

CHAPTER 2

Environment Bureau Environmental Protection Department

Reduction and recycling of food waste

**Audit Commission
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Report No. 65 of the Director of Audit contains 10 Chapters which are available on our website at <http://www.aud.gov.hk>

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REDUCTION AND RECYCLING OF FOOD WASTE

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REDUCTION AND RECYCLING OF FOOD WASTE

Executive Summary

1. In 2013, Hong Kong generated 1.36 million tonnes of food waste, of which 1.33 million tonnes (98%) were disposed of at landfills, accounting for 38% of the 3.48 million tonnes of municipal solid waste (MSW) being disposed of at the three landfills in Hong Kong. The remaining 0.03 million tonnes (2%) were recycled mainly as fertiliser. In terms of weight, the quantity of the food waste disposed of at landfills every day was equivalent to that of about 250 double-decker buses.

2. As the executive arm of the Environment Bureau (ENB), the Environmental Protection Department (EPD) is responsible for implementing waste management policies and strategies. In December 2005, the EPD published the “Policy Framework for the Management of Municipal Solid Waste (2005-2014)” (the 2005 Policy Framework), which set out strategies, targets and action plans on avoidance and minimisation; reuse, recovery and recycling; and bulk reduction and disposal of MSW which included food waste and yard waste. In May 2013, the ENB published the “Hong Kong Blueprint for Sustainable Use of Resources (2013-2022)” (the 2013 Blueprint) which set out targets to reduce the per-capita-per-day MSW disposal quantities. In February 2014, the ENB published “A Food Waste and Yard Waste Plan for Hong Kong (2014-2022)” (the 2014 Food Waste Plan) which set out a target to reduce food-waste disposal at landfills by 40% by 2022, using 2011 as the base year. In 2014-15, the estimated recurrent expenditure of the EPD’s waste (including food waste) management programme was \$2,049 million. The estimated operation cost (including collection and transfer cost) of disposing of a tonne of MSW (including food waste) was \$520. The Audit Commission (Audit) has recently conducted a review to examine the reduction and recycling of food waste by the Government with a view to identifying areas for improvement.

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Reduction in food waste

3. *Timely actions not taken to address the food-waste disposal problem.*

Food-waste disposal at landfills had increased from 3,227 tonnes per day (tpd) in 2004 to 3,648 tpd in 2013, representing a 13% increase. The disposal of large quantities of food waste at landfills in the past years had dwindled the limited and precious landfill space, and generated landfill gas and leachate that exacerbated environmental problems. Notwithstanding that the ENB set a target in the 2005 Policy Framework of reducing the quantity of MSW generation by 1% per annum up to 2014, using 2003 as the base year, the Government had taken piecemeal actions in the past years to find alternative ways for disposing of food waste. In 2014, the ENB promulgated measures and set a specific target of reducing food-waste disposal at landfills by 40% by 2022 (paras. 1.13, 2.6(a), 2.11, 2.12, 2.14 and 4.5).

4. *Many government departments invited but not signing the Food Wise Charter (FW Charter).*

In 2011, about 3,600 tpd of food waste were disposed of at landfills. In order to achieve a 40% reduction in food-waste disposal at landfills by 2022 (using 2011 as the base year), the 2014 Food Waste Plan promulgated two major food-waste-reduction measures comprising the introduction of an MSW charging scheme and the Food Wise Hong Kong Campaign (FW Campaign) which were projected to achieve 324 tpd and 360 tpd of food-waste reductions respectively. In May 2013, for the purposes of encouraging public participation in and soliciting public support for food-waste reduction programmes, the EPD introduced the FW Charter under the FW Campaign. Signees of the FW Charter pledged to implement food-waste reduction measures specified by the EPD. In addition to private businesses and organisations, from May to October 2013, the EPD had invited 12 government departments to sign the FW Charter. However, up to June 2015, only four of the 12 government departments had signed the FW Charter, at variance with the FW Campaign objective on coordinating efforts within the Government and public institutions to lead by example in food-waste reduction. After commencement of this review in May 2015, six of the remaining eight government departments had signed the FW Charter from July to October 2015 (paras. 2.2, 2.17(b), 2.19, 2.20, 2.22 and 2.38(b)).

Executive Summary

5. ***Some Correctional Services Department (CSD) institutions and Hospital Authority (HA) hospitals generating relatively high quantities of food waste.***

According to surveys conducted by the CSD and the HA in response to Audit's requests, the per-person-in-custody food-waste quantities of the 29 CSD institutions in August 2015 ranged from 0.02 kilogram (kg) to 1.61 kg per day, with an average of 0.11 kg per day, and the per-in-patient food-waste quantities of the 38 HA hospitals in July/August 2015 ranged from 0.06 kg to 0.58 kg per day, with an average of 0.31 kg per day. These variances of food-waste quantities show that some CSD institutions and HA hospitals might have adopted good food-waste-reduction practices thereby achieving low food-waste generation, whereas there is room for improvement for some other CSD institutions and HA hospitals to reduce food-waste generation (paras. 2.45 to 2.48).

6. ***Some schools not adopting green lunch practice.***

The EPD estimated that, in 2010, some 550,000 whole-day school students took lunch at school and they generated 100 tonnes of food waste and discarded 250,000 disposable lunch boxes every day which were disposed of at landfills. According to the ENB, students taking lunch through the on-site meal portioning arrangement would help reduce food waste by up to 50% because, under this arrangement, students would be conscious in making food choices and in reducing food wastage. However, according to the EPD's latest survey conducted in 2010, only 12% of students taking lunch at school took lunch through the on-site meal portioning arrangement. The survey also found 46% of students taking lunch at school used disposable containers (which would be disposed of at landfills after use) (paras. 2.53, 2.60, 2.62, 2.63, 2.66 and 2.67).

7. ***Some new schools not adopting on-site meal portioning.***

As stated in the 2009-10 Policy Address, the standard design of new schools would cater for on-site meal portioning. However, Audit noted that, up to June 2015, four of the six new schools with construction works completed from July 2011 to October 2012 which had been installed with related facilities had not adopted the on-site meal portioning arrangement (paras. 2.81 and 2.83).

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Recycling of food waste

8. The 2014 Food Waste Plan promulgated four measures for increasing food-waste recycling, comprising the provision of a private food-waste recycling facility at EcoPark in Tuen Mun by end 2015, Organic Waste Treatment Facility (OWTF) Phase 1 in North Lantau by mid-2016, OWTF Phase 2 in Sheung Shui by end 2018 and OWTF Phase 3 in Yuen Long by early 2021. Compared to the 3,600 tpd of food waste being disposed of at landfills in 2011, the EPD estimated that the EcoPark facility would treat 100 tpd of food waste, and OWTF Phases 1, 2 and 3 would treat 200 tpd, 300 tpd and 300 tpd of food waste respectively. Food-waste recycling at the EcoPark facility commenced operation in May 2015 (paras. 1.13(c), 3.2 and 3.16).

9. *Actual treatment quantity of a pilot plant significantly lower than that reported.* In August 2008, a pilot composting plant for food-waste treatment at Kowloon Bay (Pilot Plant) was completed at a cost of \$16.2 million. The objectives of the Pilot Plant were to gather useful information and local experience on collection and treatment of food waste, and to evaluate the quality and market potential of compost products generated by the Plant. In April 2009 and March 2010, the EPD informed the Panel on Environmental Affairs (EA Panel) of the Legislative Council (LegCo) that the Pilot Plant would be capable of receiving up to 4 tpd of source-separated food waste from commercial and industrial (C&I) premises. However, Audit examination revealed that, from August 2008 to June 2015, the average quantity of food waste treated at the Pilot Plant was only 0.89 tpd, representing only 22% of the 4-tpd capacity reported to the EA Panel in 2009 and 2010 (paras. 3.6, 3.7 and 3.9).

10. Furthermore, in September 2015, the EPD informed Audit that the treatment capacity of the Pilot Plant should be 1.37 tpd instead of 4 tpd of food waste. However, Audit noted that, in the first half of 2015, the average quantity of food waste treated at the Pilot Plant was only 0.65 tpd, representing only 47% of the updated treatment capacity of 1.37 tpd of the Plant (para. 3.12).

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11. ***Significant under-estimation of project cost of OWTF Phase 1 in 2010.***

As stated in the project profile of OWTF Phase 1 in October 2007, the EPD had planned to commence tendering for the project in July 2010 with a view to commissioning the facility in March 2013. However, the tender exercise for the project carried out in 2011 was cancelled in the public interest. Audit noted that the price of the lowest tender was significantly higher than the Government's earmarked funding at that time for the proposed works, which had been based on the EPD's project estimate made in late 2009. The EPD informed the EA Panel in November 2010 that the project estimate was \$489 million. Audit examination revealed that some cost components had been omitted or significantly under-estimated in the project estimate of \$489 million, leading to significant under-estimation of the project cost made in 2010 (paras. 3.20, 3.22(a), 3.23, 3.28(a) and 3.32).

12. In February 2013, the EPD carried out a re-tender exercise for the project. In October 2014, the Finance Committee of LegCo approved funding of \$1,589.2 million for the project. In December 2014, the EPD awarded a design-build-operate contract for the project. The works commenced in December 2014 and were scheduled for completion in March 2017. Partly owing to the cancellation of the tender exercise in 2011 and re-tendering of the project in 2013, the commissioning of OWTF Phase 1 would be postponed by four years, and during the period a substantial quantity of food waste would be disposed of at landfills instead of being treated by the facility. OWTF Phase 1 was designed to treat 200 tpd or 73,000 tonnes of food waste a year (paras. 3.18, 3.19, 3.26 and 3.31).

13. ***Small number of households in public rental housing (PRH) estates participating in food-waste recycling trial schemes.*** Audit noted that the Housing Department invited 52,000 (77%) of the total 67,600 households in 14 PRH estates to participate in food-waste-recycling trial schemes, under which most of the food waste collected would be delivered to a private food-waste-recycling plant for recycling into fish feed. In the event, only 6.2% of the 52,000 households participated in the schemes. In mid-2014, the schemes implemented in 13 of the 14 PRH estates ceased (paras. 3.44, 3.45 and 3.48).

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14. *Low utilisation of food-waste recycling facilities in private housing estates.* From November 2011 to June 2015, the Environment and Conservation Fund had approved funding totalling \$41.2 million for 40 private housing estates for implementing two-year food-waste recycling projects, partly for leasing on-site food-waste treatment machines. As of June 2015, 16 of the 40 estates had commenced and some had completed the projects. Audit noted that only 4.6% of the 43,091 households residing in the 16 estates had participated in the projects, which was lower than the EPD's estimated participation rate of 10%. Moreover, while a food-waste treatment machine installed in each estate could treat 100 kg of food waste a day, each of the 16 estates on average only provided 42.7 kg of daily food waste for treatment (paras. 3.53(a), 3.57 to 3.60).

Way forward

15. It is a cause for concern that the quantity of food waste disposed of at landfills had increased from 1.18 million tonnes in 2004 to 1.33 million tonnes in 2013 (a 13% increase). Moreover, Hong Kong's per-capita domestic food waste of 0.37 kg per day was 85% higher than the 0.2 kg each of Taipei and Seoul. In view of the serious problems caused by the disposal of significant quantity of food waste at landfills and the piecemeal government actions before 2014 to address this problem (see para. 3), the ENB/EPD need to strengthen efforts and expedite actions to tackle the problems encountered in implementing the various measures promulgated in the 2014 Food Waste Plan (paras. 4.4 and 4.5).

16. As OWTF Phases 1 to 3 will help reduce disposal of 0.3 million tonnes of food waste at landfills a year (representing 23% of the 1.33 million tonnes of food waste disposal in 2013), it is of utmost importance that the facilities could be provided according to the EPD's timeframe. The ENB/EPD also need to strengthen efforts on implementing trial schemes for separating and collecting food waste from the domestic and the C&I sectors to gain experience and inculcate the general public's behavioural changes in waste disposal, without which the effectiveness of the implementation of OWTFs could be undermined (paras. 1.3, 4.6 and 4.7).

Executive Summary

Audit recommendations

17. **Audit recommendations are made in the respective sections of this Audit Report. Only the key ones are highlighted in this Executive Summary. Audit has *recommended* that the Government/the HA should:**

Reduction in food waste

- (a) **be vigilant in monitoring the generation and disposal of food waste against the targets and take early corrective actions in future (para. 2.37(a));**
- (b) **remind government departments of the need to demonstrate full support to the Government's policy on food-waste reduction by signing the FW Charter (para. 2.37(b));**
- (c) **conduct reviews of food-waste quantities of CSD institutions and HA hospitals with a view to identifying areas for improvement (paras. 2.49(a) and 2.50(a));**
- (d) **periodically conduct surveys on lunch practices of all whole-day schools and encourage schools to adopt on-site meal portioning as far as possible (para. 2.88(a) and (d));**
- (e) **take measures to ensure that all new schools installed with related facilities adopt on-site meal portioning (para. 2.90(b));**

Recycling of food waste

- (f) **take measures to provide clear, relevant and important information to LegCo in future (para. 3.13(a));**
- (g) **strengthen efforts to encourage more C&I premises to participate in food-waste recycling schemes (para. 3.13(b));**

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- (h) endeavour to make a reasonable cost estimate in implementing a works project in future so that the Government can earmark sufficient funding for the project (para. 3.39(a)(ii));
- (i) invite as many households as possible, and strengthen efforts to encourage households, to participate in food-waste recycling schemes in PRH estates in future (para. 3.50(a)(i) and (ii));
- (j) consider providing support and strengthen efforts to encourage participating private estates to invite more households to participate in food-waste recycling schemes in future (para. 3.67(a)(i));

Way forward

- (k) strengthen efforts to ensure that OWTF Phase 1 would commence operation by 2017 and, subject to resource availability, commission OWTF Phases 2 and 3 by 2020 and 2022 respectively (para. 4.11(b)); and
- (l) map out and implement an effective system for separating, collecting and transporting food waste from the C&I and domestic sectors to OWTFs for treatment (para. 4.11(d)(ii)).

Response from the Government and the Hospital Authority

18. The Government and the HA agree with the audit recommendations.

PART 1: INTRODUCTION

1.1 This PART describes the background to the audit and outlines the audit objectives and scope.

Background

1.2 In general, there are two categories of food waste, namely:

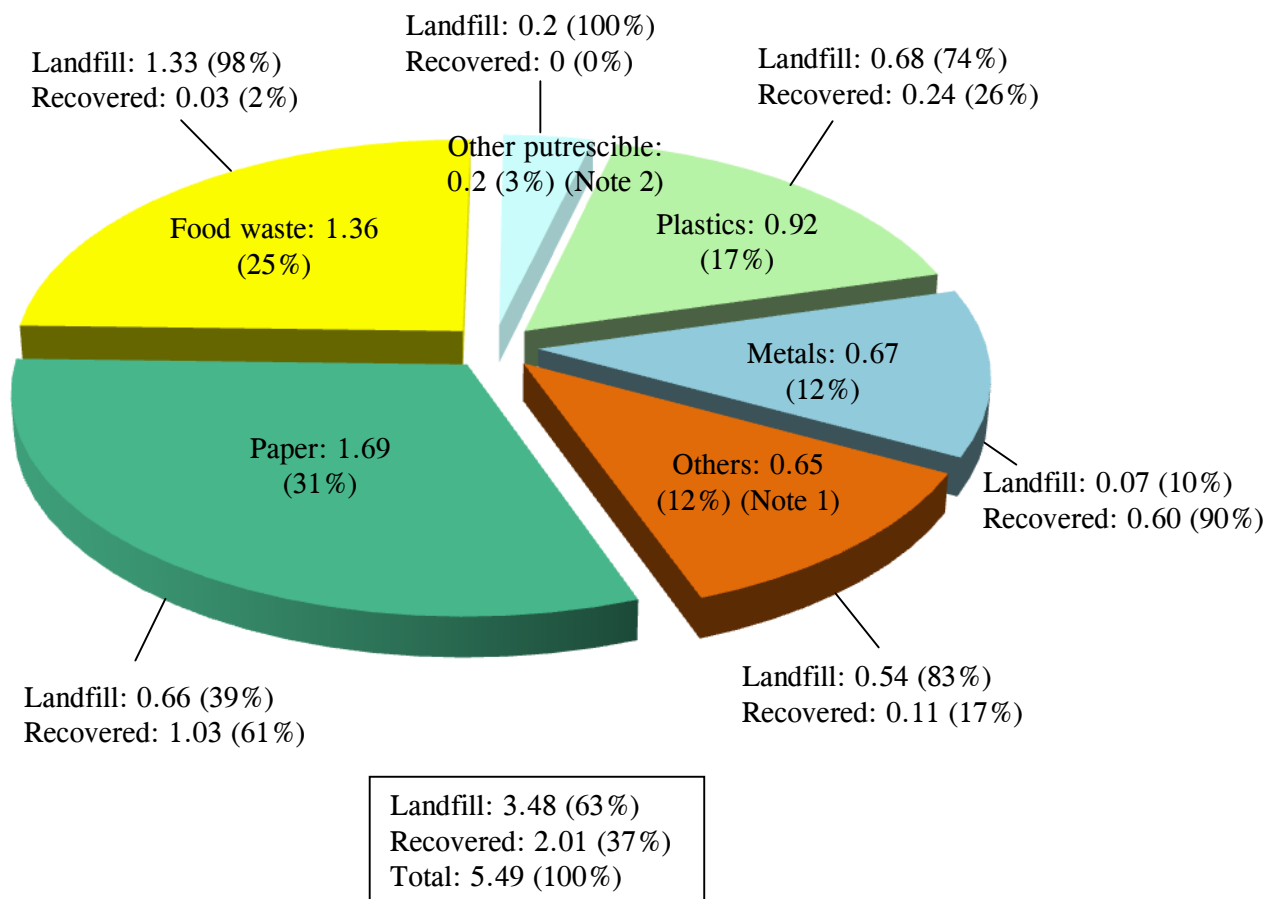
- (a) pre-consumer food waste which includes vegetative food waste (such as spoiled produce and vegetable/fruit trimmings), animal food waste (such as unwanted fish, meat and dairy products) and waste generated from food processing; and
- (b) post-consumer food waste which includes served food that has been left uneaten (i.e. plate scraping).

1.3 In 2013, Hong Kong generated 5.49 million tonnes of municipal solid waste (MSW), of which 3.48 million tonnes (63%) or 9,547 tonnes per day (tpd) were disposed of at landfills, and the remaining 2.01 million tonnes (37%) or 5,503 tpd were recovered for recycling (Note 1). Of the 5.49 million tonnes of MSW generated, 1.36 million tonnes (25%) were food waste, of which 1.33 million tonnes (98%) were disposed of at landfills and the remaining 0.03 million tonnes (2%) were recycled mainly as compost or fertiliser for greening and agriculture uses (see Figure 1). Food waste accounted for 38% of the 3.48 million tonnes of the MSW being disposed of at the three landfills in Hong Kong.

Note 1: *The 5.49 million tonnes of MSW generated and 2.01 million tonnes of MSW recovered included unknown quantities of import recyclables processed for export (see PART 2 of Chapter 1 of Director of Audit's Report No. 65).*

Figure 1

**MSW generation
(in million tonnes)
(2013)**



Source: Audit analysis of Environmental Protection Department records

Note 1: Other MSW mainly included waste glass, textiles, wood, rattan and miscellaneous household waste.

Note 2: Other putrescible mainly included yard waste and other organic waste.

Remarks: The MSW recovery quantities included unknown quantities of import recyclables processed for export (see PART 2 of Chapter 1 of Director of Audit's Report No. 65). As of September 2015, most of the related statistics for 2014 were not available.

- 1.4 Food waste is generated from:
- (a) the domestic sector including households and schools; and
 - (b) the commercial and industrial (C&I) sector including shops, restaurants, offices, hotels, factories and other businesses.

1.5 In 2013, of the 1.36 million tonnes of food waste generated, 0.97 million tonnes (71%) and 0.39 million tonnes (29%) came from the domestic and C&I sectors respectively. According to the Environmental Protection Department (EPD), the per-capita-per-day domestic food waste was 0.37 kilogram (kg), which was 85% higher than the 0.2 kg each generated by Taipei and Seoul, and the weight (Note 2) of Hong Kong's 3,600 tpd of food waste being disposed of at landfills is approximately equivalent to that of 250 double-decker buses.

Three landfills

1.6 Hong Kong has three landfills for the disposal of MSW, construction waste and special waste, namely Southeast New Territories (SENT) Landfill occupying an area of 100 hectares (ha — Note 3) in Tseung Kwan O, Northeast New Territories (NENT) Landfill occupying an area of 61 ha in Ta Kwu Ling and West New Territories (WENT) Landfill occupying an area of 110 ha in Nim Wan (Note 4). In 2013, 0.72 million tonnes (21%), 0.78 million tonnes (22%) and 1.98 million tonnes (57%) of MSW were respectively disposed of at SENT, NENT and WENT Landfills (totalled 3.48 million tonnes). From January 2016, SENT Landfill will cease receiving MSW and will only receive construction waste.

Note 2: *EPD landfill contractors conducted weighing of MSW before its disposal at landfills and annual waste composition surveys. The composition of MSW (including food waste) disposal was estimated based on the sample data collected from the surveys.*

Note 3: *A hectare (or 10,000 square metres) of land is approximately the size of a standard football pitch. Of the 100 ha of land of SENT Landfill, 50 ha is reclaimed land.*

Note 4: *Of the 110 ha of land of WENT Landfill, 43 ha is reclaimed land.*

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1.7 In December 2014, the EPD estimated that SENT, NENT and WENT Landfills would reach their original design capacity by 2015, 2016-17 and 2018-19 respectively. In the same month, the Finance Committee (FC) of the Legislative Council (LegCo) approved funding of \$2,101.6 million and \$7,510 million for extension works for SENT and NENT Landfills respectively, which would extend the serviceable lives of the two landfills to 2023 and 2028 respectively. Upon completion of extension works, the areas of SENT Landfill will increase from 100 ha to 113 ha (Note 5) and NENT Landfill from 61 ha to 131 ha. Furthermore, the FC also approved in December 2014 funding of \$38 million for carrying out the detailed study, site investigation and tender preparation work for WENT Landfill extension works. Subject to funding approval, the proposed works would extend WENT Landfill area from 110 ha to 310 ha.

1.8 In 2013, 1.33 million tonnes (38%) of 3.48 million tonnes of MSW disposed of at landfills were food waste. Therefore, effective measures to reduce food-waste quantities disposed of at landfills will significantly help preserve the precious landfill space and extend landfill serviceable lives.

Government strategies and measures

1.9 As the executive arm of the Environment Bureau (ENB), the EPD is responsible for, inter alia, implementing waste management policies and strategies. The EPD is headed by the Permanent Secretary for the Environment who also assumes the office of the Director of Environmental Protection. Appendix A shows an extract of the organisation chart of the EPD.

1.10 In December 2005, the EPD published the “Policy Framework for the Management of Municipal Solid Waste (2005-2014)” (hereinafter referred to as the 2005 Policy Framework), which set out strategies, targets and action plans on avoidance and minimisation; reuse, recovery and recycling; and bulk reduction and disposal of MSW. The waste reduction and recycling targets and related action

Note 5: *According to the EPD, the landfill extension would occupy 13 ha of additional land in Tseung Kwan O Area 137.*

plans were updated in January 2011. In May 2013, the ENB published the “Hong Kong Blueprint for Sustainable Use of Resources (2013-2022)” (hereinafter referred to as the 2013 Blueprint), which set out targets to reduce the per-capita-per-day MSW disposal rate from 1.27 kg in 2011 to 1 kg or less by 2017, and further to 0.8 kg or less by 2022.

1.11 In February 2014, the ENB published “A Food Waste and Yard Waste Plan for Hong Kong (2014-2022)” (hereinafter referred to as the 2014 Food Waste Plan). The 2014 Food Waste Plan set the following target:

Reducing food-waste disposal at landfills by 40% by 2022, using 2011 as the base year.
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1.12 The 2014 Food Waste Plan also promulgated the following four components of the Government’s strategy to achieve the food-waste-reduction target:

- (a) mobilising the community to prevent and reduce food waste at source and donate surplus food to people;
- (b) promoting and incentivising food-waste separation by the community;
- (c) implementing food-waste recycling by treating and turning separated food waste into renewable energy and converting food-waste residue into compost and fertiliser; and
- (d) providing waste-to-energy treatment for non-separated food waste.

1.13 The proposed measures set out in the 2014 Food Waste Plan for achieving the food-waste-reduction target included:

- (a) implementing food-waste prevention and reduction measures, mainly by implementing the Food Wise Hong Kong Campaign (FW Campaign), with an estimate of reducing the quantity of food waste by about 5% to 10% by 2017-18;

Introduction

- (b) implementing an MSW charging scheme aiming to reduce MSW including food waste, with an estimate of further reducing the quantity of food waste by another 10% to 15% between 2017 and 2022;
- (c) carrying out food-waste recycling by a private operator at EcoPark (Note 6) aiming to reduce food-waste quantity by 100 tpd by 2015-16; and
- (d) providing organic waste treatment facilities (OWTFs — Note 7) for recycling food waste aiming to reduce food waste by 200 tpd through the provision of the first OWTF in mid-2016, another 300 tpd through the provision of the second OWTF in end 2018, and another 300 tpd through the provision of the third OWTF in early 2021.

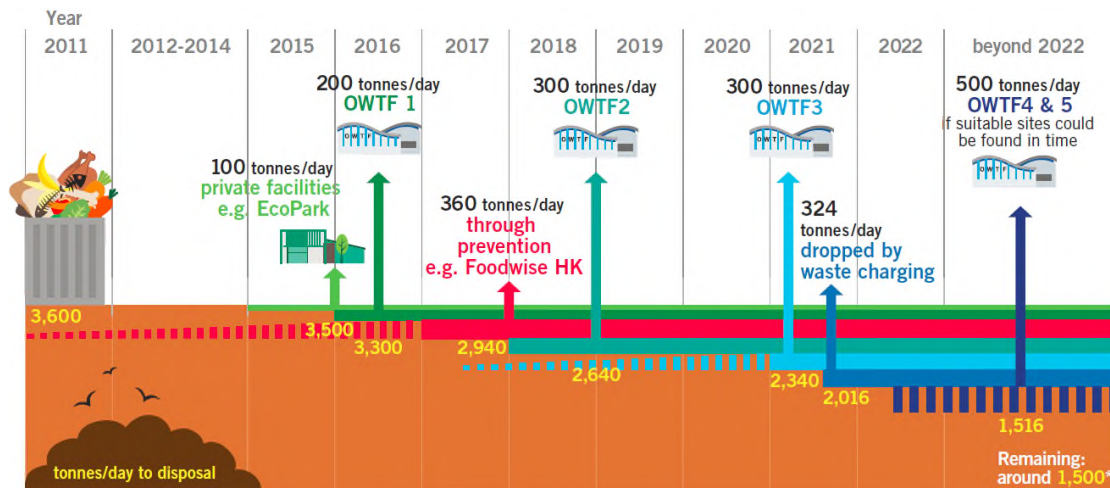
Figure 2 shows the envisaged dates and quantities of food-waste reduction by implementing the above-mentioned measures.

Note 6: *EcoPark, a 20-ha-waste-recovery park located in Tuen Mun, was developed by the EPD at a cost of \$308 million mainly for providing land at affordable cost for the recycling industry. In October 2012, the EPD and a private operator entered into a tenancy for using a land lot occupying an area of 8,500 square metres at EcoPark for recycling food waste at a monthly rent of \$180,000. Under the tenancy, the operator needed to process a minimum of 2,800 tonnes of food waste a month. The operation commenced in May 2015.*

Note 7: *OWTFs adopt biological treatment technologies for recycling and treating food waste. The treatment processes would generate biogas (a renewable energy similar to natural gas) and the residue of treatment can be used as compost or fertiliser.*

Figure 2

Projected food-waste reduction (2014)



Source: EPD records

1.14 Apart from minimising the use of the limited landfill space for disposal of food waste, strategies and actions to reduce and recycle food waste would also contribute to:

- (a) reducing related resources used in food production;
- (b) reducing greenhouse-gas emissions;
- (c) recovering useful resources from food waste; and
- (d) reducing the social cost of handling and treating food waste.

1.15 In 2014-15, the estimated recurrent expenditure of the EPD's waste (including food waste) management programme was \$2,049 million. The estimated operation cost (including collection and transfer cost) of disposing of a tonne of MSW (including food waste) was \$520.

Audit review

1.16 From 2001 to 2010, the Audit Commission (Audit) completed four reviews to examine Government actions on management of MSW. The review results were included in the following reports:

- (a) Chapter 8 of the Director of Audit's Report No. 36 of March 2001 entitled Provision of refuse transfer stations;
- (b) Chapter 7 of the Director of Audit's Report No. 39 of October 2002 entitled Management of municipal solid waste;
- (c) Chapter 11 of the Director of Audit's Report No. 51 of October 2008 entitled Reduction and recovery of municipal solid waste; and
- (d) Chapter 5 of the Director of Audit's Report No. 54 of March 2010 entitled Development of EcoPark.

1.17 The reviews found areas for improvement in the implementation of various strategies and action plans on reduction, recycling and disposal of MSW. The Public Accounts Committee of LegCo conducted public hearings in 2008 and 2010 to examine the findings included in two audit reports (see para. 1.16(c) and (d)).

1.18 In January 2015, Audit commenced a review to examine the Government's efforts in managing MSW (see Chapter 1 of the Director of Audit's Report No. 65). In May 2015, Audit commenced a review of the reduction and recycling of food waste by the Government (the subject matter of this review).

1.19 This review focuses on the following areas:

- (a) reduction in food waste (PART 2);
- (b) recycling of food waste (PART 3); and
- (c) way forward (PART 4).

Audit has identified areas where improvements can be made by the Government in the above areas and has made recommendations to address the issues.

Acknowledgement

1.20 Audit would like to acknowledge with gratitude the full cooperation of the staff of the ENB, the EPD, the Education Bureau (EDB), the Financial Services and the Treasury Bureau (FSTB), the Hospital Authority (HA) and the 12 government bureaux and departments (B/Ds — Note 8) that had been invited to sign the Food Wise Charter (FW Charter) under the FW Campaign during the course of the audit review.

Note 8: *The EPD invited the following 12 B/Ds to sign the Food Wise Charter: (1) the Auxiliary Medical Service; (2) the Civil Aid Service; (3) the Correctional Services Department; (4) the Customs and Excise Department; (5) the Fire Services Department; (6) the Food and Environmental Hygiene Department; (7) the Government Flying Service; (8) the Government Property Agency; (9) the Hong Kong Police Force; (10) the Housing Department; (11) the Immigration Department; and (12) the Leisure and Cultural Services Department.*

PART 2: REDUCTION IN FOOD WASTE

2.1 This PART examines actions taken by the ENB/EPD, the EDB, other relevant B/Ds and the HA in reducing food waste, focusing on:

- (a) measures to meet government target on food-waste reduction (see paras. 2.6 to 2.41);
- (b) food-waste reduction at Correctional Services Department (CSD) institutions and HA hospitals (see paras. 2.42 to 2.52); and
- (c) food-waste reduction at schools (see paras. 2.53 to 2.92).

2.2 Using 2011 as the base year, with an aim to achieving the Government's target to reduce food-waste disposal at landfills by 40% by 2022, the 2014 Food Waste Plan promulgated two major measures for reducing food-waste generation (see Table 1).

Table 1

Projected food-waste reduction quantities by 2022

Particulars	Projected food-waste reduction quantity (tpd)
Food-waste reduction measures (see Figure 2 in para. 1.13)	
MSW charging scheme (see paras. 2.8 to 2.10)	324 (9% of 3,600 tpd)
FW Campaign (see paras. 2.16 to 2.36)	360 (10% of 3,600 tpd)
Total	684
Food-waste quantity disposed of at landfills in 2011 (base year)	3,600

Source: Audit analysis of EPD records

2.3 One of the objectives of the FW Campaign was to coordinate efforts within the Government and public institutions to lead by example in food-waste reduction. Audit noted that different B/Ds and government-subsidised non-governmental organisations (NGOs) had made various efforts in participating in food-waste-reduction programmes. As the CSD and the HA are respectively the largest B/D and government-subsidised organisation involving provision of meals thereby generating food waste, Audit examined in detail the actions taken by these two organisations in reducing food waste. From 2013 to 2015, the 37 HA hospitals reported that they together had achieved 0.7 tpd of food-waste reduction after implementing food-waste-reduction programmes. Regarding the 29 CSD institutions, the CSD did not conduct periodic food-waste surveys to monitor the progress of reducing food-waste generation (see paras. 2.42 to 2.52).

2.4 From 2008 to September 2015, the Environment and Conservation Fund (ECF — Note 9) had provided funding for 109 schools and 31 NGOs to install on-site food-waste composters. In April 2009, January 2011 and March 2012, the ENB/EPD informed the LegCo Panel on Environmental Affairs (EA Panel) of the progress of implementing the key initiatives proposed under the 2005 Policy Framework covering pilot projects for promoting on-site food-waste composters at hotels and shopping malls with restaurants, ECF funding support for installing on-site food-waste composters in housing estates, the progress of planning OWTF Phases 1 and 2, the initiation and promotion of education and publicity programmes, and the implementation of the Food Waste Recycling Partnership Scheme.

2.5 According to the ENB, schools are the best places for inculcating social values like care for the environment, and accordingly more efforts have been made to promote food-waste reduction at schools. In this connection, in September 2009 and March 2010, the ECF approved allocation of a total of \$150 million to support schools to install facilities for them to adopt on-site meal portioning. Audit examined the actions taken by the EDB and the ENB/EPD in reducing food waste generated by students taking lunch at school. From December 2009 to June 2015, the 34 schools adopting on-site meal portioning funded by the ECF (which had provided food-waste quantities both before and after adopting the practice) reported that they together had achieved 0.8 tpd of food-waste reduction (see paras. 2.53 to 2.92).

Note 9: *The ECF was established in 1994 for funding educational, research and other projects and activities in relation to environmental and conservation matters. As of March 2014, the FC had approved funding totalling \$6,735 million for the ECF. The Secretary for the Environment acts as the trustee of the ECF.*

Measures to meet government target on food-waste reduction

2.6 It was stated in the 2005 Policy Framework that Hong Kong was able to take up by-products (mainly compost) produced from about 500 tpd of biodegradable waste (including food waste) collected from the C&I sector. In the 2013 Blueprint, the Government estimated that, by 2022, at least 500 tpd of food and organic waste would be treated to produce biogas and compost. Apart from these initiatives, neither the 2005 Policy Framework nor the 2013 Blueprint set other specific targets for reduction of food waste. Instead, they only set the following targets for reduction of MSW:

- (a) **2005 Policy Framework.** Reducing the quantity of MSW generated by 1% per annum up to year 2014, using 2003 as the base year; and
- (b) **2013 Blueprint.** Reducing the per-capita-per-day MSW disposal from 1.27 kg (using 2011 as the base year) to 1 kg or less by 2017, and to 0.8 kg or less by 2022.

2.7 In the 2014 Food Waste Plan, the ENB, for the first time, set the following specific target for reduction of food waste:

Reducing food-waste disposal at landfills by 40% by 2022, using 2011 as the base year.

Implementation of MSW charging scheme

2.8 According to the EPD, MSW charging provides an effective incentive that changes behaviour and leads people to cut down on waste generation. Overseas experience shows that MSW charging could help reduce significant waste generation (Note 10).

Note 10: *According to the EPD, since implementing the MSW charging scheme, South Korea's per-capita MSW disposal rate had dropped by 40% in a few years' time while Taipei City's per-capita disposal rate of household garbage had dropped by 65% in about 11 years.*

2.9 In December 2005, the EPD informed the Advisory Council on the Environment (ACE — Note 11) that the main objectives of MSW charging were to:

- (a) create an economic incentive for waste producers to avoid and reduce, or to recover and recycle waste; and
- (b) prevent indiscriminate use of landfills and other waste-treatment facilities.

2.10 The Government set a time target in the 2005 Policy Framework that the MSW charging bill would be submitted to LegCo in 2007. However, up to August 2015 (eight years after the original time target), the MSW charging bill had not been submitted to LegCo. According to the EPD, the MSW charging bill would be submitted to LegCo as soon as practicable within the 2016-17 legislative session. Details of implementation of the scheme and Audit's comments are included in PART 2 of Chapter 1 of Director of Audit's Report No. 65.

Areas for improvement

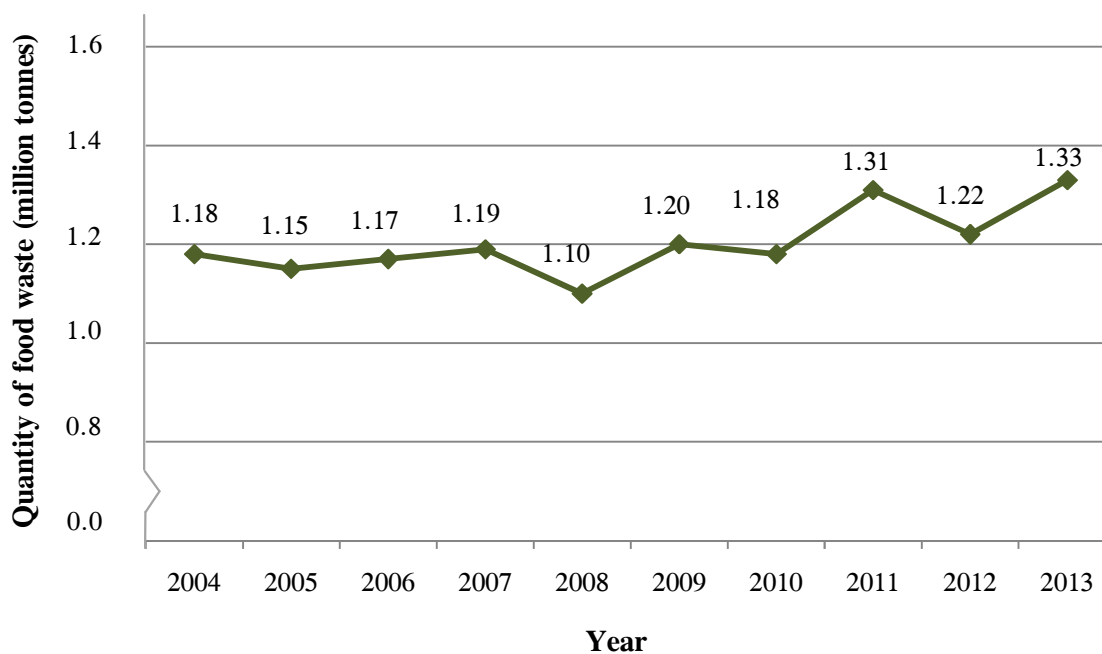
Timely actions not taken to address the food-waste disposal problem

2.11 As stated in paragraph 2.6, although the 2005 Policy Framework and 2013 Blueprint both set specific targets for reduction of MSW, apart from the estimate stated in the 2013 Blueprint that, by 2022, at least 500 tpd of food and organic waste would be treated to produce biogas and compost, they did not lay down specific targets for the reduction of food waste. Audit noted that, during the ten years from 2004 to 2013, the actual quantity of food-waste disposed of at landfills had increased from 1.18 million tonnes in 2004 (or 3,227 tpd) to 1.33 million tonnes in 2013 (or 3,648 tpd), representing a 13% increase (see Figure 3).

Note 11: *The ACE is the Government's principal advisory body on matters relating to pollution control, environmental protection and nature conservation. It is chaired by an academic with members comprising academics, businessmen, professionals and representatives from major green groups, and trade and industrial associations.*

Figure 3

**Actual food-waste disposal
(2004 to 2013)**



Source: EPD records

Remarks: According to the EPD, from 2004 to 2013, Hong Kong's annual Gross Domestic Product had increased from \$1,317 billion to \$2,132 billion (a 62% increase), the annual number of visitors from 22 million to 54 million (a 145% increase), and population from 6.8 million to 7.2 million (a 6% increase). However, Audit noted that, according to the 2005 Policy Framework (see para. 2.6(a)), it was targeted that the quantity of MSW including food-waste generation would decrease by 1% per annum up to 2014, using 2003 as the base year.

2.12 The disposal of 1.18 million to 1.33 million tonnes of food waste at landfills a year (or 3,227 to 3,648 tpd) from 2004 to 2013 had not only dwindled the limited and precious landfill space, it also exacerbated environmental problems arising from the decomposition of the waste, such as landfill gas and leachate generation. The former is malodorous, potentially suffocating and flammable while the latter is a highly polluting liquid (Note 12). Furthermore, food waste takes a long time to decompose and may cause differential settlement and instability of landfill surface, thus adversely affecting the early gainful use of closed landfill sites. The mixing up of food waste with recyclables also contaminates the latter and prevents them from being separated properly for recycling.

2.13 In PART 3 of Chapter 11 of Director of Audit's Report No. 51 of October 2008 (see para. 1.16(c)), Audit recommended that the EPD should expedite action on the recovery and recycling of putrescible waste (including food waste).

2.14 Given the fact that the quantity of food waste disposed of at landfills had increased by 13% from 2004 to 2013 and accounted for about 38% of MSW disposed of at landfills in 2013, Audit considers it unsatisfactory that the ENB and the EPD only in 2014 for the first time set a specific target of reducing food-waste disposal at landfills by 40% by 2022. More timely actions should have been taken to address the food-waste problem.

2.15 Audit notes that resolving environmental problems requires a long time, a change in the habits of the community and substantial capital investment. Therefore, taking into consideration the long time required in the process, the ENB/EPD need to be vigilant in monitoring the generation and disposal of food waste against the targets and take early corrective actions in future.

Note 12: *According to the EPD: (a) as the entire surface area of the landfill sites had been constructed with multilayer-liner systems, landfill gas and leachate could be collected and properly treated to minimise the impact on the environment; and (b) for example, landfill gas at NENT Landfill had been exported for off-site use and, starting from 2016, landfill gas at SENT Landfill will be exported for use and will result in an annual reduction in about 56,000 tonnes of carbon dioxide generated from SENT Landfill.*

Reduction in food waste

Many B/Ds invited but not signing the FW Charter

2.16 As stated in Table 1 in paragraph 2.2, the implementation of the FW Campaign is the ENB/EPD's major initiative for reducing food waste. The Campaign may help reduce 5% to 10% (Note 13) of food waste (0.07 million to 0.13 million tonnes a year or 180 to 360 tpd) by 2017-18, using 2011 as the base year.

2.17 With a view to reducing food-waste generation, in December 2012, the Food Wise Hong Kong Steering Committee (Note 14) was set up to oversee the implementation of the FW Campaign, which was formally launched in May 2013. The objectives of the FW Campaign comprised:

- (a) promoting awareness of the community on Hong Kong's waste management problems, and instilling behavioural changes at individual and household levels that would help reduce food-waste generation;
- (b) coordinating efforts within the Government and public institutions to lead by example in food-waste reduction;
- (c) drawing up and promoting good practices on food-waste reduction of C&I establishments, and encouraging leadership to take action and share best practices; and
- (d) facilitating food donation in the community.

Note 13: *According to the 2014 Food Waste Plan, the estimated 5% to 10% food-waste reduction was derived from the British experience where the national average food-waste reduction of 2% was achieved (the highest reduction rate in some districts was 14%) after a period of intense public education.*

Note 14: *The Committee is chaired by the Secretary for the Environment, with members drawn from the relevant sectors including catering, hotel, retail, property management, education, academia, green group and food-recipient organisation, and relevant B/Ds.*

2.18 Since rolling out of the FW Campaign in May 2013, the ENB/EPD have launched some programmes and activities to promote food-waste reduction (see Appendix B). Figure 4 shows a poster of the FW Campaign, depicting the icon of “Big Waster” which aims to promote a food-wise culture in Hong Kong.

Figure 4

A poster of FW Campaign



Source: EPD records

2.19 Under the FW Campaign, the ENB/EPD introduced the FW Charter in May 2013. The objectives of the FW Charter included encouraging public participation in and soliciting public support for food-waste-reduction programmes, instilling behavioural changes and raising public awareness on the issue. The FW Charter was open to enrolment by all local businesses and organisations. According to the EPD, since 2013, the ENB/EPD had invited catering services, hotels, retail businesses, property management companies, the education sector, green groups, food-recipient organisations and relevant B/Ds to show their support for the FW Campaign and to commit to reducing food waste by signing the FW Charter. As of June 2015, there were 415 FW Charter signees.

2.20 By signing the FW Charter, a signee pledged to implement the following food-waste-reduction measures:

Reduction in food waste

- (a) promoting best practices and behavioural changes to reduce food waste;
- (b) drawing up plans to promote the awareness and acceptance of food-waste reduction best practices by stakeholders within the organisations;
- (c) implementing plans with measurable targets to reduce food waste in their organisations and business settings;
- (d) encouraging and supporting the management of organisations to conduct in-house waste audits and to use the results of the audits to improve waste management performance;
- (e) supporting the FW Campaign and similar initiatives to encourage behavioural and cultural changes that engender respect for the precious food and natural resources;
- (f) promoting and adopting recipes that make use of food trimmings; and
- (g) supporting food donation activities whenever possible.

2.21 Moreover, the EPD recruited Food Wise Hong Kong Ambassadors from the community and FW Charter signees for spreading food-waste-reduction messages. The EPD organised training workshops for the Ambassadors on food-waste-reduction tips designed for specific sectors (e.g. food and beverage sector, and residential and household sectors). As of June 2015, there were a total of 2,759 Food Wise Hong Kong Ambassadors. From May 2013 to June 2015, the EPD had organised a total of 28 training workshops for the Ambassadors. The FW Campaign was awarded an Excellence Award at the “HKMA/TVB Awards for Marketing Excellence 2014” in recognition of its success in taking root in the community and promoting a food-wise culture in Hong Kong.

2.22 From May to October 2013, the EPD had invited 12 B/Ds to sign the FW Charter. However, as of June 2015, only 4 B/Ds and one of the 29 institutions of the CSD had signed the Charter. Table 2 shows the 12 B/Ds that had been invited to sign the FW Charter.

Table 2

**B/Ds invited to sign FW Charter from May to October 2013
(Position as of June 2015)**

B/D	Signed in or before June 2015	Not yet signed as of June 2015
(a) Managing in-house catering services		
Auxiliary Medical Service (AMS)	-	✓
Civil Aid Service (CAS)	✓	-
CSD (except Lo Wu Correctional Institution — Note)	-	✓
Customs and Excise Department (C&ED)	-	✓
Fire Services Department (FSD)	✓	-
Government Flying Service (GFS)	✓	-
Hong Kong Police Force (HKPF)	-	✓
Immigration Department (ImmD)	✓	-
(b) Managing premises generating significant food waste		
Food and Environmental Hygiene Department (FEHD)	-	✓
Government Property Agency (GPA)	-	✓
Housing Department (HD)	-	✓
Leisure and Cultural Services Department (LCSD)	-	✓
Total	4	8

Source: Audit analysis of B/Ds records

Note: Lo Wu Correctional Institution was the CSD's second largest institution in terms of the number of persons-in-custody. According to the CSD, this institution had signed the FW Charter because it had obvious room for food-waste reduction.

Remarks: The EPD invited the B/Ds in category (a) to sign the FW Charter by emails and those in category (b) at an inter-departmental meeting on supporting waste recycling held in October 2013.

2.23 In response to Audit's enquiries, all the 8 B/Ds which had not signed the FW Charter provided Audit with their reasons for not signing the Charter and the food-waste reduction measures adopted by them. The reasons included having a small-scale canteen and not understanding the EPD requirements (see Appendix C for details).

Reduction in food waste

2.24 As one of the objectives of the FW Campaign was for the EPD to coordinate efforts within the Government and public institutions to lead by example in food-waste reduction (see para. 2.17(b)), Audit considers it unsatisfactory that, in response to the EPD's invitation in 2013, up to June 2015, 8 (67%) of the 12 B/Ds had not signed the FW Charter.

2.25 In Audit's view, the ENB/EPD need to remind B/Ds having been invited to sign the FW Charter of the need to demonstrate full support to the Government's policy on food-waste reduction by signing the Charter.

Need to improve evaluation of FW Campaign effectiveness

2.26 Under the 2014 Food Waste Plan, the ENB/EPD envisaged that the FW Campaign launched in May 2013 might help reduce 5% to 10% of food waste by 2017-18, using 2011 as the base year. In order to monitor the progress of the implementation of the FW Campaign and assess the extent of achievement in food-waste reduction, in respect of each of the seven measures under the FW Charter (see para. 2.20), the EPD requested the signees of the FW Charter to submit returns on:

- (a) planned actions, initial targets and timeframe for implementation;
- (b) progress and achievement of implementation; and
- (c) extent of food-waste reduction through implementing planned actions.

According to the EPD, submissions of the above-mentioned returns were on a voluntary basis.

2.27 As stated in a leaflet "Invitation to sign Food Wise Charter", FW Charter signees would be asked to provide feedback by completing an implementation proforma. According to the EPD, the feedback would be used by the Food Wise Hong Kong Steering Committee to apprehend the signees' efforts made in reducing food waste and to plan for future actions.

2.28 Table 3 shows the number of signees submitting the returns and related data.

Table 3
FW Charter signees' returns
(2013 to 2015)

Particulars	September 2013 (No.)	June 2014 (No.)	February 2015 (No.)	Total (No.)
(a) Returns that should have been called for by the EPD	291	353	383	1,027
(b) Returns called for by the EPD	226 (78% of 291)	314 (89% of 353)	268 (70% of 383)	808 (79% of 1,027)
(c) Returns submitted by signees (up to July 2015)	47 (21% of 226)	29 (9% of 314)	32 (12% of 268)	108 (13% of 808)
(d) Returns submitted with measurable food-waste-reduction data	10 (21% of 47)	11 (38% of 29)	5 (16% of 32)	26 (24% of 108)

Source: Audit analysis of EPD records

2.29 As shown in Table 3, of the 291, 353 and 383 returns (totalled 1,027 returns) that should have been called for by the EPD in 2013, 2014 and 2015 respectively, the EPD only called for 226, 314 and 268 returns (totalled 808 returns), omitting to call for the other 219 returns (21%). In Audit's view, the ENB/EPD need to take measures to prevent recurrence of similar omissions in future.

2.30 Moreover, Table 3 also shows that, of the total 808 returns called for by the EPD from 2013 to 2015, only 108 (13%) returns from the FW Charter signees had been received. Audit noted that the EPD had not sent reminders to the related signees to ask for the returns. Audit considers that the ENB/EPD need to take actions to ascertain the reasons of many signees not submitting returns and their difficulties in doing so with a view to providing necessary assistance to them.

Reduction in food waste

2.31 Furthermore, of the total 108 returns submitted by signees from September 2013 to July 2015, only 26 (24%) contained measurable food-waste-reduction data. In this connection, Audit noted that the EPD had not issued guidelines to the signees on methodologies for compiling measurable food-waste-reduction data, which were essential for assessing the effectiveness of the FW Campaign. Audit considers it undesirable that, of the total 1,027 returns that should have been submitted by signees of the FW Charter, only 26 (2.5%) returns contained measurable food-waste-reduction data.

2.32 In October 2015, the EPD informed Audit that:

- (a) for wider sharing with other stakeholders and FW Charter signees, the EPD had taken actions to encourage participation and feedback from FW Charter signees such as by gathering experiences and feedback from the signees once every six months wherever possible. The EPD had shared some good stories obtained from FW Charter signees through various workshops and by displaying the stories in its roving exhibitions in different districts. The EPD had consolidated useful experiences from the signees in the Good Practice Guides for six sectors (see item 8 in Appendix B) and the Feature Articles on Food Waste Reduction published on the FW Campaign website; and
- (b) where measurable data were provided, the EPD would deploy the information for sharing and promotion. While the EPD would continue to assist FW Charter signees to provide measurable data, some signees might not be ready to do so as they did not manage food-waste generating facilities directly, or the food-waste-reduction data might not be available or comprehensive enough.

2.33 As instituting new processes and changing people's habits on food-waste reduction require time and sustained efforts, the ENB/EPD need to monitor progress and achievement and strengthen efforts to increase participation of B/Ds and the community in food-waste-reduction programmes. In Audit's view, the ENB/EPD need to issue guidelines on compiling measurable food-waste-reduction data, provide food-waste-reduction guidance to B/Ds that have contracted out catering services, and strengthen efforts to encourage the signees to submit returns and

related measurable data. In order to provide incentives for signees to submit returns and related data, the ENB/EPD need to consider publishing the related data and good practices of the best-performing signees and extend some forms of commendation to them.

2.34 Given that only 26 returns contained measurable food-waste-reduction data, the ENB/EPD need to explore ways and means to evaluate the effectiveness of the FW Campaign and the extent of achieving the projected reduction of food waste by 5% to 10% by 2017-18, using 2011 as the base year.

2.35 Besides, Audit also noted that the following B/Ds who were FW Charter signees had not submitted all the data required:

- (a) **CAS.** It only submitted 1 (in 2015) of the 2 requested returns (in 2014 and 2015), and the return did not include any measurable data; and
- (b) **FSD, GFS and ImmD.** All the 3 returns each of the FSD and the ImmD, and 2 returns of the GFS did not include measurable data.

2.36 As one of the objectives of the FW Campaign is for the ENB/EPD to coordinate efforts within the Government and public institutions to lead by example in food-waste reduction, in Audit's view, the ENB/EPD need to consider publishing the related data of the B/Ds having signed the FW Charter to show the effectiveness of their efforts made in reducing food waste and in support of the Government's policy on food-waste reduction.

Audit recommendations

2.37 **Audit has recommended that the Secretary for the Environment and the Director of Environmental Protection should:**

Timely actions not taken to address the food-waste disposal problem

- (a) **be vigilant in monitoring the generation and disposal of food waste against the targets and take early corrective actions in future;**

Reduction in food waste

Many B/Ds invited but not signing the FW Charter

- (b) **remind B/Ds having been invited to sign the FW Charter of the need to demonstrate full support to the Government's policy on food-waste reduction by signing the Charter;**

Need to improve evaluation of FW Campaign effectiveness

- (c) **take actions to ascertain the reasons of many FW Charter signees not submitting returns and their difficulties in doing so with a view to providing necessary assistance to them;**
- (d) **issue guidelines on methodologies for compiling measurable food-waste-reduction data;**
- (e) **strengthen efforts to encourage FW Charter signees to submit returns and related measurable data;**
- (f) **consider publishing the good practices of the best-performing FW Charter signees together with their food-waste-reduction data, and extend some forms of commendation to them;**
- (g) **explore ways and means to evaluate the effectiveness of the FW Campaign and the extent of achieving the projected reduction of food waste by 5% to 10% by 2017-18, using 2011 as the base year; and**
- (h) **consider publishing the food-waste-reduction data of the B/Ds having signed the FW Charter to show the effectiveness of their efforts made in reducing food waste and in support of the Government's policy on food-waste reduction.**

Response from the Government

2.38 The Secretary for the Environment and the Director of Environmental Protection agree with the audit recommendations. The Director of Environmental Protection has said that:

- (a) for paragraph 2.37(a), the EPD will continue to closely monitor the generation and disposal of food waste against the targets set in the 2014 Food Waste Plan;
- (b) for paragraph 2.37(b), the EPD has followed up with the B/Ds on their difficulties in signing the FW Charter and helped address their concerns. Of the 8 relevant B/Ds yet to sign the Charter as of June 2015 (see Table 2 in para. 2.22), the AMS, the CSD, the C&ED, the HKPF, the GPA and the LCSD had signed the Charter from July to October 2015;
- (c) for paragraph 2.37(e), the EPD will strengthen efforts to encourage and facilitate FW Charter signees to provide returns and related measurable data;
- (d) for paragraph 2.37(f), the EPD will enhance efforts to consolidate good experiences and practices, including those of the Charter signees, and share them through the network of the FW Campaign, including its website, Facebook and good practice guides; and
- (e) for paragraph 2.37(g), the EPD has commissioned a food-waste survey/audit for the food and beverage sector covering the period 2014 to 2016 with a view to providing information to evaluate the effectiveness of the FW Campaign in the sector.

2.39 The Controller, Government Flying Service has said that:

- (a) the GFS will provide the EPD with measurable food-waste-reduction data according to guidelines to be issued by the ENB/EPD;
- (b) since September 2011, the GFS has joined the food-waste recycling programme of the Hong Kong Airport Authority, whose contractor has collected the GFS's food waste for recycling. The contractor had collected 3,873 kg of food waste from the GFS from July to December 2013 and 2,707 kg in 2014; and
- (c) the GFS has signed and implemented the various measures of the FW Charter to increase the green awareness of its staff.

Reduction in food waste

2.40 The Chief Staff Officer, Auxiliary Medical Service has said that:

- (a) the AMS supports the Government's policy on food-waste reduction; and
- (b) as the canteen in the AMS is being operated by a service contractor, the AMS would support the Charter by disseminating information to the contractor in promoting food-waste reduction to encourage him to improve waste management, and putting up posters/publicity materials promoting the Charter.

2.41 The Director of Leisure and Cultural Services has said that the LCSD supports the FW Charter by disseminating information to its contractors to encourage them to improve food-waste management, and putting up posters and publicity materials provided by the EPD for promoting the FW Charter.

Food-waste reduction at Correctional Services Department institutions and Hospital Authority hospitals

2.42 The CSD and the HA are respectively the largest B/D and government-subsidised organisation that involve providing meals. Audit examined the measures taken by these two organisations in reducing food waste.

2.43 As at 21 August 2015, the CSD managed 29 institutions with 8,478 persons-in-custody (PICs). Between April 2013 and May 2014, the CSD launched the "Waste No Food Scheme" at four institutions (Note 15) under which PICs volunteering to participate in the scheme (Note 16) would be provided with 15% to 25% less of rice, potatoes or chapatti. According to the CSD:

Note 15: *The four institutions were Lo Wu Correctional Institution, Nei Kwu Correctional Institution, Tai Lam Centre for Women and Tai Lam Correctional Institution (Elderly Unit).*

Note 16: *According to the CSD, for humane reasons, PICs can participate in the scheme on a voluntary basis.*

- (a) the PICs of the four institutions were either women or elderly who normally consumed less food than PICs at other CSD institutions. These four institutions together achieved about 0.13 tpd of food-waste reduction from October 2014 to September 2015; and
- (b) the quantity of food waste generated in most of the remaining 25 CSD institutions was insignificant.

The per-PIC-per-day quantities of food waste of the 29 CSD institutions are shown in Appendix D.

2.44 Regarding the HA, as at 1 August 2015, it managed 38 hospitals (having a total of 21,724 in-patients) providing in-patient food services. In September 2011, the HA launched a save-rice programme at all HA hospitals by phases under which the quantity of rice served in a meal would be reduced from 0.25 kg to 0.20 kg (a 20% reduction). Nevertheless, in-patients who asked for more rice would be provided with additional rice. Moreover, since 2004, the HA had implemented an arrangement under which HA staff would place on-line meal orders for individual in-patients by taking into account their need and their health conditions.

Areas for improvement

Some CSD institutions generating relatively high per-PIC-per-day food-waste quantity

2.45 As mentioned in paragraph 2.43, from October 2014 to September 2015, four CSD institutions participating in the “Waste No Food Scheme” together had achieved about 0.13 tpd of food-waste reduction. However, the CSD did not conduct periodic food-waste surveys to monitor the progress of reducing food-waste generation of the 29 CSD institutions. In August 2015, in response to Audit’s request, the CSD carried out a food-waste survey on post-consumer food waste (see para. 1.2(b)) on three consecutive days at each of the 29 CSD institutions. The quantities of per-PIC-per-day food waste of each of the 29 institutions are shown in Appendix D.

Reduction in food waste

2.46 As shown in Appendix D, the per-PIC-per-day food-waste quantities of the 29 CSD institutions ranged from 0.02 kg to 1.61 kg (Note 17), with an average of 0.11 kg, revealing that some CSD institutions might have adopted good food-waste-reduction practices thereby achieving low food-waste generation. In Audit's view, the CSD needs to conduct a review of its institutions having relatively low per-PIC-per-day food-waste quantities and those having relatively high per-PIC-per-day food-waste quantities with a view to identifying good practices. The CSD also needs to conduct periodic surveys on food-waste quantities of individual CSD institutions. For public accountability and to provide incentives for improvement, the CSD needs to consider periodically publishing the per-PIC-per-day food-waste quantities of individual CSD institutions.

Some HA hospitals generating relatively high per-in-patient-per-day food-waste quantity

2.47 In 2013-14, 2014-15 and July/August 2015 (Note 18), the HA conducted three annual food-waste surveys on post-consumer food waste at 38 HA hospitals (Note 19). Audit noted that the total post-consumer food waste had reduced from 6.23 tpd as revealed in the 2013-14 survey to 5.56 tpd as revealed in the July/August 2015 survey, representing an 11% reduction. The quantities of per-in-patient-per-day food waste of each of the 38 HA hospitals as revealed in the July/August 2015 survey are shown in Appendix E.

2.48 As shown in Appendix E, the per-in-patient-per-day food-waste quantities of the 38 HA hospitals ranged from 0.06 kg to 0.58 kg, with an average of 0.31 kg, revealing that some HA hospitals might have adopted good food-waste-reduction practices thereby achieving low food-waste generation. In Audit's view, the HA needs to implement similar measures as mentioned in paragraph 2.46.

Note 17: *According to the CSD, the relatively high quantity of 1.61 kg of the Pelican House (a half-way house) involved only two PICs. PICs in the half-way house were permitted to leave the house for day activities and might choose to consume their own food.*

Note 18: *The HA conducted a three-day survey in July/August 2015 in response to Audit's request.*

Note 19: *From April 2013 to August 2014, the HA was managing 37 hospitals. North Lantau Hospital commenced operation in September 2014.*

Audit recommendations

2.49 **Audit has *recommended* that the Commissioner of Correctional Services, in collaboration with the Director of Environmental Protection, should:**

- (a) **conduct a review of the CSD institutions having:**
 - (i) **relatively low per-PIC-per-day food-waste quantities with a view to identifying good practices; and**
 - (ii) **relatively high per-PIC-per-day food-waste quantities with a view to identifying areas for improvement;**
- (b) **conduct periodic surveys on food-waste quantities of individual CSD institutions; and**
- (c) **consider periodically publishing the per-PIC-per-day food-waste quantities of individual CSD institutions.**

2.50 **Audit has also *recommended* that the Chief Executive, Hospital Authority, in collaboration with the Director of Environmental Protection, should:**

- (a) **conduct a review of the HA hospitals having:**
 - (i) **relatively low per-in-patient-per-day food-waste quantities with a view to identifying good practices; and**
 - (ii) **relatively high per-in-patient-per-day food-waste quantities with a view to identifying areas for improvement; and**
- (b) **consider periodically publishing the per-in-patient-per-day food-waste quantities of individual HA hospitals.**

Response from the Government and the Hospital Authority

2.51 The Commissioner of Correctional Services agrees with the audit recommendations in paragraph 2.49.

2.52 The Chief Executive, Hospital Authority agrees with the audit recommendations in paragraph 2.50. He has said that:

- (a) for paragraph 2.50(a), the HA food-waste surveys have shown that the food-waste percentages of HA hospitals are on a decreasing trend. The HA will continue to identify good practices and areas for improvement with a view to further minimising food wastage; and
- (b) for paragraph 2.50(b), the HA will consider periodically publishing food-waste information of HA hospitals.

Food-waste reduction at schools

Meal-portioning arrangements at schools

2.53 According to the EPD, adopting green lunch practices in schools provides a unique education opportunity for students to learn first-hand about how to protect the environment, inculcates behavioural changes and spreads the positive message of environmental protection. In 2008 and 2010, the EPD conducted two surveys on lunch practices of all schools (referred to as the 2008 Survey and 2010 Survey respectively). According to the survey results and EPD's projection, around 100 tonnes of food waste were generated by students taking lunch at school every day. According to the EPD:

- (a) the 2008 Survey was conducted to assess the common lunch practices of students with a view to promulgating initiatives to promote green lunch, which included wider adoption of on-site meal portioning in schools and encouragement of more students to use reusable food containers and cutlery;

- (b) the EPD noted from results of the 2008 Survey that some schools might not be fully equipped to adopt on-site meal portioning due to various technical and physical constraints (such as schools not built with suitable venues to accommodate students for the practice). Therefore, the Government needed to provide assistance to these schools to overcome their difficulties; and
- (c) the 2010 Survey was conducted as a follow-up survey to collect updated information on green lunch practices of schools.

2.54 In October 2009, the Chief Executive of the Hong Kong Special Administrative Region said in his 2009-10 Policy Address that, to further reduce food waste and disposable lunch boxes:

- (a) the ENB and the EDB would jointly invite all schools to sign a Green Lunch Charter to encourage schools to stop using disposable containers and adopt on-site meal portioning where possible;
- (b) the ECF would provide a subsidy for schools to install the necessary equipment for adopting on-site meal portioning; and
- (c) the standard design of new schools would cater for on-site meal portioning.

2.55 According to the EPD's "Guideline on How to Promote Green Lunch in Schools" issued in August 2013 (Note 20), other than students bringing their own lunch provided by parents (which would avoid the use of disposable containers), there are three different types of meal-portioning arrangements for providing students with lunch at school, as follows:

- (a) *on-site meal portioning using reusable containers.* Under this arrangement, cooked food is delivered by lunch suppliers to schools in large containers which would be reheated before portioning to students on-site by using washable and reusable dining wares, including trays and cutlery (see Photograph 1). Hence, the quantity of food portioned can be

Note 20: *The Guideline was first issued in October 2007 and was subsequently updated and revised.*

Reduction in food waste

flexibly adjusted in response to different requests such that food waste can be reduced. Subject to the availability of suitable areas at individual schools, students may take lunch in a designated dining area (see Photograph 2) or in classrooms;

Photographs 1 and 2

Students taking lunch at school under on-site meal portioning

Photograph 1



Photograph 2



Source: EPD records

- (b) ***off-site meal portioning using reusable containers.*** Under this arrangement, cooked food is portioned and packed in reusable containers at the kitchens of lunch suppliers before delivering to schools for distribution to students; and
- (c) ***off-site meal portioning using disposable containers.*** Apart from using disposable containers (Note 21), this arrangement is similar to the one in (b) above.

From the waste reduction perspective, on-site meal portioning is the most desirable option. According to the 2009-10 Policy Address, schools were encouraged to stop using disposable containers and adopt on-site meal portioning where possible (see para. 2.54(a)).

Note 21: *Disposable containers are usually made of polypropylene, polyfoam, tin foil and paper.*

On-site meal portioning projects funded by the ECF

2.56 In September 2009 and March 2010, the ECF Committee (Note 22) approved allocation of \$50 million and \$100 million respectively to support schools to carry out conversion works and install facilities for adopting on-site meal portioning, including electrical and water installation, dining tables and chairs, and reusable lunch containers and cutlery. According to the EPD and the ECF guidelines:

- (a) a school interested in applying for ECF funding may request the ECF Secretariat (i.e. the EPD) to arrange for a site visit for conducting a preliminary assessment on the feasibility to adopt on-site meal portioning at the school (Note 23);
- (b) a school found being technically feasible for adopting on-site meal portioning may then submit a funding application. From December 2009 (commencement of accepting applications) to June 2015, \$149.88 million ECF funding had been approved for related projects carried out at 114 schools;
- (c) within two months from completion of the conversion and installation works, the school is required to submit to the EPD a works-completion report with details of the adoption of on-site meal portioning, including the number of students participating in the arrangement; and
- (d) the school is also required to adopt on-site meal portioning for at least 36 months after completion of the conversion and installation works.

Note 22: *The ECF Committee, established under the Environment and Conservation Fund Ordinance (Cap. 450) in 1994, comprises the chairman and not more than 8 members appointed by the Chief Executive of the Hong Kong Special Administrative Region and 4 ex-officio members from the ENB, the EPD, the EDB and the Agriculture, Fisheries and Conservation Department. The EPD provides secretariat and administrative support to the ECF Committee. Its terms of reference include vetting funding applications from local non-profit-making organisations, and advising the trustee of the ECF (i.e. the Secretary for the Environment) on the amount of fund to be allocated for each project.*

Note 23: *The EPD has appointed the Electrical and Mechanical Services Trading Fund to provide professional support to schools, such as conducting site visits to assess the feasibility of schools to adopt on-site meal portioning.*

Reduction in food waste

Green Lunch Charter

2.57 To further reduce waste, promote healthy living and inculcate the values of caring for the environment among students, in February 2010, the ENB and the EDB jointly invited all schools to sign the Green Lunch Charter. Signees of the Charter would endeavour to:

- (a) arrange students to use reusable food containers and cutlery; and
- (b) adopt on-site meal portioning in providing lunch to students.

2.58 According to the EPD, signing the Green Lunch Charter is voluntary in nature, and schools interested in installing on-site meal portioning facilities may seek funding support from the ECF irrespective of whether they have signed the Green Lunch Charter.

Areas for improvement

Some schools not adopting green lunch practice

2.59 According to the EPD, the benefits of adopting on-site meal portioning include:

- (a) avoiding using disposable containers and cutlery, hence reducing waste disposal at landfills; and
- (b) reducing food waste because the quantity of food served can be flexibly adjusted according to the need of individual students.

2.60 In June 2013, the ENB informed the FC that on-site meal portioning facilitated students to adjust the meal portion as they needed and to directly engage students to consciously make choices in reducing food wastage, which was estimated to be able to contribute to food waste reduction by up to 50%.

2.61 As of September 2014, there were 1,131 whole-day schools (comprising 562 primary, 509 secondary and 60 special schools), with a total of about 704,000 students in Hong Kong. Table 4 shows the numbers of schools having signed the Green Lunch Charter and those having been granted ECF funding for adopting on-site meal portioning as of June 2015.

Table 4
Number of whole-day schools
(June 2015)

Particulars	Government school (No.)	Subsidised school (Note 1) (No.)	Private school (Note 2) (No.)	Total (No.)
Total	63	920	148	1,131
Signed Green Lunch Charter	35 (56% of 63)	251 (27% of 920)	8 (5% of 148)	294 (26% of 1,131)
Granted ECF funding for adopting on-site meal portioning	Nil (Note 3)	114 (Total \$149.88 million of funding approved)	Nil (Note 4)	114

Source: Audit analysis of EDB and EPD records

Note 1: Subsidised schools mainly included aided schools and schools under the Direct Subsidy Scheme.

Note 2: Private schools included all international schools.

Note 3: Government schools may apply for funding from the minor building works block vote of the Architectural Services Department to carry out the necessary retrofitting works for adopting on-site meal portioning. As of June 2015, no government school had applied for funding for the purpose.

Note 4: The ECF Committee would consider applications from private schools on a case-by-case basis. As of June 2015, no private school had applied for funding for the purpose.

Reduction in food waste

2.62 According to the 2008 and the 2010 Surveys, the EPD estimated that some 550,000 whole-day school students took lunch at school (Note 24). The survey results are shown in Table 5.

Table 5
Results of 2008 and 2010 Surveys

Particulars	2008 Survey	2010 Survey
(a) Number of schools surveyed	1,202	1,123
(b) Number of schools responded	361 (30% of 1,202)	771 (69% of 1,123)
(c) Number of schools providing per-student-per-lunch food-waste quantities	88 (24% of 361)	157 (20% of 771)
(d) Percentage of students taking lunch at school:		
(i) provided by parents	25%	24%
(ii) through on-site meal portioning	9%	12%
(iii) through off-site meal portioning using reusable containers	17%	18%
(iv) through off-site meal portioning using disposable containers	49%	46%
Total	100%	100%

Source: Audit analysis of EPD records

Note 24: *According to the EPD, in the 2007/08 and 2009/10 school years, 33% of 819,000 students and 31% of 796,000 students in whole-day schools respectively took lunch outside schools.*

2.63 As shown in Table 5, for the 771 schools responding to the 2010 Survey, only 12% of students taking lunch at school took lunch through the on-site meal portioning arrangement. On the other hand, 46% of students taking lunch at school took lunch by using disposable containers. Audit noted that, as of June 2015, except the 114 subsidised schools adopting on-site meal portioning funded by the ECF (see Table 4 in para. 2.61), the EPD did not have information on the number of other schools adopting the on-site meal portioning arrangement. Furthermore, from January 2011 to August 2015, other than the 114 schools adopting on-site meal portioning funded by the ECF, the EPD had not conducted any survey on lunch practices of other whole-day schools.

2.64 In September and October 2015, the EPD informed Audit that:

- (a) from 2009 to 2014, according to works-completion reports (see 2.56(c)) submitted by the schools funded by the ECF, the EPD estimated that around 56,000 students had benefited from taking lunch at school through on-site meal portioning. In order to encourage schools to adopt the on-site meal portioning arrangement, in 2013, the EPD had introduced to the management of 740 subsidised schools about the ECF funding support for the purpose; and
- (b) after conducting site visits to some schools for assessing the feasibility of adopting on-site meal portioning, it was found that a number of schools had physical and technical constraints for carrying out the necessary conversion works for the arrangement. The constraints included lack of space, potential problems regarding electrical/water installation works and building works to convert an existing area (such as playground and multi-purpose areas) into a kitchen and a dining area.

Reduction in food waste

2.65 Audit noted that, from November 2009 to August 2015, the ECF had received a total of 277 requests from schools for carrying out site visits to assess the feasibility for them to adopt the on-site meal portioning practice, of which 163 (59%) schools had been assessed to be feasible for adopting the practice (Note 25). However, according to the EPD, it had not approached other schools to ascertain their technical and physical feasibility for adopting on-site meal portioning.

2.66 In Audit's view, the ENB/EPD need to periodically conduct surveys on lunch practices of all whole-day schools to obtain and publish the survey results, which provide a basis for the ENB/EPD in formulating strategies and action plans on encouraging more schools to adopt green lunch practice in future. The ENB/EPD also need to encourage schools to carry out assessments of their feasibility to adopt on-site meal portioning. In view of the benefits of reducing the generation of food waste and disposable lunch boxes which would be disposed of at landfills, Audit considers that the ENB/EPD need to strengthen efforts to encourage more schools to adopt the on-site meal portioning arrangement as far as possible. For schools which are assessed to be technically not feasible to adopt on-site meal portioning, the ENB/EPD need to encourage them to use reusable lunch boxes instead of disposable ones.

Lack of updated information on students taking lunch by using disposable containers

2.67 As shown in Table 5 in paragraph 2.62, in the 2010 Survey, 46% of students taking lunch in schools used disposable containers. According to the 2008 and the 2010 Surveys, the EPD estimated some 270,000 and 250,000 disposable food containers were respectively used at schools every day which were disposed of at landfills.

Note 25: *Regarding the 277 requests from schools for site visits:*

- (a) *for the 163 schools assessed to be feasible for adopting on-site meal portioning, 114 schools were approved with ECF funding, 42 schools had subsequently decided not to apply for ECF funding, 6 schools' applications were under processing and 1 school's application had been rejected by the ECF; and*
- (b) *for the remaining 114 schools (277 less 163 schools), 102 schools were found not feasible for adopting on-site meal portioning, 8 schools had decided not to continue the application and 4 schools' applications were under processing.*

2.68 In June 2010, the EPD informed the EA Panel that, with the establishment of the Green Lunch Charter and the support of funding from the ECF:

- (a) it had set targets to reduce the number of disposable lunch boxes by 20,000 per day by the 2011/12 school year and a further 40,000 per day by the 2012/13 school year; and
- (b) it would conduct surveys to ascertain the latest situation and review the above targets accordingly.

2.69 Based on the estimated daily 270,000 disposable lunch boxes used in 2008 (see para. 2.67), the estimated number of such lunch boxes used daily was expected to decrease to 250,000 in 2011/12 school year and 210,000 in 2012/13 school year. However, except the surveys conducted on 114 schools adopting on-site meal portioning funded by the ECF, the EPD had not conducted any survey on lunch practices of other whole-day schools from January 2011 to August 2015 (as of June 2015, there were 1,131 whole-day schools — see Table 4 in para. 2.61). Hence, the EPD could not make use of updated survey results and latest development to review the targets on the issue. Audit considers that the ENB/EPD need to take follow-up actions on this matter.

Need to take measures to reduce per-student-per-lunch food waste of some schools

2.70 As shown in Table 5 in paragraph 2.62, in the 2010 Survey, 157 schools (20% of 771 schools responded in the Survey) provided the EPD with per-student-per-lunch food-waste quantities. According to the survey results, the per-student-per-lunch food-waste quantities of:

- (a) 99 schools (63%) ranged from 0 kg to 0.04 kg;
- (b) 28 schools (18%) ranged from more than 0.04 kg to 0.08 kg;
- (c) 19 schools (12%) ranged from more than 0.08 kg to 0.12 kg;
- (d) 6 schools (4%) ranged from more than 0.12 kg to 0.16 kg; and
- (e) 5 schools (3%) ranged from more than 0.23 kg to 0.44 kg.

Reduction in food waste

2.71 As shown in paragraph 2.70, the per-student-per-lunch food-waste quantities of the 157 schools ranged from 0 kg to 0.44 kg, with an average of 0.04 kg. The survey results revealed that schools had varying degrees of success in reducing food waste. While many schools had achieved relatively low food-waste generation, some schools had room for improvement in food-waste reduction. The EPD needs to encourage those schools having high food-waste generation (such as the five schools generating 0.23 kg to 0.44 kg per-student-per-lunch of food waste — see para. 2.70(e) above) to implement enhanced food-waste-reduction measures.

2.72 In September and October 2015, the EPD informed Audit that:

- (a) limitations in the food-waste surveys might affect the accuracy of the survey results, and different choices of food consumed by students might produce different quantities of food waste; and
- (b) the per-student-per-lunch food-waste quantities of the majority (over 90%) of schools surveyed was between 0 kg to 0.16 kg, which was not on the high side, and some food waste was unavoidable (such as banana peels and chicken bones). There were practical difficulties in setting an objective benchmark on the quantities of food waste generated.

2.73 Audit noted that only 20% of schools responded in the 2010 Survey provided food-waste quantities, and the survey was conducted five years ago. In Audit's view, the ENB/EPD need to periodically conduct surveys of the schools (see para. 2.66), and based on statistics obtained from surveys, identify areas for improvement in reducing per-student-per-lunch food-waste quantities. To promote good practice, the ENB/EPD may consider extending some forms of commendation to schools showing good performance in terms of food-waste reduction, and publishing their per-student-per-lunch food-waste quantities and good practices in food-waste reduction, which may provide good guidance/models for other schools to follow. The ENB/EPD also need to consider issuing guidelines to schools on methodologies for measuring food-waste quantities, and encourage schools to provide quantities of food waste in surveys.

Some schools not providing required returns on food-waste quantities

2.74 As shown in Table 4 in paragraph 2.61, as of June 2015, 114 subsidised schools had been granted ECF funding for carrying out conversion works for adoption of on-site meal portioning. Before July 2011, the EPD had requested the ECF-funded schools to provide on a voluntary basis returns about their lunch practices, including the quantities of food waste before and after adopting on-site meal portioning. From July 2011 onwards, as a condition of receiving funding from the ECF stated in the approval letter, before installation of related facilities, the schools needed to submit returns to the EPD on food-waste quantities. They also needed to submit returns on food-waste quantities after adopting on-site meal portioning.

2.75 As of June 2015, of the 114 schools, related conversion works at 105 schools (92%) had been completed. Of these 105 schools, the ECF had approved funding to 73 schools before July 2011 and to 32 schools in or after July 2011. Details of returns submitted by the 105 schools are shown in Table 6.

Table 6

**Returns on food-waste quantities from
105 schools receiving ECF funding
(June 2015)**

Information provided by schools on food-waste quantities	Schools receiving ECF funding		
	Approved before July 2011 (No.)	Approved in or after July 2011 (No.)	Total (No.)
(a) Both before and after adopting on-site meal portioning	29	5	34
(b) Only after adopting on-site meal portioning	33	3	36
(c) Only before adopting on-site meal portioning	3	9	12
(d) No related information provided	8	15	23
Total	73	32	105

Source: Audit analysis of EPD records

Reduction in food waste

The ENB/EPD need to take follow-up actions on schools receiving ECF funding but not submitting the required returns.

2.76 Moreover, Audit noted that:

- (a) for the 70 schools providing food-waste quantities after adopting on-site meal portioning (see items (a) and (b) of Table 6), the quantities of per-student-per-lunch food waste after adopting the practice ranged from 0 kg to 0.18 kg; and
- (b) for the 34 schools providing food-waste quantities both before and after adopting on-site meal portioning (see item (a) of Table 6), the quantities of per-student-per-lunch food waste after adopting the practice ranged from 0 kg to 0.15 kg. The 34 schools achieved a total of 0.8 tpd of food-waste reduction, and 0.05 kg of per-student-per-lunch food-waste reduction after adopting on-site meal portioning.

2.77 According to the ECF's "Guide to Application — On-site Meal Portioning Projects in Schools", a school receiving ECF funding is required to grant unconditionally and irrevocably to the Government the right to publish the results of adopting on-site meal portioning. Audit considers that, in order to promote adoption of on-site meal portioning, the ENB/EPD need to consider publishing the per-student-per-lunch food-waste quantities of the schools before and after adopting on-site meal portioning and their good practices in food-waste reduction.

Need to assess effectiveness of EPD actions to promote green lunch practices

2.78 From February 2010 to June 2015, 294 schools (26% of total 1,131 whole-day schools) had signed the Green Lunch Charter (see Table 4 in para. 2.61). However, the ENB and the EDB had not evaluated the signees' performance in practising green lunch. The EPD also had not evaluated the effectiveness of its actions to promote green lunch practices. Given that adopting green lunch practices can inculcate behavioural changes and spread the positive message of environmental protection to students (see para. 2.53), the EPD needs to take follow-up actions in these areas.

Some new schools not adopting on-site meal portioning

2.79 According to the EDB:

- (a) when planning for the construction of a new school, the EDB would conduct formal discussion with the school management or the school-sponsoring body about the standard provision of school facilities (including on-site meal portioning facilities — Note 26); and
- (b) before seeking funding approval from LegCo for the construction works of a new school to be built by the Government, the EDB would provide the school management with a set of the general layout plans for each floor of the school premises for comments and agreement.

2.80 In March 2010, the ENB informed LegCo that on-site meal portioning facilities would become standard facilities of newly built schools, and that seven schools under construction and due for completion between February 2011 and February 2012 would be installed with such facilities.

2.81 As of June 2015, six new schools (Note 27) with construction works completed from July 2011 to October 2012 had been installed with on-site meal-portioning facilities. However, Audit noted that four (67%) of the six schools had not adopted on-site meal portioning. According to the EDB, it had not ascertained the reasons of the four schools for not adopting on-site meal portioning. Audit considers that the EDB needs to take follow-up actions on the issue.

Note 26: *According to the EDB, the necessary fittings for implementing on-site meal portioning (such as wash basins and power supply) would be provided in the tuck-shop-cum-central-portioning area. The furniture and equipment (such as heaters and cookers) would be procured by the schools as appropriate upon completion of the new school premises.*

Note 27: *According to the EDB, of the seven schools mentioned to LegCo in March 2010 (see para. 2.80), owing to technical constraints, two schools were eventually only partially installed with on-site meal portioning facilities in their new school premises. Another school not having been confirmed in March 2010 as technically feasible for installing on-site meal portioning facilities was subsequently installed with such facilities. Therefore, a total of six new schools were installed with the facilities.*

Reduction in food waste

2.82 In October 2015, the EDB informed Audit that:

- (a) lunch arrangement in schools was affected by various factors, such as the number of students staying at schools for lunch, physical area of the canteen and stakeholders' views; and
- (b) some schools might have genuine difficulties in practising on-site meal portioning.

2.83 As stated in the 2009-10 Policy Address, the standard design of new schools would cater for on-site meal portioning (see para. 2.54(c)). Audit considers it unsatisfactory that, notwithstanding on-site meal portioning facilities had been provided at the four schools at additional costs, the four schools did not make use of the facilities after school commissioning, and the EDB had not taken follow-up actions. In Audit's view, the EDB, in collaboration with the ENB/EPD, needs to liaise with the four schools with a view to providing necessary assistance for them to adopt on-site meal portioning as far as practicable. The ENB/EPD and the EDB need to take measures to ensure that all new schools installed with related facilities adopt on-site meal portioning.

Early actions needed to release surplus fund from completed ECF projects

2.84 As of June 2015, of the \$150 million earmarked for supporting on-site meal portioning projects, the ECF had approved a total of \$149.88 million for financing 114 projects (see para. 2.56(b)). Audit noted that, as of June 2015, other six applications for funding totalling \$8.9 million had been submitted and awaiting the ECF Committee's approval. Of the six applications:

- (a) three applications with a total applied funding of \$4.6 million (submitted from March to June 2015) were under assessment; and
- (b) for three applications with a total applied funding of \$4.3 million (submitted in 2010 and 2011), the EPD was awaiting further information on students' dining places from the three schools.

2.85 Furthermore, as of June 2015, of the 114 approved projects, 105 had been completed. Of these 105 projects, the accounts of 2 had been finalised, which indicated that the amounts of funding approved were in excess of the actual expenditures. The excess fund had been released for financing other projects. Regarding the remaining 103 projects, Audit noted that many had been completed for a long time and that there were substantial excess amounts of approved funding over the up-to-date expenditures. However, their accounts had not been finalised and thus the excess fund could not be released to finance other projects (see Table 7).

Table 7
Completed ECF projects with accounts not yet finalised
(June 2015)

Period from project completion date to June 2015	Projects (No.)	Total excess amount of approved funding over up-to-date expenditure (\$ million)
8 months to 1 year	7	2
More than 1 year to 2 years	7	2
More than 2 years to 3 years	18	7
More than 3 years to 4 years	33	9
More than 4 years to 5 years and 1 month	38	10
Total	103	30

Source: Audit analysis of EPD records

Reduction in food waste

2.86 Of the 103 projects, 100 were carried out by the Electrical and Mechanical Services Trading Fund (EMSTF — Note 28) and the remaining 3 by school-appointed contractors. Audit noted that:

- (a) under the agreement between the EPD and the EMSTF, the EMSTF needed to provide quarterly summaries on the financial status and progress of the related works to the EPD. According to the quarterly summary as of June 2015 provided by the EMSTF, for the 100 projects, the excess amounts of approved funding over total contract costs aggregated \$27 million; and
- (b) according to the ECF funding requirement, schools employing contractors other than the EMSTF needed to submit audited statements of accounts within two months of completion of projects for the ECF Committee's endorsement. As of June 2015, the three schools employing other contractors had submitted the audited statements of accounts, but the EPD had yet to submit the accounts to the ECF Committee for endorsement.

2.87 In Audit's view, the ENB/EPD need to expedite actions to finalise the accounts of completed projects, so that excess amounts of approved funding over actual expenditures can be released to finance other qualified projects.

Audit recommendations

2.88 **Audit has recommended that the Secretary for the Environment and the Director of Environmental Protection, in collaboration with the Secretary for Education, should:**

- (a) **consider periodically conducting surveys on lunch practices of all whole-day schools with a view to obtaining and publishing pertinent statistics;**

Note 28: *The EMSTF was set up in August 1996 under the Trading Funds Ordinance (Cap. 430) to manage and account for the operation of certain services of the Electrical and Mechanical Services Department. The services provided by the EMSTF include operation and maintenance of electrical, mechanical, electronic and building services systems and equipment.*

- (b) based on survey results in (a), conduct a review of the schools with a view to identifying areas for improvement in reducing per-student-per-lunch food-waste quantities;**
- (c) encourage schools to carry out assessments of their feasibility to adopt on-site meal portioning;**
- (d) for schools which are assessed to be technically feasible to adopt on-site meal portioning, encourage them to adopt the arrangement as far as possible;**
- (e) for schools which are assessed to be technically not feasible to adopt on-site meal portioning, encourage them to use reusable lunch boxes instead of disposable ones;**
- (f) review the targets on reduction of using disposable lunch boxes at schools;**
- (g) consider extending some forms of commendation to schools showing good performance in terms of food-waste reduction, and publishing their per-student-per-lunch food-waste quantities and good practices in food-waste reduction;**
- (h) consider issuing guidelines to schools on methodologies of measuring food-waste quantities;**
- (i) encourage schools to provide quantities of food waste in surveys; and**
- (j) explore ways and means to evaluate the effectiveness of EPD actions to promote green lunch practices, including the Green Lunch Charter.**

Reduction in food waste

2.89 **Audit has also *recommended* that the Secretary for the Environment and the Director of Environmental Protection should, in managing on-site meal portioning projects funded by the ECF:**

- (a) **take follow-up actions on schools not submitting returns on quantities of food waste generated before and after adopting on-site meal portioning;**
- (b) **consider publishing the per-student-per-lunch food-waste quantities of the schools before and after adopting on-site meal portioning and their good practices in food-waste reduction; and**
- (c) **expedite actions to finalise the accounts of completed projects.**

2.90 **Audit has also *recommended* that the Secretary for Education, in collaboration with the Secretary for the Environment and the Director of Environmental Protection, should:**

- (a) **take actions to ascertain the reasons of the four new schools installed with on-site meal portioning facilities not adopting on-site meal portioning, and provide necessary assistance for them to adopt the meal arrangement as far as practicable; and**
- (b) **take measures to ensure that all new schools installed with related facilities adopt on-site meal portioning.**

Response from the Government

2.91 **The Secretary for the Environment and the Director of Environmental Protection agree with the audit recommendations in paragraphs 2.88 to 2.90. The Director of Environmental Protection has said that:**

- (a) **for paragraph 2.88, the ENB/EPD, in collaboration with the EDB, will:**

- (i) consider conducting periodic surveys to obtain information on lunch practices at school, including the use of disposable lunch boxes and food-waste quantities, and providing methodologies for measuring food-waste quantities. They will also review the targets on reduction of using disposable lunch boxes at school;
 - (ii) further promote green lunch practices among schools. To maximise the publicity effect, the EPD will consider further promoting green lunch practices in schools through the FW Campaign;
 - (iii) further strengthen efforts to encourage schools to adopt green lunch practices including reviewing the relevant guidelines and circulars and commending schools with good performance; and
 - (iv) explore ways to encourage schools to submit returns on food-waste-reduction quantities through enhanced communications with schools, and consider publishing the good practices in food-waste reduction;
- (b) for paragraph 2.89(a), as the submission of returns from schools is an on-going exercise, the EPD expects that more returns will be received in the coming new school term. For those schools which had already implemented on-site meal portioning, they might not have maintained data on food-waste quantities before implementing the practice. Nevertheless, the EPD will endeavour to invite the schools to find out the food-waste quantities from their past records as far as possible;
- (c) for paragraph 2.89(b), the EPD will work out arrangements for publishing the per-student-per-lunch food-waste quantities of the schools before and after adopting on-site meal portioning and their good practices in food-waste reduction through an appropriate channel; and
- (d) for paragraph 2.89(c), the EPD will expedite actions to finalise the accounts of completed projects.

Reduction in food waste

2.92 The Secretary for Education agrees with the audit recommendations in paragraph 2.90. He has said that:

- (a) for paragraph 2.90(a), the EDB will take follow-up actions to ascertain the reasons of the four schools concerned for not adopting on-site meal portioning and, in collaboration with the ENB/EPD, provide assistance to the four schools concerned to adopt on-site meal portioning as far as practicable;
- (b) for paragraph 2.90(b), the EDB, in collaboration with the ENB/EPD, will take measures to require all new schools installed with related facilities to adopt on-site meal portioning unless there are exceptional circumstances with justifiable reasons;
- (c) for audit recommendations in paragraph 2.88, the EDB will continue to facilitate and work in collaboration with the ENB/EPD to implement the recommendations to further promote food-waste reduction at schools; and
- (d) for the implementation of audit recommendations in paragraph 2.88(a), (b), (f) and (h), the EDB will provide assistance to the ENB/EPD when and where necessary.

PART 3: RECYCLING OF FOOD WASTE

3.1 This PART examines actions taken by the ENB, the EPD and the HD in recycling food waste, focusing on:

- (a) food-waste recycling at Kowloon Bay Pilot Composting Plant (see paras. 3.6 to 3.14);
- (b) food-waste recycling at OWTFs (see paras. 3.15 to 3.41);
- (c) food-waste recycling in public rental housing (PRH) estates (see paras. 3.42 to 3.52); and
- (d) food-waste recycling in private housing estates (see paras. 3.53 to 3.68).

3.2 With a view to achieving the Government's target to reduce food-waste disposal at landfills by 40% by 2022, using 2011 as the base year, the 2014 Food Waste Plan promulgated four measures for increasing food-waste recycling (see Table 8).

Recycling of food waste

Table 8

Projected food-waste recycling quantities by 2022

Particulars	Projected food-waste recycling quantity		
	Domestic sector (tpd)	C&I sector (tpd)	Total (tpd)
Food-waste recycling measures (see Figure 2 in para. 1.13)			
Private facilities at EcoPark by end 2015 (see para. 3.3)	—	100	100 (about 3% of 3,600 tpd)
OWTF Phase 1 by mid-2016 (see paras. 3.15 to 3.41)	—	200	200 (about 6% of 3,600 tpd)
OWTF Phase 2 by end 2018 (see paras. 4.6 to 4.12)	—	300	300 (about 8% of 3,600 tpd)
OWTF Phase 3 by early 2021 (see paras. 4.6 to 4.12)	208	92	300 (about 8% of 3,600 tpd) (Note)
Total	208	692	900
Food-waste quantity disposed of at landfills in 2011 (base year)	2,500	1,100	3,600

Source: Audit analysis of EPD records

Note: The quantities of food waste generated from the domestic and C&I sectors targeted for treatment at OWTF Phase 3 are estimated by Audit based on the corresponding proportion of food waste being disposed of at landfills in 2011. According to the EPD, these quantities are subject to detailed studies and investigations.

3.3 In October 2012, the EPD entered into a tenancy agreement with a private operator for leasing a land lot occupying an area of 8,500 square metres at EcoPark for recycling food waste at a monthly rent of \$180,000. Under the tenancy agreement, the operator was expected to treat a minimum of 2,800 tonnes of food waste a month, or 93 tpd of food waste. The operation commenced in May 2015.

3.4 For the purpose of educating the C&I sector to practise food-waste reduction and source separation and preparing for large-scale food-waste recycling through the implementation of OWTF Phases 1 to 3 (see paras. 3.15 to 3.41), the ENB/EPD constructed the Kowloon Bay Pilot Composting Plant (works completed in August 2008) for treating food waste (0.88 tpd in 2014), and launched in June 2010 the Food Waste Recycling Partnership Scheme (see paras. 3.6 to 3.14). In addition, at end 2012, the HD implemented trial schemes on food-waste recycling in phases using its resources in 14 PRH estates under a community environmental educational programme. The 14 PRH estates participated in the schemes on average provided a total of 1.6 tpd of food waste from January 2013 to July 2014 (see paras. 3.42 to 3.52).

3.5 Moreover, in February 2011, the ECF Committee endorsed the provision of \$50 million to finance a scheme on supporting food-waste recycling projects in private housing estates. The objectives of the scheme were to promote food-waste reduction and source separation and recycling in the domestic sector, to try out the logistics in the collection and recycling of food waste for future reference and to engender behavioural changes of the participating households. The 16 private housing estates participated in the scheme on average provided a total of 0.7 tpd of food waste from September 2012 to June 2015 (see paras. 3.53 to 3.68).

Food-waste recycling at Kowloon Bay Pilot Composting Plant

3.6 In June 2006, the EPD appointed a consultant (the 2006 Consultancy Study) to design, develop and conduct trials at the Kowloon Bay Pilot Composting Plant (the Pilot Plant) for biological treatment of source-separated biodegradable waste, and to formulate and evaluate the requirements for the development of large-scale biological treatment facilities in Hong Kong. In June 2008, the EPD informed the ACE that, in order to gather useful information and local experience on collection and treatment of food waste, and to evaluate the quality, market

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potential and applicability of compost products, the EPD would develop the Pilot Plant with a treatment capacity of about 4 tpd of source-separated food waste from C&I establishments, which would produce compost as a by-product.

3.7 In August 2008, the construction of the Pilot Plant was completed at a total cost of \$16.2 million and the EPD consultant (see para. 3.6) commenced operation of the plant. In April 2009 and March 2010, the EPD informed the EA Panel that the Pilot Plant would be capable of receiving up to 4 tpd of source-separated food waste from C&I premises. In September 2009, the EPD engaged the EMSTF to operate the Pilot Plant, and the EMSTF took over the operation in April 2010 through its contractor. In 2014-15, the operation fee was \$2.87 million.

3.8 In June 2010, the EPD launched the Food Waste Recycling Partnership Scheme (the Partnership Scheme) in collaboration with the C&I sector to provide training to managerial and front-line staff of participating premises on good food-waste management practices, aiming to cultivate and sustain behavioural changes in the C&I sector on food-waste reduction and source separation of food waste. Participating premises would carry out food-waste separation at source, and the EMSTF contractor would collect and deliver the food waste to the Pilot Plant for recycling. Under the Partnership Scheme, the EPD invited the C&I premises to practise source-separation of food waste each for two to nine months. From the commencement of the Partnership Scheme in June 2010 to July 2015, a total of 189 C&I premises had participated in the Scheme. According to the EPD, the participating C&I premises and their front-line staff had become familiar with the practices of collection and source-separation of food waste.

Areas for improvement

Actual treatment quantity of Pilot Plant significantly lower than that reported to LegCo and ACE

3.9 From 2008 to 2010, the EPD had informed the ACE and the EA Panel that the Pilot Plant would treat/receive up to 4 tpd of food waste (see paras. 3.6 and 3.7). However, Audit noted that, from August 2008 to June 2015, the average quantity of food waste treated at the plant was only 0.89 tpd (see Table 9), representing only 22% of the 4-tpd capacity reported to the ACE and the EA Panel.

Table 9

**Actual food-waste treatment quantity of Pilot Plant
(August 2008 to June 2015)**

Year	Quantity of food waste treated	
	Total (tonnes)	Daily average (tpd)
2008 (Aug. to Dec.)	43	0.28
2009	224	0.61
2010	367 (see para. 3.10(a))	1.01
2011	561	1.54
2012	288	0.79
2013	315	0.86
2014	322	0.88
2015 (Jan. to Jun.)	118	0.65
Overall	2,238	0.89

Source: Audit analysis of EPD records

3.10 In May 2013, in response to a LegCo Member's enquiry, the ENB informed LegCo that the quantity of food waste recycled in the Pilot Plant in 2010 was 278 tonnes. In July, September and October 2015, the EPD informed Audit that:

- (a) the 367 tonnes of food waste treated in 2010 comprised 89 tonnes collected from January to May 2010 for testing and commissioning of the Pilot Plant and 278 tonnes from June to December 2010. In this connection, the Partnership Scheme was launched in June 2010 (see para. 3.8). As the LegCo Member asked for the Government's action to mobilise the public and the C&I sector to reduce food waste, the 89 tonnes of food waste collected from January to May 2010 for testing and commissioning were not included in the quantity reported to LegCo in May 2013;

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- (b) the 4-tpd of source-separated food waste from C&I premises as stated in the ACE and EA Panel papers (see paras. 3.6 and 3.7) was referring to the total quantity of organic waste (including food waste, bulking agents (e.g. bark chips and saw dust) and premature compost) putting into the Pilot Plant. The addition of bulking agents and premature compost was required to achieve the optimal composting of food waste. As the term “organic waste” was less well-understood generally and less well-defined at that time because of limited experience, a layman term “food waste” was used instead in the papers to better reflect the main focus of the pilot project. The contract between the EMSTF and its contractor (see para. 3.7) also specified that the total treatment capacity of the Pilot Plant was 4 tpd (including bulking agents); and

- (c) participation by C&I premises in the Partnership Scheme was on a voluntary basis. The factors affecting the actual quantity of food waste delivered to the Pilot Plant included the business nature of the C&I premises, the quantity of food waste that could be source-separated, and their daily operations and resources for practising source separation. Therefore, the quantity of food waste delivered to the Pilot Plant would vary among different C&I premises and even vary from day to day for the same premises.

3.11 In Audit’s view, in informing LegCo and the ACE from 2008 to 2010 (see paras. 3.6 and 3.7) that the Pilot Plant would treat/receive up to 4 tpd of food waste, this quantity of food waste could be perceived as the net quantity of food waste to be treated a day. If the 4 tpd of food waste had included bulking agents and other non-food-waste materials (e.g. premature compost), the EPD should have clearly stated the related quantities in providing the related information to LegCo and the ACE. The ENB/EPD need to make improvement in this area.

Low utilisation of food-waste recycling facility

3.12 In September 2015, the EPD informed Audit that the total treatment capacity of the Pilot Plant was about 500 tonnes of food waste per year (i.e. 1.37 tpd), and that the Pilot Plant would provide sufficient capacity for handling the fluctuating quantities of food waste collected from the C&I sector.

However, the average quantity of food waste treated was 0.65 tpd in the first half of 2015 (see Table 9 in para. 3.9), representing only 47% of the treatment capacity of 1.37 tpd of the Pilot Plant. In order to fully utilise the treatment capacity of the Pilot Plant and to inculcate behavioural changes in the C&I sector on food-waste reduction and source separation of food waste, the ENB/EPD need to strengthen efforts to encourage more C&I premises to participate in the Partnership Scheme.

Audit recommendations

3.13 **Audit has recommended that the Secretary for the Environment and the Director of Environmental Protection should:**

- (a) **take measures to provide clear, relevant and important information to LegCo and the ACE in future; and**
- (b) **strengthen efforts to encourage more C&I premises to participate in the Food Waste Recycling Partnership Scheme.**

Response from the Government

3.14 The Secretary for the Environment and the Director of Environmental Protection agree with the audit recommendations.

Food-waste recycling at organic waste treatment facilities

3.15 The 2013 Blueprint set targets to reduce the per-capita-per-day MSW disposal rate from 1.27 kg in 2011 to 1 kg or below by 2017, and further to 0.8 kg or below by 2022. Under the 2013 Blueprint, modern large-scale OWTFs would be developed in phases, with the first two phases set out as follows:

- (a) OWTF Phase 1 for commissioning by 2016, which would treat 200 tpd of food waste (or 73,000 tonnes per year); and
- (b) OWTF Phase 2 for commissioning by 2017, which would treat 300 tpd of food waste (or 109,500 tonnes per year).

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3.16 OWTFs adopt the anaerobic-digestion technology for treating food waste where micro-organisms would decompose organic matter and generate biogas (a renewable energy similar to natural gas) and a residue that can be processed for use as compost or fertiliser. The energy produced can be used to run the OWTFs and surplus energy can be directed for other uses. Under the 2014 Food Waste Plan, the ENB further elaborated its plan to develop OWTFs by phases (see Table 10).

Table 10

Proposed OWTFs under 2014 Food Waste Plan

OWTF Phase	Location	Planned food-waste treatment capacity	Projected commissioning date
1	Siu Ho Wan in North Lantau	200 tpd (73,000 tonnes per year)	Mid-2016
2	Sha Ling in Sheung Shui	300 tpd (109,500 tonnes per year)	End 2018
3	Shek Kong in Yuen Long	300 tpd (109,500 tonnes per year)	Early 2021
4 and 5	To be determined	Total capacity of 500 tpd (182,500 tonnes per year)	Beyond 2022

Source: Audit analysis of EPD records

3.17 In September 2015, the EPD informed Audit that the updated estimated commissioning dates of OWTF Phases 1, 2 and 3 were mid-2017, 2020 and 2022 respectively.

OWTF Phase 1

3.18 In August 2008, the EPD appointed a consultant (Consultant A) at a lump-sum price of \$6.2 million for carrying out engineering feasibility study, project cost estimation, environmental impact assessment (EIA) study and tendering for appointing a contractor for OWTF Phase 1. In October 2014, the FC approved funding of \$1,589.2 million (in money-of-the-day (MOD — Note 29) prices — see Appendix F for the cost breakdown information) for the design and construction of OWTF Phase 1, which was targeted for commissioning in mid-2017.

3.19 After conducting open tendering in early 2013, in December 2014, the EPD awarded a design-build-operate contract (Contract A) at a total cost of \$2,380.6 million to a contractor (Contractor A) for carrying out the detailed design, construction works and operating OWTF Phase 1 for 15 years after completion of the construction works. The total contract cost of \$2,380.6 million included annual operation fees to be funded under the General Revenue Account. Under Contract A, the works commenced in December 2014 and were scheduled for completion in March 2017.

Areas for improvement

Significant under-estimation of project cost of OWTF Phase 1 in 2010

3.20 According to the project profile of OWTF Phase 1 published in October 2007 under the EIA Ordinance (Cap. 499 — Note 30), the tendering for the project was planned to commence in July 2010 with a view to commissioning the facility in March 2013. In July 2010, the EPD informed the ENB that:

Note 29: *MOD prices of a works project indicate the estimated cost of the project after adjusting for forecast inflationary increases in construction prices during the period up to the completion of construction works.*

Note 30: *An OWTF is a designated project under the EIA Ordinance, and a person who wishes to carry out a designated project needs to submit a project profile to the Director of Environmental Protection for issuing an EIA study brief. Thereafter, he needs to prepare an EIA report based on the EIA study brief for submission to the Director for approval, and to obtain an environmental permit before constructing or operating the project. The EPD has set up a separate division to handle matters related to the EIA Ordinance.*

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- (a) the parallel-tendering approach (Note 31) was a fast-track mode which would help commission OWTF Phase 1 by 2013 and enable the Government to obtain a realistic cost estimate for the facility; and
- (b) by adopting the parallel-tendering approach, the risk to the Government of aborting the tender exercise due to lack of funding was low.

In August 2010, the ENB approved the EPD's proposal to adopt the parallel-tendering approach.

3.21 From October to December 2010, with the approval of the Permanent Secretary for Financial Services and the Treasury (Treasury) on the advice of the Central Tender Board (Note 32), the EPD openly invited interested contractors to participate in a prequalification exercise for selecting the best three contractors (having suitable experience, adequate resources and capability) to submit tenders for the project.

3.22 In November 2010, the EPD informed the EA Panel that:

- (a) the estimated cost of the project was \$489 million (in MOD prices), and that the EPD would finalise the cost estimate based on the tender prices received and compile a cost breakdown prior to submitting the proposal to the Public Works Subcommittee (PWSC) of LegCo for consideration; and
- (b) the EPD planned to proceed with the tendering for the project before seeking funding approval from the FC with a view to completing OWTF Phase 1 by 2014.

Note 31: *According to Financial Circular No. 2/2009 "Initiating Works-related Tendering and Consultants Selection Procedures Before Funding is Secured" issued in January 2009, Directors of Bureaux may allow tenders for works projects to be invited before funding is secured, without separate approval from the FSTB.*

Note 32: *The Central Tender Board comprises the chairman (the Permanent Secretary for Financial Services and the Treasury (Treasury)) and four members to consider tender matters and make recommendation on acceptance of tenders.*

3.23 In June 2011, the EPD, with the assistance of Consultant A, invited prequalified tenderers to submit tenders for the project (2011 Tender Exercise). In March 2012, after assessments of tenders received in November 2011, the EPD found that the price of the lowest tender was significantly higher than the Government's earmarked funding for the proposed works. In the same month, the EPD informed the Central Tender Board that:

- (a) the funding earmarked for the project was based on the cost estimate made in late 2009; and
- (b) the tender prices received were unreasonably high when compared with updated estimates (Note 33) and the project cost could be reduced by introducing some cost-reduction measures, including extending the design and construction period from 730 days to 920 days, introducing more milestone payments to reduce the contractor's finance cost, and introducing a guaranteed food waste tonnage of 50 tpd (i.e. 18,250 tonnes per year) to reduce the risk of waste-quantity uncertainty faced by the contractor.

The Central Tender Board approved the EPD's proposal to cancel the 2011 Tender Exercise in the public interest.

3.24 In June 2012, in response to the FSTB's enquiry, the EPD said that:

- (a) the EPD's project team had been working under a very tight programme to finalise the tender documents for tender invitation in June 2011, and it was impracticable to come up with a revised cost estimate at that time;
- (b) the cost review carried out by the project team before tender closing date in November 2011 indicated that the capital cost of the proposed works would be substantially increased to approximately \$1,100 million such that the originally earmarked funding would not be adequate to cover the capital cost; and

Note 33: *In October 2015, the EPD informed Audit that the updated estimates had been worked out based on the latest market prices and condition at that time.*

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- (c) given the sharp rising trends in the construction-cost indices and the lack of local reference for similar facilities, the EPD had decided to wait for the completion of the tender assessment in March 2012 when a definitive project cost estimate could be made available before seeking approval to increase the amount of earmarked funding for the proposed works.

3.25 In July 2012, after consulting the EPD's legal adviser, the EPD instructed Consultant A to carry out additional services relating to a re-tender exercise for the project at a lump-sum fee of \$1.8 million, and the EPD added a provision in the consultancy agreement that the proposed additional services to be undertaken by Consultant A would not release Consultant A from any liability to the Government relating to the consultancy work for OWTF Phase 1.

3.26 In February 2013, the EPD, with the assistance of Consultant A, commenced a re-tender exercise for the project through open tendering. Three tenders were received by the tender closing date in July 2013. In December 2014, Contract A was awarded to Contractor A (see para. 3.19).

3.27 On 13 March 2014, the ENB/EPD informed the EA Panel that the capital cost of the proposed works for OWTF Phase 1 was estimated at \$1,532.8 million (in MOD prices — Note 34). The ENB/EPD also informed the EA Panel that the initial estimate of \$489 million (in MOD prices) presented in the EA Panel paper of November 2010 (see para. 3.22(a)) was an indicative figure based on an initial, broad-brush scheme, and the main reasons for the differences between the latest project cost and the initial indicative estimate included:

- (a) since 2010, there had been significant increases in the costs of capital works projects. For instance, the Building Services Tender Price Index had increased by over 65% in the previous few years;

Note 34: *Partly due to an increase in the price level, the project cost approved by the FC in October 2014 was \$1,589.2 million (see para. 3.18).*

- (b) during the detailed designs, additional provisions were identified for providing a sufficient and robust treatment capacity to meet the service-level requirements for continuous 24-hour operation of the facility in normal and anticipated circumstances of scheduled maintenance, overhauls, variation in quality of incoming food waste, and inclement weather conditions. These requirements included the provision of pre-treatment facilities to render the food waste suitable for anaerobic digestion, enhanced waste-water treatment requirements, and increased waste treatment and office-floor areas to meet operational requirements;
- (c) after conducting a detailed site condition study, natural terrain and slope protection cum mitigation works had been proposed. Additional environmental mitigation and monitoring measures had also been identified for implementing the recommendations stated in the EIA study;
- (d) design of the combined heat and power generators and associated control system for export of surplus electricity could only be finalised after the quantity of surplus electricity available for export had been ascertained in the detailed design of the treatment facility; and
- (e) consultants' fees for contract administration and remuneration of resident site staff were later found to be required.

3.28 Regarding the ENB/EPD's reasons for the differences between the initial indicative estimate of \$489 million (in MOD prices) reported to the EA Panel in November 2010 and the project estimate of \$1,532.8 million (in MOD prices) reported to the EA Panel in March 2014, representing a 213% increase, Audit examination revealed that:

- (a) for paragraph 3.27(a), in October 2015, the EPD informed Audit that the project cost of \$489 million reported to the EA Panel in November 2010 had been based on the price level in the second quarter of 2010, and the \$1,532.8 million reported in March 2014 had been based on the price level in the second quarter of 2013. The increases in the related price indices from the second quarter of 2010 to the second quarter of 2013 were:

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- (i) the Building Services Tender Price Index (compiled by the Architectural Services Department) had increased from 135 to 230 (representing a 70% increase);
 - (ii) the Building Works Tender Price Index (compiled by the Architectural Services Department) had increased from 1,161 to 1,532 (representing a 32% increase); and
 - (iii) the Civil Engineering Works Index (compiled by the Civil Engineering and Development Department) had increased from 482.4 to 575.0 (representing a 19% increase);
- (b) for paragraph 3.27(b), the EPD had engaged Consultant A at a lump-sum price of \$6.2 million to carry out the engineering feasibility study, the project cost estimation, the EIA study and tendering for appointing a contractor for OWTF Phase 1. In this connection, the EIA report prepared by Consultant A in December 2009 and approved by the EPD in February 2010 had already indicated that OWTF Phase 1 would be operated on a 24-hour daily basis, and pre-treatment and waste-water treatment facilities would be provided. The costs associated with these arrangements should have been included in the project estimate of \$489 million. As approved by the FC in October 2014, the estimated costs of the pre-treatment system and waste-water treatment system were \$56.2 million and \$50.7 million respectively (in September 2014 prices — see items 3(b) and 5 in Appendix F);
- (c) for paragraph 3.27(c), in November 2006, the Civil Engineering and Development Department requested that a natural terrain hazard study should be conducted for the project, but the EPD had not included this work in the consultancy agreement entered into with Consultant A in August 2008. In September 2011, the EPD requested Consultant A to carry out the study at an additional cost of \$0.8 million. According to the EPD, the cost of the required slope mitigation works was \$66.7 million, which should have been included in the project estimate of \$489 million. Audit considers that the EPD needs to take measures to prevent recurrence of such an omission in future;

- (d) for paragraph 3.27(d), OWTF Phase 1 is a waste-to-energy facility and the EPD informed EA Panel in November 2010 that up to 28 million kilowatt-hour (kWh) of surplus electricity could be exported every year that would be adequate for use by 3,000 households (Note 35). Therefore, the cost of providing the power generators and associated control system should have been included in the project estimate of \$489 million. As approved by the FC in October 2014, the estimated cost of the facility was \$105.3 million (in September 2014 prices — see item 6 in Appendix F); and
- (e) for paragraph 3.27(e), the cost estimates for consultants' fees for contract administration and remuneration of resident site staff should have been included in the project estimate of \$489 million. As approved by the FC in October 2014, the related estimated cost was \$43.2 million (\$25.5 million plus \$17.7 million in September 2014 prices — see items 9 and 10 in Appendix F).

Audit considers that the ENB/EPD need to take measures to provide clear, relevant and important information to LegCo in future (see para. 3.13(a)).

3.29 In November 2010, the EPD informed the EA Panel that the estimated cost of the project was \$489 million (in MOD prices). As it transpired, the 2011 Tender Exercise was cancelled in the public interest. Audit noted that the price of the lowest tender was significantly higher than the Government's earmarked funding for the proposed works and the EPD considered that the price of the lowest tender was unreasonably high (see para. 3.23). In the event, another tender exercise was carried out in February 2013 through open tendering, and the FC approved in October 2014 funding of \$1,589.2 million (in MOD prices) for the design and construction of the project.

Note 35: *In July, September and October 2015, the EPD informed Audit that:*

- (a) *there was a typographical error in the EA Panel paper of November 2010 where "28 million kWh" should read "14 million kWh", and the EPD had subsequently corrected this error in the information provided to the PWSC and the FC for seeking funding approval in 2014; and*
- (b) *the key information that the surplus electricity would be adequate for use by 3,000 households as a major environmental benefit of the project had been correctly conveyed to LegCo in the same EA Panel paper. The typographical error in the EA Panel paper had not materially affected the main subject of the discussion.*

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3.30 In September and October 2015, the EPD informed Audit that:

- (a) the scale of OWTF Phase 1 was the first of its kind in Hong Kong, and there was no applicable cost-reference data to allow the EPD to come up with an accurate cost estimate for the project. The EPD had adopted a prudent and cautious approach of going for tendering prior to submitting a funding application to the PWSC in order to get a more reliable estimate for seeking funding approval. Upon the completion and approval of the EIA report in February 2010 (see para. 3.28(b)), the EPD carried out more detailed designs to develop the project specifications and requirements in accordance with the findings and recommendations in the approved EIA report and to meet other necessary service and operational requirements. These project specifications and requirements had been incorporated in the 2011 Tender Exercise;
- (b) in parallel with the 2011 Tender Exercise, the EPD carried out an in-house assessment on the source of funding for a contract-administration consultancy. After assessment, the EPD decided to include the cost of the contract-administration consultancy and that of the associated remuneration of resident site staff under the project (see para. 3.28(e)). The EPD only commenced the process for engaging the contract-administration consultant in January 2012. While the tender returns in the 2011 Tender Exercise reflected the requirements based on detailed studies on site conditions and operational needs, ENB/EPD analyses indicated that the general market volatility particularly in the construction industry since 2010 would significantly increase the tender prices reflected in the tender returns to cover the associated risks and costs. If the returned tender prices were not unreasonably high, the EPD would have followed the established administrative procedures to seek the Government's approval to increase the funding earmarked for the project; and
- (c) the updated project cost estimate compiled according to the tender price received in the tender exercise conducted in 2013 (representing the updated market price), together with a detailed breakdown of all the major works components, had been provided to the EA Panel, the PWSC and the FC for seeking funding approval in 2014. There was no omission of works in the 2014 cost estimates, and there was no impact on the overall implementation and the cost of the OWTF Phase 1 project. The fact that the capital and operation costs of Contract A awarded in

December 2014 were lower than those of the returned tender prices in the 2011 Tender Exercise had proven that the EPD's proposal to cancel the 2011 Tender Exercise on public interest grounds (see para. 3.23) was prudent, correct and justified.

3.31 Partly owing to the cancellation of the 2011 Tender Exercise and re-tendering of the project in 2013, the commissioning of OWTF Phase 1 would be postponed by four years from March 2013 to mid-2017. During the four-year period, a substantial quantity of food waste would be disposed of at landfills instead of being treated by the facility. In this connection, OWTF Phase 1 was designed to treat 200 tpd or 73,000 tonnes of food waste a year. While Audit noted that the cancellation of the 2011 Tender Exercise was made in the public interest (see para. 3.23), the tender cancellation could undermine the Government's credibility in conducting tender exercises.

3.32 Audit also noted that, mainly owing to the omissions or significant under-estimation of some cost components in the project estimate made in November 2010 (see para. 3.28(b) to (e)), the project estimate of \$489 million (in MOD prices) had been significantly under-estimated. As a result, the Government's earmarked funding for the project was insufficient to meet the project cost. The ENB/EPD need to draw lessons from this incident and take measures to make improvement in implementing a works project in future.

Need to provide LegCo with cost-breakdown information

3.33 On 21 March 2014, in response to the EA Panel's request for detailed breakdown information of the original project estimate of \$489 million for comparison with the updated project estimate of \$1,532.8 million, the ENB/EPD said that:

- (a) they did not have the detailed breakdown information on the project cost of \$489 million estimated in 2010; and
- (b) the \$489 million was an indicative figure based on an initial broad-brush scheme, comprising provision for basic plant and equipment for anaerobic digestion and composting (estimated at \$250 million), and basic civil engineering and building works (estimated at \$239 million).

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- 3.34 In September and October 2015, the EPD informed Audit that:
- (a) the project estimate of \$489 million was a rough and indicative one based on a broad-brush scheme developed in April 2007 under the 2006 Consultancy Study (see para. 3.6), and the scheme was used as the reference basis for working out the initial capital cost estimate stated in the Technical Feasibility Statement (Note 36) for OWTF Phase 1 prepared by the EPD in July 2007;
 - (b) the broad-brush scheme developed in April 2007 was compiled based on information collected from overseas anaerobic-digestion suppliers for the development of large-scale biological treatment facilities; and
 - (c) the cost figures were intended for indicative purposes and subject to change when further information on the development of OWTF Phase 1 was available and they had been prepared before the appointment of Consultant A to carry out the engineering feasibility study in August 2008. The detailed engineering feasibility study was completed in February 2011.
- 3.35 Appendix G shows the cost breakdown of \$489 million according to the Technical Feasibility Statement prepared by the EPD in July 2007 and approved by the Development Bureau in August 2007, together with the EPD's project cost updates from August 2007 to November 2010.
- 3.36 Audit considers that the cost-breakdown information of \$489 million in Appendix G would facilitate the EA Panel in conducting a cost comparison in March 2014 with the updated cost breakdown of \$1,532.8 million (see para. 3.33). Therefore, the ENB/EPD need to endeavour to provide cost-breakdown information requested by LegCo in future.

Note 36: *According to the prevailing Financial Circular No. 11/2001 "Requirements for Project Definition Statement and Technical Feasibility Statement for Capital Works Projects" issued in November 2001, a works department concerned was required to complete a Technical Feasibility Statement. Financial Circular No. 11/2001 was replaced by Financial Circular No. 4/2012 in July 2012 with the above requirement remaining unchanged.*

Risk of inadequate food waste delivered to OWTF Phase 1

3.37 In November 2010, the EPD informed the EA Panel that OWTF Phase 1 would provide treatment for source-separated organic waste primarily coming from the C&I establishments located in districts near Siu Ho Wan, such as Lantau Island, Tsuen Wan, Kwai Tsing, Sham Shui Po, Yau Tsim Mong and Kowloon City. According to the EPD's plan, of the design capacity of OWTF Phase 1 of 200 tpd, 85.6 tpd (43%) would be utilised by the food waste generated by the 25 wet markets located in the related districts managed by the FEHD, and the remaining 114.4 tpd (57%) of food waste will be provided by private sectors such as shopping malls, food factories, restaurants and hotels.

3.38 In October 2011, the FEHD informed the EPD that, in view of resource consideration, the FEHD would only select 5 wet markets for delivering 11.5 tpd of food waste (i.e. representing only 13% of the planned 85.6 tpd) to OWTF Phase 1. In Audit's view, the ENB/EPD need to take measures to ensure that adequate quantity of food waste is collected and delivered to OWTF Phase 1 for treatment upon its commissioning in mid-2017.

Audit recommendations

3.39 **Audit has recommended that the Secretary for the Environment and the Director of Environmental Protection should:**

- (a) **in implementing a works project in future:**
 - (i) **take measures to ensure that significant work requirements are included in a consultancy agreement; and**
 - (ii) **endeavour to make a reasonable cost estimate so that the Government can earmark sufficient funding for the project; and**
- (b) **take measures to ensure that adequate quantity of food waste is collected and delivered to OWTF Phase 1 for treatment upon its commissioning in mid-2017.**

Response from the Government

3.40 The Secretary for the Environment and the Director of Environmental Protection agree with the audit recommendations. The Director of Environmental Protection has said that:

- (a) for paragraph 3.39(a), the EPD will continue to make reasonable cost estimates and ensure that significant work requirements are stipulated in project consultancy agreements; and
- (b) for paragraph 3.39(b), the EPD has engaged a service contractor to liaise with the C&I sector and will continue to secure support from the major food-waste-generation establishments to deliver source-separated food waste to OWTF Phase 1 for treatment upon its commissioning in mid-2017.

3.41 The Director of Food and Environmental Hygiene has said that, for paragraph 3.38:

- (a) the FEHD has provided the EPD with data on the daily waste generation of wet markets to facilitate the EPD's estimation of the quantity of food waste that could be separated for collection and delivery to OWTF Phase 1; and
- (b) subject to the FEHD's resources and capability in food-waste separation, collection and delivery, it will continue to work in collaboration with the EPD to collect and deliver food waste from stall operators in public markets (including cooked food markets) to OWTF Phase 1.

Food-waste recycling in public rental housing estates

3.42 Since 2005, in order to raise environmental awareness among PRH residents and instil a culture of protecting and improving the environment, the HD had launched a community environmental educational programme in PRH estates (a total of 171 estates had participated in the programme as of August 2015), under which three NGOs had been engaged to assist in carrying out related activities. While the programme focused on different environmental themes every year, since 2012, the programme had focused on reduction of MSW including food waste.

On-site recycling scheme

3.43 In December 2012, under the community environmental educational programme, the HD implemented a trial on-site food-waste recycling scheme using its resources in Lam Tin Estate. Under the trial scheme, the HD procured and installed food-waste treatment facilities in Lam Tin Estate for decomposing food waste (by micro-organisms) into fertiliser for use by the Estate. Of the 3,000 PRH flats in Lam Tin Estate, 90 households (3%) had participated in the scheme. Under the scheme, each participating household was provided with a food-waste bucket for storing food waste and delivering to a collection point, where the bucket would be exchanged for a clean and empty one. The HD cleansing staff would collect the food-waste buckets and empty the food waste into receiving bins for fermentation before burying it into the ground for further treatment.

Off-site recycling schemes

3.44 From November 2012 to July 2014, under the community environmental educational programme, the HD had implemented trial off-site recycling schemes in 13 PRH estates (Note 37) using its own resources. Of the total 64,600 PRH flats in the 13 PRH estates, 3,108 households (4.8%) had participated in the schemes.

Note 37: *The 13 PRH estates were:*

- (a) *5 estates which commenced participating in the scheme in 2012, namely Ching Ho Estate, Lai Kok Estate, Nam Shan Estate, Tin Tsz Estate and Tin Wah Estate; and*
- (b) *8 estates which commenced participating in the scheme in 2013 and 2014, namely Grandeur Terrace, Kai Tin Estate, Lai On Estate, Lei Muk Shue Estate, On Yam Estate, Sun Chui Estate, Tin Ching Estate and Tsz Ching Estate.*

Recycling of food waste

Under the schemes, there were two arrangements for collecting food waste. Firstly, each participating household was provided with a food-waste bucket for storing food waste and delivering to a collection point, where the bucket would be exchanged for a clean and empty one. Secondly, a household would directly empty the food waste into a large food-waste container. The HD provided funding (Note 38) of \$72,490 a month to three NGOs for engaging a recycler to collect and transport the food waste from the 13 PRH estates to a private food-waste-recycling plant in Yuen Long for recycling the food waste into fish feed for selling by the recycler.

Areas for improvement

Small number of households in PRH estates participating in food-waste recycling trial schemes

3.45 According to surveys conducted by an HD consultant in 2012, 2013 and 2014, 66.1%, 66.5% and 65.2% of respondent residents of PRH estates respectively indicated that they would support and participate in food-waste recycling if it was implemented at their estates. However, Audit noted that, during the implementation of the schemes from November 2012 to July 2014, of the 67,600 households residing in all the 111 blocks in the 14 PRH estates, the HD had only invited 52,000 households in 86 blocks (77%) to participate in the food-waste-recycling schemes. In the event, only 3,198 (i.e. 6.2% of the 52,000 households invited) households had participated in the schemes.

3.46 During the 19 months from January 2013 to July 2014 (Note 39), the participating households had provided food waste weighing 599 tonnes. On average, 0.58 kg per-household-per-day of food waste was collected for treatment.

Note 38: *According to the HD, for both the on-site and off-site recycling schemes, it had incurred capital cost of the relevant building works and procuring the food-waste buckets, as well as the day-to-day running cost of water, electricity and hiring the related staff.*

Note 39: *Each of the 14 estates had participated in the scheme for different periods of time, ranging from 6 to 21 months. According to the HD, the quantities of food waste collected in the two preparatory months (i.e. November and December 2012) should be excluded in calculating the per-household-per-day food waste.*

3.47 In Audit's view, in implementing food-waste recycling schemes in future, the HD needs to invite as many households as possible to participate in the schemes. The HD also needs to strengthen efforts to encourage households to participate in the food-waste recycling schemes in future. To provide incentives for households to participate in the schemes, the HD may consider extending some forms of commendation to the participating households.

Cessation of food-waste recycling in PRH estates

3.48 In April 2014, the HD requested the EPD to provide annual funding of \$440,000 to support the continued operation of food-waste recycling in seven estates where the trial food-waste recycling schemes would end in June 2014. In this connection, in addition to the HD-funded food-waste recycling schemes (see paras. 3.43 and 3.44), from December 2011 to December 2013, the HD had implemented a trial food-waste recycling scheme funded by the EPD in two PRH estates using on-site composters. In reply, the EPD said that PRH estates were not qualified to apply for funding from the ECF for implementing food-waste recycling schemes because the HD might receive other forms of government funding. In October 2015, the HD informed Audit that, after conducting a review of the trial schemes (including the funding consideration), it had decided to:

- (a) taking into account the cost effectiveness, workload implications, tenants' responses, capacity of the food-waste recycler, and the food safety of the fish feed produced, cease the trial food-waste recycling schemes in 13 estates adopting off-site recycling with only Lam Tin Estate (adopting on-site recycling) continuing its food-waste recycling; and
- (b) since the trial schemes had provided invaluable experience in food-waste recycling for any future implementation of similar schemes in PRH estates, move on to a promotion-cum-incentive stage for waste reduction at source under the community environmental educational programme and expand the focus to reduction of all MSW.

Recycling of food waste

3.49 Audit notes that some 30% of Hong Kong's population live in PRH estates which are under the HD's management. In Audit's view, the HD needs to take the lead to practise food-waste recycling in PRH estates which would set an example for private housing estates to follow. Therefore, the HD and the ENB/EPD need to explore ways to finance food-waste recycling schemes in PRH estates.

Audit recommendations

3.50 **Audit recommends that the Director of Housing, in collaboration with the Secretary for the Environment and the Director of Environmental Protection, should:**

- (a) **in implementing food-waste recycling schemes in PRH estates in future:**
 - (i) **invite as many households as possible to participate in the schemes;**
 - (ii) **strengthen efforts to encourage households to participate in the schemes; and**
 - (iii) **consider extending some forms of commendation to the participating households; and**
- (b) **take the lead to practise food-waste recycling in PRH estates to set an example for private housing estates to follow.**

Response from the Government

3.51 The Director of Housing agrees with the audit recommendations. He has said that:

- (a) the Housing Authority aims to provide green and healthy living to PRH tenants and always supports the Government in pursuing environmental protection policies; and

- (b) the HD will continue to promote the reduction in food waste and other MSW in PRH estates and support the Government's green initiatives, keep in view developments in relation to food-waste reduction and recycling (such as the capacity and effectiveness of recyclers) and, taking into account Audit's recommendations, consider implementing suitable measures and initiatives.

3.52 The Director of Environmental Protection has said that the EPD will continue to provide technical assistance to the HD to practise food-waste recycling in PRH estates.

Food-waste recycling in private housing estates

3.53 In February 2011, the ECF Committee earmarked \$50 million to support the EPD's proposed scheme to implement food-waste collection and recycling projects in private housing estates. According to the EPD, the objectives of the scheme were to promote food-waste reduction, source separation and recycling in the domestic sector, to try out the logistics in the collection and recycling of food waste, and to engender behavioural changes of the participating households. The EPD also informed the ECF Committee that:

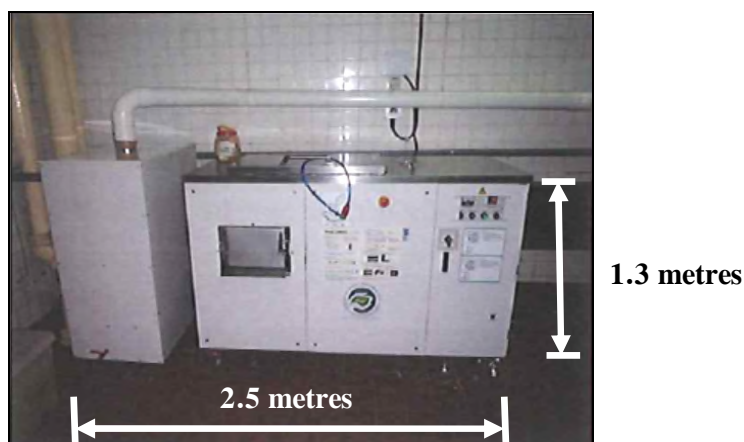
- (a) each approved housing estate would launch a two-year project using a leased on-site food-waste treatment machine (see Photograph 3 and Note 40) with a treatment capacity of 50 to 100 kg of food waste a day (i.e. 18.3 to 36.5 tonnes per year); and
- (b) the earmarked amount of \$50 million was estimated to cater for 80,000 households with an average participation rate of 10%.

In July 2011, the EPD set up a help-desk to provide technical advice and assistance on food waste collection and recycling to private housing estates requiring such assistance.

Note 40: *Under a lease of a food-waste treatment machine, the machine could be retained by the lessee upon expiry of the two-year lease period at a buy-in cost.*

Photograph 3

On-site food-waste treatment machine



Source: EPD records

3.54 According to the 2014 Food Waste Plan published in February 2014, the Government envisaged that 250,000 households (i.e. around 11% of the 2,270,000 households in Hong Kong) would participate in separation of food waste by 2022. In September 2014, the EPD informed LegCo that, as of August 2014, 39 private housing estates had received funding under the ECF to install food-waste treatment facilities, and a total of 1,400 tonnes of food waste would be recycled each year (i.e. 3.8 tpd).

3.55 In September 2014, the EPD informed the ECF Committee that some private housing estates would have difficulties to finance the full operation cost after the two-year period and these estates would most likely discontinue the food-waste recycling projects due to lack of further funding support. Subsequently, the ECF Committee approved the EPD's proposal that, upon successful application by housing estates, further funding support (also known as extended funding support) for another two years (subject to a maximum of 50% of the actual operation cost and a ceiling of \$0.3 million for each project) would be provided to enable the estates to continue their food-waste recycling projects, and there would be no further funding support upon completion of the extended two-year period. The ECF Committee also earmarked additional \$10 million to cater for applications from other private housing estates on top of the \$50 million originally earmarked in 2011 (see para. 3.53).

3.56 According to the EPD, food-waste recycling schemes in housing estates using individual on-site treatment machines are for educational and awareness-raising purposes in the interim period before the building up of adequate food-waste treatment capacities in various regions in Hong Kong, because there are many constraints and operational problems associated with the use of on-site treatment machines in individual estates, making them not a viable long-term food-waste recycling solution for Hong Kong. In this connection, the EPD informed the ECF Committee in September 2014 that since on-site recycling was not the most suitable long-term solution for Hong Kong, the EPD recommended that the continuation of the food-waste recycling schemes in private housing estates should be reviewed nearer to the commissioning of OWTF Phase 1 (i.e. in mid-2017 — see para. 3.17).

3.57 From November 2011 to June 2015, the ECF Committee had granted funding approvals to 47 private housing estates for implementing food-waste recycling projects (see Table 11):

Table 11

**ECF projects on food-waste recycling in private estates
(November 2011 to June 2015)**

Project	Number of estates	Approved funding (\$ million)
(a) Completed and:		
(i) applied for extended funding support (see para. 3.55)	3	2.9
(ii) not applied for extended funding support	6	5.7
	—	—
Sub-total for completed projects	9	8.6
(b) In progress	7	6.9
(c) Not yet commenced	24	25.7
(d) Withdrawn by estates before project commencement	7	Not applicable
Total	47	41.2

Source: EPD records

Areas for improvement

Low utilisation of food-waste recycling facilities in private housing estates

3.58 As of June 2015, 9 recycling projects had been completed and 7 projects were in progress. The 16 estates involved were inhabited by 43,091 households. Of the 16 estates, 14 (with a total of 29,804 households) provided air-tight containers to 1,644 participating households for storing and delivering food waste to collection points located at management offices. For the remaining 2 estates (with 13,287 households), the 337 participating households put food waste into collection bins located in common areas or put food-waste containers outside their units for collection by cleaners.

3.59 During the 34 months from commencement of the recycling projects in September 2012 to June 2015, of the 43,091 households residing in the 16 estates, 1,981 households (4.6% — ranging from 2.2% to 24.1% in each of the 16 estates) had participated in the recycling projects, which had provided food waste weighing 415 tonnes. On average, food waste of 42.7 kg per estate per day (ranging from 13 kg to 75.5 kg in each of the 16 estates) and 0.35 kg per household per day was collected for treatment (Note 41).

3.60 Audit noted that the overall average household participation rate of 4.6% of the recycling projects was much lower than that of 10% estimated by the EPD in February 2011 (see para. 3.53(b)). In this connection, the Government envisages that 11% of all the households in Hong Kong will participate in separation of food waste by 2022 (see para. 3.54). Given that the on-site treatment machines each had a daily treatment capacity of 100 kg of food waste, the 42.7 kg of food waste collected per estate per day only accounted for 42.7% of the total treatment capacity of the machines.

Note 41: *Each of the 16 estates had participated in the scheme for different periods of time, ranging from 2 to 24 months.*

3.61 According to the EPD, each on-site treatment machine would be able to treat food waste generated from about 200 households. Given that only 13% to 76% of the capacity of the 16 treatment machines had been utilised (see para. 3.59), in implementing food-waste recycling schemes in private housing estates, the ENB/EPD need to consider providing more support and strengthen efforts to encourage participating estates to invite more households to participate in the schemes. To provide incentives for households to participate in the schemes, the ENB/EPD may consider extending some forms of commendation to the best-performing housing estates.

Estates withdrawing from food-waste recycling schemes due to short-term funding

3.62 Up to June 2015, 7 approved estates had withdrawn from participating in the recycling projects before project commencement (see item (d) of Table 11 in para. 3.57). Audit examination of EPD records revealed that the main reason for the withdrawals was that the projects could not be sustainable in long term as the funding support would only be available for a two-year period.

3.63 Moreover, after launching the extended funding arrangement in September 2014, up to June 2015, 6 (67%) of the 9 completed projects had not applied for the extended funding support after expiry of the original two-year period (see item (a)(ii) of Table 11 in para. 3.57). According to the ENB/EPD, OWTF Phase 3 with a capacity of treating 300 tonnes of food waste a day would commence treating domestic food waste from 2022 (see paras. 4.6 and 4.7). In Audit's view, the ENB/EPD need to strengthen efforts on implementing trial schemes on separating and collecting food waste from the domestic sector to better prepare for the commissioning of OWTF Phase 3 in 2022.

3.64 The food-waste recycling schemes in both the PRH estates and private housing estates will provide valuable experience to the EPD in implementing full-scale food-waste recycling schemes in future. In addition, residents of these estates will accumulate experience and nurture habits in food-waste separation for recycling. In Audit's view, the ENB/EPD need to conduct a review and consider

Recycling of food waste

providing more incentives to housing estates so that they can continue participating in the related schemes, bearing in mind the exacerbated environmental problems arising from decomposition of food waste, the high cost of disposing of food waste at landfills and the significant problem of the limited landfill space being used up in the foreseeable future.

Many approved projects not yet commenced

3.65 As of June 2015, 24 approved projects had not commenced (see item (c) of Table 11 in para. 3.57). The related time periods are as follows:

Period from approval date to June 2015	Number of projects
Less than 1 month	5
1 to 12 months	2
13 to 24 months	17
Total	24

According to the EPD, the estates concerned had been taking actions to lease on-site food-waste treatment machines and to recruit the required operational staff, and a participating estate would normally take 8 months to complete the procurement procedures and install the treatment machines.

3.66 Moreover, as of June 2015, of the 6 completed recycling projects not having applied for extended funding support (see item (a)(ii) of Table 11 in para. 3.57), Audit noted that the food-waste treatment machine of one project had been transferred by the EPD for use in another ECF project, and the treatment machine of another project had been returned to the supplier. The treatment machines of the remaining 4 projects (which had been acquired by the ECF) had remained idle at the related estates. As 24 approved recycling projects had not commenced, the ENB/EPD need to assess the condition of the idle treatment machines with a view to transferring the appropriate ones for gainful use in other projects. The ENB/EPD also need to strengthen assistance provided to the estates through the help-desk (see para. 3.53), with a view to commencing the 24 approved projects as early as possible.

Audit recommendations

3.67 **Audit has *recommended* that the Secretary for the Environment and the Director of Environmental Protection should:**

- (a) in implementing food-waste recycling schemes in private housing estates:**
 - (i) consider providing support and strengthen efforts to encourage participating estates to invite more households to participate in the schemes in future; and**
 - (ii) consider extending some forms of commendation to the best-performing housing estates;**
- (b) strengthen efforts on implementing trial schemes on separating and collecting food waste from the domestic sector;**
- (c) conduct a review of the need to provide more incentives to housing estates participating in food-waste recycling schemes so that they can continue participating in the schemes;**
- (d) assess the condition of the four idle food-waste treatment machines with a view to transferring the appropriate ones for gainful use in other projects; and**
- (e) strengthen assistance provided to the private housing estates concerned with a view to commencing the 24 approved food-waste recycling projects as early as possible.**

Response from the Government

3.68 The Secretary for the Environment and the Director of Environmental Protection agree with the audit recommendations. The Director of Environmental Protection has said that the EPD will identify suitable projects for transfer of the food-waste treatment machines that are still in working condition.

PART 4: WAY FORWARD

4.1 This PART outlines the major audit observations and examines the way forward.

Government actions to reduce and recycle food waste

4.2 In 2011, 3,600 tpd of food waste were disposed of at landfills. Under the 2014 Food Waste Plan, the ENB/EPD aimed to reduce quantity of food waste disposed of at landfills by implementing the MSW charging scheme (aiming to reduce 324 tpd of food waste or 9% of 3,600 tpd) and the FW Campaign (aiming to reduce 360 tpd of food waste or 10% of 3,600 tpd). However, Audit examination revealed that there was room for improvement by the CSD, the HA and schools in reducing food waste. Audit has recommended that the pertinent B/Ds should strengthen efforts in implementing the MSW charging scheme and FW Campaign, and make improvements in related areas.

4.3 Regarding food-waste recycling, the 2014 Food Waste Plan promulgated initiatives to recycle a total of 900 tpd of food waste (25% of 3,600 tpd), comprising 100 tpd of food waste to be recycled by the private facility at EcoPark and progressively up to 800 tpd by OWTF Phases 1 to 3. For the purpose of educating the C&I and domestic sectors to practise food-waste reduction and source separation to prepare for large-scale food-waste recycling at OWTF Phases 1 to 3, the ENB/EPD constructed the Pilot Plant to treat food waste collected from the C&I sector (the plant recycled 0.88 tpd of food waste in 2014) and provided financial support through the ECF to private housing estates to implement food-waste recycling projects (which together recycled 0.7 tpd of food waste from September 2012 to June 2015). Furthermore, the HD also implemented trial schemes on food-waste recycling in 14 PRH estates, which together recycled 1.6 tpd of food waste from January 2013 to July 2014. Audit has recommended that the ENB/EPD and the HD should strengthen efforts and make improvements in the above-mentioned areas.

Way forward

4.4 In 2013, Hong Kong generated 1.36 million tonnes of food waste, of which 1.33 million tonnes (98%) were disposed of at landfills and the remaining 0.03 million tonnes (2%) were recycled mainly as compost or fertiliser. Moreover, food waste disposed of at landfills accounted for 38% of the total 3.48 million tonnes of MSW disposed of at landfills in the year. It is a cause for concern that food waste disposed of at landfills had increased from 1.18 million tonnes in 2004 to 1.33 million tonnes in 2013 (a 13% increase). According to the EPD, Hong Kong's per-capita-per-day domestic food waste of 0.37 kg was 85% higher than the 0.2 kg each generated by Taipei and Seoul.

4.5 Hong Kong is facing a significant MSW disposal problem as the existing three landfills, subject to the FC's funding approval for WENT extension works and after completing the approved and proposed extension works, would reach their capacity from 2023 to 2034. Disposal of large quantities of food waste at landfills also increases the generation of greenhouse gas and leachate where the latter is a highly polluting liquid. Furthermore, food waste takes a long time to decompose and may cause instability of landfill surface. These problems would delay the gainful use of closed landfill sites. Audit noted that the Government had taken piecemeal actions in the past years to address the food-waste problem, and it only in 2014 for the first time set a specific target for reducing food-waste disposal at landfills by 40% by 2022. As revealed in the various parts of this review, the progress and achievement of government actions taken so far to address the food-waste problem has been less than satisfactory. Therefore, the ENB/EPD need to strengthen efforts and expedite actions to tackle the problems encountered in implementing the various measures set out in the 2014 Food Waste Plan with a view to achieving the target of reducing food-waste disposal at landfills by 40% by 2022, using 2011 as the base year.

4.6 The EPD has planned to commission OWTFs by three phases, namely Phase 1 in mid-2017, Phases 2 in 2020 and Phase 3 in 2022. In this connection, implementation of OWTF Phases 2 and 3 is subject to the Government's established funding-allocation mechanism and the FC's funding approvals. The timely completion of the three phases of OWTFs would help reduce disposal of 0.3 million tonnes of food waste at landfills a year, accounting for 23% of the annual food-waste disposal (assuming the quantity remains unchanged from 2013 to 2022). Therefore, it is of utmost importance that the facilities could be installed within the EPD's updated timeframe. In view of the fact that OWTF Phase 1 would take nine

Way forward

years from conducting the engineering feasibility study in August 2008 to commissioning in mid-2017, Audit considers that the ENB/EPD need to take early actions and strengthen efforts with a view to ensuring that Phases 2 and 3 of OWTFs would commence operation by 2020 and 2022 respectively. Given that upon commissioning of OWTF Phases 1 to 3, they would only treat in aggregate 0.3 million tonnes of the total 1.33 million tonnes of food waste that would otherwise be disposed of at landfills a year, the ENB/EPD need to commence planning for additional OWTFs to treat the remaining food waste that can be separated and collected for treatment.

4.7 According to the ENB/EPD, Phases 1 and 2 of OWTFs would be used to treat food waste generated by the C&I sector and Phase 3 by both the C&I sector and the domestic sector. Audit considers that the ENB/EPD need to strengthen efforts on implementing trial schemes in separating and collecting food waste from the domestic and C&I sectors to gain experience and inculcate the general public's behavioural changes in waste disposal to prepare for the full implementation of the OWTFs (see paras. 3.13(b) and 3.67(b)). In Audit's view, based on lessons learned from the operation of the Pilot Plant and the food-waste-recycling schemes in the private housing and PRH estates, the ENB/EPD need to critically assess if sufficient food waste could be collected for the OWTFs, and take early actions to map out and implement an effective system for separating, collecting and transporting food waste from the C&I and domestic sectors to the OWTFs for treatment.

4.8 In June 2013, the Food and Health Bureau informed LegCo that the FEHD and its contractors collected 85% of MSW from households, and private contractors collected the remaining 15% of MSW from households and the C&I sector. According to the EPD, the refuse collection vehicles of the FEHD may not be suitable for collecting food waste because of the stringent need to prevent leachate spillage and to contain the odour problem during transportation of food waste. In October 2015, the EPD informed Audit that the C&I establishments were responsible for delivering their waste either to refuse transfer stations or landfills, and the C&I sector would be responsible for arranging suitable vehicles to deliver the separated food waste to OWTF Phase 1 upon its commissioning in mid-2017. In Audit's view, the ENB/EPD need to liaise with the C&I sector to make suitable arrangements (including provision of suitable vehicles) for transporting food waste to OWTFs.

4.9 In October 2015, the EPD informed Audit that the anaerobic-digestion treatment technology would likely be adopted for OWTF Phase 3 subject to findings of the forthcoming engineering feasibility study, and the production of compost as a by-product from Phase 3 had yet to be determined.

4.10 The large quantities of compost produced as a by-product by the OWTFs need to be gainfully used. According to the EPD, OWTF Phases 1 and 2 would respectively produce 7,400 tonnes and 14,900 tonnes of compost each year. In the event that OWTF Phase 3 would adopt anaerobic digestion as the treatment technology where the residuals would be processed to become compost, as the facility would have the same food-waste treatment capacity of 300 tpd as OWTF Phase 2 (see Table 10 in para. 3.16), Phase 3 might also produce additional 14,900 tonnes of compost a year. In this connection, in April 2014, the ENB/EPD informed the PWSC that the total demand for compost in Hong Kong would be around 20,000 tonnes a year. Unless other ways of using compost are identified, it would appear that the local demand would not be able to absorb the 37,200 (7,400 + 14,900 + 14,900) tonnes of compost potentially to be generated by OWTF Phases 1 to 3. In Audit's view, the ENB/EPD need to take early actions with a view to exploring ways and means to make beneficial use of the compost that would be generated by OWTF Phases 1 to 3.

Audit recommendations

4.11 **Audit has recommended that the Secretary for the Environment and the Director of Environmental Protection should strengthen efforts and expedite actions to:**

- (a) **implement the various measures set out in the 2014 Food Waste Plan;**
- (b) **ensure that OWTF Phase 1 would commence operation by 2017 and, subject to resource availability, commission OWTF Phases 2 and 3 by 2020 and 2022 respectively;**
- (c) **commence planning for additional OWTFs to treat the remaining food waste that can be separated and collected for treatment;**

Way forward

- (d) **based on lessons learned from the operation of the Pilot Plant and the food-waste-recycling schemes in the private housing and PRH estates:**
 - (i) **critically assess if sufficient food waste could be collected for treatment by the OWTFs; and**
 - (ii) **map out and implement an effective system for separating, collecting and transporting food waste from the C&I and domestic sectors to OWTFs for treatment;**
- (e) **liaise with the C&I sector to make suitable arrangements (including provision of suitable vehicles) for transporting food waste to OWTFs; and**
- (f) **explore ways and means to make beneficial use of the compost that would be generated by OWTF Phases 1 to 3.**

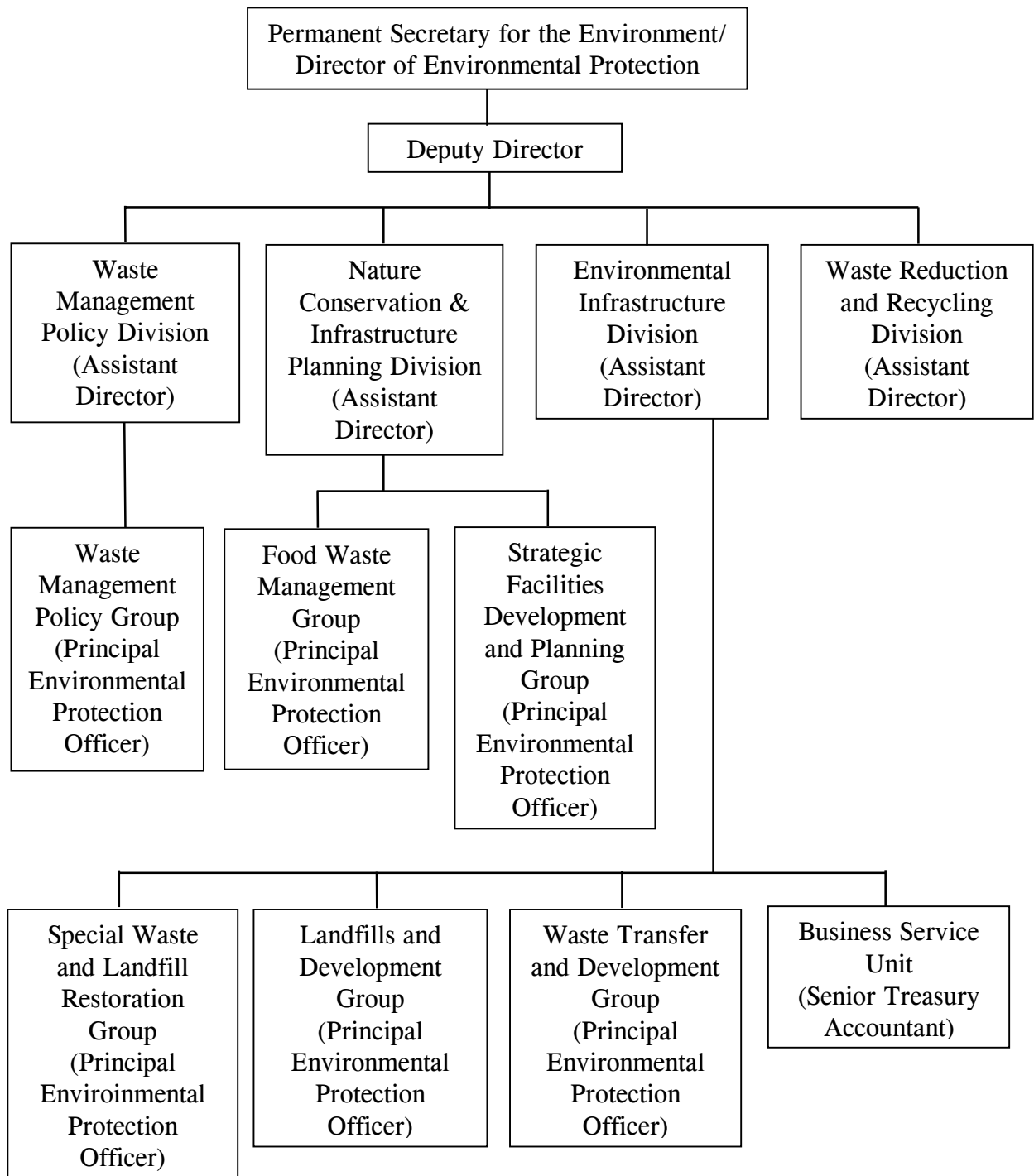
Response from the Government

4.12 The Secretary for the Environment and the Director of Environmental Protection agree with the audit recommendations. The Director of Environmental Protection has said that:

- (a) for paragraph 4.11(a), the EPD will take all possible steps to expedite actions in implementing the measures set out in the 2014 Food Waste Plan;
- (b) for paragraph 4.11(b), the EPD will take measures to ensure that OWTF Phase 1 will commence operation by 2017 and will endeavour to take forward OWTF Phases 2 and 3 as early as practicable;
- (c) for paragraph 4.11(c), the EPD will continue to work with the relevant B/Ds to identify suitable sites for constructing additional OWTFs to treat the remaining food waste that can be separated and collected for treatment;

- (d) for paragraph 4.11(d), the EPD has engaged a service contractor to liaise with the C&I sector, and will continue to secure support from major food-waste-generation establishments to deliver source-separated food waste to OWTF Phase 1 for treatment upon its commissioning in mid-2017. The EPD will also commission a study on the food-waste collection and delivery arrangements to prepare for the operation of future OWTFs;
- (e) for paragraph 4.11(e), the EPD will strengthen efforts to liaise and work with the relevant trades and organisations for them to make suitable arrangements (including provision of suitable vehicles) to deliver food waste to OWTF Phase 1; and
- (f) for paragraph 4.11(f), the EPD will continue to explore ways to make good use of compost to be generated from the initial phases of OWTFs.

**Environmental Protection Department
Organisation chart (extract)
(30 June 2015)**



Source: EPD records

**Programmes and activities under
the Food Wise Hong Kong Campaign
(August 2015)**

Engagement and social mobilisation activities

1. Launching of Food Wise Eateries Scheme specifically targeted at the food and beverage sector to promote food wise, meal portioning and other food-waste-reduction measures (to be launched in late 2015)
2. Establishing FW Charter and launching Food Wise Hong Kong Ambassador Scheme (see paras. 2.19 to 2.21)
3. Collaborating with major community associations and organisations to promote food-waste avoidance and reduction at households (see para. 2.21)

Publicity and education activities

4. Promoting the “Big Waster” icon (see Figure 4 in para. 2.18)
5. Launching media publicity
6. Carrying out roving exhibitions

Technical support activities

7. Organising food-wise training sessions and sharing workshops (see para. 2.21)
8. Producing Food Waste Reduction Good Practice Guides between May 2013 and October 2014 for six sectors, namely residential, shopping mall, market, educational, food and beverage, and hotel
9. Conducting three-level (i.e. baseline, interim and final) territory-wide food-waste surveys and audits for the food and beverage sector (baseline audit already conducted in 2014, and interim and final audits would be conducted in 2015 and 2016 respectively)

Source: EPD records

**Government bureaux and departments invited
but not signing the Food Wise Charter
(June 2015)**

B/D	Main reasons for not signing the Charter	Main measures adopted for reducing food waste
(a) AMS	<ul style="list-style-type: none"> • Not viable for the only one small-scale canteen with slim profit margin to invest in drawing up and implementing a food-waste-reduction plan and audit the implementation 	<ul style="list-style-type: none"> • Would remind the canteen operator to take practical actions to reduce food waste in its operation as far as possible
(b) CSD (other than Lo Wu Correctional Institution)	<ul style="list-style-type: none"> • Assigned Lo Wu Correctional Institution to sign the FW Charter in 2013 (see Note to Table 2 in para. 2.22) 	<ul style="list-style-type: none"> • A “Waste No Food Scheme” launched at four CSD institutions since April 2013
(c) C&ED	<ul style="list-style-type: none"> • Requested the EPD to clarify the third and fourth measures of the Charter (see para. 2.20(c) and (d)) in May 2013. However, up to June 2015, the C&ED had not received any reply from the EPD 	<ul style="list-style-type: none"> • Arranged canteen operators to attend green-measure seminars • Reminded canteen operators to be attentive to customers’ request on reducing food portion • Put up reminders at canteen on reduction of food waste, avoiding over-purchase of food and making good use of surplus food
(d) HKPF	<ul style="list-style-type: none"> • The commitments under the FW Charter presented a new and specialised subject to the HKPF • Needed to ascertain the specific measures and undertakings, and assess the capability and readiness of HKPF’s catering service contractors, having regard to relevant experience available 	<ul style="list-style-type: none"> • Encouraged contractors to adopt practical FW Charter measures in reducing food waste (e.g. not to provide food more than could be consumed, estimate daily requirement to keep waste to minimum and request staff to take home surplus cooked food for consumption) • Shared with HKPF members food-waste reduction principles to enhance their awareness and commitment

Appendix C
(Cont'd)
(para. 2.23 refers)

B/D	Main reasons for not signing the Charter	Main measures adopted for reducing food waste
(e) FEHD	<ul style="list-style-type: none"> • Implementing the second and third measures of the Charter (see para. 2.20(b) and (c)) fell beyond FEHD's capacity and capability • Could not restrict the type of recipes adopted by tenants and holders of food business licences 	<ul style="list-style-type: none"> • Nominated some public markets to join the Partnership Scheme • Assisted in drafting the market-sector Food Waste Reduction Good Practice Guide • Gave out related leaflets to fast-food vendors in Lunar New Year Fairs • Issued food-safety guidelines on food donation • Installed a food-waste composter since end 2012 at a public market on a trial basis
(f) GPA	<ul style="list-style-type: none"> • Not approached by the EPD to sign the Charter after the inter-departmental meeting on supporting waste recycling held in October 2013 	<ul style="list-style-type: none"> • Implemented a trial scheme on installing food-waste composters since 2013 in three government quarters • Held canned food-donation campaign in July and August 2014 • Displayed food-waste reduction/recycling posters in all government quarters since July 2015
(g) HD	<ul style="list-style-type: none"> • Not yet fully fulfilled the Charter regarding implementing plans with measurable targets and conducting waste audits 	<ul style="list-style-type: none"> • Held "Cherish food with rewards" campaign in 2012 and "Food waste has value" green recipe competition in 2013 • Launched "Empty your plate" campaign, issued pamphlets on "Eat light, eat right" tips and showed "Go green. Eat light. So easy!" video in 2014

Appendix C
 (Cont'd)
 (para. 2.23 refers)

B/D	Main reasons for not signing the Charter	Main measures adopted for reducing food waste
(h) LCSD	<ul style="list-style-type: none"> • Had not operated any catering service, and operation not involved production of food and generation of food waste • Catering outlets inside LCSD venues were all contracted out • LCSD contractors would decide whether to adopt related measures or sign the Charter 	<ul style="list-style-type: none"> • No information provided

Source: B/Ds records

Appendix D
(paras. 2.43, 2.45
and 2.46 refer)

**Per-person-in-custody-per-day food-waste quantities of
29 Correctional Services Department institutions
(August 2015)**

No.	CSD Institution	Average number of PICs provided with meals by the CSD	Per-PIC- per-day food waste (kg)
1	Pelican House (Note 1)	2	1.61
2	Phoenix House (Note 1)	4	1.03
3	Tai Lam Centre for Women (Note 2)	175	1.00
4	Tai Tam Gap Correctional Institution	105	0.37
5	Lai Hang Rehabilitation Centre (Note 1)	11	0.36
6	Wai Lan Rehabilitation Centre (Note 1)	1	0.33
7	Lai Sun Correctional Institution	38	0.29
8	Nei Kwu Correctional Institution	136	0.27
9	Tung Tau Correctional Institution	297	0.27
10	Chi Lan Rehabilitation Centre	10	0.23
11	Lai King Correctional Institution	120	0.19
12	Siu Lam Psychiatric Centre	248	0.17
13	Pik Uk Correctional Institution	320	0.14
14	Pik Uk Prison	358	0.12
15	Lo Wu Correctional Institution	1,238	0.11
16	Pak Sha Wan Correctional Institution	284	0.09
17-18	Sha Tsui Correctional Institution/ Lai Chi Rehabilitation Centre	71	0.09
19	Tai Lam Correctional Institution	437	0.09
20	Tong Fuk Correctional Institution	659	0.09
21	Cape Collinson Correctional Institution	105	0.07
22	Lai Chi Kok Reception Centre	1,399	0.06
23	Shek Pik Prison	411	0.04
24	Stanley Prison	1,215	0.03
25	Hei Ling Chau Addiction Treatment Centre	459	0.02
26	Hei Ling Chau Correctional Institution	349	0.02
27	Bauhinia House (Note 1)	0	N/A
28	Queen Elizabeth Hospital Custodial Ward	0	N/A
29	Queen Mary Hospital Custodial Ward	0	N/A

Source: Audit analysis of CSD records

Note 1: PICs in half-way houses and Phase II of rehabilitation-centre programmes (i.e. CSD institutions No. 1, 2, 5, 6 and 27) were permitted to leave the CSD institutions for day activities and they may choose to consume their own food. Numbers of PICs taking meals outside CSD institutions were not included in this Appendix.

Note 2: According to the CSD, participation rate of this institution in the "Waste No Food Scheme" (see para. 2.43) was relatively low because many of the PICs in the institution were less acclimatised to the new environment.

Appendix E
(paras. 2.47
and 2.48 refer)

**Per-in-patient-per-day food-waste quantities of
38 Hospital Authority hospitals
(July/August 2015)**

No.	HA hospital	Average number of in-patients (Note)	Per-in-patient-per- day food waste (kg)
1	Grantham Hospital	244	0.58
2-4	Kowloon Hospital/Hong Kong Eye Hospital/ Hong Kong Buddhist Hospital	1,346	0.46
5	Tung Wah Hospital	353	0.37
6	United Christian Hospital	1,138	0.37
7	Haven of Hope Hospital	409	0.36
8	Queen Elizabeth Hospital	2,217	0.36
9	Princess Margaret Hospital	1,299	0.35
10	North Lantau Hospital	38	0.34
11-13	The Duchess of Kent Children's Hospital at Sandy Bay/Tung Wah Group of Hospitals Fung Yiu King Hospital/MacLehose Medical Rehabilitation Centre	297	0.34
14	Queen Mary Hospital	1,344	0.33
15	Tseung Kwan O Hospital	543	0.32
16	North District Hospital	456	0.29
17	Caritas Medical Centre	773	0.28
18	Yan Chai Hospital	554	0.26
19	Alice Ho Miu Ling Nethersole Hospital	314	0.23
20	Tai Po Hospital	633	0.22
21	St. John Hospital	12	0.20
22	Pamela Youde Nethersole Eastern Hospital	1,412	0.19
23	Kwong Wah Hospital	728	0.18
24	Pok Oi Hospital	443	0.17
25	Tuen Mun Hospital	1,667	0.17
26	Cheshire Home, Chung Hom Kok	184	0.14
27	Kwai Chung Hospital	679	0.13
28	Prince of Wales Hospital	1,379	0.13
29-30	Shatin Hospital/Bradbury Hospice	536	0.13
31-32	Tung Wah Group of Hospitals Wong Tai Sin Hospital/Our Lady of Maryknoll Hospital	572	0.11
33	Wong Chuk Hang Hospital	516	0.11
34	Tung Wah Eastern Hospital	210	0.10
35-36	Castle Peak Hospital/Siu Lam Hospital	1,281	0.08
37	Cheshire Home, Shatin	317	0.08
38	Ruttonjee Hospital and Tang Shiu Kin Hospital	606	0.06

Source: *Audit analysis of HA records*

Note: *During the three-day survey period, some in-patients did not take meal and others took one to three meals a day. For simplicity, the data included all in-patients irrespective of the number of meals provided to each of them.*

**Project estimates of Organic Waste Treatment Facility Phase 1
(October 2014)**

Works item	Cost estimate (\$ million)
(1) Site formation, geotechnical, drainage and civil works	138.6
(2) Architectural, building and landscape works	473.0
(3) Organic waste treatment facilities	
(a) Waste receiving system	93.1
(b) Pre-treatment system	56.2
(c) Anaerobic digestion system	67.9
(d) Composting system	24.3
(e) Biogas cleaning and storage system	24.4
(f) Associated electrical, control and instrument installations	<u>83.0</u>
Sub-total for works item (3)	348.9
(4) Ancillary works and facilities	66.1
(5) Waste-water treatment system	50.7
(6) Heat recovery, power generation and surplus electricity export systems	105.3
(7) Pollution control and environmental monitoring facilities	43.9
(8) Mitigation measures and environmental monitoring and audit for construction works	12.8
(9) Consultants' fees for contract administration and operational performance reviews	25.5
(10) Remuneration of resident site staff	17.7
(11) Contingencies	128.0
Sub-total (in September 2014 prices)	1,410.5
(12) Provision for price adjustment	178.7
Total (in MOD prices)	1,589.2

Source: Paper submitted by the ENB to the FC in October 2014

**Project estimates of Organic Waste Treatment Facility Phase 1
(November 2010)**

Particulars	Cost estimate (\$ million)
(A) According to Technical Feasibility Statement approved in Aug. 2007	
(1) Civil engineering works:	
(a) Foundation	30.0
(b) Superstructure	20.0
(2) Plant and equipment:	
(a) Pre-treatment unit	27.0
(b) Anaerobic digestion unit	54.0
(c) Dewatering and mixing unit	9.0
(d) Biogas treatment and valorisation unit	36.0
(e) Composting unit	39.0
(f) Air treatment unit	14.0
(g) Waste-water treatment unit	6.0
(h) Electrical and mechanical equipment	10.0
(i) Other associated facilities	5.0
(3) Contingencies	<u>25.0</u>
Sub-total	275.0
(B) According to the EPD's project cost updates from Aug. 2007 to Nov. 2010	
(1) Changes in project design:	
(a) Enhanced building design and increase in floor space for education centre	54.0
(b) Increase in foundation requirement based on updated ground investigation results	20.0
(c) Provision for nullah decking to overcome site constraint	19.0
(d) Additional green measures	13.0
(e) Additional commissioning expenses	10.0
(f) Incorporation of approved EIA recommendations (e.g. special fencing, green features and green roof)	6.0
(g) Road works not identified at initial stage	5.0
(h) Works for sale of electricity	5.0
(2) Fee for contract supervision not identified at initial stage	13.3
(3) Increase in project contingencies	14.5
(4) Price fluctuation adjustments:	
(a) in 2008	7.1
(b) in 2009	-19.3
(c) in 2010	<u>7.4</u>
Sub-total	<u>155.0</u>
Cost estimate (at price level in second quarter of 2010)	430.0
(5) Provision for price adjustment	<u>59.0</u>
Total (in MOD prices)	489.0

Source: EPD records

Acronyms and abbreviations

ACE	Advisory Council on the Environment
AMS	Auxiliary Medical Service
Audit	Audit Commission
B/D	Government bureau and department
CAS	Civil Aid Service
CSD	Correctional Services Department
C&ED	Customs and Excise Department
C&I	Commercial and industrial
EA Panel	Panel on Environmental Affairs
ECF	Environment and Conservation Fund
EDB	Education Bureau
EIA	Environmental impact assessment
EMSTF	Electrical and Mechanical Services Trading Fund
ENB	Environment Bureau
EPD	Environmental Protection Department
FC	Finance Committee
FEHD	Food and Environmental Hygiene Department
FSD	Fire Services Department
FSTB	Financial Services and the Treasury Bureau
FW Campaign	Food Wise Hong Kong Campaign
FW Charter	Food Wise Charter
GFS	Government Flying Service
GPA	Government Property Agency
ha	hectares
HA	Hospital Authority
HD	Housing Department
HKPF	Hong Kong Police Force
ImmD	Immigration Department
kg	kilogram
kWh	kilowatt-hour
LCSD	Leisure and Cultural Services Department
LegCo	Legislative Council
MOD	Money-of-the-day
MSW	Municipal solid waste
NENT	Northeast New Territories
NGO	Non-governmental organisation
OWTF	Organic waste treatment facility
PIC	Person-in-custody
PRH	Public rental housing
PWSC	Public Works Subcommittee
SENT	Southeast New Territories
tpd	tonnes per day
WENT	West New Territories