and enhancing the facilities for protection of the safety and well-being of the University community as well as the whole environment.

1.2.1 Outdoor Air Quality

(a) Discharge of Contaminated Air

- **Laboratory**

  Jet nozzles were added to fume extraction risers from laboratories so that better air dispersion is achieved for improving outdoor air conditions and fresh air intakes are prevented from being polluted by exhausts.

Newly installed jet nozzles on the roof of Purple Zone, AC1

- **Vehicle Exhaust**

Reduced

1,470

kg CO_2-e

An electric vehicle was leased and used as one of the University's fleet vehicles to cut down carbon footprint of the fleet and also eliminate roadside pollution. A reduction in carbon emission of 1,470 kg CO_2-e was achieved last year.

Drivers of the University are, from time to time, inducted on eco / green driving technique / hints (such as gently pressing the accelerator when driving off from a stationary position, avoiding sudden acceleration or hard braking, switching off car engine when

waiting, avoiding traffic congestion and unnecessary extra mileage, etc.) in the hope to maintain a high fuel efficient University fleet.

- **Ambient Foul Smell**

  It is due to the growing student population, the 20-year old main underground soil and waste pipe laid under the Service Road is not sufficient to cater for the discharge from canteens and sanitary fixtures. When wastewater flowing in "full-bore" condition inside the pipes, foul smell was expelled out from the vent pipes or manholes. After enlargement, not only fouled smell can be eliminated but also the outdoor air quality can be enhanced.

- **Maintenance and Construction Works Sites**

  To meet the 3+3+4 curriculum, various new buildings were completed and as a consequence, considerable alteration works are being proceeded. In order to provide a pollution-free and hygienic campus, we are monitoring closely our contractors to contain dust, noise, dirt and irritating odor within the working sites whereby impact on the indoor working environment is minimized. For those unavoidable noisy work, they are scheduled to be carried out after hours so as to minimize disruption to departments concerned.

(b) Use of Refrigerant

As our commitment to protect the Earth's protective ozone layer and to reduce global warming, CDFO recovers and reuses refrigerants in the process of equipment alteration and/or servicing. Environment-friendly non-CFC/non-HCFC refrigerants will be used for new chillers in the replacement programme.

1.2.2 Indoor Air and Environment Quality

(a) Maintenance of Hygienic and Pleasant Campus Environment

CDFO encourages and supports its cleaning contractor to use quieter vacuum cleaners and cleaning agents made from natural materials and hence, to minimize the impact of cleaning agents on indoor air quality (IAQ), working and studying environment.

The installation of six numbers of BioZone Air Purifiers in some communal areas and toilets where foul smell exists was completed and they are observed to be effective in removing foul smell. BioZone Air Purifier makes use of Photoplasma Purification Process by creating highly purifying compounds to destroy unwanted chemicals, microbes and contaminants and, hence, to eradicate unpleasant odours.

(b) Elimination of Indoor Air Contamination on Campus

In order to minimize indoor air contaminants in the air ducts of central air-conditioning system, disinfection of air ducts by applying a medical grade absorber has been included in the air-conditioning system maintenance term contract as a routine item.

To minimize the potential of legionella growth in some less frequent used water systems, cleaners are required to help prevent stagnancy of water in the pipings by turning on the water taps or inducing a flow of water during their routine cleaning. As a precautionary measure, periodic microbiological tests for legionella for potentially high risk areas, such as cooling towers, drinking fountains and shower heads in shower rooms of Hu Fa Kuang Sports Centre (Sports Centre) are carried out.

(c) Improvement of Ventilation System

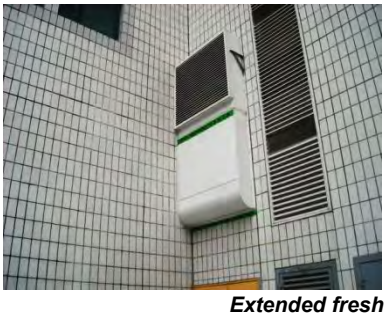
In order to provide better human comfort in some relatively densely populated office areas, energy recovery ventilators were installed at high level of windows to increase the fresh air supply rate.

(d) Improvement of Indoor Air

Extension works was completed for the fume exhaust stack of the Department of Physics and Materials Science laboratory currently on high level of Floor 1, Fong Yun-wah Building to roof level of Blue Zone, Academic 1 (AC1) to prevent "short-circuiting" or re-entry of exhaust air.

Newly installed fume extraction fan LCF-35 on the roof of Blue Zone, AC1

Modification and relocation of some of the fresh air intakes of AC1 currently located near street level or exhaust air louvers to at least Floor 2 level was done to mitigate the possibility of fresh air contaminated by exhaust air.



Extended fresh air intake louver to upper location outside 1SC10

Extended fresh air intake louver to upper location outside 1SC04

(e) Enforcement of Smoking Ban on Campus

Posting of warning notices at strategic locations; increased patrol of black spots by guards; issuance of email broadcasting messages and reporting of smoking complaints to Tobacco Control Office of Department of Health of the HKSAR Government were some of the measures put in place to control illegal smoking on campus.

(f) IAQ Survey

As a continual monitoring measure, university-wide indoor air quality (IAQ) survey / measurement is performed on a regular basis. The current survey being conducted has proved that the IAQ on campus is up to the HKSAR Government's IAQ Objectives "Good Class" or above standards, safe and hygienic due to good maintenance.

For newly completed buildings well before occupied as classrooms or offices, IAQ surveys are carried out to ascertain that HKSAR Government standards in respect of IAQ are complied with.

1.2.3 Noise Control

(a) Enhancement of Teaching Environment

Modification works was completed for 6 of the classrooms on Floor 4 and 44 of the classrooms on Floor 5 in AC1 to remove the return air plenums of fan coil units away from the fan motors to reduce noise distracting students' attention in class.

1.2.4 Wastewater Treatment and Neutralization

(a) Effluents Discharged from Catering Operation

The two electroflocculation systems being operated on campus again managed to control about 80,000m^3 of wastewater produced from the concerned catering outlets to within the effluent discharge limits regulated by the Environmental Protection Department (EPD) of HKSAR Government.

Monitoring of discharged wastewater from all catering outlets is on-going to ascertain compliance with discharge limits. CityU has had no fines for environmental non-compliance in the past year.

(b) Wastewater Discharged from Laboratories

Our properly maintained Neutralization System processed about 36,000m^3 of wastewater discharged from laboratories last year, ensuring EPD's discharge limits are met.

No water bodies are affected by CityU's discharge of water and runoff.

Spotlight on Water Conservation, Consumption and Management

1.3 Water Conservation, Consumption and Management

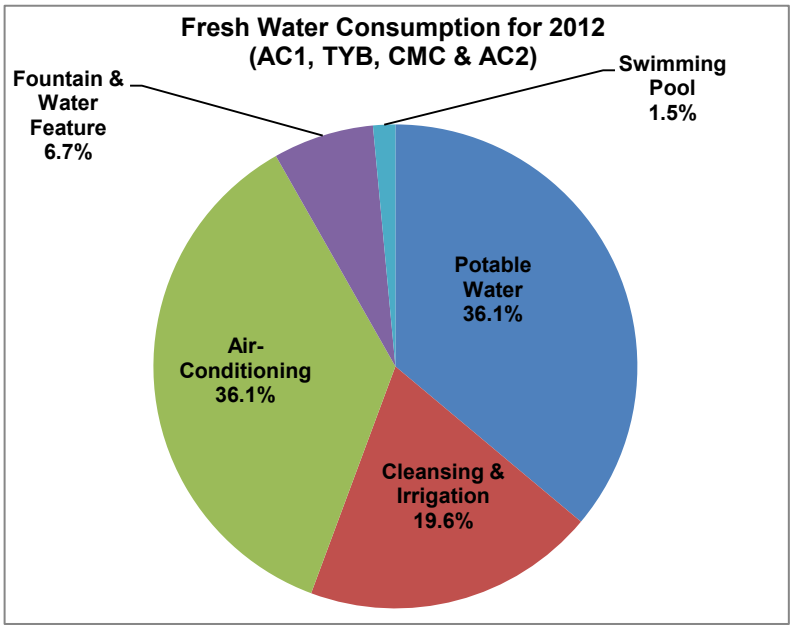
The University has been able to decrease water consumption in 2012 even while the number of students has increased.

1.3.1 Water Consumption and Management

The fresh water consumption on campus for various purposes in year 2012 is depicted in the following table and pie chart.

		2011		2012	
		m^3 (x1000)	%	m^3 (x1000)	%
1	Potable Water				
	Amenities Building & Sports Centre	17.8	9.8	16.4	9.4
	Academic & Administration Buildings	47.1	25.9	38.4	21.9
	To Yuen Building (TYB)	0.8	0.5	0.7	0.4
	CMC	0.5	0.3	0.7	0.4
	AC2			7.0	4.0
	Subtotal	66.3	36.5	63.2	36.1
2	Cleansing & Irrigation				
	Amenities Building & Sports Centre	5.0	2.8	8.1	4.6
	Academic & Administration Buildings	12.8	7.1	24.2	13.8
	TYB	0.1	0.1	0.1	0.0
	CMC	2.6	1.4	1.2	0.7
	AC2			0.7	0.4
	Subtotal	20.6	11.3	34.3	19.6
3	Air-conditioning				
	AC1	40.6	22.3	50.8	29.0
	AC2			12.4	7.1
	Subtotal	40.6	22.3	63.2	36.1
4	Fountain & Water Feature	50.8	27.9	11.8	6.7
5	Swimming Pool	3.6	2.0	2.6	1.5
	Yearly Total (x1000m3)	181.8		175.0	
	Consumption / month (x1000m3)	15.2		14.6	
	Consumption / day / person (litre)	19.3		17.2	

Note The water consumption for CMC is counted to Campus since year 2001
The water consumption for AC2 is counted to Campus since year 2012.



1.3.2 Water Audit

Used

13%

less water

Compared with that of year 2011, the annual fresh water consumption in year 2012 decreased by 13.34% and the following particulars were observed :

(a) The cleansing and irrigation water consumption was increased by 86.33%. The reason is mainly due to the completion of AC2 and partial completion of AC3 and watering of plants in external and sloped areas is required.

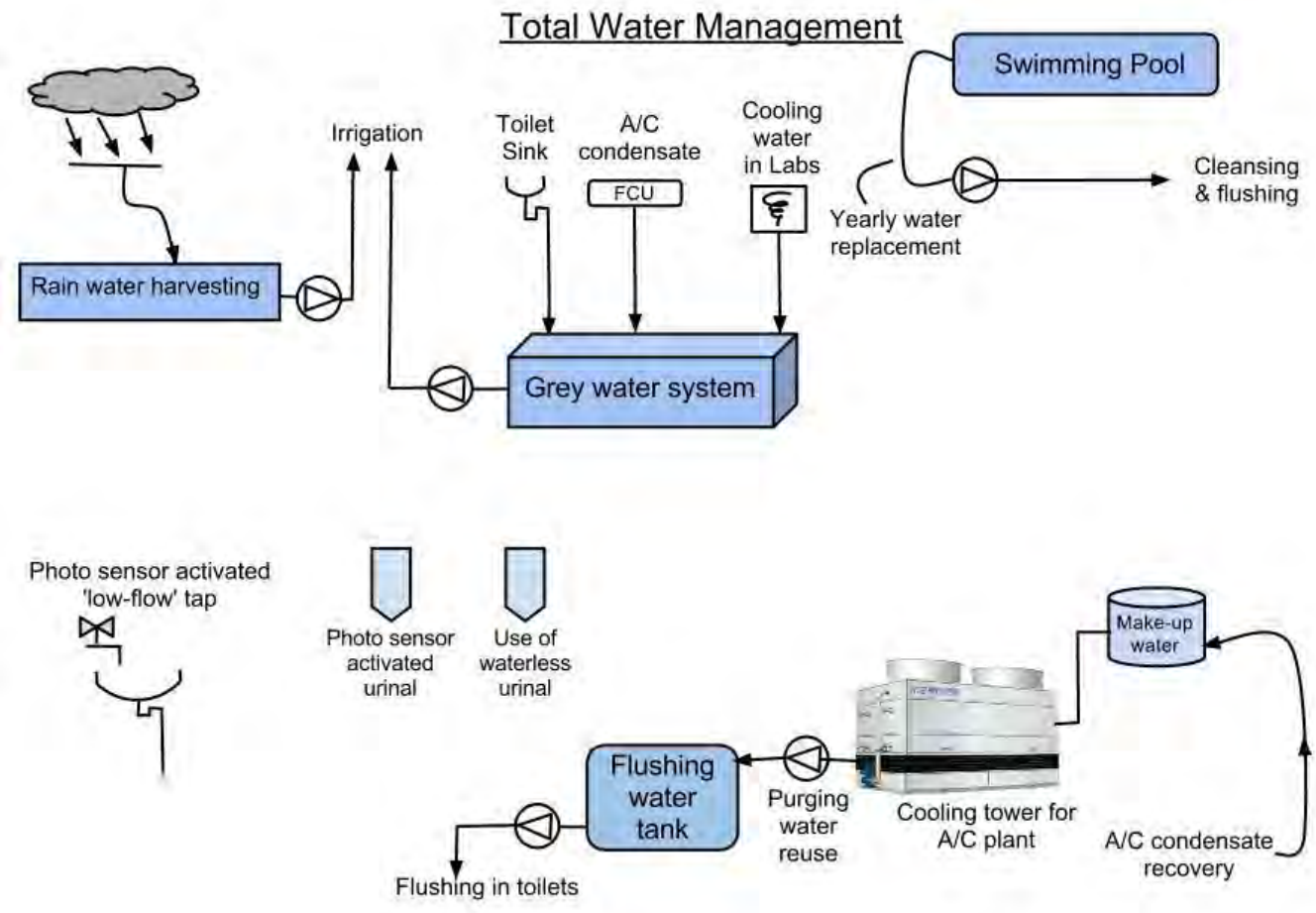
(b) The water consumption for the evaporative cooling tower of air-conditioning plant was increased by 25.02% as compared with that of year 2011. It is because all water-cooled chillers were in full operation last year.

(c) The water consumption of fountain & water features was decreased by 76.77%. It is due to that the leaking underground pipes were replaced.

(d) Potable water consumption decreased by 14.60% compared with 2011 even though the number of students increased since September 2012. This is probably due to opening of AC2 and some staff and students moved to AC2.

(e) Compared with that of year 2011, the water consumption due to water replenishment for swimming pool in year 2012 decreased by 27.09%. Such decrease is mainly due to the reduced frequency of cleansing swimming pool deck.

It can be seen that fresh water demand of various types is dependent on some external factors including staff and student population, rainfall quantity, outdoor dry bulb and wet bulb temperatures. However, we adopted a "total water management" approach (refer to the picture below) to minimize using water through reducing consumption, recycling and harvesting. The opportunity of using various measures was explored in both new and existing buildings. It includes minimizing water usage through the application of water saving aerators, reduce water wastage by reusing the bleed-off from cooling towers for flushing purpose and recovering water through grey water system for irrigation. In the new building of Academic 3 (AC3), rainwater harvesting system has also been installed.



1.3.3 Use of Waterless Urinal System

Saved

12,215m³

flushing water

The existing 'Desert Cube Waterless Urinal System' was extended to some male toilets of CMC and AC2, a total of over 12,215m^3 of flushing water was saved in 2012, which is equivalent to an annual reduction in carbon emission of about 2.1 tonnes CO_2-e.

1.3.4 Potable Water Saving Measures

Saved

5,310m³

potable water

A total of 251 water saving aerators were installed for washbasin taps in toilets of AC2 while 38 self-activated water saving aerators for CMC. In addition, water saving aerators were installed for all the 39 washbasin taps in the toilets of NSB. An annual saving of about 10,627m^3 of potable water was achieved which is equivalent to an annual reduction in carbon emission of about 1.75 tonnes CO_2-e.

The measure will also be extended to all washbasin taps in the newly completed AC3.

Before

After

To achieve water saving, use of water saving shower heads was extended to senior staff quarters. The new shower head can reduce water by as much as 50% compared with the traditional one.

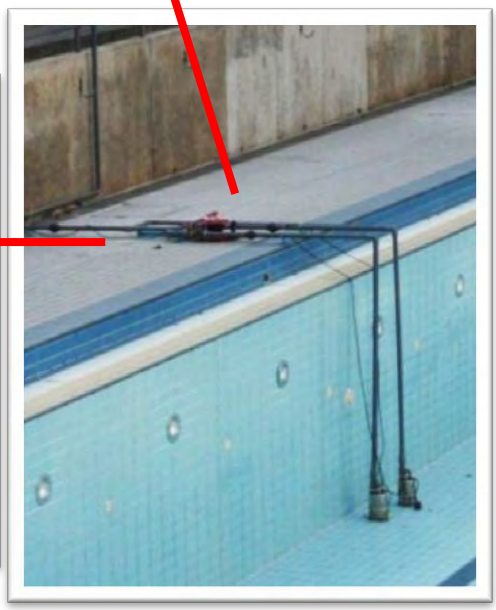
Before

After

1.3.5 Water Recycling

(a) Swimming Pool

Although the discarded pool water after closure of the Swimming Pool could not be used for watering shrubs, lawn and seasonal flowers, we were able to arrange using the discarded 2,000m^3 of pool water for cleansing and flushing of toilets so as to avoid wastage of direct discharging into government drain.



(b) Rainwater Harvesting

In order to reduce the University's water footprint, a rainwater harvesting system of 51,400 litres for recycling of rainwater for irrigation is now made available in

Spotlight on
Campus Energy Efficiency

1.4 Campus Energy Efficiency

1.4.1 Energy Efficiency Improvement

(a) Energy Efficiency Improvement on Mechanical Ventilation and Air-conditioning System

Reduced
1,827
tonnes CO_2-e per year

(i) Operating Water-cooled Chillers in lieu of Air-cooled Chillers

Since August 2012, air-cooled chillers on Roof, Blue Zone, AC1 have been suspended for operation because the capacity of the more energy efficient water-cooled chillers is sufficient to handle the base cooling load in summer season.

(ii) Raising Chilled Water Temperature

Chilled water temperature is raised from 7.2°C to 8.0°C for summer operation so as to increase the chiller plant energy efficiency. Such measure is made possible because the room temperature of those critical areas is under continuous monitoring by the building automation system.

(iii) Trial Use of Energy Efficient Refrigerant (R454) with Low Carbon Emission

Environment-friendly refrigerant R454 is being tried in air-cooled chillers. The chiller is anticipated to be operated at 15% higher efficiency.

(b) Energy Efficiency Improvement on Lift System

(i) Use of Energy Efficient P-M Motor for Lift Upgrading

Reduced 7.2 tonnes CO_2-e per year

Six aged passenger lifts were upgraded in year 2012. Energy efficient P-M motors were used for the traction machine in the replacement. Compared with the old installation, over 40% of energy was saved after the lifts were upgraded. The effect of energy saving in lift upgrading is pronounced as energy consumption in lift operation decreased by 15% compared with year 2011, even though more students are using the campus in 334 double cohorts.

(c) Energy Efficiency Improvement on Lighting System

(i) De-lamping in Library and Public Corridors

The de-lamping process continued at some overlit areas (e.g. Library and common corridors) in year 2012.

Reduced 62.5 tonnes CO_2-e per year

(ii) Use of LED Lamps

8W LED lamp bulbs were used to replace 50W halogen spotlights in various areas on campus. Also, to minimize the labor-intensive work of replacing lamp bulbs, LED lamps are used to replace those downlights with fluorescent lamps at particularly high levels of lecture theatres or atriums.

(d) Use of Energy Efficient Water-cooled Chillers

(i) Use Energy Efficient Water-cooled Chillers in lieu of Air-cooled Chiller for 24-hour Service

In view of the high demand of air-conditioning service in non-normal operation hours, we have suspended using the less efficient air-cooled chillers in night time since August 2012. As a result, more energy can be saved in using high efficient water-cooled chillers around the clock.

(e) Summary of Energy Efficiency Improvement Initiatives Completed in Year 2012

Reduced
1,936
tonnes CO_2-e per year

Description	Estimated Annual Saving (kWh)
Replacement of about 277 sets of compact fluorescent luminaire and downlights by LED lamps in Library, Wei Hing Theatre and department offices	71,540
Replacement of 10 sets of spotlight with fluorescent lamps at roof garden, Floor 5, Yellow Zone, AC1	2,450
De-lamping of 279 sets of lamps in Library and staircases at CMC	24,570
Replacement of lamps with energy efficient LED or florescent lamps in communal areas of various staff quarters and shortening their operation hours	9,140
Use of energy efficient water-cooled chillers in lieu of air-cooled chillers	3,150,000
Use of energy efficient P-M motor in lift upgrading (6 nos. completed)	24,550
Shortening of operation hours of air-side equipment of air-conditioning system in Library, lecture theatres, laboratories and public corridors	30,000
Shortening of operation hours of water feature pumps in Chinese Garden	26,000
Total (kWh)	**3,338,250**
Total reduction in carbon emission per year	**1,936 tonnes** *(equivalent to planting 84,182 trees)*

(f) Energy Efficiency Improvement in Senior Staff Quarters

Our efforts in energy saving and energy efficiency improvement continue in the residential estates on campus and the energy saving measures we implemented include the replacement of lighting fixtures by the energy efficient types and shortening the operating time of lighting in some communal areas. The details of the energy saving measures for various senior staff quarters are summarized as follows:

Reduced
0.4
tonnes CO_2-e per year

(i) Tak Chee Yuen

- 3 sets of 70W lamps at external walls were replaced by 20W energy saving lamps. A total of about 660 kWh of energy was saved per year.

Reduced
1.6
tonnes CO_2-e per year

(ii) Nam Shan Yuen

- 30 sets of 14W / 18W / 28W lamps in corridors and rear staircases were removed in common areas. A total of about 2,680 kWh of energy was saved per year.
- The operating time of 53 sets of lamps in lift lobbies and playing areas were adjusted from 24 hours to 12 hours daily. A total of about 2,500 kWh of energy was saved per year.

Reduced
1.9
tonnes CO_2-e per year

(iii) Academic Exchange Building

- For student hostels, about 250 lamps were replaced with 8W LED lamp. A total of about 3,300 kWh of energy was saved last year.

Before

After

- For visitor quarters, infra-red sensors to operate 13 sets of ceiling lamps have been installed in rear staircases. A total of about 630 kWh of energy was saved last year.

1.4.2 Use of Renewable Energy

(a) Inventory of Installation

In year 2012, there is more capacity of renewable energy installation in the portfolio after the PV panels and solar landscape lighting have been completed in the new building of AC3.

Offset
29.7
tonnes CO_2-e per year

By end of year 2012, an annual energy of 51,200 kWh (equivalent to 29.7 tonnes of CO2-e) was generated on campus from the renewable energy installation. The portfolio of renewable energy installation mainly consists of the following:

- PV solar panel in Student Residence;
- Solar panel/wind turbine hybrid lamp poles in Student Residence;
- PV thermal solar panels in TYB;
- "Evacuated tube" type solar thermal panel at Sports Centre in AC1; and
- PV solar panels in AC3.

(b) The Largest PV Panel System on Campus

Our second and the largest photovoltaic (PV) system on campus has been recently completed in Academic Building. This system mainly comprises 30 nos. horizontal PV panels of 5.55 kW total power rating and is connected to the electrical power distribution grid of the building. A total electrical energy converted from sunlight per year by the system is 6,150 kWh.

1.4.3 Operational and Maintenance Measures

It is recognized that remarkable energy saving can be achieved with minimum investment cost if appropriate measures are used in the daily operation and maintenance of the building services systems. In year 2012, we continued our effort to explore the opportunity in increasing the operation efficiency of our physical plants. Among them, some key energy saving initiatives are described as follows :

(a) To minimize wastage of operating air handling units in laboratory, local switches have been installed to enable staff to switch off the equipment when there are no teaching or research activities.

(b) To set at a higher temperature of 27°C in some communal areas for energy saving.

(c) To shorten the operating hours of air-handling units serving classrooms and lecture theatres by 15 minutes.

(d) To raise the supply air temperature of pre-treated fresh air handling units without compromising the human comfort in space.

1.4.4 Power Management

(a) Energy Audit

We support EMSD's energy survey on the education and hospital sectors. Energy consumption data of electrical equipment and building services systems' operation information was prepared and submitted for their data analysis.

(b) Power Quality

Web-based power management system is extended its use to the new building of AC3. The data is transmitted back to AC1 for central energy monitoring and management.

In AC1, power factor was achieved averagely at 0.954 and above in the power distribution system. Also, the percentage of total harmonic distortion (THD) due to non-linear load measured at the main incomer and submains can meet the operation limit required by China Light & Power. The load factor (kWh/Max.kVA) was monitored and attained at 435 and above with an aim to achieve a lower unit charge in the electricity bill under the Large Power Tariff.

(c) Energy Consumption Statement

In order to raise user departments' awareness of environment protection, we initiated to issue Electricity Consumption Statement to departments on a quarterly basis for their reference since April 2012. We hope that such move can drive users to be alert of the trend of electricity consumption. As a result, each department can improve energy usage performance in a self-regulatory way.

1.4.5 Energy Consumption Analysis

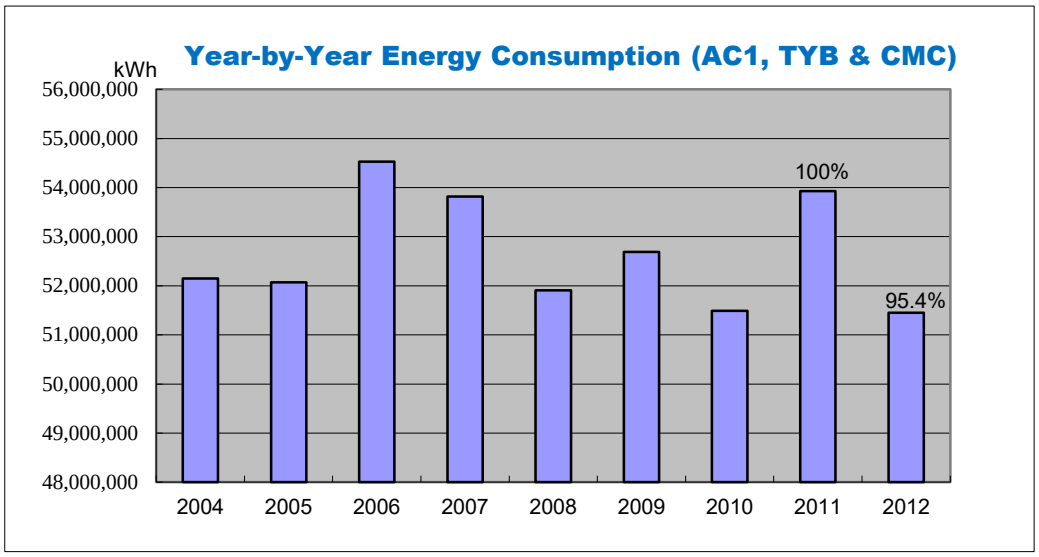
(a) Consumption

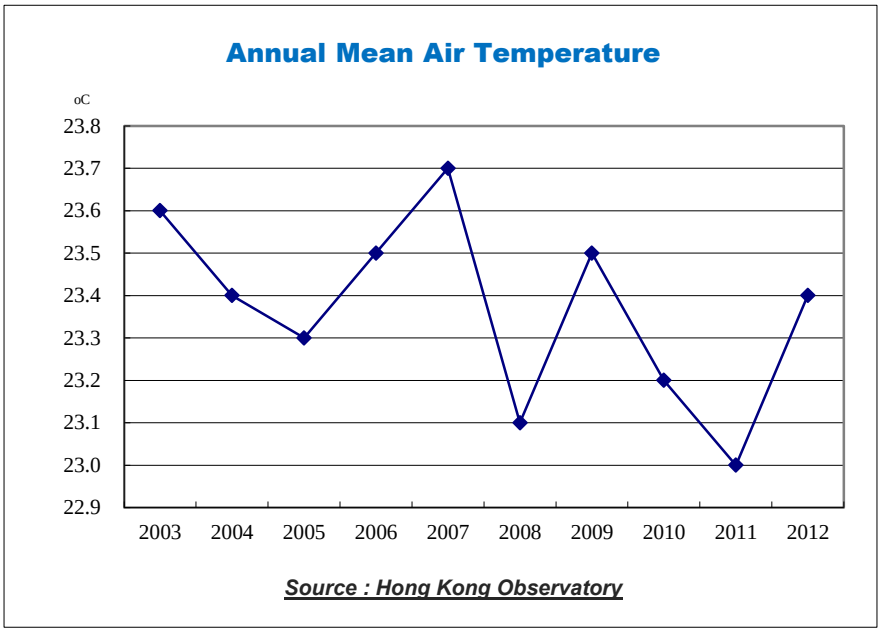
(i) Performance

The energy consumption performance of the main campus (excluding AC2, Student Residence and University premises located off-campus) in year 2012 and its comparison with those of the preceding years are summarized as follows :

Period	2008	2009	2010	2011	2012
Energy consumption (kWh)	51,906,241 (96.3%)	52,692,853 (97.7%)	51,491,662 (95.5%)	53,926,444 (100%)	51,447,656 (95.4%)
Cost of energy	$40,711,767	$40,831,557	$40,972,059	$44,589,633	$44,861,719
Cost per kWh	$0.784	$0.775	$0.796	$0.827	$0.872
Total AC1, TYB & CMC gross floor area(m^2)	166,109.00	166,109.00	166,109.00	189,858.00	189,858.00
Total no. of student and staff	28,328 (110.0%)	27,063 (105.0%)	26,207 (101.7%)	25,764 (100%)	27,946 (108.5%)
Consumption per capita (kWh)	1,832 (87.5%)	1,947 (93.0%)	1,965 (93.9%)	2,093 (100%)	1,841 (88.0%)
Energy consumption per m^2 (kWh/m^2)	312.48 (110.0%)	317.22 (111.7%)	309.99 (109.1%)	284.04 (100%)	270.98 (95.4%)
Energy cost per m^2	$245.09 (104.4%)	$245.81 (104.7%)	$246.66 (105.0%)	$234.86 (100%)	$236.29 (100.6%)

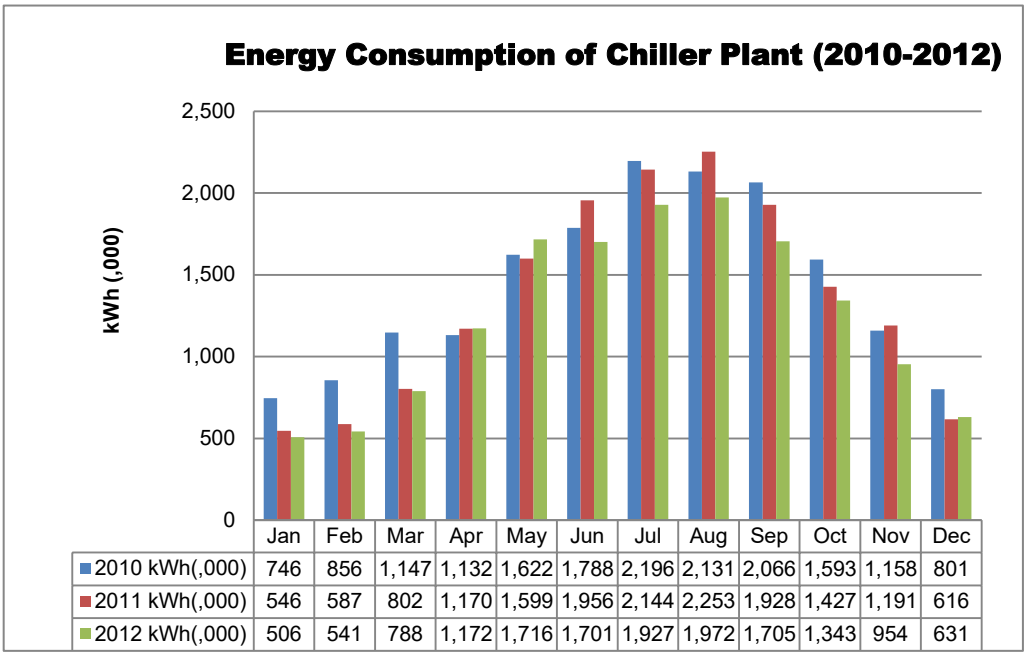
Remark: CMC is included


Year-by-Year Energy Consumption (AC1, TYB & CMC)
kWh
56,000,000
55,000,000
54,000,000
53,000,000
52,000,000
51,000,000
50,000,000
49,000,000
48,000,000
100%
95.4%
2004
2005
2006
2007
2008
2009
2010
2011
2012


Annual Mean Air Temperature
oC
23.8
23.7
23.6
23.5
23.4
23.3
23.2
23.1
23.0
22.9
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Source : Hong Kong Observatory

In year 2012, the main campus consumed 51,447,656 kWh of energy which, when compared with that of year 2011, has decreased by 4.6%. The decrease in energy consumption in year 2012 was attributable to the following factors :

- Referring to the chart below, it shows that energy consumption in chiller plant saw a significant reduction of 7.8% using year-to-year comparison. In AC1, the energy saving contributed by chiller plant operation is 1,261,399 kWh which represented the large share of 50.9% in the total saving. This saving is more obvious after August 2012 when we abandoned using some less efficient air-cooled chillers operation in the chiller plant (which comprises a combination of air-cooled and water-cooled chillers).



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010 kWh(,000)	746	856	1,147	1,132	1,622	1,788	2,196	2,131	2,066	1,593	1,158	801
2011 kWh(,000)	546	587	802	1,170	1,599	1,956	2,144	2,253	1,928	1,427	1,191	616
2012 kWh(,000)	506	541	788	1,172	1,716	1,701	1,927	1,972	1,705	1,343	954	631

- Energy saving resulted from de-lamping of lighting fittings in communal areas.

- Energy saving resulted from using LED lamps to replace halogen lamps in display spot lighting.

- Air-cooled chillers of relatively low energy efficiency were minimized for operation in night time since October 2011 and the air-conditioning was completely serviced by the water-cooled chillers.

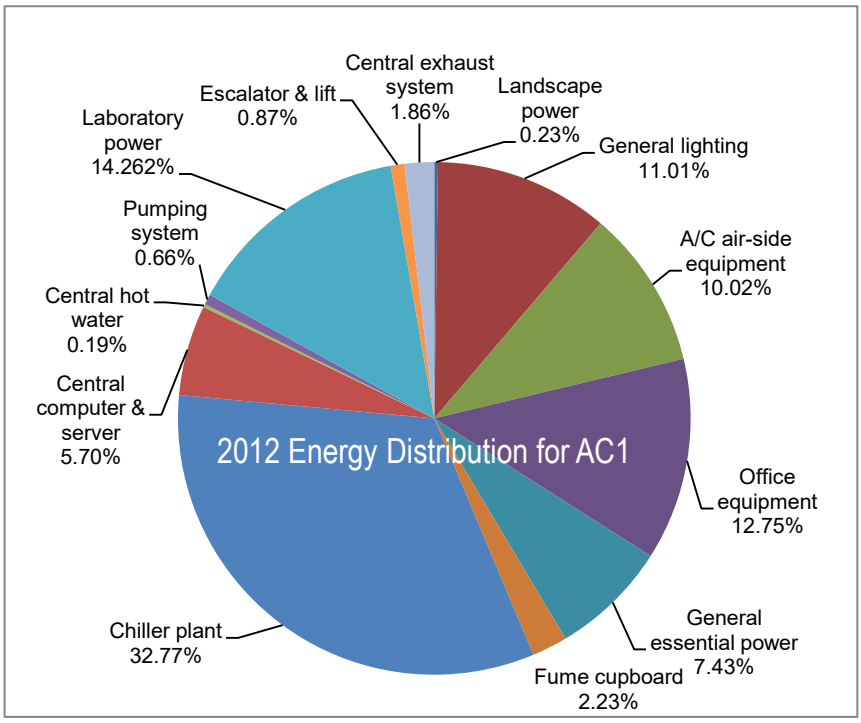
- The operation hours of air-side equipment in the air-conditioning system was shortened in lecture theatres, laboratories and communal areas of AC1.

- Users in some areas of AC1 (viz., Floor 2, Amenities Building and Floor 2, Green, Blue and Yellow Zones of AC1) have moved out to AC2. It resulted in energy reduction in AC1. Whereas, the energy consumption data of AC2 will not be reflected in this Report.

- Compared with year 2011, the average outdoor mean temperature of year 2012 (23.4°C) is 0.4°C higher. It had posed additional cooling load to the air-conditioning system.

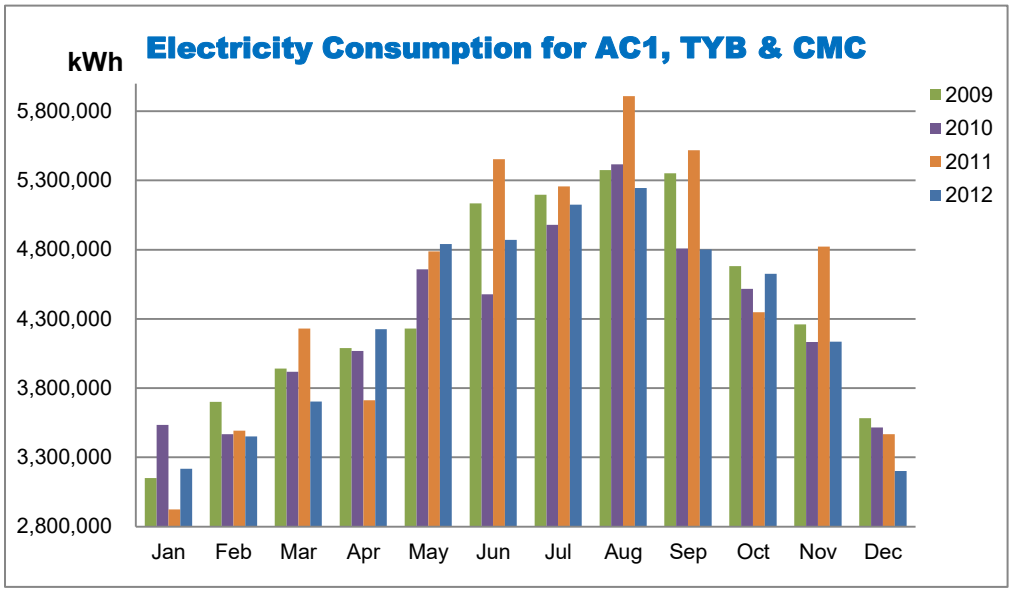
(ii) Consumption Distribution

From the following pie chart, it shows that the largest energy consumption in AC1 is attributed to the central air-conditioning plant which represents 32.8% of total, followed by laboratory power (14.3%), office equipment (12.8%), general lighting (11.0%) and air-conditioning air-side equipment (10.0%).



(iii) Month-to-month Energy Consumption Pattern

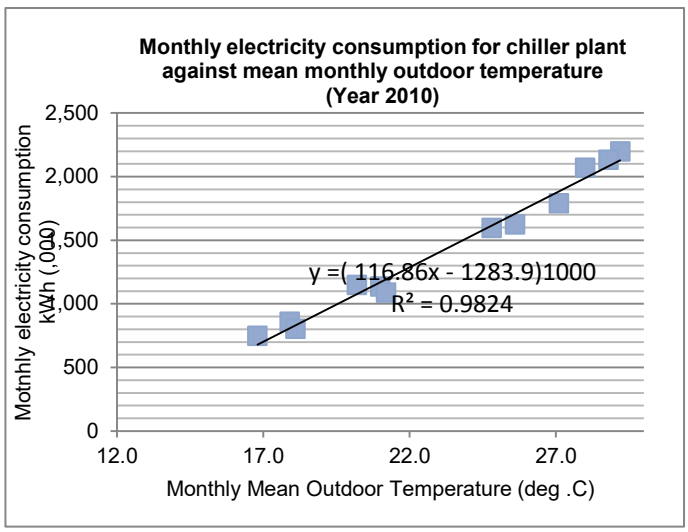
When compared with that of year 2011, generally the monthly consumptions in 2012 are lower, particularly in the summer months (between May and September 2012). The energy saving is most outstanding in August and September. It is because we have minimized using less energy efficient air-cooled chillers for night time operation since August 2012. Thus significant energy saving was accrued from chilled plant operation which used totally water-cooled chillers. On the contrary, higher energy consumption was found in April and October compared with year 2011 because of the higher outdoor mean temperatures in these two months. Consequently, it had posed larger cooling load demand in the air-conditioning system.

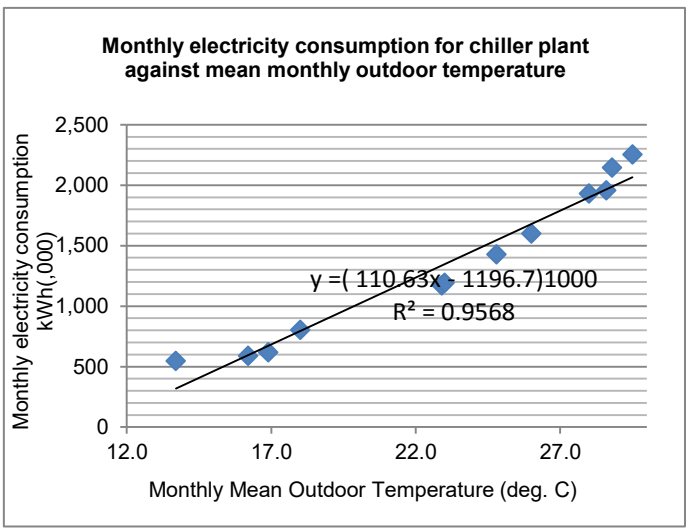


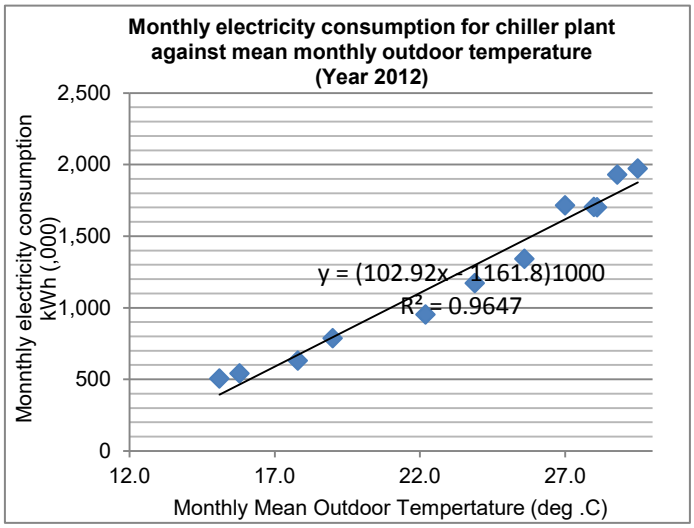
(iv) Patterns of Energy Consumption

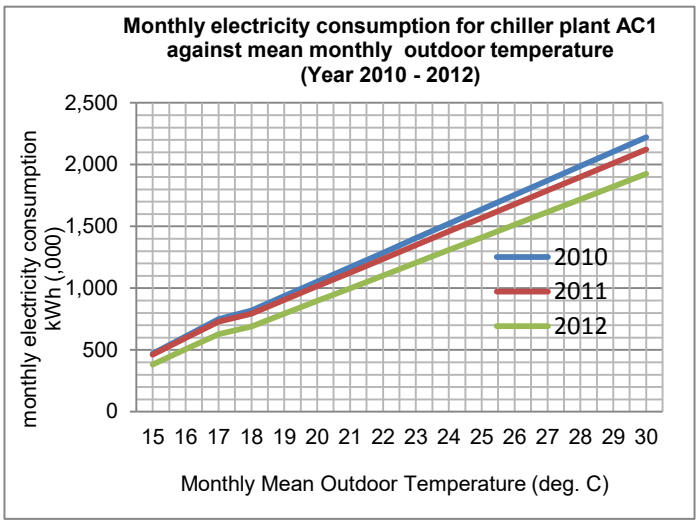
By examination of the energy consumption data, it was found that energy saving in air-conditioning chiller plant accounted for about 61% of the total saving. Since the air-conditioning energy consumption shows a good correlation with the weather changes, thermal performance lines (TPL) (i.e. correlation curve) are drawn for the last three years (2010-2012) for comparison. From the charts, it indicates that the slope of TPL for 2012 is gentler than previous years. It can be explained by the fact that we have totally used higher energy efficient water-cooled chillers in the air-conditioning plant.

In addition, the TPL of year 2012 stays consistently below the lines of previous years. Such phenomenon indicates that those base loads of the building (which is not weather dependent, such as energy due to lighting fixtures and other electrical equipment) decreased. It reflects that energy saving has been attained in various energy saving measures, such as delamping in lighting system and shortening of running hours in air-side equipment of air-conditioning system and so forth.



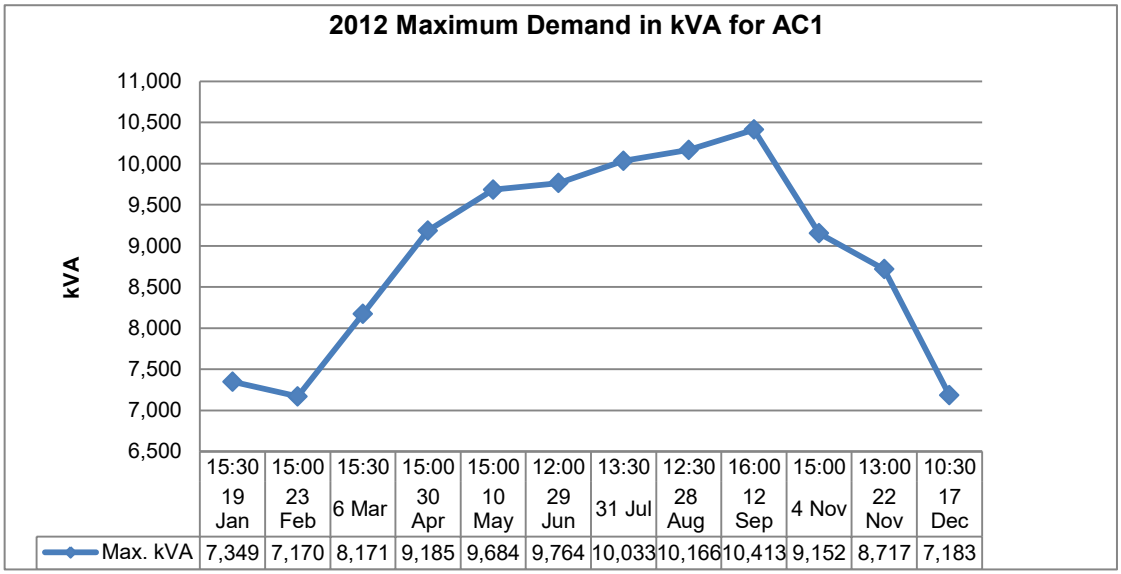






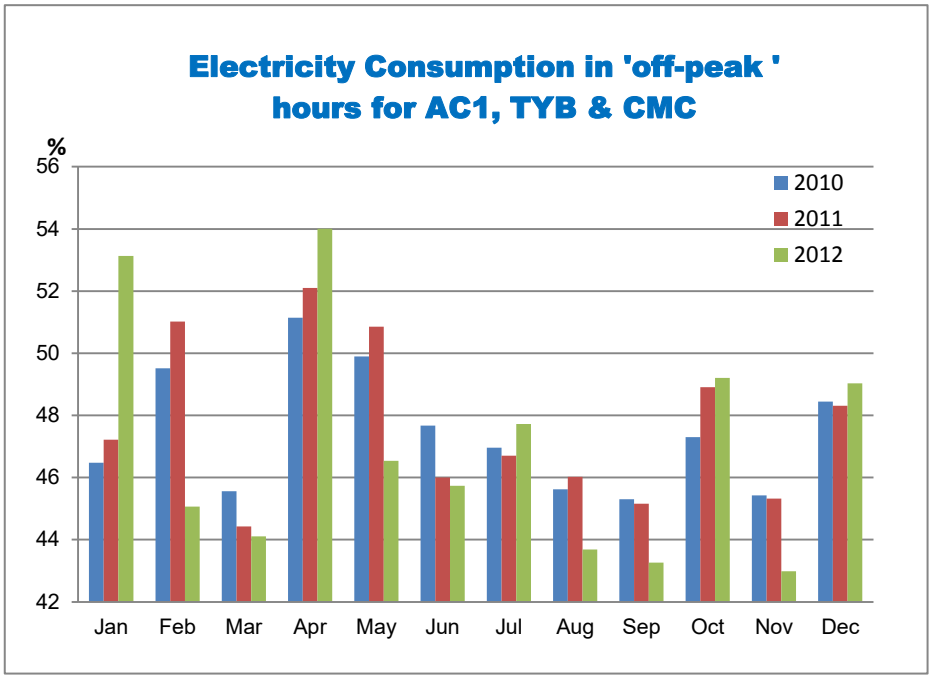
(v) Electricity Demand in Peak Hours

The graph below shows that the maximum kVA demand during peak hours (i.e. 0900 to 2100 on weekdays) occurs mostly in the period between 1200 and 1600 in each month. The highest values occurred in summer months between May and September. It is because maximum kVA of the building exhibits a good correlation with the peak electrical load in chiller plant operation which in turn follows the cooling load pattern caused by the weather. Compared with year 2011, the maximum kVA decreased averagely by 3.6% in these peak months. This phenomenon can be explained by the fact that chiller plant ran at lower demand and higher efficiency when water-cooled chillers instead of air-cooled chillers were used in operation.



(vi) Consumption during Off-peak Hours

The following graph shows that energy consumption at off-peak hours (i.e. 2100 to 0900 on weekdays and Saturday, and all hours on Sunday) maintained at a relative high percentage (47% in average of the total). It reveals that campus activities continue during off-peak hours and users keep on using most energy-consuming equipment, office appliances, computer workstations, lighting and air-conditioning services. This phenomenon is more pronounced in January, April, October and December.



(vii) Request for Extended Air-conditioning and Lighting Provision

Compared with that of year 2011, requests from user departments for additional air-conditioning and lighting services after normal hours increased dramatically by 221% in year 2012. Details of the top 10 user departments who made the most requests are shown in ***Appendix I***.

Same as last few years, Students' Union and Electronic Engineering Department stayed as the two users who made the highest number of requests on extended hour service among other users.

(b) Tariff and Expenditure

In comparison between year 2012 and 2011, the energy consumption of campus (including building AC1, TYB and CMC) decreased by 4.6%. Whilst expenditure on electricity bill increased by 0.61% despite that the student/staff population increased by 8.5%. It should be noted that year 2012 is the first year we include the new building, CMC into our energy study.

In year 2012, CLP increased the Tariff in terms of both Energy Charge and Fuel Clause. As each building on campus uses different type of Tariff, the weighted average of Unit Charge (cost per kWh) in year 2012 is $0.872/unit which is 6.34% higher than that of year 2011 ($0.820).

In year 2012, we had tried our best effort in energy saving to combat the tariff increase. In face of the tariff increase, the electricity bill of AC1 can be possibly decreased by 0.58%. It is because energy saving of 5.88% was achieved. The load factor (unit consumed/on-peak max. demand) decrease slightly from 445 in year 2011 to 437 in year 2012.

The unit charges for various buildings on campus are shown below :

Location	Unit Charge ($)	Tariff Type
TYB	1.014	Bulk
AC1	0.861	Large Power
CMC	0.929	Bulk
Weighted average (based on the aggregated charge divided by the aggregated electricity units)	**0.872**	

The distribution of expenditures on energy consumption is tabulated here under :

Area	Category	Jan – Dec 2009	Jan – Dec 2010	Jan – Dec 2011	Jan – Dec 2012
Campus	Electricity ***[i]***	$40,831,557	$40,972,059	$40,242,421	$44,861,719
	Gas ***[ii]***	$6,053	$5,464	$4,458	$4,889
Senior Staff Quarters ***[iii]*** (Public area)	Electricity	$365,626	$413,868	$373,260	$378,281
Academic Exchange Building ***[iv]***	Electricity	$781,425	$767,872	$709,410	$812,692
External Offices ***[v]***	Electricity	$1,172,352	$1,413,704	$1,322,835	$1,480,249
Total energy cost incurred		**$42,898,187**	**$43,157,013**	**$42,652,383**	**$47,537,829**

Remark :

[i] *AC1 includes AC1, Administration Building and Amenities Building and Sports Centre, but exclude catering outlets, Bookshop and Hang Seng Bank. CMC is included.*

[ii] *include gas-dehumidifiers installed in EE laboratory on Floor 2, Fong Yun-wah Building.*

[iii] *include public area for Tak Chee Yuen and Nam ShanYuen.*

[iv] *include public area and SCOPE.*

[v] *include offices in Festival Walk Tower, Grandtech Centre, Chak On Centre, InnoCentre, Hong Kong Science Park, Kin Fat Industrial Centre, Ka Chi School and NSB.*

1.4.6 3-year (2012-2014) Carbon Reduction / Energy Saving Plan

(a) The Plan

Subsequent to completion of the last 3-year (2009-2011) carbon reduction / energy saving plan, another 3-year (2012-2014) plan was promulgated with a target to achieve a reduction of 6% (year-to-year) in energy consumption by end of year 2014, using year 2011 as the benchmark.

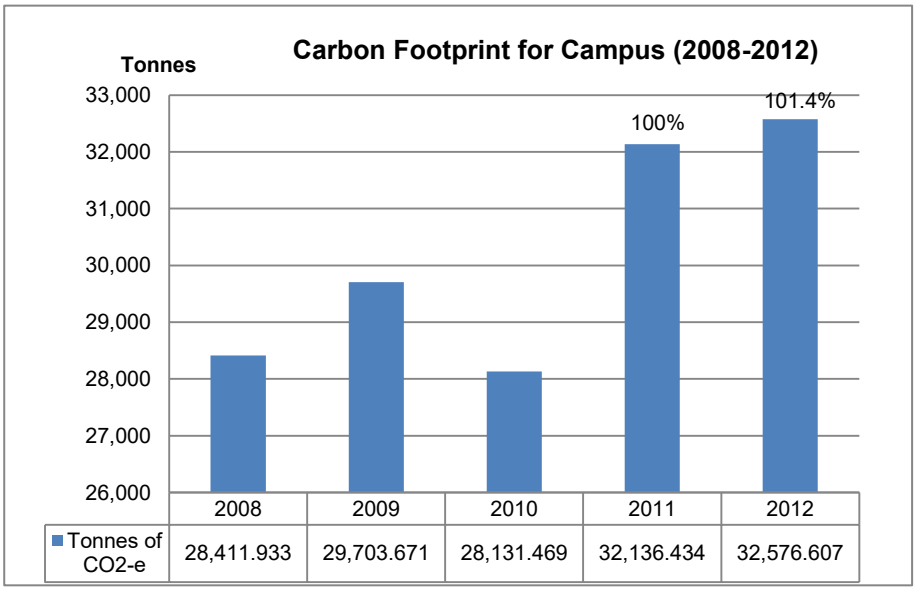
Our performance in year 2012 is encouraging because 2.1% reduction in energy consumption (4.6% reduction in terms of carbon emission) was achieved in year 2012. The performance data of both energy consumption and GHG emission are summarized as follows:

	Year 2011	Year 2012
Electrical Energy Consumption (kWh)	53,926,444 (100%)	51,447,656 (95.4%)
Net GHG Emission (tonnes)	31,817 (100%)	29,840 (93.8%)

(b) Carbon Footprint

The carbon footprint for the period (2008-2012) is shown in the chart below. Compared with that of year 2011, the total carbon footprint for campus (including AC1, TYB and CMC) has been increased by 1.4% (i.e. 440 tonnes CO_2-e which equates to planting of 19,130 no. of trees). The Performance Report on GHG Emissions and Removals for year 2012 is given in ***Appendix II*** and the key performance indicators of our GHG for Year 2012 are :

Total GHG Emissions : 32,577 tonnes of CO_2-e
Footprint per capita : 1.166 tonnes of CO_2-e/person



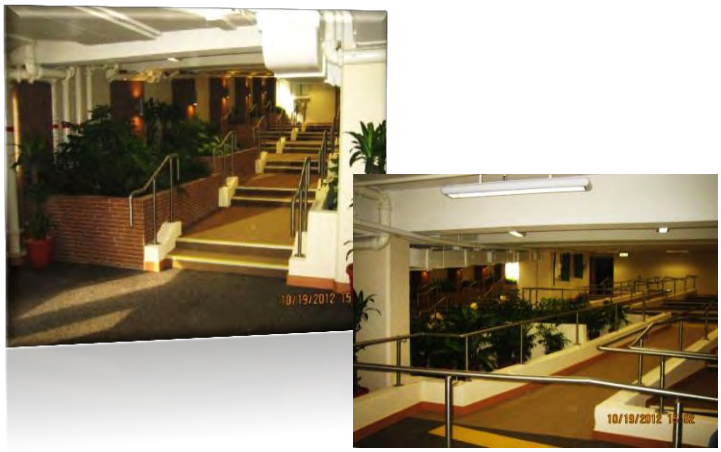
Spotlight on Campus Greening

1.5 Campus Greening

CDFO continues making great efforts on improving greenery / landscape with the view to providing a welcome campus ambiance that University community can enjoy with pride.

1.5.1 New Initiatives

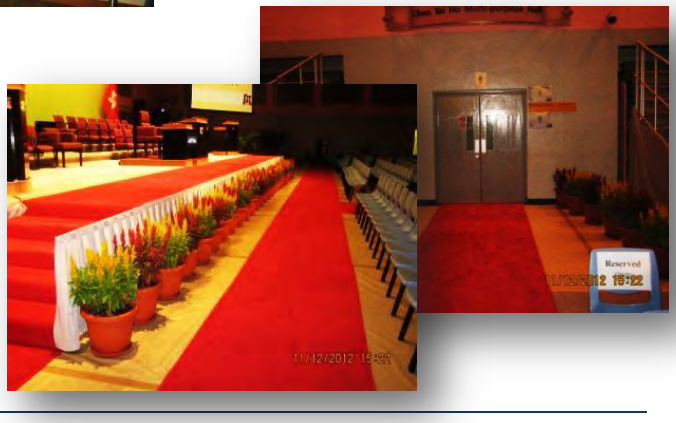
In order to soften hard surfaces and enhance the greenery at prominent locations on campus on campus, climbing plants and flowers were created.



With the occupation of NSB, more than 100 potted plants were placed there to provide an inviting atmosphere for the research staff and students to make frequent use of the areas.

1.5.2 Events

Seasonal flowers were provided to enrich the atmosphere in important events, such as Congregation.



1.5.3 Tree Inventory and Management System

The first phase of inputting data in the Tree Inventory and Management System (TIMS) for 265 trees in Chinese Garden was finished. The second phase of entering data for the trees on Campus Ground Level at Nam Shan Chuen entrance and along Nam Shan Chuen Road is in progress.

1.5.4 Use of Eco-fertilizer

CDFO recycles food waste generated from Senior Staff Quarters into fertilizer and uses the composted food waste on landscaping areas on campus. A total of about 110 kg of fertilizer has been produced and applied last year.

1.5.5 Irrigation of Vegetation

In order to achieve conservation of water and effective watering for plants and trees on campus, in addition to regular review of irrigation frequency and duration taking into account various factors such as weather change and species of plants and trees, sprinklers are replaced by drip pipe system gradually.

1.5.6 Green Roof

Advice was rendered to the GROW project funded by the Campus Sustainability Fund of the Office of the Provost and coordinated by Green Connections. The project involves growing permaculture on the roof of AC2.

Spotlight on Development of New Buildings

1.6 Development of New Buildings

CDFO recognizes reaching the highest level of green or energy performance is most cost-effective when timed to coincide with new construction and has taken the opportunity to include green features in all our newly constructed CMC, the AC2, the CityU Shenzhen Research Institute Building and the AC3.

The following are examples of energy efficiency features and green facilities which have been incorporated in the above-mentioned new buildings:

(a) Recycled Feature

- Harvesting of rainwater for irrigation and recycling of cooling tower bleed-off water for flushing.
- Recycling of air-conditioning condensate water for air-conditioning make-up water.

(b) Green Feature

- Green roof.

(c) Renewable Energy Technology

- Photovoltaic (PV) system fed into grid.
- Self-contained type PV cell landscape lights.

(d) Energy Efficiency Feature

- Water-cooled chillers.
- Heat wheel for energy reclaim of exhaust air from all air-conditioned areas.
- CO_2 sensors to control fresh air supply.
- Lighting control by daylight sensors in classrooms.
- LED type exit signs.
- High efficiency T5 fittings.
- Lifts with Variable Voltage Variable Frequency (VVVF) Drive System.
- Automatic on/off switching off lighting and ventilation fan inside lift cars.

Spotlight on
Benchmarking with Peer Institutions

(e) Energy Management Feature

- Web-based energy metering.

1.7 Benchmarking with Peer Institutions

CDFO's membership in the Tertiary Education Facilities Management Association (TEFMA) allows leading universities in the Asia and Australasia region to share CityU's campus sustainability data in TEFMA's annual benchmarking survey.

Participation in the Hong Kong Sustainable Campus Consortium established under the Heads of Universities Committee in 2010 further extends our opportunities to share experience and best practices with the city's eight publicly-funded universities concerned with campus sustainability and related issues.

Spotlight on Support of Student Green Activities

2. Green Activities and Collaborations

We have continued sharing our expertise with the stakeholders of CityU and interested members of the public concerned with campus sustainability and related issues, supporting students' and green groups' green campaigns and participating in green promotions.

2.1 Support of Student Green Activities

(a) "Greenlight Angel Programme" of the Environmental Protection Society of SU

CDFO supported the Programme by issuing certificates to the greenlight angels certifiying their work on promoting environmental protection on campus.

(b) Waste Audit

Further to the waste audit initiated by CDFO and conducted by a group of environmental protection ambassadors of the Environmental Protection Society (EPS) of SU in CityU in 2011, liaison with EPS continues with the aim to arrange a large scale waste audit covering all the areas on campus including communal areas, lecture theatres, classrooms, laboratory areas, workshops and offices.

(c) Guided Tours

In coordination with the EPS of SU, CDFO provided guide tours to the food waste collection and energy saving facilities of CityU on 20 & 27 February 2012 for a group of Greenlight Angels.

Spotlight on Contribution to Student Learning and Teaching

2.2 Contribution to Student Learning and Teaching

(d) **<u>Internship Programme</u>**

CDFO offered another 6-week programme to four students of SA majoring in environmental policy studies from 4 June to 15 July 2012 to learn hand-on experience. Each student had been assigned with specific focus area to conduct carbon auditing on campus. At the end of the programme, the concerned students made the presentation about their six-week learning experience.

(e) A guide tour to the Greywater Recycling Plant was conducted by CDFO on 27 February 2012 for 24 students of BCH on the course of BCH4023 Biological Treatment of Wastes.

(f) A talk on how to prepare a carbon audit report on greenhouse gas emission and removal was given on 16 February 2012 to a group of 25 students of EE on a GE course by our Office.

(g) A guide tour to the Thermal Solar Panel for Hot Water Heating on rooftop of Sports Centre and Green Roof of AC2 was conducted by CDFO on 14 June 2012 for a group of students of EE on a Gateway Education course.

(h) 4 students from the Department of English and Department of SA were supplied with required information by the Office on CityU food waste management to enable them to work on their level 1 competition task of the Green Leaders Tournament 2012 organized by AIESEC.

(i) Our Office provided a group of Year 2 students from the Associate of Arts in Communication and Public Relations working on a research assignment with information on the paper collection facilities on CityU campus and our paper collection contractor.

(j) Two students on a MSc course in Environmental and Public Health Management of the Hong Kong Baptist University was provided by the Office with required information on the environmental management system of CDFO including environmental policy, environmental managemental plans, internal audit, surveillance audit, certification audit, etc.

Spotlight on Collaboration with Others

2.3 Collaboration with Others

(k) Police Force Senior Executive Management Forum

In response to the invitation of the Planning and Development Branch of the Hong Kong Police Force (HKPF) of HKSAR Government, a presentation was given by CDFO on "Energy Saving Initiatives on Campus" on 24 April 2012 to introduce to the senior executives of HKPF the latest technology and initiatives in energy saving on CityU campus.

(l) Earth Hour 2012 Lunch Talk

In response to the invitation of the EPS of SU of CityU, a talk was delivered on 14 March 2012 to promote practical actions against climate, such as energy usage controls, reducing energy consumption and positive attitude on energy saving.

(m) "Green Hong Kong. Carbon Audit Campaign" of the EPD of HKSAR Government

As a Green Partner, carbon audit data of CityU was reported to EPD to support them to further promote the "Green Hong Kong. Carbon Audit "campaign.

(n) Low Carbon Energy Future – Good news, Bad news and the Best route forward

Attended the seminar on "Low Carbon Energy Future" jointly organized by Business Environment Council, Civic Exchange and British Consulate-General Hong Kong with keynote speaker, Prof Julia King, UK Low Carbon Business Ambassador and Vice Chancellor, Aston University and met with Prof King as members of the Hong Kong Sustainable Campus Consortium to exchange best practices, learn about the role of UK universities in addressing climate change and possibly identify opportunities to collaborate on 2 May 2012.

(o) Distinguished Talk on Climate Change by Prof Tim Flannery

Attended the talk "How Academics Can Help, and Influence, the Climate Change Policy of Governments and Business" delivered by Prof Tim Flannery, Chief Commissioner of the Australian Climate Commission on 21 March 2012.

A CityU Announcement Portal (CAP) was also issued to promote the talk to all staff and students of CityU to encourage them to attend.

(p) Advanced Workshop on Building Energy Efficiency

Attended the workshop on "Advanced Workshop on Building Energy Efficiency" organized by the Institute of Space and Earth Information Science of Chinese University of Hong Kong on 30 May 2012 to learn about methodologies, technologies and application experiences for saving energy in different types of buildings under different climate conditions.

(q) Hong Kong No Air-Con Night

The "Hong Kong No Air-Con Night 香港無冷氣夜" campaign organized by the Green Sense on 27 September 2012 was a 12-hour-long air-conditioning out action starting from 7:00 p.m. to encourage the whole society to save energy. Students residing at Student Residence supported the event.

CityU actively supported the event by raising the indoor temperature in some communal areas on CityU campus - lecture theatres, Library, Sports Centre, Canteen and Wei Hing Theatre – to 25°C to lower power consumption. The chilled water supply for public areas was also shut off.

Spotlight on Enhancing Community Awareness

2.4 Enhancing Community Awareness

(r) WWF "Earth Hour 2012"

Same as in the past few years, CityU supported the "Earth Hour 2012" campaign held on the 31 March 2012 by turning off non-essential lights in corridors or external / public areas at AC1, Administration Buildings, Amenities Building, AC2 and CMC for one hour from 8:30pm to 9:30pm.

CAPs were also issued to all staff and students of CityU to encourage them and their families to support this meaningful event by turning off lights in office and at home with the aim to arouse awareness on global warming, energy saving, and reducing emission of pollutants and greenhouse gases.

(s) "Hong Kong's First Zero Carbon Building" Naming Competition

A CAP was issued to encourage CityU's staff, students and their families to participate in the "Hong Kong's First Zero Carbon Building" naming competition to submit ideas to name the Building.

(t) "Zero Food Waste in CityU" Programme

A one and a half years' "Zero Food Waste in CityU" programme was launched in early 2012 jointly with Greeners Action with the support of the Environment and Conservation Fund to promote reduction of food waste on campus. Campaigns orchestrated by representatives from Student Development Services (SDS), Student Residence Office (SRO), Finance Office (FO), CDFO and Greeners Action – Kick-off Ceremony of Zero Food Waste Week in CityU, Food Waste Sources Separation in Canteen, Schools' Save Food Day, Mascot Design Competition, Zero Food Waste Week in CityU, Tongue Twister Competition, "Food Waste, Where to go?" Exhibition, Debate Contest on Food Waste Management Policy and Visits to Kowloon Bay Waste Recycling Centre - were conducted throughout 2012 to promote food waste reduction in CityU.

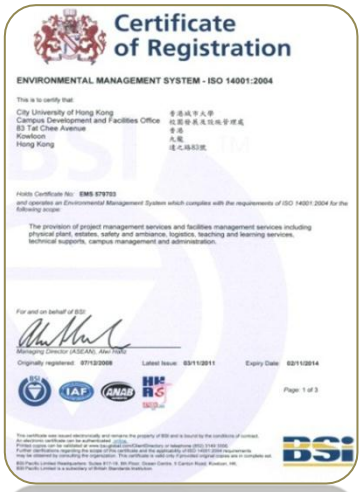
Achievements

3. Achievements

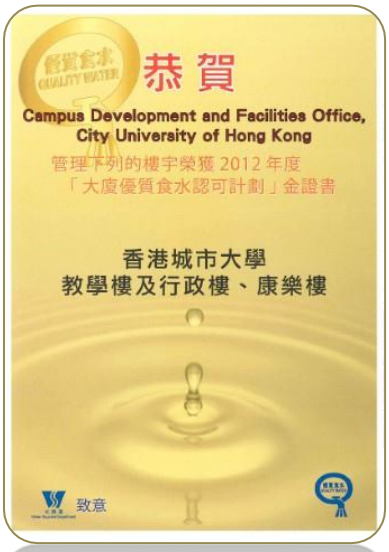
Evidence of our efforts to create a low-carbon campus being widely recognized is clearly seen in the many awards received.

3.1 ISO 14001 : 2004 Certification

Certified to be in compliance with the requirements of ISO14001 EMS for the 11th year, which is a recognition of CDFO's commitment in applying internationally recognized green practices at work.


Certificate of Registration

ENVIRONMENTAL MANAGEMENT SYSTEM - ISO 14001:2004


恭賀

Campus Development and Facilities Office, City University of Hong Kong

管理下列的樓宇榮獲 2012 年度「大廈優質食水認可計劃」金證書

香港城市大學
教學樓及行政樓、康樂樓

致意

3.2 Certificate of Fresh Water Plumbing Quality Maintenance Recognition Scheme

Gold certificate was awarded for the third year for our dedication to maintain good water quality to the University community through proper maintenance of water tanks, pumps and water pipework in buildings, satisfying the prescribed requirements of the Fresh Water Plumbing Quality Maintenance Scheme of the Water Supplies Department of the HKSAR Government.

3.3 Wastewi$e Label of the Hong Kong Awards for Environmental Excellence

"Class of Excellence" Wastewi$e Label was awarded for the tenth years, which recognized CDFO's outstanding performance in waste reduction and environmental protection.

3.4 Programme on Source Separation of Waste

The CityU was awarded an Appreciation Certificate by the EPD of HKSAR Government during the "Love Food Waste Not" Summit in recognition of our sustainable contribution towards source separation of waste.

3.5 Commendation Scheme on Source Separation of Commercial and Industrial Waste 2011/12

The CityU was awarded the "Gold Award" of the other building types of the captioned programme organized by the EPD of the HKSAR Government in recognition of our achievements in waste reduction and recycling over the past few years.

3.6 Commendation Scheme on Source Separation of Commercial and Industrial Waste 2011/12

The CityU was also awarded the annual special "Award for Promotion" and Certificate of Appreciation of the captioned programme organized by the EPD of the HKSAR Government in recognition of our active participation and outstanding performance in source separation of waste and waste reduction.

3.7 Power Smart Contest 2012

CityU won the 2nd-runner-up "Big Saver" award in "company" category of the captioned Contest organized by Friends of the Earth (HK).

3.8 Hong Kong Building Environment Assessment Method (HK-BEAM)

CMC, AC2 and CityU(Shenzhen) Research Institute Building achieved the rating of Platinum, Gold and Bronze standard of the BEAM respectively.

3.9 Green Building Award

A Merit Award was awarded to AC3 in the Green Building Award 2012 for the adoption of sustainable planning and design of the building.

3.10 China Green Building Council's Green Building Design Label

CMC attained China Green Building Council's Green Building Design Label 2-Star Rating.

The Way Forward

The CDFO commits continuing to implement the third 3-year Energy Saving Plan for 2012 – 14 targeting to save 6% of energy consumption (year-to-year) using 2011 as the baseline.

Progress towards sustainability requires focused collective commitment from every member of the University community. Sustainability is a fundamental principle that underlies CDFO's operations.

Appendix I

Appendix I

Top Ten Departments Making the Most Requests for Additional Air-conditioning and Lighting Provisions

Rank	2010			2011			2012		
	Department	Total number of service requests	Total hours extended	Department	Total number of service requests	Total hours extended	Department	Total number of service requests	Total hours extended
1	SU	628	5,648.0	SU	108	930.3	SU	378	3147.0
2	EE	181	554.5	EE	200	749.8	EE	263	1354.1
3	EF	62	430.5	EF	162	565.0	MA	120	963.4
4	MEEM	97	266.5	SS	159	477.3	SS	173	754.0
5	CTL	68	235.5	SLW	188	455.4	MS	203	753.4
6	SS	67	218.0	MA	45	336.0	CS	173	720.9
7	BCH	34	205.0	AC	91	318.8	EF	118	690.1
8	MGT	56	168.0	CTL	84	283.2	SLW	176	567.2
9	EN	35	149.0	CS	53	271.1	MBE	108	546.9
10	CS	49	144.0	MS	84	233.2	SA	75	723.6
Total number of hours extended for the year	8,019.0			4,620.1			10,220.6		
Total number of service requests for the year	1,277.0			1,174.0			1,787.0		
The month of highest extended hours	August			October			November		

Appendix II

Appendix II

Performance Report

on

Greenhouse Gas (GHG) /

Carbon Reduction

for

City University of Hong Kong Campus

2012

1. Reporting Entity

This is the Performance Report on Greenhouse Gas (GHG) / Carbon Reduction for City University of Hong Kong (CityU) Campus 2012 prepared by the Campus Development Facilities Office, City University of Hong Kong.

2. Campus Development Facilities Office (CDFO)

The CDFO is charged with the responsibility for administering, managing and coordinating all efforts related to the provision of the required facilities and support services to meet the strategic objectives of the University whose occupiers include students, faculties, staff, staff of affiliated business entities, workers of contractors, and visitors. The affiliated business entities include bank, bookstore, caterers, and health centre. The contractors include the companies who provide the services for cleaning, security, maintenance and construction works.

Energy management and environment protection are part of the duties of CDFO. CDFO had represented the University to sign the Carbon Reduction Charter which was organized by Environmental Protection Department of the HKSAR Government in July 2008. Commitment is made to conduct carbon audit on campus buildings on a yearly basis and to improve the GHG performance.

3. Reporting Period

This report covers the period from 1 January to 31 December 2012.

4. Scope of Physical Boundaries

(a) The physical boundaries for this report include the Campus of the City University of Hong Kong which comprises the following:

- Academic 1, Administration Buildings, Hu Fa Kuang Sports Centre and Amenities Building within the Site Lot at 83, Tat Chee Avenue, Kowloon Tong.
- To Yuen Building within the Site Lot at 31, To Yuen Street, Kowloon.
- Run Run Shaw Creative Media Centre within the Site Lot at 18 Tat Hong Avenue, Kowloon Tong.

(b) These buildings are mainly used for the following functional purposes:

- Academic 1: offices, lecture theatres, classrooms, library, computer rooms, plant rooms, machine rooms, workshops, laboratories and research centres.
- Administration Buildings: offices, laboratories, conference rooms, classrooms, workshops, reading room, machine rooms and plant rooms.
- Hu Fa Kuang Sports Centre and Amenities Building: sports halls, student activities rooms, exhibition rooms, health centre, canteen, restaurants, and offices.
- To Yuen Building: offices, meeting rooms and conference rooms.
- Run Run Shaw Creative Media Centre: offices, lecture theatres, exhibition areas and conference rooms.

(c) The gross floor areas of the reporting buildings are summarized as follows:

Building	**Approx. Gross Floor Area (GFA) (m^2)**
Academic 1, Administration Buildings, Hu Fa Kuang Sports Centre and Amenities Building	159,471 m^2
To Yuen Building	6,638 m^2
Run Run Shaw Creative Media Centre	23,749 m^2

(d) The Academic Exchange Building, Academic 2, Student Residence and all off-campus premises are excluded for carbon accounting in this report.

5. Scope of Operational Boundaries

The carbon accounting in this report will include:

a) Scope 1 (Direct Emissions) Activities

- Stationary Combustion Sources: emergency genset, and towngas-driven dehumidifiers;
- Mobile Combustion Sources: car fleet serving staff and logistics; and
- Fugitive Emissions: Air-conditioning equipment.

The following will be excluded:

- Motor vehicles operated by outsourced contractors for any activities associated with CityU;
- HFCs and PFCs emissions from laboratory equipment; and
- HFCs and PFCs emissions from refrigeration and air-conditioning equipment which are removed from Campus for disposal.

b) Scope 2 (Energy Indirect Emissions) Activities

- Electricity purchase from China Light and Power Company (CLP).
- Towngas purchased from the Hong Kong and China Gas Company (HKCG).

c) Scope 3 (Other Indirect Emissions) Activities

- Methane gas generation at landfill due to disposal of paper waste;
- GHG emissions due to electricity used for fresh water processing by Water Supplies Department (WSD);
- GHG emissions due to electricity used for sewage processing by Drainage Services Department.

6. Methodologies for quantifying emissions and removals

a) The calculation of scope 2 energy indirect emissions is based on the information from CLP electricity bills, HKCG towngas bills, and WSD water bills.

b) In the lack of accurate information on the paper purchase and inventory, the quantity of paper waste is estimated based on paper collected for disposal and recycling.

7. Information on GHG emissions and removals

The results for GHG emissions and removals for scope 1, scope 2 and scope 3 activities are shown in the Summary Table with detailed calculations shown in Tables 1 – 9 attached.

8. Information on GHG emissions and removals over time

The report format, methodology of accounting and carbon calculations is based on the 'Guidelines to Account for and Report on Greenhouse Gas Emissions and Removals for Buildings (Commercial, Residential or Institutional Purposes) in Hong Kong, 2008 Edition' issued by Environmental Protection Department of the HKSAR Government.

9. Information on GHG offsets and programmes

(a) The part of GHG emissions due to the electricity and towngas consumption will be sent to Tertiary Education Facilities Management Association (TEFMA) each year. The information will be published in the annual benchmark survey to all member institutions of TEFMA for reference.

(b) Apart from the figure on net carbon emission, the kg CO_2-e/floor area and kg CO_2-e/person will be used as the ratio indicators to measure performance.

(c) A 3-year (2012-2014) Plan was formulated to reduce the annual carbon emission by 6% by end of year 2014, using the emissions in year 2011 as the 'baseline'. A campus-wide energy audit has been conducted and completed in March, 2011.

(d) In year 2009, 35 nos. "vacuum type" solar panels (with daily solar energy collection in average total capacity of 85 kWh) were installed on roof of Amenities Building to generate hot water as supplementary heating for shower rooms in Hu Fa Kuang Sports Centre.

(e) It was already a practice adopted by the University to collect paper separately for recycling in the waste disposal process.

10. Contact Persons

This report was prepared by the CDFO of the University. Any queries or suggestions can be directed to Mr. P.K. Chan at 3442 6908 or Mr. Tony Tung at 3442 6850 or write to fmwork@cityu.edu.hk.

Summary Table on Greenhouse Gas (GHG) Emissions and Removal
for Campus of City University of Hong Kong for 2012

Updated : 21 Feb 2013

Description (by sources, areas, etc.)	Emissions by gas type [(in tonnes of CO_2-equivalent) (CO_{2-e})]					
	Carbon dioxide (CO_2)	Methane (CH_4)	Nitrous oxide (N_2O)	Hydrofluoro-carbons (HFCs)	Perfluoro-carbons (PFCs)	Total
Scope 1 Direct Emissions						
Stationary Combustion Sources						
Standby-generator	0.569852	0.000109414	0.000500092	**N/A**	**N/A**	0.570
Dehumidifier in CS laboratory	0.577075	0.000192003	0.000629145	**N/A**	**N/A**	0.578
Mobile Combustion Sources						
Vehicle	45.92200344	0.077417681	4.740505901	**N/A**	**N/A**	50.740
Fugitive Emissions						
Refrigerant used in A/C plant	**N/A**	**N/A**	**N/A**	941.104		941.104
Other Direct Emissions						
NIL						0.000
Scope 1 Emissions Total	47.06893044	0.077719099	4.741635138	941.104		***992.992***
Scope 1 Direct Removals						
Planting of Additional Trees based on year 2007						
Campus	-2.53	**N/A**	**N/A**	**N/A**	**N/A**	-2.530
Other Direct Removals						
Wind & solar light tower	0.054					0.054
Vacuum tube solar panel for shower	10.98					10.980
Scope 1 Removals Total	8.504	0	0	0	0	***8.504***
Scope 2 Energy Indirect Emission (To be reported in general without being classified into specific gas type)						
Electricity Purchased						
Campus						32,044.610
Towngas Purchased						
Campus						0.122
Scope 2 Emission Total						***32,044.732***
Scope 3 Other Indirect Emissions						
Methane Generation at Landfill due to Disposal of Paper Waste						
Campus	**N/A**	No data	**N/A**	**N/A**	**N/A**	No data
Electricity for Processing Fresh Water (To be reported in general without being classified into specfic gas type)						
Campus						64.066
Electricity for Processing Sewage (To be reported in general without being classified into specfic gas type)						
Campus						26.450
Others						
NIL						0.000
Scope 3 Emissions Total						***90.516***
Other GHG Offsets / Removals						
On-site Renewable Energy Sources for Off-site Uses						
NIL						***0.000***
Off-site GHG Reduction Projects in Hong Kong						
Waste paper for recycling		486.1728				***486.173***
Off-site GHG Reduction Projects outside Hong Kong						
NIL						***0.000***

Summary of Results

Total Scope 1 Emissions :	**992.992**	Tonnes of CO_{2-e}
Total Scope 1 Removals :	**8.504**	Tonnes of CO_{2-e}
Total Scope 2 Emissions :	**32,044.732**	Tonnes of CO_{2-e}
Total Scope 3 Emissions :	**90.516**	Tonnes of CO_{2-e}
Total other GHG Offsets / Removals :	**486.173**	Tonnes of CO_{2-e}
Total Net GHG Emissions :	**33,119.736**	Tonnes of CO_{2-e}
GHG Performance in Ratio Indicator :	**1.185**	Tonnes of CO_{2-e} / person
	0.174	Tonnes of CO_{2-e} / m^2

Table 1 : GHG Emissions from Stationary Sources for 2012

Step 1	Step 2			Step 3	Step 4	Step 5	Step 6	Step 7	Step 8
A	B	C	D	E	F	G	H	I	J
Source description with location (e.g. boilers, furnances, ovens, and emergency electricity generator etc.)	Fuel Information			CO_2 emission factor	CO_2 emissions in tonnes of CO_2 equivalent ((B x E) / 1000)	CH_4 emission factor	CH_4 emissions in tonnes of CO_2 equivalent ((B x G) / (1000 x 1000) x GWP)	N_4O emission factor	N_2O emissions in tonnes of CO_2 equivalent ((B x I) / (1000 x 1000) x GWP)
	Fuel used		Fuel type						
	Amount	Unit							
AC1 Standby-generator	116	litre	diesel oil	2.614	0.303224	0.0239	5.82204E-05	0.0074	0.000266104
CMC Standby-generator	102	litre	diesel oil	2.614	0.266628	0.0239	5.11938E-05	0.0074	0.000233988
Dehumidifier for CS Laboratory at Floor 2, Administration Building	205	48MJ	Towngas	2.815	0.577075	0.0446	0.000192003	0.0099	0.000629145
Total					**1.146927**		**0.000301417**		**0.001129237**

Note : The towngas being consumed by commercial sector (caterer) is not included.

Table 2 : GHG Emissions from the Mobile Sources for 2012

Step 1	Step 2		Step 3	Step 4	Step 5	Step 6	Step 7	Step 8
A	B	C	D	E	F	G	H	I
Source description (by different vehicle and fuel tpyes)	Fuel Information		CO_2 emission factor [Note 1]	CO_2 emissions in tonnes of CO_2 equivalent ((B x D) / 1000)	CH_4 emission factor [Note 2]	CH_4 emissions in tonnes of CO_2 equivalent ((B x F) / (1000 x 1000) x GWP [Note 4])	N_2O emission factor [Note 3]	N_2O emissions in tonnes of CO_2 equivalent ((B x H) / (1000 x 1000) x GWP [Note 4])
	Amount of fuel used (in litres)	Fuel type						
Road Transport(vehicle no.)								
MH4999 passenger car	1753.05	petrol	2.36	4.137	0.253	0.009	1.105	0.601
LY7643 passenger car	2016.47	petrol	2.36	4.759	0.253	0.011	1.105	0.691
FL8988 passenger car	1894.69	petrol	2.36	4.471	0.253	0.010	1.105	0.649
MU6235 passenger car	2053.93	petrol	2.36	4.847	0.253	0.011	1.105	0.704
KP8936 passenger car	935.44	petrol	2.36	2.208	0.253	0.005	1.105	0.320
FY880 passenger car	2022.31	petrol	2.36	4.773	0.253	0.011	1.105	0.693
JW7858 passenger car	1103.23	petrol	2.36	2.604	0.253	0.006	1.105	0.378
GG7750 medium goods vehicle	2839.06	diesel oil	2.614	7.421	0.145	0.009	0.072	0.063
HS783 (Nissan) van	2673.69	diesel oil	2.614	6.989	0.072	0.004	0.506	0.419
EK1983(Hiace) van	1355.79	diesel oil	2.614	3.544	0.072	0.002	0.506	0.213
RU5133 van	64.62	diesel oil	2.614	0.169	0.072	0.000	0.506	0.010
Navigation								
NIL								
Aviation								
NIL								
Total				**45.922**		**0.077**		**4.741**

Table 3 : HFC and PFC Emissions from Refrigeration / Air-conditioning Equipment (Operation Process) for 2012

Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7
A	**B**	**C**	**D**	**E**	**F**	**G**
Type of refrigerant	Amount of HFC / PFC at the beginning of the reporting period (kg)	Amount of HFC / PFC purchased during the reporting period (kg)	Amount of HFC / PFC disposed (through environmentally responsible means) during the reporting period (kg)	Amount of HFC / PFC at reporting period (kg)	GWP of refrigerant	HFC / PFC emissions in tonnes of CO_2 equivalent ((B + C - D - E) x F / 1000)
R22	9	54	45	18	0	0
R407C	11	0	2	9	1526	0
R407C	454				1526	692.804
R134a	191				1300	248.3
Total						**941.104**

Note : R22 is not covered as recognized gases group in Kyoto protocol, the GWP is considered to be zero as stated in EPD's guideline.

Table 4 : Direct GHG Removals from Newly Planted Trees for 2012

Step 1	Step 2	Step 3	Step 4	Step 5
A	**B**	**C**	**D**	**E**
Source description (Location of the trees planted)	No. of trees planted (unit)	No. of trees removed (unit)	CO_2 removal factor [Note] (kg/unit/year)	CO_2 removals in tonnes of CO_2 equivalent ((B-C) x D / 1000 x length of reportingperiod (in years))
Within physical boundary of the Campus as defined	7	117	23	-2.53
Total				**-2.53**

Note : 1. The default figure for the removal potential of each unit of tree is trees commonly found in Hong Kong which are able to reach at least 5 metres in height.

2. The nos. of trees planted or removed in step 2 and 3 are based on year 2007.

Table 5 : GHG Emissions from Electricity Purchased from Power Companies for 2012

Step 1	Step 2	Step 3		Step 4	
A	**B**	**C**		**D**	
Facility / source description (i.e. Area / facilities the electricity bill is reporting)	Amount of electricity purchased (in kWh)	Emission factor (kg / kWh)		Indirect GHG emissions in tonnes tonnes of CO_2 equivalent	
		Power company - specific	Territory-wide default value	Power company - specific	Territory-wide default value
Academic Building 1, Administration Building, Amenities Building and Sport Complex	47,823,707	0.59	0.7	28,215.987	33476.5949
Creative Multimedia Centre	5,191,260	0.59	0.7	3,062.843	3633.882
To Yuen Building	1,297,931	0.59	0.7	765.779	908.5517
Total				**32,044.610**	**38019.0286**

Note : The electricity being consumed by commercial sector (caterer, bank and bookshop) is not included.

The Power company specific emission factor 0.59 is extracted from CLP Substantiability Report 2011, it will be updated once the emission factor of Yr 2012 is available from CLP at about mid of March.

Table 6 : GHG Emissions from Towngas Purchased from the Hong Kong and China Gas Company for 2012

Step 1	Step 2	Step 3	Step 4
A	**B**	**C**	**D**
Facility / source description (i.e. Area / facilities the Towngas bill is reporting)	Amount of Towngas purchased (Unit [Note])	Emission factor (kg / Unit)	Indirect GHG emissions in tonnes of CO_2 equivalent (B x C / 1000)
Dehumidifier for CS Laboratory at Floor 2, Administration Building	205	0.595	0.122
Total			**0.122**

Note : Each unit registered by gas meter represents that the town gas with a heat value of 48 MJ. The emission factor only accounts for the emissions during the production of Towngas within the company. The GHG emission associated with combustion of Towngas within the physical boundary is reported under Scpoe 1.

Table 7 : Methane Generation at Landfill in Hong Kong due to Disposal of Paper Waste for 2012

Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7
A	B	C	D	E	F	C
Source description (i.e. Area / floor)	Amount of paper in storage at the beginning of the reporting period (kg)	Amount of paper purchased during the reporting period (kg)	Amount of paper collected for recycling during the reporting period (kg)	Amount of paper in storage at the end of the reporting period (kg)	Emission factor (kg CO_2-e / kg of waste) Note 1	Indirect emissions in tonnes of CO_2 equivalent ((B + C - D - E) x F / 1000)
Campus	0	101286 Note 2		0	4.8	-486.1728
Total						**-486.1728**

Note 1 : For simplifying the accounting process, the default emission factor assumes that the total **raw amount of CH4 emitted throughout the whole decomposition process of the paper waste disposed at** landfills will be emitted into the atmosphere within the same reporting period as paper waste collected. In addition, the default value does not take into account the reduction in emission due to collect, recovery and utilization of landfill gas due to the management practices at landfills.

Note 2 : The quantity is based on the amount of waste paper collected for recycling. The amount of GHG avoided is also reported as part of the off-site GHG emission reduction efforts.

Table 8 : GHG Emission due to Electricity Used for Fresh Water Processing by Water Supplies for 2012

Step 1	Step 2	Step 3	Step 4
A	**B**	**C**	**D**
Source description (i.e. Area / facilities the water service bill is reporting)	Amount of water consumed as listed on the water service bill (m^3)	Emission factor (kg / m3) [Note]	Emission in tonnes of CO_2 equivalent (B x C / 1000)
Academic Building 1, Administration Building, Amenities Building and Sport Complex	152216	0.4137	62.972
Creative Multimedia Centre	1919	0.4137	0.794
To Yuen Building	725	0.4137	0.300
Total			**64.066**

Note : 1. The emission factor used for year 2007 is 0.4137 kg CO2-e /m^3, which is the approximation provided by EPD's guideline.

2. The fresh water being consumed by commercial sector (caterer) is not included.

Table 9 : GHG Emission due to Electricity Used for Sewage Processing by Drainage Services Department for 2012

Step 1	Step 2	Step 3	Step 4
A	B	C	D
Source description (i.e. Area / facilities the water service bill is reporting)	Fresh water consumption (m^3)	Default Emission factor (kg / m^3) Note	Emission in tonnes of CO_2 equivalent (B x C / 1000)
Academic Building 1, Administration Building, Amenities Building and Sport Complex	152216	0.1708	25.998
Creative Multimedia Centre	1919	0.1708	0.328
To Yuen Building	725	0.1708	0.124
Total			**26.450**

Note : The default emission factor is determined according to the purpose of water used as follows:

Source description	Default Emission Factor (kg / m^3)
Restaurants and catering services	(0.7 x Emission Factor) assuming 70% of the fresh water consumed will enter the sewage system.
Other commercial, residential and institutional purposes	(1.0 x Emission Factor) assuming 100% of the fresh water cosumed will enter the sewage system.

In which emission factor is the emission factor of GHG emissions due to electricity used for processing fresh water derived from the following equation :
Emission Factor = Unit electricity consumption of processing sewage (from DSD) x Territoy-wide default value (i.e. 0.7kg /kWh) of purchased electricity provided in Table 5.
The emission factor used for year 2007 is 0.1708 kg CO2-e / m^3 which is the approximation provided by EDP'S guideline.

Note : The fresh water being consumed by commercial sector (caterer) is not included.