

SUSTAINABLE SOCIAL HOUSING TRANSFORMATION IN MAINTENANCE AND MANAGEMENT PRACTICES FOR PUBLIC RENTAL HOUSING IN HONG KONG

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Summary

The Hong Kong Housing Authority (HKHA) now manages some 700,000 public rental flats, a stock which has gradually built up over the past half a century. HKHA has shaped and re-shaped her maintenance and management strategies in this stretch of time as both her buildings and population age with time. The transformation centred on sustainability of the estates as communities in the built environment. The focus is on people.

Maintenance strategy moved from the traditional responsive mode to life-cycle planning. Along the time-line are the CARE (Condition, Appraisal, Repair and Examination), Home-CARE and Total Maintenance Schemes. Estate renewal moved from the Comprehensive Redevelopment Programme to the new Long Term Housing Strategy, Comprehensive Structural Investigation Programme, Estate Improvement Programme and addition of lifts and other provisions to improve accessibility within the estates and inside the buildings. Provision of estate management services moved from conventional transactional mode to participative mode, engaging not just the tenants that also the Non-government Organizations (NGO) and the local communities. The Estate Management Advisory Committees (EMAC), the Housing Channel, Marking Scheme for Estate Management Enforcement, the Housing Advisory and Service Team are rolled out as solid steps along this direction. Latest technologies and tenant participation drives are introduced to reduce energy consumption and waste to contribute towards building an eco city. The concept of providing shelters for the needy gradually evolved to the building of the home and a supportive community. This paper maps the transformation, with particular reference to fostering harmonious communities, caring for people of different ages and abilities, community participation, life-cycle care of the built environment, estate rejuvenation, and contributions to building a more ecologically friendly city.

Keywords: maintenance, sustainability, structural investigation, estate improvement, life-cycle maintenance, eco-city.

1. Introduction

1.1 Public Housing – through the years

Hong Kong's public housing programme has a long and remarkable history. It all started when a tragic fire raged through the Shek Kip Mei squatter area on the Christmas Eve of 1953, leaving 53,000 people homeless. The Hong Kong Government built the first resettlement estate on the site of the ashes to provide basic shelter for those affected by the disaster, and laid the foundation stone for an ambitious public housing programme which has spanned over the next fifty years in Hong Kong. Today, HKHA provides housing for 2.1 million people which are nearly one third of the population in Hong Kong with a stock of around 700,000 rental flats.

After the Shek Kip Mei fire, the immediate objective is simply to house all those homeless fire victims in the quickest possible way. Seven storey walk-up blocks with communal facilities only were therefore provided. With the continual influx of immigrants from Mainland, it has quickly been turned into a massive housing programme for the low income citizens. The programme has picked up its momentum when the HKHA was set up in 1973. It propelled in big strides the advancement in building quality, management and maintenance service since then.

1.2 Demographic Changes

Hong Kong's population has been growing at a rate of about one million people per decade over the last 4 decades. With low birth rates and longer life expectancy, the elderly population (age 65 and over) rose from 5% in 1971 to 12.9% in 2010. It is expected that the median age of Hong Kong's population will be increased from 39.6 in 2006 to 46.1 in 2036 and the elderly population will constitute 26% of the total population in 2036. The percentage of ageing population in public housing estates will be even higher due to the high percentage of elderly people living in public housing estates. The challenge for HKHA is to provide sustainable housing for the changing age profile of the tenants.

1.3 Paradigm Shift – tenants as the managed or as customers

Hong Kong is one of the most densely populated cities in the world. The older housing estates are generally larger than the younger ones and are well qualified to be regarded as a community. Take Tai Wo Hau Estate as an example. It has 17 domestic high rise buildings containing some 7,900 flats. The population is around 23,000, roughly the same as that of Warwick in the UK. It is not difficult for administrators to recognize the importance, or rather the potential social benefits of community development in these estates, and thus that of participation of the people there.

In a wider sense, ever since the 1967 riots, the Hong Kong government has taken proactive steps in pushing for community building. At a district level, we saw the launching of the City District Office Scheme in 1968 and at estate level, the Estate Community Work Offices in 1972. Such community building moves were overshadowed by the rather unique trajectory of democratic development which Hong Kong followed in the 1980's, in the run up to the reverting of the sovereignty back to China. The District Boards, later renamed as District Councils, were established in 1982 and the first ever elections were held in 1985. Tenants in public housing estates became target voter groups. Estate management and maintenance services began to be critically examined under a customer's lens by the vote-seeking Councillors.

1.4 The Ageing Estates and the Age of Corrosion

Buildings and their facilities will inevitably deteriorate over time. Hong Kong's climate is sub-tropical, warm and humid. Effect of acid rain, coastal environment and use of sea water for flushing in the toilets also increase the risk of chloride contamination of the buildings. The inherent problems of earlier design, which include lower concrete strength and smaller concrete cover to reinforcement as well as lack of waterproofing system, poor floor screed and pipes piercing

through the floor, also made the buildings more vulnerable to ingress of water and contaminants into the concrete.

2. From Birth to Re-birth of the Built Environment

2.1 The building stock

As at 2010, the stock of public rental buildings consists of about 1,130 reinforced concrete buildings, which range from seven storeys to over forty storeys high. Over 210 of these buildings were constructed in or before the 1970s while the earliest buildings were dating back as early as 1952.

To meet the continued demand for public housing, new housing estates are constructed, adding to the housing stock of about 15,000 new flats in each of the coming 5 years. Despite the redevelopment and construction programmes, HKHA's housing stock is ageing gradually. About half of the blocks are more than 20 years old.

2.2 Redevelopment and Policy to sustain public housing

The early seven storey walk-up blocks with communal facilities built in 1950s and 1960s were soon found no longer considered acceptable to the tenants. Renewal of 240 blocks of this type in 12 resettlement estates was started in 1972 by either demolishing them or converting them into self-contained flats. In 1985, this redevelopment programme was expanded to another 12 middle-aged estates under the Extended Redevelopment Programme. Three years later, HKHA launched the Comprehensive Redevelopment Programme (CRP) to redevelop a total of over 500 public housing blocks of rather obsolete designs and the whole project was completed in 2010.

The massive removal of older blocks since the 1970s has successfully improved the building quality of HKHA's housing stock and hence living environment of the tenants. However, as pointed out in the 1998 White Paper on Long Term Housing Strategy in Hong Kong issued by the Hong Kong Government that it "inevitably exerts a heavy drain on land, manpower and financial resources." It further concluded that "Redevelopment should be therefore undertaken only when necessary to replace housing blocks which are no longer safe or economic to maintain. And even then, redevelopment should be undertaken on a selective estate by estate basis since it may not be necessary or appropriate to redevelop a whole class of estate." In 2005, with the CRP approaching its completion, HKHA re-affirmed the strategy established in the Paper and re-directed its focus to sustaining its current stock as far as possible. The two-pillar strategy is that the building will be demolished only if it is unsafe or beyond economic repair. Estate by estate structural investigation was then started to look into the structural conditions of the aged estates and to decide the way forward of the estate concerned based on the two-pillar consideration.

To ascertain whether the building should indeed be sustained, the HKHA launched the Comprehensive Structural Investigation Programme (CSIP) in 2005 to look into the structural conditions of the older buildings with the aim to establishing what needs to be done to better sustain them for at least 15 years. With the completion of the first stage of the investigation, covering 90 buildings containing about 36,000 flats in the 10 oldest estates, the programme was expanded to cover another 32 aged estates by 2018

2.3 The Problem of Age

The investigation so far carried out reveals that there is a significant chance that what appears to be a sound structural member may have the embedded reinforcement corroded to an advanced stage. Such phenomenon of "hidden corrosion" is well recognised of chloride-induced corrosion in

porous concrete, though there is little literature available on its correlation with neither the level of chloride in the concrete nor the quality of the concrete. The data so far gathered indicated that with a high chloride ion level in the concrete, there is a significant high level of 'hiddenness' of the steel bar corrosion in low grade concretes.

The investigation also provides broad evidence to suggest that chloride contamination of toilets with sea water WC flushing with toilet-cum-bathroom design without bath tubs, contributes significantly to the deterioration of these toilets and the repairs would not be effective if they were not carried out to tackle the root cause. Small patch concrete repairs in chloride contaminated concrete might induce 'patch - accelerated corrosion' of steel embedded in the contaminated concrete adjacent to the repaired patch. Laying an extra screed on the top of the original porous sand-cement screed at the toilet might create an 'aqueduct' to spread the water and a 'sponge' soaked with water which slowly seeps into the concrete slab below. Carbonation is yet another cause of corrosions of steel bar in the concrete of old buildings. A package of innovative repair solutions were developed to sustain these building cost-effectively.

The HKHA also actively considered converting less popular and under-utilized non-domestic properties into the needed welfare and community use for the benefit of the community in recent years. Conversion of Shek Kip Mei Factory to Creative Art Centre has successfully created a new landmark in the Shek Kip Mei district. The conversion of carpark in Tin Heng Estate into commercial, community and welfare use was also well received by tenants and local community. These revitalisation schemes have put much impetus in promoting community building and sustainability of the estates.

2.4 Estate Improvement

In 1980s and 1990s, estate improvement works were seen as an extension of the routine maintenance tasks. They normally are facility-based aiming at upgrading the aged/ruined service items such as lifts and water supply system. On this basis, HKHA, in 1990, started a programme to review the communal facilities and environmental quality of 10 former Housing Authority estates by identifying the upgrading works and new provisions required. This has subsequently turned into various major improvement programmes for all estates including lift modernisation, redecoration and rewiring programmes. These programmes have successfully maintained or upgraded the facilities provided in various old estates in the past. In the meantime, throughout the years, these estates have nourished a community bonding which is especially cherished by those grown up in or are ageing with the estates.

In recent years, HKHA has re-orientated its estate improvement strategy by placing great importance in sustaining the older estates in three fronts: economical, social and environmental. An Estate Improvement Programme (EIP) will be formulated for each old estate, which has been appraised under the CSIP leading to the decision to retain rather than to redevelop it. The key concerns of the tenants for a particular estate will be found out through surveys and consultation. Improvements will put people first and be activity-based to reinforce community bonding and cater for the needs of different age groups, in particular the elderly, rather than facility-based. The estate common areas and non-domestic premises will be brought up to date to suit the tenants' needs. Recreational facilities will be enhanced to cater for different age groups and re-shaping public space for better social interaction including installation of fitness equipment for the elderly. Weather-protected passage and barrier-free access will be integrated into a master pedestrian network to improve pedestrian circulation especially with the needs of the aged and disabled tenants in mind. The external façade and public areas will be face lifted and upgraded to provide a pleasing living environment for our tenants. The EIP of Choi Hung Estate won a Gold Award of Quality Public Housing Construction and Maintenance Award 2010 as well as Merit Award at the Hong Kong Green Building Award 2010.

3. From Tenant Management to Community Development

3.1 Tenant Participation

HKHA made big strides in the 1990's in engaging the public in running her business. The HKHA held its first open meeting in 1991 as a step to make the HKHA more transparent and open. Positive comments were received. HKHA Members also agreed that a special open meeting should continue to be held each year to enable the Committees and Members to review the work of the past year and to propose the general direction of work to be covered in the year ahead.

While policies and practices became more people-focused, pressure from the community for more public accountability was on the rise. Political climate was turbulent. HKHA introduced the Estate Management Advisory Committee (EMAC) scheme in 1995, which was fully implemented in all estates by 1997. The scheme aims to further devolve the responsibility for estate management to local level, enhance communication with tenants, and increase tenants' participation, through having tenant representatives as Members.

Through periodical meetings, EMAC members can advise on local estate management matters and provide input on priorities of maintenance/improvement works. Besides, EMAC members can participate in the drawing up of estate action plans and appraise the performance of service contractors. Representatives from service contractors will be invited to attend EMAC meeting on a need basis. Views of the EMAC will also be taken into account during contract extensions or renewals.

3.2 Community building – partnering, education, communication

The EMACs sometimes organized community activities in partnership with non-government organizations (NGOs). HKHA conducted an opinion survey in 2009 to gain views of the EMACs on the value of the various education, social and community events organized in partnership with NGOs. The response was overwhelming – EMACs reflected that these activities not only enhanced the harmony of families and community, they also strengthened the sense of belonging among residents. HKHA also held five large scale symposiums in 2009, including EMAC members, NGO representatives, local dignitaries and district councillors, government officials and stakeholders who were invited to share their views and experience with regard to neighbourhood-based support networks within the community. In 2009-2010, some 460 partnering functions have been held with funding supported by HKHA.

Community-building activities were often also educational in nature – art appreciation, conservation, clean habits and promoting civic duties. The Tung Chung Artwalk, an outdoor arena for 26 artistic creations by local artists, was opened in 2002. The complete collection is arranged in the open area of Yat Tung Estate, forming a trail for art appreciation. Each of these artworks inspires in its own way by Tung Chung's development from a fishing village to a vibrant new town, is a testament to the historical changes of this township. Through continued efforts to bring and integrate art into public estates, the HKHA hopes to enable public housing tenants to appreciate art in the comfort of their neighborhoods, enhance their living environment and strengthen their sense of belonging to the community.

In 2003, following the outbreak of Severe Respiratory Syndrome (SARS) in the territory, the Government set up the Team Clean to establish and promote a sustainable, cross-sectoral approach to improve Hong Kong's environmental hygiene. In support of the Team Clean's recommendations, the HKHA launched in the same year the "Marking Scheme for Tenancy Enforcement" to promote civic duties amongst public housing tenants and to improve the living environment of the estates. The scheme targets at misdeeds that have adverse effects or pose a hazard to public health. Misdeeds are divided into 4 categories according to the degree of seriousness. Each category of misdeeds carries pre-assigned penalty points with a 2-years validity period. Action for tenancy termination will be taken when the points accumulate to a ceiling threshold. In 2006 the scheme was renamed as the "Marking Scheme for Estate Management Enforcement" to signify its wider use for more effective estate management. According to HA's Public Housing Recurrent Survey 2010, an overwhelming majority of the public housing tenants

(97%) had knowledge of the Marking Scheme and there was significant increase (from 52% in 2003 to 76% in 2010) in their satisfaction level towards the overall cleanliness and hygienic conditions of estate common areas. In September 2009, the Scheme received an award under the “Enforcement/Regulatory Service” category of the Civil Service Outstanding Service Award Scheme.

With the threat of avian flu in December 2008, HKHA continued to take a tough stand in the battle against the spread of the disease. Measures include maintaining a higher degree of cleanliness and hygiene in HKHA’s markets, especially those with live poultry stalls, as well as attempts to minimize the presence of pigeons and other wild birds in public housing estates. Action has been taken to prohibit tenants from feeding feral birds with a view to preventing the occurrence and spread of bird flu in the estate environment. Special cleansing contractors have been hired to clean and disinfect areas with bird droppings and more importantly, to ensure the proper disposal of sick or dead birds found in the estates.

Since 2004, public housing tenants can get information about the latest policies and services of the HKHA through the Housing Channel. It is an initiative by the HKHA to further enhance communication with its tenants. Through liquid crystal display (LCD) monitors installed on the ground floor lobby of residential blocks, the Housing Channel broadcasts video programmes on housing-related matters through broadband transmission. Some of the programmes will also be uploaded onto the HA Web Site. Apart from broadcasting programmes, the system also provides an efficient platform for individual estate management offices to communicate with their tenants on important matters relating to building maintenance and management. Estate management staff can input and upload the messages and the information will be displayed at the bottom of the LCD monitors in the form of rolling text. In emergency situations such as sudden suspension of water or electricity supply, tenants can be notified quickly.

HKHA recognizes that community building can start right at the beginning. In 2008, HA set up the pilot Housing Advisory and Service Team to serve tenants moving in to the new estates in the Tin Shui Wai District. The team helps the Social Welfare Department and the NGOs to outreach the tenants, in particular the ‘high-risk’ families who may need assistance, by taking a coordinating role and in providing actual service. The team conducts orientation briefings and home visits and refer needy families to the concerned departments or voluntary agencies for assistance, assists EMACs in conducting functions to incubate a stronger sense of belonging and foster community building, and provides training and seminars on community building for EMAC members. In view of the effectiveness of the scheme, it was extended to cover other new towns including Yuen Long, Tuen Mun and Tung Chung in early 2010.

3.3 Caring for the elderly – the hardware

Public housing estates constructed on hillsides are normally provided with staircases as means of pedestrian access for connecting platforms at various levels within the estates, or for connecting with adjacent estates or public roads. Low rise blocks in 12 estates, of typically 7 storeys, were designed without lift. In order to enhance the pedestrian circulation for the tenants and allow barrier-free access for the disabled and elderly, the HKHA has embarked on a programme of addition of lifts, escalators and footbridges at external areas and addition of lifts in existing public housing blocks without lift service. By 2012, all floors of public housing blocks will be served by lifts unless technically not feasible. The HKHA also supports the “Ageing in Place” philosophy in their housing building design. “Universal Design” that works for all residents throughout their life will be adopted. The design applies to all flats and common areas wherever possible to avoid the need for upheaval of the residents from their own flats to purposely designed flats when they aged or become disabled, or the need to retrofit the flats to enable the residents to live independently. Elderly tenants are also given grants to acquire Emergency Alarm System services in the market.

3.4 Caring for the elderly – harmonious family support

HKHA has a long history of making special effort in caring for the elderly. To encourage younger families to take care of their elderly parents or relatives, the HKHA has introduced schemes since 1982 and 1990 respectively under which applicants of families with elderly persons for public rental housing can get advanced allocation up to a maximum of two to three years. These schemes were enhanced in 2007 in support of the call of the Government's policy of fostering harmonious families, announced by the Chief Executive in his 2006/07 Policy Address. As a total package, HKHA also launched a series of housing schemes promoting "Harmonious Families" for sitting tenants. These initiatives were designed to encourage family members to live either in closer proximity with their parents or elderly relatives to ensure their care and well-being. In addition to providing better care and attention for the elderly and the disadvantaged, the schemes facilitate "ageing in place" while also fostering a culture of care and mutual support within the community.

In 2009, the schemes received a further boost. The two original priority schemes for applicants were replaced by the Harmonious Families Priority Scheme. The new scheme makes it easier for applicants to live with and care for their elderly relatives. In addition to awarding a credit in waiting time, an applicant who chooses to live with at least one related elderly member under a single roof may opt for any district, while an applicant with a nuclear family and at least one related elderly member has the choice to live in two nearby flats in any non-urban district.

4. Maintenance – From Touch-up to Life-cycle Maintenance

4.1 From CARE to HomeCARE

Just as tenants become the centre of HKHA's focus in management practices, HKHA is placing more and more emphasis on human aspect in her maintenance strategy. At the same time, maintenance strategy moved on from 'breakdown maintenance' to planned and preventive programmes.

In 1993, HKHA launched the CARE (Condition, Appraisal, Repair and Evaluate) programme to place all public rental estates under a comprehensive, cyclical system of planned maintenance and improvement. It was a 6-year cyclical programme that consisted of the Condition Survey (C), Appraisal (A), Repair (R), and Examination (E) stages. At the commencement of the CARE cycle, the condition of each building was surveyed and appraised, and works programmes were developed. This was followed by the repair stage. The appraisal and repair processes normally took two years to complete. Thereafter the building was expected to enjoy a quiet period free from major maintenance activities for about four years before the next cycle would begin.

Customer service initiatives and improvement items alongside the traditional maintenance items were included in the CARE contracts. By the turn of the century, practically all estates had enjoyed the CARE. Conditions of the buildings were successfully maintained and even raised. Maintenance related complaints fell significantly during these years. However obvious improvement opportunities became apparent. For example, some tenants had a perception that CARE included comprehensive renewal of all fixtures within each flat and that if the opportunity was missed in the planned works programme, no in-flat work will be carried out until the next CARE cycle. Our experience was that even the decision of repairing rather than replacing worn-out toilet doors could arouse a heated debate in which members of the District Councils might play a part.

In 2001, HKHA launched the HomeCARE programme to replace the CARE programme. The new system introduced a quick, serving culture into building maintenance, and at the same time clarified landlord's and tenant's responsibilities for in-flat maintenance. The new In-flat Repair-on-Demand Service was supported by educational publicity materials, customer briefings, customer-oriented repair contracts and dedicated maintenance contractor's public relations representatives. Preventive maintenance inspections for common and external areas were enhanced with daily patrols by estate assistants, half-yearly technical inspections by district maintenance staff and annual maintenance appraisals by professional staff.

4.2 Maintenance as a Service

Traditionally building maintenance professionals care most about the cost, time and quality of the repair work. On the other hand, tenants, as receiver of the service, care more about how the request for repair is handled. They are concerned about how easy and convenient the repair appointment is made, and whether the worker is punctual, polite, and keeps the flat clean and tidy. To push for quality service, HKHA established a scheme, known as Quality Maintenance Contactor (QMC) Scheme in 2000 to enroll maintenance contractors who were dedicated to quality reform and cultural change, and able to demonstrate their sound management, good quality of works and reliable service. These QMCs have been given more tender opportunities.

The various culture-change initiatives gradually bear fruit. The annual public housing recurrent survey saw good results on the satisfaction index related to maintenance-related services provided by HKHA. In 2001, only 30% of households were satisfied or very satisfied with maintenance-related services. The figure rose to 36% in 2003, 49% in 2005, 56% in 2007 and 61% in 2009 and 64% in 2010.

4.3 Total Maintenance Scheme (TMS)

In 2005, the HKHA took a bold step forward by launching the Total Maintenance Scheme (TMS), which introduced proactive and customer-oriented services to in-flat maintenance. Rather than reacting to complaints or requests for repair, trained In-flat Inspection Ambassadors pay visits to flats to check if repairs are necessary. Minor repairs are carried out on the spot while works orders are issued immediately for more serious problems. Protection measures including screening-off the work area and properly covering the tenant's belongings are taken during the repair, and immediately after which dust and debris are to be removed. The Ambassadors would also make use of the inspection opportunity to educate tenants how to address minor maintenance problems promptly to prevent deterioration. To promote the service culture, experience sharing seminars and workshops for maintenance contractors and departmental staff are arranged. Regular meetings are also held with Estate Management Advisory Committees, District Council members and tenants. To promote awareness and the value of the TMS to estate tenants, a Maintenance Education Centre and various Mobile Maintenance Education Booths are set up where display boards, videos corners and mock up of buildings components are used for demonstration. Promotional videos using celebrity icons are broadcast at estates.

A computerized system has been developed to support the TMS. Inspection findings are recorded on personal digital assistants (PDAs) by the Ambassadors. When repair is required, a works order can be issued immediately with the PDA with a printout to the tenant for record. To strengthen communication with tenants, a maintenance hotline supported by a call centre using facilities of the system has been set up to handle calls concerning inspection appointments, complaints and enquiries. Regular reports are generated by the system to facilitate monitoring of the appointment and repair service. Data of inspection and repair form useful maintenance history for analysis and future use. The use of PDAs has been extended to record performance of the contractors in the Maintenance Assessment Scoring System.

In November 2007, the scheme received the Best Public Service Application (Innovative) Silver Award, the Best Public Service Application (Most Favoured) Bronze Award as well as the Departmental Service Enhancement Award and the General Public Service Award. As at April 2011, the 3 phases of independent customer satisfaction surveys carried out since the launch of the TMS revealed an encouraging customer satisfaction level consistently maintained above 81.3% on the TMS repair and maintenance services, which is a marked improvement from 43% as achieved before the scheme. Building on the momentum of this positive response, the HKHA has decided to extend the TMS to become a regular departmental programme on a cyclical basis.

Successful elements of the TMS were adopted in the development of a new approach to maintenance-service-on-request known as Responsive In-flat Maintenance Service (RIMS) to meet the in-flat maintenance needs of tenants between TMS cycles and for young estates not covered by the TMS. As at April 2011, TMS inspections have been completed in 177 estates and RIMS have been launched in 191 estates.

4.4 Life-cycle maintenance strategy

In 2008, a maintenance framework was established to holistically plan and integrate maintenance works effectively according to the age and condition of individual estates. New cycles of maintenance and improvement works including external façade and common area repair/redecoration, re-roofing, re-plumbing, above ground drainage replacement, underground pipes replacement and road re-surfacing, lift modernization, pump replacement and electrical re-wiring for each estate are planned and synchronized together with the CSIP, EIP and TMS. Based on factors specific to the estate including the condition, repair history and ad-hoc maintenance requirements, an estate action plan is drawn up and reviewed annually. With this approach, our housing stock would be better maintained with emphasis on preventive maintenance, leading to a longer building life and lower life cycle cost.

Incorporating the Radio Frequency Identification (RFID) techniques, HKHA has also been on-trial the use of PDAs in the routine maintenance activities from 2010 onwards. All major building services equipment are to be assigned with a unique tag number of which the equipment particulars, maintenance/repair history, test data, etc. are recorded and uploaded into the mainframe computer at HAHQ through the application of PDAs at site. Maintenance personnel and HA supervisory staff can monitor and observe the equipment conditions effectively. It is also a useful tool to ensure the equipment/system are being properly maintained and attended by the maintenance contractors.

5. “Eco” City

5.1 Reduction of Greenhouse Gas (GHG) emission

Climate change has become a global concern and a challenge to the international community. The emission of GHG has proved to be one of the major contributions of the “global warming effect”. Without major “energy-intensive industries” in the area, electricity generation is the major source of GHG emission in Hong Kong, accounting for over 60% of the total local emissions. Other key sources of GHG emission are from the transport sector (16%) and the waste (12%). Among various use of electricity, buildings account for some 90% in Hong Kong. Therefore, reducing electricity consumption for building operations can help to bring down GHG emissions. It will also provide significant benefits of reducing operational costs and improving the local air quality.

To support this initiative, HKHA has volunteered to conduct Carbon Audit for five selected buildings of different block types and usage (two office blocks, two rental blocks and 1 shopping centre) since August 2008. The first round of Carbon Audit for the five selected buildings revealed that the GHG emissions are ranging between 129 to 4,790 tonnes of CO₂ equivalent. It is noted that electricity utilization is the major contribution of the GHG emission in the building, over 90% in general. Whenever feasible during the renovation or improvement work, the HA will adopt the new design as described in the abovementioned paragraph (item 4.1 to item 4.7). The HA will use the more energy efficient equipment e.g. T5 lamps, LED lightings, VVVF drive of lift control, optimize the chiller system control and fine-tune the operation period for the air-conditioning equipment, lightings, lifts and escalators. Besides, refrigerant consumption or leakage for the air-conditioning equipment is the next highest factor and the HA has to enhance the preventive maintenance work of the chillers to reduce the leakage of refrigerant. During the overhauling work of the chillers, the refrigerant is disposed through environmentally means.

The second Carbon Audit Report from August 2009 to July 2010 reveals that there is a reduction of GHG emissions from 1.8% to 14.1%. Although, Carbon Audit are currently only carried out to five selected premises, those measures to reduce the electricity utilizations / GHG emissions are applied to all other HA's premises since 2001.

5.2 Energy Efficiency Enhancement

HKHA is always acting pro-actively to enhance energy efficiency in public housing estates with a view to reducing greenhouse gas emission and providing a green environment to our tenants. A number of energy saving initiatives have been implemented in the past decades and achieved with good results.

For low cost measures, opal diffusers are replaced with clear diffusers for corridor lighting to increase the illumination level without the increase in electricity consumption. Lighting illumination at corridor is then adjusted to minimum level in daytime. Timer settings for public lightings are also adjusted bimonthly to optimize the use of sunlight according to the seasonal changes of daylight.

Higher efficiency equipment is adopted in public housing estates to optimise energy usage. Public lighting installation in corridors, lift lobbies and outdoor areas has been upgraded with high efficiency fluorescent tubes and electronic ballasts. High efficiency pumps and variable drive motors are also employed in pumping and lift installations. In addition, a replacement programme of T8 with more efficient T5 luminaries in existing exit and directional signs has been rolled out and will be completed in 2011. A 20-30% saving in electricity is achieved.

HKHA continues to explore and study application of more energy efficient equipment to further reduce energy consumption. Energy efficient LED light has been on-trial for use in several public corridors with over 10 different suppliers. The equipment reliability and illumination performance are closely monitored, aiming to develop a suitable type of LED light application for HA rental blocks.

Through continuous effort in past years, the total annual electricity consumption on communal portion of PRH domestic blocks has successfully reduced from 512 million kWh in 2001/02 to 485 million kWh in 2009/10 (i.e. a drop of 5.3% in eight years), but the total number of domestic flats being increased from 584,525 domestic flats to 624,884 units during the same period (i.e. an increase of 6.9%). There is a drop of 12% on the averaged electricity consumption for communal area services per rental flat in eight years time.

5.3 Green Practices

In 2009 to encourage tenants' participation in tree conservation and estate greening, the HKHA held an election on Top Ten Favourite Trees in the public housing estates. 30 trees were nominated by the Organizing Committee from a vast number of trees planted in public housing estates. Votes from tenants were then invited and scores were given by an adjudication panel consisting of professionals. Tenants were very enthusiastic about the election and nearly 2,500 voted either by post, fax, ballot boxes or via the web site.

To continue fostering the concept of tree conservation and estate greening, "Tree Ambassadors" in more than 100 public housing estates are recruited through nominations co-ordinated through EMACs. Basic training on tree conservation is provided to these residents.

This community participation scheme engages HKHA's tenants, contractors and the local community in greening public housing projects while realizing their social responsibilities. Under this scheme, new works building contractors join hands with EMACs, NGOs and schools to foster a greater sense of belonging and community as well as to promote the benefits of a green lifestyle.

Seedlings are given out to participants who nurture the plants at home until they are ready to be transplanted into the planters and gardens of new estates. The first phase of the scheme was launched in 2007, with hundreds of residents, students and community members from seven

estates helping to look after 5,000 seedlings, which were subsequently replanted as part of the estates' green landscapes.

HKHA has all along been partners of local green groups, such as the Green Power, the Conservancy Association and the FoE(HK), in kicking off community environmental programme since early 2008. Each of the three green groups designed in-depth education and community activities for a total of 30 selected public housing estates to generate greater environmental awareness and promote energy conservation. A tracking survey indicated that tenants' attitude and awareness have improved. Over 73% of the surveyed residents said that they know more about environmental issues.

HKHA launched in 2005 a long-term community environmental programme "Green Delights in Estates" to promote environmental awareness among estate tenants through a series of educational and community activities. These activities are organized in conjunction with local green groups to design and implement green initiatives involving 30 estates in each year. While driving home the green message and promoting positive green practices, such activities help build the community.

5.4 Waste Management

Supporting the government's policy to increase recycling, HKHA began the involvement in the Source Separation of Domestic Waste programme since 2005. The programme has now been fully implemented in all 153 public housing estates under HKHA.

HKHA has pledged to reduce domestic waste by 1% a year, despite the growing number of estates and tenants. To achieve this target, HKHA has been recovering paper, aluminium cans and plastic bottles, and have also been working with charitable organizations to collect clothing in public housing estates. Figures have grown substantially over the years – in 2005/06, HKHA collected 199 tonnes of plastic bottles; by 2009/10, this figure has increased to 1,218 tonnes. Similarly, the recovery of aluminium cans grew from 128 tonnes in 2005/06 to 520 tonnes in 2009/10. HKHA has also been participating in various programmes launched by the Environmental Protection Department, such as the recycling of rechargeable batteries, fluorescent lamps and computers.

Apart from the source separation of non-organic domestic waste, HKHA is exploring the feasibility of promoting the recycling of organic food waste to public housing tenants. To start with, food waste compostors are installed in some pilot estates selected to join this pioneer programme. Volume of the food waste is reduced significantly during the composting process which can in turn alleviate the increasing demand for waste dumping sites. Furthermore, part of the composted end products can also be used as organic fertilizers for planters in public housing estates.

6. Conclusion and Way Forward

The Hong Kong Housing Authority is committed to provide affordable quality housing, management, maintenance and other housing related services to meet the needs of her tenants in a proactive and caring manner. With the ageing of her housing stock as well as her tenants, HKHA has, in the past years transformed her management and maintenance strategy centering on sustainability of the estates and communities in the built environment, focusing on people, and being mindful of the need to contribute to building an eco-city. The concept of providing shelters for the needy has gradually evolved towards the building of the home and a supportive community.

The ageing of sitting tenants, ageing of housing buildings, the changing in tenants' expectation and general improving living standard at large do exert high demand on quality of service in managing and maintaining buildings. Tapping of tenant's need in good time and continual revamping the management and maintenance practices to suit rising aspiration is a must for sustaining the buildings and its associated community in good shape. HKHA will continue in this direction and will

look for improvement in her maintenance and management practices as well as latest technology advancement to better her housing stock to meet the need of her customers.

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