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SUSTAINABILITY OF WATER AND SANITATION SYSTEMS

Hong Kong wastewater — now and future*Dr S.L. Tang, Hong Kong*

HONG KONG HAS a coastline of 547km for its land area of 1,075km². A high proportion of the land is hilly and only 10% is urban, with 90% of Hong Kong's 6 million population and much of its industrial activities located within 2km from the coastline, in particular Kowloon and the northern part of the Hong Kong Island bordering the Victoria Harbour (the harbour between Kowloon and Hong Kong Island). Over 90% of the urban area is served by public sewerage (separate system). In the past, wastewaters collected from the urban sewerage system were discharged, with or without screening, through outfalls to the Victoria Harbour where the wastewaters could be diluted due to fast moving currents. For areas away from the Victoria Harbour (e.g. New Territories), biological treatment plants were built to treat the wastewaters and the final effluents would be discharged to rivers or bays whose assimilation capacity was low (Tang, 1984). In early 1995, there were 22 screening plants located along the coastline of the urban area and 6 biological treatment plants 5 of which were located in the New Territories and 1 in the southern Hong Kong Island (Fig. 1).

Present situation

Due to the rapid growth of population and industry in the past decade, today, a total of about 2 millions m³ per

day of wastewater is treated by those screening plants and biological treatment plants (Wong, February 1995). On the top of that, about 1.5 million m³ per day of excess sewage is discharged to stormwater drains and, when finally reaching the harbour, results in serious pollution (Hong Kong EPD, April 1995). The quality of water in the harbour has been deteriorating. The strategy used in the past (as described in the previous paragraph) can no more cope with the present situation. Hong Kong now requires a new Sewage Strategy which is capable of solving the immediate problem and is sustainable in the next three or four decades.

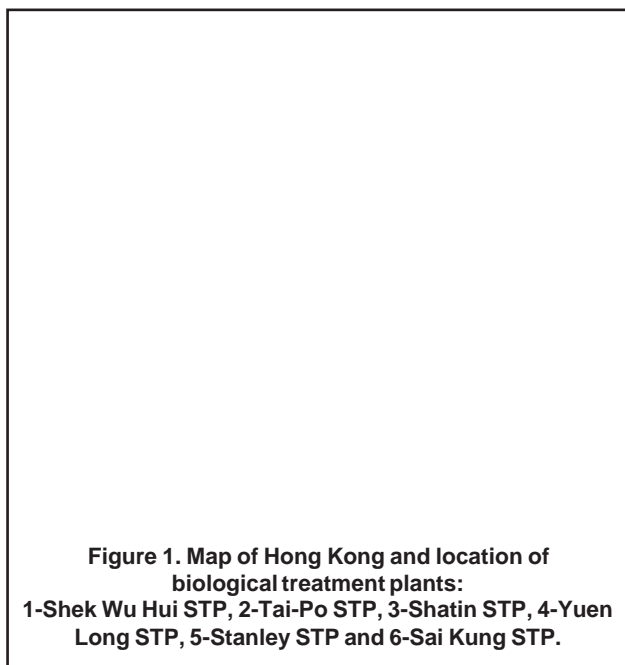


Figure 1. Map of Hong Kong and location of biological treatment plants:
1-Shek Wu Hui STP, 2-Tai-Po STP, 3-Shatin STP, 4-Yuen Long STP, 5-Stanley STP and 6-Sai Kung STP.

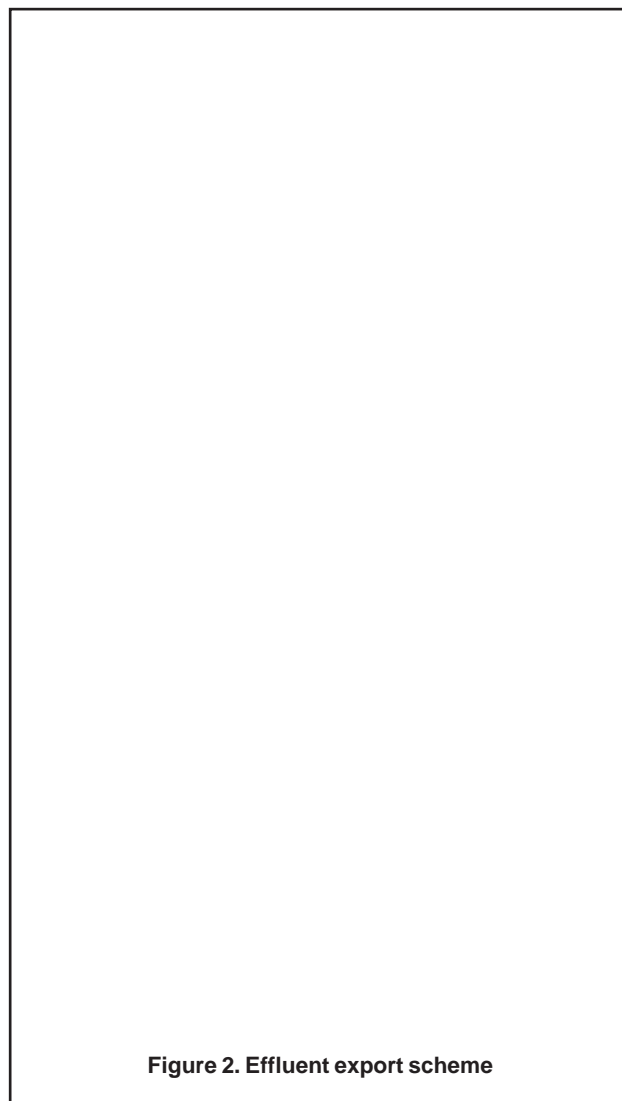


Figure 2. Effluent export scheme

Biological treatment

According to the new Sewage Strategy, the biological treatment plants will continue to be used. All the six biological plants will treat about 0.45 million m³ per day of wastewaters. The Yuen Long and Shek Wu Hui Treatment Plants will continue to discharge their effluents through rivers to the Deep Bay. The Sai Kung Treatment Plant will continue to discharge its effluent directly to the Port shelter, and the effluent of the Stanley Treatment Plant will continue to be discharged to the sea south of the Hong Kong Island. The effluents of the Shatin and Tai-Po Treatment Plants, however, will no longer be discharged to the Tolo Harbour. This Harbour experienced a very serious deterioration in water quality due to its enclosed nature and there is an Effluent Export Scheme being implemented in which secondarily treated effluents from these two plants originally discharged to the Tolo Harbour will be led to the Victoria Harbour through the Kai Tak Nullah (Fig. 2).

Sewerage master plans

Excess sewerage resulting in pollution of the stormwater drains and rural streams has to be dealt with. A pro-

gramme is being implemented to renew the main sewers in the urban areas which were found to be too small. New sewers are to be provided to those unsewered areas in the more rural parts of the territory. The whole Hong Kong has been divided into 16 sewage catchment areas, and 16 Sewerage Master Plans are being designed or constructed so that almost all of the population and industries in Hong Kong will be connected to an adequately sized public sewerage system in less than 10 years from now. The total costs of implementing these sewerage systems were estimated to be over HK\$7 billions (ie. US\$0.9 billions) at 1992 prices.

Strategic sewage disposal scheme (SSDS)

The SSDS is a plan to collect sewage from the urban areas of Kowloon and Hong Kong Island through a system of deep tunnels (Fig. 3) (Hong Kong EPD, April 1995). The sewage originally treated by the screening plants and discharged to the Victoria Harbour will be rerouted to this deep tunnel system, the deepest of which will be 150m underground (Tam, March 1995). All the tunnels will be at least 30m beneath the bed rock level so that there will be no disturbance to the sophisticated develop-

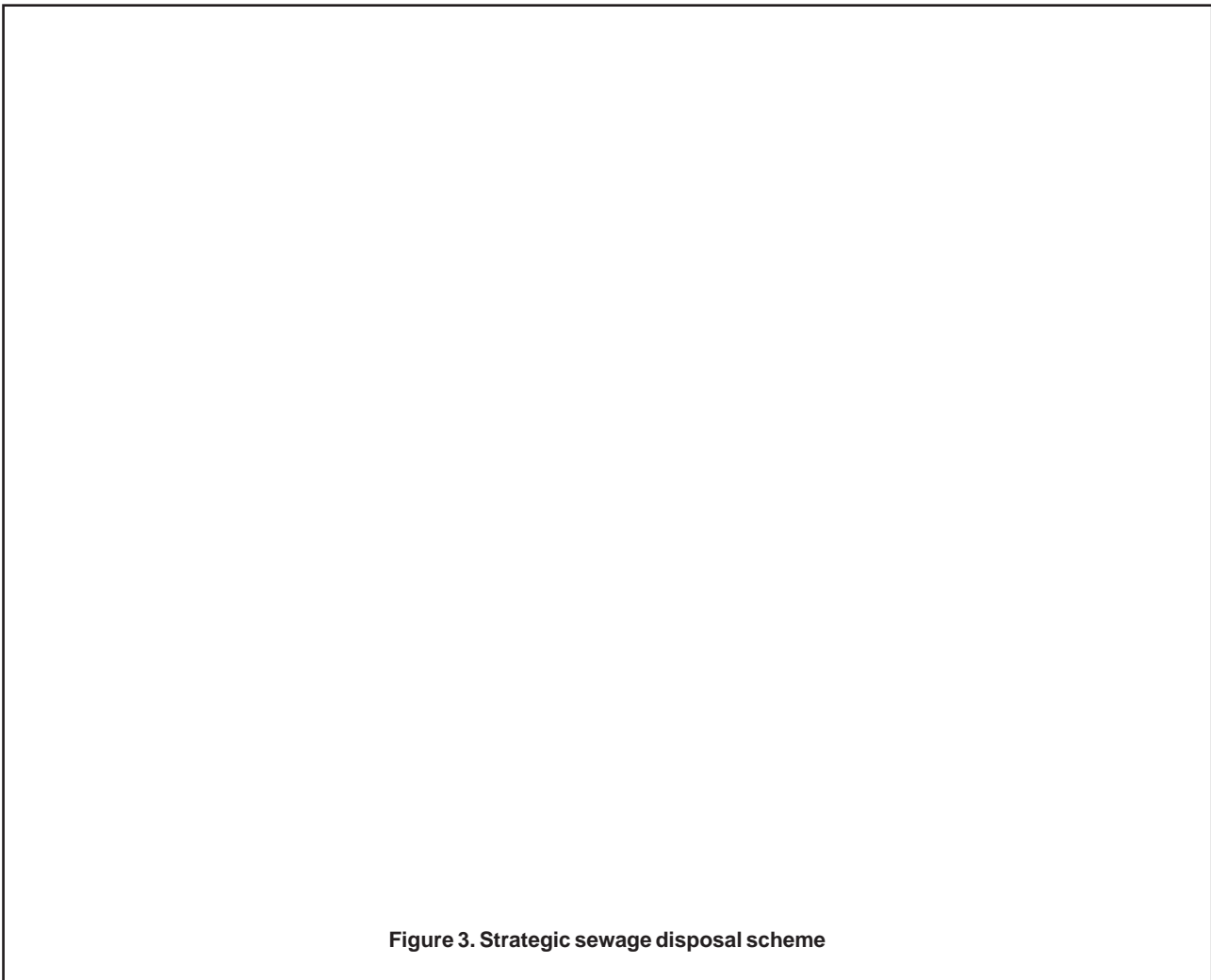


Figure 3. Strategic sewage disposal scheme

ments above ground. The tunnels vary in size from 900mm diameter at the upstream section to 4m at the treatment plant, and will be driven by tunnel boring machines (TBMs). The tunnel system will lead all sewage to a chemically enhanced primary treatment plant at Stonecutter's Island and the effluent will be discharged to the Western Harbour initially. The next stage will be to construct a long deep tunnel submarine outfall to convey the chemically enhanced primarily treated sewage from Stonecutters Island to the deep ocean waters south of Lamma Island. The total costs of the SSDS were estimated to be over HK\$12 billions (ie. US\$1.55 billions) at 1993 prices.

The decision ahead

There is a concern that the chemically enhanced primarily treated effluent discharged at the outfall may not fully achieve the seabed level dissolved oxygen standard. It is not possible, however, to predict accurately the scale of this problem at the time being, and it would be necessary to monitor the water quality at the outfall after its construction. As a precaution, a site at Mount Davis

(west end of Hong Kong Island) is reserved to accommodate a secondary treatment stage if the future monitoring of water quality at the outfall reveals that this is necessary. The additional cost of a secondary treatment plant was estimated to be over HK\$4 billions (ie. US\$0.52 billions) at 1995 prices.

References

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