

MANAGEMENT OF FOOD WASTE TREATMENT FACILITIES BY THE ENVIRONMENTAL PROTECTION DEPARTMENT

Executive Summary

1. Lucid waters and lush mountains are invaluable assets. According to the Environmental Protection Department (EPD), about 10,900 tonnes of municipal solid waste were landfilled in Hong Kong per day in 2023, of which around 29% (i.e. about 3,200 tonnes) were food waste, constituting the largest municipal solid waste category. At present, most of Hong Kong's food waste is disposed of at landfills together with other municipal solid waste. According to the Environment and Ecology Bureau, there was a need to develop modern facilities to recycle and convert source-separated food waste into useful resources including energy.

2. As at 31 March 2025, food waste treatment facilities included two organic resources recovery centres (ORRCs), namely ORRC Phase 1 (hereinafter referred to as O·PARK1) and ORRC Phase 2 (hereinafter referred to as O·PARK2), and two pilot food waste pre-treatment facilities (FWPFs) at the Tai Po Sewage Treatment Works (TPSTW) (hereinafter referred to as TPFWPF) and the Sha Tin Sewage Treatment Works (STSTW) (hereinafter referred to as STFWPF) under the food waste/sewage sludge anaerobic co-digestion trial scheme, as follows:

- (a) **ORRCs.** In October 2014 and June 2019, the Finance Committee of the Legislative Council approved the design and construction of O·PARK1 and O·PARK2 under two projects (Projects A and B) at an approved project estimate of \$1,589.2 million and \$2,453 million (which was further increased to \$2,583.7 million in March 2024) respectively. In November 2014 and July 2019, EPD awarded 2 consultancies (Consultancies Q and S) to consultants (Consultants Q and S) for the design and construction supervision work of O·PARK1 and O·PARK2 respectively. In November 2014 and August 2019, EPD awarded 2 design-build-operate (DBO) contracts (Contracts A and B) to 2 contractors (Contractors A and B) for the design, construction and operation of O·PARK1 and O·PARK2 respectively. The design and

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construction of O-PARK1 with the design treatment capacity of 200 tonnes per day (tpd) was substantially completed on 3 December 2018 and operation stage commenced on 4 December 2018, and the design and construction of O-PARK2 with the design treatment capacity of 300 tpd was substantially completed on 31 December 2024 and operation stage commenced on 1 January 2025. As at 31 March 2025, the total project costs for Projects A and B were \$1,433.7 million and \$2,454.3 million respectively; and

- (b) ***FWPFs.*** Design and construction of TPFWPF and STFWPF were funded under the block allocation of the Capital Works Reserve Fund. The approved funding for design and construction of TPFWPF and STFWPF were \$29.9 million and \$28.7 million respectively. In October 2015 and June 2020, EPD awarded 2 consultancies (Consultancies T and U) to consultants (Consultants T and U) for the investigation, design and construction supervision work of TPFWPF and STFWPF respectively. In November 2017 and May 2022, EPD awarded 2 DBO contracts (Contracts C and D) to 2 contractors (Contractors C and D) for the design, construction and operation of TPFWPF and STFWPF respectively. The design and construction of TPFWPF with the design treatment capacity of 50 tpd was substantially completed on 14 August 2019 and operation stage commenced on 15 August 2019, and the design and construction of STFWPF with the design treatment capacity of 50 tpd was substantially completed on 14 November 2023 and operation stage commenced on 15 November 2023. As at 31 March 2025, the total costs for the design and construction of TPFWPF and STFWPF were \$25.3 million and \$20.8 million respectively.

EPD is responsible for monitoring the design, construction and operation of these food waste treatment facilities. The Audit Commission (Audit) has recently conducted a review of EPD's work in the management of food waste treatment facilities.

Design and construction of organic resources recovery centres

3. ***Omission of some necessary slope works in Contract A.*** While Contract A stipulated that Contractor A should carry out all necessary geotechnical investigations and natural terrain hazard mitigation works for the natural terrain, Contract A did not cover the relevant works for man-made slopes. After Contract A was awarded to Contractor A in November 2014, EPD found that there were 5 man-made slopes

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within the site specified in Contract A that would be affected by the development of O·PARK1, and it was required to undertake the geotechnical investigations and studies, and necessary slope stabilisation works on these slopes in accordance with government guidelines. In the event, 3 Employer's Changes (ECs) (later valued at a total cost of \$18.4 million) were issued under Contract A to instruct Contractor A to carry out the design of slope stabilisation works, site clearance and slope stabilisation works on the man-made slopes concerned (para. 2.4).

4. ***Construction works completed later than the scheduled completion date of Contract A.*** The design and construction works of O·PARK1 under Contract A was substantially completed on 3 December 2018, 627 days later than the original completion date of 16 March 2017. As at 31 March 2025, of the delay of 627 days: (a) extension of time (EOT) of 445 days was granted to Contractor A under Contract A such that the revised completion date of the construction works of O·PARK1 was 4 June 2018 and prolongation costs of \$44 million were paid to Contractor A; and (b) the remaining 182 days were subject to liquidated damages of \$49.7 million imposed on Contractor A. In implementing works projects, EPD needs to take measures to ensure the timely completion of construction works for the commissioning of facilities by contractors (paras. 2.6 and 2.8).

5. ***Need to expedite the assessment of claims under Contract B.*** As at 31 March 2025, the assessment of claims (involving both EOT and monetary claims) submitted by Contractor B under Contract B was still in progress. Audit examined the 42 claims submitted by Contractor B up to March 2025 and noted that the processing time of some claims was long. As at 31 March 2025, of the 42 claims, 22 (52%) were with assessment results pending from Consultant S, comprising: (a) 13 (59% of 22) quantified claims submitted by Contractor B between June 2020 and October 2023 (i.e. a lapse of 17 to 57 months); and (b) 9 (41% of 22) non-quantified claims submitted by Contractor B between April 2022 and October 2024 (i.e. a lapse of 5 to 35 months) (para. 2.12).

6. ***Delay in commissioning of visitor centre of O·PARK1.*** According to Contract A, Contractor A should be responsible for the design, construction and operation of the visitor centre at O·PARK1. Audit noted that: (a) while it was planned that the visitor centre would be commissioned at the same time as O·PARK1, it was commissioned 2.2 years (i.e. on 1 March 2021) after the commissioning of O·PARK1 on 4 December 2018. In this connection: (i) several ECs were issued under Contract A at different stages during the design and construction of the visitor centre to upgrade its design (including one issued after the visitor centre was substantially

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completed); and (ii) there was a delay in substantial completion of the visitor centre from May 2019 to May 2020 (i.e. 12 months later than the target completion date); and (b) the revised design of the visitor centre was only finalised when most of the plant facilities, equipment and ventilation system of O·PARK1 were already in place at that time. The design of the visitor centre and the associated education activities (e.g. the guided tours) were therefore constrained by the existing set-up and layout, and the standard of ventilation and odour control was considered not be able to fully meet the expectations for public visits and educational uses. In the event, 2 ECs (estimated at a total cost of \$1.7 million) were issued in 2024 for implementing odour mitigation enhancement works along the visitor path at O·PARK1 (paras. 2.23 to 2.26).

7. ***Low utilisation of visitor centre of O·PARK1.*** To cater for the anticipated increase in visitors from the original design of 80 visitors to 480 visitors per week (or 24,960 visitors per year), EPD approved an EC under Contract A in June 2017 to meet the additional operation and maintenance costs of \$3.4 million per year. In September 2022, the EC was revised to \$9.4 million per year, covering the period from March 2020 to December 2025. Audit noted that, excluding the first year of operation when it was disrupted by coronavirus disease (COVID-19) epidemic, from the second to fourth year of operation: (a) the number of visitors of the three years was on a decreasing trend from 9,721 in the second year to 5,913 in the fourth year; and (b) none of the years could meet the annual target number of 24,960 visitors. The shortfalls of the second, third and fourth year were 61%, 63% and 76% respectively (paras. 2.29 and 2.30).

Operation of organic resources recovery centres

8. ***Scope for enhancing the utilisation of ORRCs.*** The design treatment capacity of O·PARK1 and O·PARK2 are 200 tpd and 300 tpd respectively, representing an annual capacity of 73,000 tonnes and 109,500 tonnes respectively. Audit found that since the commissioning of ORRCs (O·PARK1 in December 2018 and O·PARK2 in January 2025) and up to March 2025: (a) the annual utilisation rate of O·PARK1 increased from 46% in 2019 to 82% in 2024, but decreased to 56% in 2025 (up to March); and (b) the overall utilisation rate of ORRCs in 2025 (up to March) was 61% (para. 3.4).

9. ***High proportion of inert materials found in food waste received at O·PARK1.*** According to Contract A, inert materials (e.g. plastic utensils, packaging

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materials and cans that are not suitable for biological treatment) should not exceed 20% by weight in any individual load of food waste received. Audit noted that while the annual proportion of inert materials by weight found in the food waste received at O·PARK1 ranged from 11 % to 19% since its commissioning in December 2018 and up to December 2023 (i.e. 61 months), the situation deteriorated in 2024 and 2025 (up to March) (i.e. 15 months). The proportion of inert materials was 23% in 2024 and 29% in 2025 (up to March), and there were 12 (80%) months in which the proportion of inert materials exceeded 20% by weight (paras. 3.6 and 3.7).

10. ***Scope for improvement in processing incidents of failure to operate O·PARK1.*** According to Contract A, in the event that Contractor A fails to operate the facility, it should not be entitled to payment of such part of the operation fee for that month. Since the commissioning of O·PARK1 and up to March 2025, there were incidents considered as “failure to operate the facility” of a total of 16 days and deductions from the operation fees to Contractor A had been made. Audit noted that: (a) Contract A did not clearly specify the assessment criteria for determining the circumstances that would constitute “failure to operate the facility” and inconsistent treatments were adopted by EPD in processing two incidents of failure to operate O·PARK1 despite their similar nature; and (b) in March 2025, there was an incident at O·PARK1 and its food waste reception had been suspended for 10 days. According to EPD, it was concluded in October 2025 (i.e. a lapse of 7 months) that the incident would be considered as “failure to operate the facility” and deduction of the monthly payment to Contractor A would be made (paras. 3.12 and 3.13).

11. ***Scope for strengthening the monitoring of air emission from the ammonia stripping plant at O·PARK1.*** According to Contract A, environmental monitoring and auditing are required during the works and the operation of O·PARK1. Audit noted that: (a) from April 2019 to March 2025, of the 52,608 sets of air emission data for each parameter collected and monitored hourly at the ammonia stripping plant at O·PARK1, exceedance of emission limits specified in the environmental monitoring and audit manual was found in 19.1%, 14.3% and 6.3% of the monitoring data for nitrogen oxides, ammonia and sulphur dioxide respectively; and (b) from May 2020 to September 2024, EPD issued 5 ECs (estimated at a total cost of \$8.2 million) under Contract A to instruct Contractor A to conduct feasibility studies and trial of new technology, aiming at reducing the emission of air pollutants from the ammonia stripping plant at O·PARK1. However, exceedance of emission limits of nitrogen oxides, ammonia and sulphur dioxide from the ammonia stripping plant at O·PARK1 persisted as at 30 June 2025 (paras. 3.15 and 3.16).

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12. ***Need to ensure compliance with the performance requirements relating to air quality and quality of compost under Contract A.*** To monitor the performance of Contractor A, performance requirements are set out under Contract A. In the event of non-compliance with any of the performance requirements being detected, non-compliance points, subject to a cap of the maximum number of non-compliance points for each category of performance requirements, would be allocated to Contractor A and monthly payments to Contractor A would be deducted. According to EPD, since the commissioning of O-PARK1 in December 2018 and up to March 2025 (involving 76 reporting months), a total of 6,810 non-compliance points had been allocated to Contractor A and a total of \$15.1 million had been deducted from the operation fees to Contractor A. Audit noted that, of the 6,810 points, 4,087 (60%) were related to the air quality and 1,740 (26%) were related to the quality of compost (paras. 3.29 and 3.30), as follows:

- (a) ***Air quality.*** Non-compliance points related to non-compliance with the air quality requirements had been allocated to Contractor A in all the 76 (100% of 76) reporting months, of which the maximum number of points were allocated in 54 (71% of 76) reporting months. Notwithstanding that follow-up actions had been taken by Contractor A, air quality problem persisted as at 31 March 2025 (para.3.30(a)); and
- (b) ***Quality of compost.*** Non-compliance points related to non-compliance with the quality requirement of compost had been allocated to Contractor A in 56 (74% of 76) reporting months, of which the maximum number of points were allocated in 19 (34% of 56) reporting months. Notwithstanding that feasibility studies, reviews and trials had been conducted by Contractor A to formulate modification to the existing composting process and replace the existing units in the composting system between January 2019 and June 2024, allocation of non-compliance points to Contractor A was still noted during the period from July 2024 to March 2025 due to poor quality of compost (para.3.30(b)).

13. ***Failure in meeting the performance requirement relating to export of surplus electricity under Contract A.*** According to Contract A, when the facility (i.e. O-PARK1) has been in operation for 12 months (i.e. since 4 December 2019) and the quantity of average monthly food waste treated at O-PARK1 over the past 12 months is 3,040 tonnes or above, Contractor A should produce and export the minimum monthly surplus electricity to the grid of the utility company after self-sustaining the internal use of the facility. Audit noted that: (a) of the 64 reporting months from December 2019 to March 2025, the quantities of average monthly food

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waste treated at O·PARK1 over the past 12 months were 3,040 tonnes or above in 49 reporting months. Contractor A could not produce and export the minimum monthly surplus electricity for all the 49 reporting months; and (b) while there were non-compliances with the operational performance requirement, according to Contractor A, the characteristics of food waste received at O·PARK1 were different from that specified in the tender documents and requested for adjustment to the performance requirement relating to export of surplus electricity. As the mechanism for the non-compliance points allocation relating to export of surplus electricity was yet to be finalised, EPD did not allocate any non-compliance points to Contractor A and the deduction of monthly operation fees had been put on hold since March 2021 (paras. 3.33 to 3.35).

14. *Non-compliance with quality standards of fertiliser under Contract B.* A contractor's performance monitoring mechanism similar to that for Contractor A was in place for Contractor B (see para. 12). According to Contract B, Contractor B should ensure that the quality of the fertiliser produced from O·PARK2 complies with the relevant quality standards according to the functional uses. Audit noted that: (a) since the commissioning of O·PARK2 in January 2025 and up to March 2025, all fertilisers produced (i.e. 686 tonnes) did not meet the performance requirement on quality standards of fertiliser and had been disposed of at the landfills; (b) notwithstanding that rectification actions had been taken to address the quality issues of fertiliser, as at 30 September 2025, the fertiliser produced from O·PARK2 had not yet met the quality standards; and (c) Contractor B claimed that the non-compliance with the quality standards of fertiliser was due to the additional requirement of treating pig manure resulting in a change in the composition of the organic waste treated at the facility. It was agreed among EPD, Consultant S and Contractor B that a 12-month period starting from January 2025 would be allowed for the collection of operational data and evaluation of the overall impacts of O·PARK2's treatment of pig manure on its systems. Therefore, the allocation of non-compliance points and respective deduction of monthly operation fees related to non-compliance with the performance requirement on quality standards of fertiliser had been put on hold (paras. 3.29 and 3.37 to 3.39).

Design, construction and operation of food waste pre-treatment facilities at sewage treatment works

15. *Scope for improvement in designing the food waste pre-treatment process.* According to Contract C, to avoid the blockage or damage of the mechanical equipment downstream, the treated material with particle size less than or equal to

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20 millimetres was set as the original contract requirement. Since the commissioning of TPFWPF in August 2019 and up to March 2025, there was a series of incidents of blockage of treated material transfer pipelines resulting in a total of 125 days of suspension in the operation of TPFWPF despite that the particle size of the treated material provided by Contractor C was less than or equal to 20 millimetres. Audit noted that: (a) from April 2020 to November 2022, 1 Variation Order to Consultant T and 6 ECs to Contractor C with a total cost of \$7.1 million had been issued by EPD to tackle the blockage incidents, including enhancement works to further reduce the particle size of the treated material; and (b) while surveys and studies had been conducted to assess the quantity and quality of collectable food waste in Hong Kong and from the major factories in the Tai Po Industrial Estate between 2005 and 2015, certain types of food waste received at TPFWPF had not been identified in the surveys and studies (e.g. large amount of bones, fibres and herb residues). EPD needs to draw lessons from the blockage incidents of TPFWPF with a view to improving the design of the food waste pre-treatment process in future works projects (paras. 4.4 to 4.6).

16. ***Scope for enhancing the utilisation of STFWPF.*** The operation stage of TPFWPF and STFWPF commenced on 15 August 2019 and 15 November 2023 respectively and the design treatment capacity of both TPFWPF and STFWPF are 50 tpd. Audit analysed the utilisation of FWPFs since their commissioning and up to March 2025, and found that: (a) while the annual utilisation rate of TPFWPF increased from 11% in 2020 to 85% in 2025 (up to March), the rate of STFWPF remained 20% or less since its commissioning and decreased from 20% in 2024 to 16% in 2025 (up to March); and (b) the overall utilisation rate of FWPFs in 2024 and 2025 (up to March) was only about 50% (paras. 4.11 and 4.12).

17. ***High variable operation costs for FWPFs.*** According to Contracts C and D, the variable component of the monthly operation fees paid to Contractors C and D is calculated based on the guaranteed tonnage (daily for Contract C and monthly for Contract D) or the actual tonnage of food waste treated by the facilities, whichever is higher (para. 4.14). Audit noted that:

- (a) ***TPFWPF.*** Of the 2,056 days of operation since its commissioning and up to March 2025, there were 927 (45%) days where the actual tonnage of daily food waste treated by TPFWPF was lower than the daily guaranteed tonnage (i.e. 15 tpd) specified in Contract C. As a result, the total variable operation fees to Contractor C (i.e. \$231,245) was 21% higher than the

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variable operation fees calculated based on the actual tonnage of food waste treated by the facility (i.e. \$191,000) (para. 4.15(a)); and

- (b) **STFWPF.** Since the post-commissioning of STFWPF in June 2024 (i.e. when monthly variable operation fee is applicable) and up to March 2025 (involving 10 months), the actual tonnage of food waste treated by STFWPF in 9.5 (95%) months was lower than the monthly guaranteed tonnage (i.e. 15 tpd × number of available days in a month) specified in Contract D. As a result, the total variable operation fees to Contractor D (i.e. about \$1.3 million) was 211% higher than the variable operation fees calculated based on the actual tonnage of food waste treated by the facility (i.e. \$412,160) (para. 4.15(b)).

18. ***Need to review the effectiveness of the food waste/sewage sludge anaerobic co-digestion trial schemes at TPSTW and STSTW.*** According to EPD, to enhance the overall food waste recycling capacity in Hong Kong, EPD collaborated with the Drainage Services Department (DSD) in implementing the food waste/sewage sludge anaerobic co-digestion trial schemes at TPSTW and STSTW. Contract C for TPFWPF ended on 14 August 2025 after 6 years of operation. To provide a seamless continuation of the food waste pre-treatment services under the trial scheme, in July 2025, EPD had awarded a follow-on contract for the 12-month operation of TPFWPF. Besides, Contract D for STFWPF would end in November 2028. Audit noted that EPD had not conducted any evaluation on the effectiveness of the food waste/sewage sludge anaerobic co-digestion trial schemes at TPSTW and STSTW since their commissioning (paras. 4.22 and 4.23).

Audit recommendations

19. **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 Director of Environmental Protection should:**

Design and construction of ORRCs

- (a) **in implementing works projects:**
- (i) **carry out ground investigation works as comprehensively as practicable at the project planning stage and to ensure that all**

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necessary slope works are included in the tender documents in accordance with government guidelines (para. 2.21(a)(i));

- (ii) ensure the timely completion of construction works for the commissioning of facilities by contractors (para. 2.21(a)(ii)); and
- (iii) draw lessons from the events leading to the delay in commissioning of the visitor centre at O·PARK1 (para. 2.32(a));
- (b) expedite the assessment of claims submitted by Contractor B under Contract B as appropriate (para. 2.21(c));
- (c) expedite the completion of the implementation of the odour mitigation enhancement works along the visitor path at O·PARK1 and closely monitor their effectiveness (para. 2.32(b));
- (d) improve the utilisation rate of the visitor centre of O·PARK1, review its cost-effectiveness and take remedial measures where appropriate (para. 2.32(c) and (d));

Operation of ORRCs

- (e) step up efforts in enhancing the utilisation of O·PARK1 and O·PARK2 and take necessary actions to rectify the situation of high proportion of inert materials found in the food waste received at O·PARK1 (para. 3.27(a) and (b));
- (f) ensure that all incidents of failure to operate O·PARK1 are properly processed by EPD and operation fees to Contractor A are deducted in a timely manner (para. 3.27(e));
- (g) keep under review the effectiveness of the follow-up actions taken by Contractor A in rectifying the emission of air pollutants from the ammonia stripping plant at O·PARK1 (para. 3.27(f));
- (h) ascertain the reasons for the persistent non-compliances with performance requirements relating to air quality and quality of

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compost at O·PARK1 by Contractor A and take further measures to rectify the situation as appropriate (para. 3.44(a));

- (i) keep under review the effectiveness of the follow-up actions taken by Contractor A in mitigating the issues related to air quality and quality of compost at O·PARK1 (para. 3.44(b));
- (j) ascertain the reasons for the persistent failure in producing and exporting the minimum monthly surplus electricity at O·PARK1 by Contractor A and take follow-up actions as appropriate (para. 3.44(c));
- (k) resolve with Contractor A the dispute regarding the allocation of non-compliance points in respect of the performance requirement relating to export of surplus electricity and adjust the monthly operation fees to Contractor A as soon as practicable (para. 3.44(d));
- (l) follow up with Contractor B for the rectification actions for the non-compliance with the quality standards of fertiliser and devise measures to address the quality issues of fertiliser produced from O·PARK2 as early as practicable (para. 3.44(e));
- (m) resolve with Contractor B the allocation of non-compliance points relating to the performance requirement on quality standards of fertiliser and adjust the monthly operation fees to Contractor B as early as practicable (para. 3.44(f));

Design, construction and operation of FWPFs at STWs

- (n) draw lessons from the blockage incidents of TPFWPF with a view to improving the design of the food waste pre-treatment process in future works projects (para. 4.9(a));
- (o) step up efforts in enhancing the utilisation of STFWPF as far as practicable (e.g. discussing with DSD the acceptance criteria and allowable quantity of food waste slurry) (para. 4.24(a));
- (p) closely monitor the variable operation costs for TPFWPF and STFWPF (para. 4.24(b)); and

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- (q) **conduct a review on the food waste/sewage sludge anaerobic co-digestion trial schemes at TPSTW and STSTW to evaluate their effectiveness and determine the way forward, taking into account the audit observations and recommendations in this Audit Report (para. 4.24(f)).**

Response from the Government

20. The Director of Environmental Protection agrees with the audit recommendations.