SEWERAGE SYSTEMS IN RURAL AREAS

Executive Summary

1. According to the Environmental Protection Department (EPD), as of April 2016, about 510,000 population in Hong Kong were residing in village houses, squatters and private housing developments (mostly located in the New Territories) not being provided with public sewerage facilities. Of the 510,000 population, 115,000 (23%) were residing in areas being installed with private on-site sewage treatment plants and the remaining 395,000 (77%) population mainly relied on septic-tank-and-soakaway (STS) systems for treating their sewage or dry-weather-flow interceptors for reducing pollution caused by untreated sewage. Unsatisfactory installation and maintenance of STS systems would cause pollution to the environment and potential health hazards to people in the vicinity.

2. Under the Water Pollution Control Ordinance (Cap. 358 — WPC Ordinance), the EPD is responsible for monitoring the water quality of rivers and coastal areas and controlling pollution of these water bodies. Water Quality Objectives (WQOs) are established under the WPC Ordinance to lay down water quality requirements for a water body. Various WQOs expressed in numerical or narrative forms have been established, including the WQOs on *Escherichia coli (E. coli)*, which is used as an indicator of faecal contamination and pollution. The EPD has also formulated 16 Sewerage Master Plans (SMPs) which set out at regional/district level sewage collection, treatment and disposal programmes, including programmes for the provision of public sewerage systems for unsewered rural villages (hereinafter referred to as village sewerage programmes (VS programmes)).

3. Under the VS programmes, as of January 2015, of the 970 rural villages covered under the 16 SMP areas in Hong Kong, public sewerage works for 170 (17.5%) villages had been completed, 340 (35%) villages were under construction or included in the Public Works Programme, 170 (17.5%) villages were under planning and 290 (30%) villages would not be carried out due to their remoteness and difficult site topography. From 1989-90 to 2015-16, the Government's expenditures on implementation of the VS programmes and related works totalled $8.2 billion and the estimated expenditures from 2016-17 to 2025-26

totalled $2.7 billion. The Drainage Services Department is responsible for implementing works under the VS programmes. The Audit Commission (Audit) has recently conducted a review to examine the sewerage systems in rural areas.

Pollution control in unsewered areas

4. ***High E. coli levels at many water control subzones.*** *E. coli* is a bacterium that is commonly found in the intestine and faeces of humans and other warm-blooded animals, and the level of *E. coli* in a water body is used as an indicator of faecal contamination and pollution. According to the EPD, WQOs on *E. coli* were established to protect the public from the risk of exposure to disease-causing microorganisms, and could be used to assess and monitor the effectiveness of environmental improvement measures as well as to signal the need for further actions to improve water quality. Of the 71 river monitoring stations situated in water control subzones where WQOs on *E. coli* had been established, Audit examination revealed that the average levels of *E. coli* found at 63 (89%) stations had exceeded the corresponding statutory WQOs in 2015. For Yuen Long District and North District which had a large number of unsewered villages, in 2015, while the statutory WQOs established for the water control subzones located in the two districts ranged from 0 to 1,000 *E. coli* per 100 millilitres (mL) of water, the average levels of *E. coli* at 14 (58%) of the pertinent 24 river monitoring stations exceeded 10,000 *E. coli* per 100 mL of water, indicating that sewage discharged from unsewered villages in these areas could have caused faecal contamination and pollution to rivers in the areas (paras. 1.6, 1.9, 2.5 and 2.7(a)).

5. ***Lack of effective means to prevent STS systems from causing pollution.*** According to the EPD, many village sites located in flood plains (e.g. in Yuen Long, Kam Tin, North District and Tai Po areas) were not suitable for the operation of STS systems, the systems installed in some unsewered areas were generally ineffective and sewage from these areas was a source of pollution to nearby watercourses and marine waters. For the purpose of ameliorating the problems, the EPD has implemented works projects under the VS programmes to install public sewerage systems for unsewered villages. In the meantime, many of the 70,000 unsewered village houses rely on STS systems for treating their sewage, and some of the 84,000 unsewered residential squatters rely on dry-weather-flow interceptors for reducing pollution caused by the untreated sewage (paras. 1.2, 1.4, 1.10, 2.19 and 2.22(a)).

6. According to the then Planning, Environment and Lands Branch of the Government Secretariat, a licensing scheme for STS systems would be the best and the only way through which the Government and the community could make real progress in improving the environment of the New Territories. From 1993, an owner of an STS system might apply to the EPD for issuance of a perpetual licence under the WPC Ordinance for his STS system, which specified the related operational and maintenance requirements. However, Audit examination revealed that, as of August 2016, of the 70,000 village houses and 84,000 residential squatters, only 1,912 had been issued with licences for STS systems. According to the EPD, licensing of STS systems was not mandatory under the WPC Ordinance. Moreover, the EPD did not conduct periodic inspections of STS systems installed for unsewered houses, nor maintain a database for such systems, adversely affecting the effectiveness of its monitoring and enforcement actions on these systems (paras. 2.16 and 2.21 to 2.30).

7. ***Requirements for some STS systems not on par with EPD practice note.*** According to the EPD, an STS system having been designed, constructed and maintained in accordance with a practice note issued by it in 1993 would help achieve the intended sewage treatment function of the system and prevent related sewage discharge from polluting the environment. EPD practice note specified that an STS system should be located at least 100 metres from the boundaries of gazetted beaches, and percolation tests should be carried out for the system irrespective of the number of houses to be served and the distance of the system from sensitive water bodies. However, the certificate of exemption issued by the Lands Department for pertinent drainage works in the New Territories specified differently, by stating that an STS system should only be located beyond 30 metres from beaches, and percolation tests need not be carried out if an STS system served a single village house and was located beyond 30 metres from streams, springs, wells and beaches (paras. 2.36 and 2.37).

8. ***No licences issued for desludging of septic tanks and disposal of excretal matter.*** Under the Waste Disposal Ordinance (Cap. 354 — WD Ordinance), on the condition that the EPD and the Food and Environmental Hygiene Department (FEHD) provide any services for desludging of septic tanks and disposal of excretal matter from such tanks, or any person is permitted to provide such services under a licence issued by the EPD and the FEHD, any person who provides such services without obtaining a licence from the EPD and the FEHD commits an offence. As of

April 2016, 78 private desludging operators (having a total of 317 desludging vehicles) were involved in the provision of related services. Audit noted that, as of October 2016, none of the 78 desludging operators had been issued licences under the WD Ordinance from the EPD or the FEHD for provision of the desludging and related disposal services (paras. 2.45 to 2.47).

Planning and implementation of village sewerage programmes

9. ***Need to prevent uncontrolled discharge of untreated sewage from residential squatters.*** As of December 2015, 84,000 residential squatters were located in 791 areas. According to the EPD: (a) STS systems were generally not installed for squatter areas and untreated sewage generated from the squatters was mostly directly discharged into the nearby rivers or other water bodies, causing water pollution and environmental problems; and (b) dry-weather-flow interceptors had been installed for some squatter areas to help ameliorate the pollution problem. However, the EPD did not have readily available information on the squatter areas having been installed with dry-weather-flow interceptors. Furthermore, Audit noted that, for a project having an Approved Project Estimate (APE) of $33 million for installing public sewers for a squatter area in Tuen Mun completed in May 2011, up to June 2016, only 112 (41%) of the 270 squatters in the area had been connected to public sewers (paras. 3.4 to 3.9).

10. ***Delays in implementing the VS programmes.*** In May 2001, the EPD informed the Legislative Council (LegCo) that village sewerage works for 8 of the 16 SMP areas were targeted for completion between 2004 and 2009. Moreover, in May 2009, the EPD informed LegCo that the target completion dates had been extended to between 2013-14 and 2017-18. However, Audit examination revealed that these time targets could not be met. As of June 2016, of the total 662 villages covered under the VS programmes for the eight SMP areas, public sewerage works for 178 (27%) villages had been completed, 10 sewerage projects involving 77 (12%) villages were in progress, 24 sewerage projects involving 238 (36%) villages were under planning and sewerage projects under the Public Works Programme had not been created for the remaining 169 (25%) villages (paras. 3.15 and 3.16).

11. ***Slippages in implementing village sewerage projects.*** For a village sewerage project in Sha Tin and Tai Po having an APE of $381.4 million, mainly owing to objections on private land resumption, there was a slippage of 25 months in completing the works. In another project in Tuen Mun having an APE of $1,340 million, mainly due to the need to divert unrecorded underground utilities and a delay to seek legal advice on adopting appropriate procedures for road closure related to the works, the project was delayed by 17 months (paras. 3.23 to 3.28 and 3.31).

Sewer connection of village houses

12. Under the Government's policy, public sewers would only be constructed up to the lot boundaries of private land as far as practicable, and village-house owners need to carry out works at their own cost to connect their sewerage systems with public sewers. According to the EPD, as of June 2016, 14,710 village houses located at 178 villages in the eight SMP areas were covered by public sewers. However, 4,531 (31%) houses had not been connected to the public sewers, which comprised: (a) 3,168 houses not being ready for sewer connection or having technical problems for the connection; and (b) 1,363 houses where the house owners did not take required sewer-connection actions (paras. 4.2 and 4.6).

13. ***Inadequate actions taken to cause house owners to carry out sewer-connection works.*** According to the EPD, the majority of sewer-connection works would be completed by village-house owners between 2 and 5 years after completion of public-sewer works. However, Audit examination of the progress of sewer connections at 5 villages and 1 squatter area (having a total of 385 houses suitable for sewer connection) revealed that, as of June 2016, while the related public sewerage works had been completed 5 to 15 years ago, only 144 (37%) houses had been connected to public sewers. In one case involving public sewerage works having an APE of $2.7 million being carried out for 2 elderly homes and a village comprising 56 houses in Yuen Long, owing to objections of village representatives of 49 houses, public sewerage works for these 49 houses were not carried out. Public sewerage works for the remaining 7 houses were completed in December 2000. However, up to June 2016, none of the 7 houses had been connected to public sewers. In another case involving public sewerage works having an APE of $125.1 million for 8 unsewered areas, which included a village comprising 62 houses in North District where the works were completed in June 2006, up to June 2016, only 12 (19%) houses had been connected to public sewers (paras. 4.7 and 4.11).

Audit recommendations

14. **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 should:**

Pollution control in unsewered areas

(a) **consider periodically conducting assessments of the extent of pollution of major rivers caused by village sewage discharge, and publishing the results of assessments (para. 2.12);**

(b) **explore ways and means to strengthen control over high-risk STS systems (para. 2.40);**

(c) **review and revise the Lands Department's requirements for STS systems specified in the certificate of exemption such that they are in line with the EPD's practice note as far as practicable (para. 2.41);**

(d) **explore ways and means to strengthen controls over desludging operations (para. 2.54(a));**

Planning and implementation of village sewerage programmes

(e) **take measures to ascertain the extent and effectiveness of dry-weather-flow interceptors in reducing pollution caused by untreated sewage generated from unsewered residential squatters (para. 3.13(c));**

(f) **periodically inform LegCo of the progress of implementing the VS programmes, with comparisons with the time targets set for implementing the programmes (para. 3.39(a));**

Sewer connection of village houses

(g) **take effective measures to ensure that houses suitable for sewer connection are connected to public sewers within a reasonable time after completion of public sewer works (para. 4.19(a)); and**

(h) **periodically publish the progress of sewer-connection works of individual villages (para. 4.19(g)).**

Response from the Government

15. The Government agrees with the audit recommendations.