

# **Food Waste Recycling Projects in Housing Estates**

## **Executive Summary**

**Hong Kong Productivity Council**



**March 2016**

## Executive Summary

### Background

1. In February 2011, the ECF Committee endorsed the provision of funding support to the Projects with an earmarked amount of \$50 million. In July 2011, the Environment and Conservation Fund (ECF) allocated \$50 million as a subsidy and launched the "Food Waste Recycling Projects in Housing Estates" programme to encourage the source separation and recycling of food waste. The subsidy will provide funds to support housing estates to set up on-site food waste treatment facilities, organize food waste collection and recovery programmes and associated activities for 2-year. These projects also encourage housing estates to engage non-governmental organization (NGOs) to organize educational and promotion activities in order to raise residents' awareness towards food waste reduction and encourage their participation in food waste recovery. In Sept 2014, the earmarked amount was increased to \$60 million and the extension scheme was introduced to support those satisfactorily completed project, for another 2-year subject to terms and conditions.
2. By the time of this report compilation at end of May 2015, 11 housing estates were approved for the Phase 1 Projects in November 2011. The 11 housing estates are Lung Poon Court (龍蟠苑) (FWR001), The Capitol, LOHAS Park (日出康城首都) (FWR002), Laguna Verde (海逸豪園) (FWR005), Woodland Crest (奕翠園) (FWR007), Grand Promenade (嘉亨灣) (FWR008), Braemar Hill Mansion (賽西湖大廈) (FWR011), Park Island (珀麗灣) (FWR014), Gold Coast (黃金海岸) (FWR015), Hong Lok Yuen (康樂園) (FWR016), Discovery Bay (愉景灣) (FWR017), Sereno Verde (蝶翠峰)(FWR018).
3. 24 housing estates were approved for the Phase 2 Projects since September 2014. The 24 housing estates are Sceneway Garden (匯景花園) (FWR004), Harbour Place(海濱南岸) (FWR009), Serenade Cove (韻濤居) (FWR012), Manhattan Hill (曼克頓山) (FWR023), Pacific Palisades (寶馬山花園) (FWR030), Ocean Shores (維景灣畔) (FWR035), Tin Shing Court (天盛苑) (FWR036), Sham Wan Towers (深灣軒) (FWR038), Wonderland Villas (華景山莊) (FWR040), Peak One (壹號雲頂) (FWR041), The Latitude (譽 港灣) (FWR042), Ming Nga Court (明雅苑) (FWR043), Royal Peninsula (半島豪庭) (FWR045), Scenic View (曉暉花園) (FWR046), Po Sing Centre (寶星中心) (FWR047), The Parcville (采葉庭) (FWR050), Pristine Villa (曉翠山莊) (FWR052), Yu Tung Court (裕東苑) (FWR053), Grand Del Sol (朗晴居) (FWR054), Grand Pacific Views / Grand Pacific Heights (浪琴軒/海琴軒) (FWR057), Metropolis Plaza (新都廣場) (FWR063), Aegean Coast (愛琴海岸) (FWR064), Lei On Court (鯉安苑) (FWR065), Aria Kowloon Park (峻弦) (FWR072). However, to date it was noted that Yu Tung Court (FWR053) and Pristine Villa (FWR052) had withdrawn the application.
4. A help-desk service has been set up since July 2011 by appointing the Hong Kong Productivity Council to provide technical support to the housing estates and to conduct review of the Project.

### **Progress of the Phase 1 & 2 Projects**

5. All of the 11 housing estates in Phase 1 have already commenced food waste recycling. 6 housing estates of Phase 2 have commenced the Scheme Programme. The Latitude (譽 港灣) (FWR042) of Phase 2 had completed the testing and commissioning of the composting machine and commenced the programme in June 2015.
6. Since 2012, the help-desk has been collecting information and data from the housing estates in Phase 1 and Phase 2 to evaluate the performance of the Projects. Three questionnaire surveys (survey1: before the installation of food waste composting machine; survey 2: six months later after the commencement of the Scheme programme and survey 3: the completion of the project) were distributed to 11 housing estates of Phase 1 and one questionnaire survey to 14 housing estates of Phase 2 separately. To measure the effectiveness of the educational programme and behavioral change of the residents on food waste reduction and separation.

### **Progress of the Phase 1 & 2 Projects**

7. This review is based on the information and routine operation data of the 11 housing estates of Phase 1 and 5 housing estates of Phase 2 and their food waste education and recycling activities collected up to May 2015; as well as the results of household questionnaire surveys of 16 housing estates of Phase 1 & 2.
8. The review of the project based on 2 aspects: (A) Behavioral change of the residents and the effectiveness of the educational programme (B) Households' participation and on-site recycling. As Phase 2 still in the initial stage, thus the review is mainly focus on the housing estates of Phase 1. The major findings of the review are summarized below.

#### **(A) Behavioral change of residents and the effectiveness of educational programme**

9. The results of the third survey carried out after 24-month project period reveals the behavioral change of the residents on food waste reduction and separation and the effectiveness of the educational programme. More than half (65.4%) of the respondents indicated that the food waste generation by themselves has decreased after the project implementation as shown in Figure 1. Besides, within these respondents, there were about 22.5% of the respondents reduced 50% or more food waste generation after joining FWRP as shown in Figure 2.

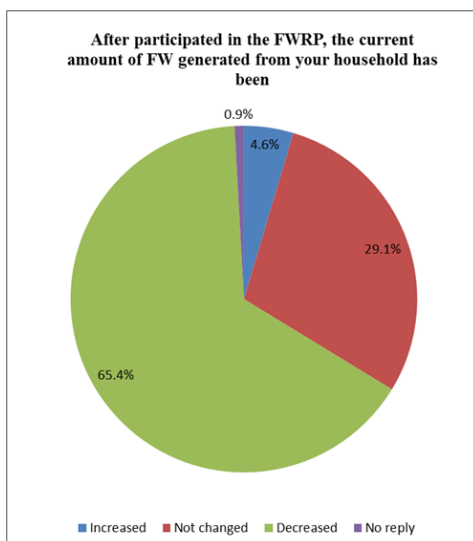


Figure 1: Change of food waste generation after participating in FWRP

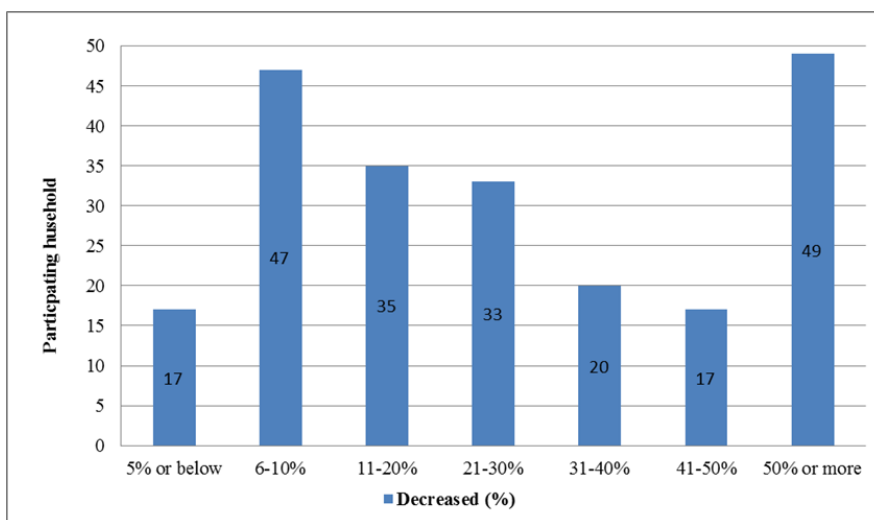


Figure 2: Percentage decrease of food waste generation after participating in FWRP

10. The educational programmes organized by the property management company and non-government organization were mainly comprised of briefing, workshop, visiting, carnival, poster and competition. As indicated in Figure 3, more than 80% of the respondents were satisfied with the educational programme. In addition, over 89% of respondents learnt the seriousness of food waste problem in Hong Kong, methods in reducing food waste and food waste could be recycled to useful materials and it is shown in Figure 4.

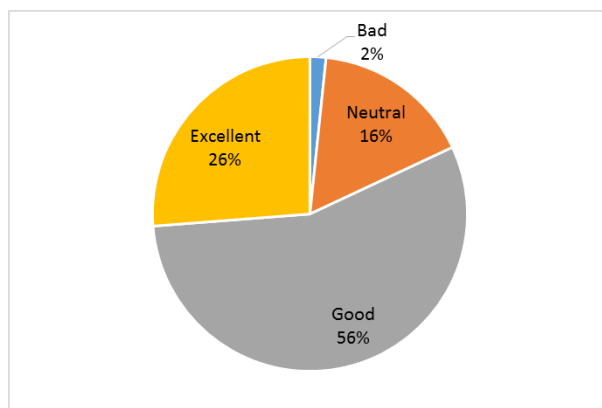


Figure 3: Comment of educational programme from residents

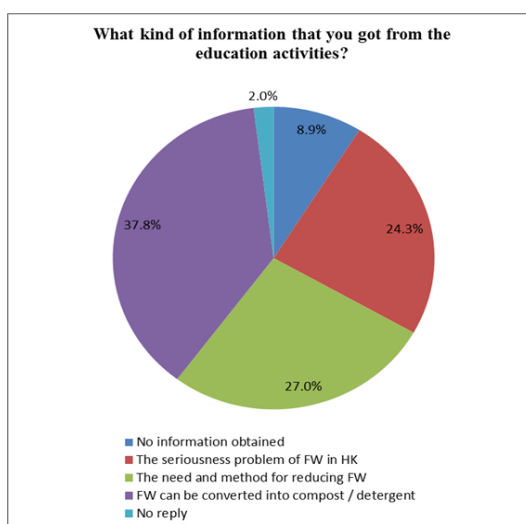


Figure 4: Information obtained from the educational programme

### Households' participation and on-site recycling

11. On the basis that the on-site composters set up by the housing estates would have a treatment capacity of 50kg/d and 100kg/d food waste, it has been estimated that the housing estate should enroll about 60 to 120 households for food waste recycling, according to the then prevailing application guideline. Over the 24- month project period, the 11 housing estates of Phase 1 were obliged to maintain the enrollment number to approximately 120 households every month.
12. When compare the anticipated participating household number with the average actual participating number of Phase 1 housing estates, 5 out of 11 housing estates achieved more than 50% and only 2 housing estates achieved around 10% as their anticipated number were far more than the treatment capacity of the composter. It is noted that the overall average participating rate of Phase 1 housing estates was 53.9%. On the other hand, the average participating rate of 2 housing estates of Phase 1 were more than 70% and 3 housing estates were more than 40%. However, down trend of overall participating rate was observed over the 24-month project period.
13. It is noted that while the average daily amount of food waste treated by the on-site composters varies amongst individual housing estates, it ranged from 1.47 kg food waste per household to 0.42 kg food waste per household. Given this, and that the number of households enrolled in some of the housing estates were considerably less than 120, there should be scope for some of the housing estates to enroll more households for food waste recycling.
14. Among the 11 housing estates of Phase 1, there were several settings of buildings leading to various kinds of food waste collection methods developed. Individual town houses mainly adopted individual household collection by operators. Most multi-storey estates adopted centralized food waste collection method where participating households hand in air-tight containers with source separated food waste to the centralized collection point(s). It is observed that operation in both types of developments and collection methods were in general smooth and no major problems were identified.
15. All the housing estates adopted on-site electrical composters for food waste recycling. 4 models of composters were adopted in the housing estates. There was no major mechanical and electrical fault of the composters during the implementation of the project.

16. Over the 24-month project period, the quantity of daily input food waste was far lower than the treatment capacity. In addition, the treatment capacity was also affected by other factors like participation rate, food waste quality and collection practices. Therefore, the actual daily treatment capacity of the composters could not be verified.
17. With occasional reports from the PMC of some Phase 1 housing estates, odourous smell was found at the composting area of installed composters. With the technical advice from Help-desk Service and the improvement work by supplier/PMC, the odour was controlled to the minimum level. Activated Carbon and/or Bio-filter were installed in the composters respectively to treat the odour so as to alleviate the smell.
18. Samples of compost after maturation in the housing estates were collected for laboratory analysis. In general, the collected samples met most of the parameters in the Compost and Soil Conditioner Quality Standards 2005 except pH, moisture content and Seed Germination Index. The compliance with heavy metals and pathogen parameters indicated that the compost would be safe to use without major health concerns. The non-compliance with pH and Seed Germination Index standards suggested that maturation of the compost might be incomplete. According to the Compost and Soil Conditioner Quality Standards 2005, most of samples from the composter might not be suitable for organic farm; but they were suitable for non-agriculture use, such as landscaping.
19. For the usage of the compost, housing estates of Phase 1 mainly used the compost at the planting area inside the housing estates, distributed to residents, donated to the nearby school and non-profit farm for education purpose or farming respectively.

## **Conclusion and Recommendation**

### **Conclusion**

20. 11 housing estates of Phase 1 and 6 housing estates of Phase 2 commenced the implementation of the FWRP so as to conduct the food waste separation and recycling as well as education programme to raise the awareness of residents towards food waste problem. The projects have been conducting more than 24 month, by the data reported were up to May 2015, 9 of the 11 housing estates in Phase 1 had completed the tasks of the projects and 7 housing estates were planning to extend the project;
21. According to the submitted data from Phase 1 participating housing estates, the analysis results are presented as following:
  - a) Participation rate is defined as the ratio between the average active handing in separated food waste and the number of households enrolled in the FWRP and expressed in percentage. An average overall participation rate of Phase 1 housing estates was 53.9%, in general, it was gradually falling from 60.5% to 44.8%. Amount the Phase 1 housing estates, Park Island performed at the highest average participating rate at 96%;
  - b) Utilization rate is the long term average of daily food waste input / claimed daily treatment capacity from the suppliers. An average utilization rate was 47.9% and Woodland Crest and Park Island were performed above 75%;

- c) Total amount of food waste collected from the participating household was 404.5 tonnes whereas 325 tonnes of food waste had been treated on-site which was about 80.3% of the total amount of food waste collected. The difference in the collected and treated food waste quantities was due to the actual operation constraints, practical treatment capacity and quality of food waste of individual sites, etc.;
  - d) Total amount of compost produced was about 46 tonnes and the results of laboratory analysis of the samples were carried out according to Hong Kong Resources Centre Standard. In general, all samples passed the heavy metal and pathogen tests, hence, the compost was suggested to be applied in 1) landscaping in housing estates, 2) distribution to participating households for gardening; and 3) donating to the non-profit organization;
  - e) In general, overall average food waste generated per household was shown to be decreasing from 1.06kg to 0.94kg.
22. From the three questionnaire surveys conducted at different timeline of the projects, it was shown that about 21%, 44% and 63.4% of residents had decreased the food waste generated at the initial stage of FWRP, 6-month after participated in the FWRP and the 24-month after participated in the FWRP respectively. It is also observed that the awareness of the food waste separation and the behavior change in food waste generation were gradually increased among the participating households;
23. The housing estates have implemented food waste education programmes through display panel, exhibition, carnivals, seminar/ sharing sessions and workshops. They were generally well received;
24. The household survey results and the per household food waste collected data suggest that food waste recycling projects with education programmes are effective in encouraging more households to reduce food waste. It has been observed in general that there is a reduction in food waste from the households participated in the Projects;
25. The treatment capacity of the composter could not be evaluated due to insufficient input amount of food waste;
26. The most common operation problem associated with the on-site composter is odour nuisance while overall the composter operation so far is acceptable;
27. The usage of the compost were mainly applied at the planting area inside the housing estates, distributed to residents, donated to the nearby school and non-profit farm for education purpose or farming;

### **Recommendation**

28. The educational programme should be organized all-around 24-month period to maintain the momentum of the residents to join the project;
29. PMC should encourage the residents to participate in the project and keep the enrollment number to approximately 120 households to sustain the project.

30. To minimize the operational problem, sufficient ventilation or air change for the installed area. The ventilation system should be switched on all the time and the discharged point of the ventilation system should be remote from residents or building or pedestrian on the walk-path. Finally, the discharged point for wastewater should be connected to government foul sewer.
31. Compliment should be given to those housing estates of Phase 1 which showed the high achievement in the following area: 1) meeting the planning figure of participating household; 2) downtrend of food waste generation and 3) utilization rate of the composter throughout the project period. Park Island (FWR014); Hong Lok Yuen (FWR016) and Woodland Crest (FWR007) performed at 90.8%; 78.3% and 78.3% respectively with regard to achieving the planned number of participating household. Park Island (FWR014), Woodland Crest (FWR007) and Sereno Verde (FWR018) showed a great downtrend on food waste generation during the project period and Woodland Crest (FWR007) and Park Island (FWR014) showed more than 75% utilization rate of the composter throughout the project period. Commendation could be given to these outstanding performance housing estates indeed to set a good example to the others housing estates.