LC Paper No. CB(1)908/20-21(05)

For discussion
on 24 May 2021

Legislative Council
Panel on Environmental Affairs

Enhancing the Quality of Coastal Waters of Victoria Harbour

PURPOSE

This paper briefs Members on the overall measures for enhancing the quality of coastal waters of Victoria Harbour and the implementation plan.

BACKGROUND

2. The Government strives to improve the water quality of Victoria Harbour. Since the end of the last century, the Harbour Area Treatment Scheme (HATS), the largest sewerage infrastructure project even embarked on in Hong Kong, has been implemented in stages. With the progressive commissioning of HATS Stage 1, Advance Disinfection Facilities and Stage 2A in 2001, 2010 and 2015 respectively, all sewage generated from both sides of Victoria Harbour (including Tsuen Wan and the south western districts of Hong Kong Island) is conveyed through deep tunnels to the Stonecutters Island Sewage Treatment Works for centralised chemically-enhanced primary treatment and disinfection, before being discharged to the western harbour waters through submarine pipeline.

3. After the commissioning of HATS, the water quality of Victoria Harbour has markedly improved. As compared to the water quality monitoring data acquired before 2001, the overall dissolved oxygen level in the Victoria Harbour Water Control Zone has increased by 14% in 2020. There has also been a substantial reduction of pollutants, including about 90% decrease in *Escherichia coli* (*E. coli*), 47% decrease in unionised ammonia nitrogen and 12% decrease in total inorganic nitrogen (see **Figure 1**). In the

past 3 years (i.e. 2018 – 2020), the overall compliance rate of Water Quality Objectives for the Victoria Harbour Water Control Zone has reached 90% or above. With the improvement in water quality, the annual cross-harbour swim race, suspended for years because of poor water quality, was resumed in 2011. In 2017, the event returned to its original race route in central harbour, with the start point at Tsim Sha Tsui adopted 40 years ago.

4. Hong Kong adopts separate collection systems for sewage and stormwater. Although sewage collected by sewerage system is treated and disinfected before discharge, rainwater gathered as surface run-off is directly discharged into the sea. In the densely populated old urban districts on both sides of Victoria Harbour, due to vibrant city activities, some polluted surface run-off will inevitably drain into the harbour via the stormwater drainage system and affect the quality of the near-shore waters. The non-point pollution sources of surface run-off are extensive, including roadside wet markets, outdoor eateries and various cleaning activities in public places and back alleys (e.g. cleaning of dishes and garbage bins) etc. Besides, misconnection of foul sewers to stormwater drainage system (hereinafter referred to as sewer misconnection), may discharge sewage into the stormwater drainage system, hence affecting the coastal water quality and environment of Victoria Harbour.

5. The Government commissioned a consultancy study on further enhancing the quality of coastal waters of Victoria Harbour in January 2016. In December 2017, when we reported to the Advisory Council on the Environment and the Panel on Environmental Affairs of the Legislative Council (LegCo) the work progress in improving the overall water quality of Hong Kong, we had introduced the investigation findings and recommendations of the study consultant. Members noted the effectiveness of the related work and supported the Government to continue with its efforts in enhancing the quality of near-shore waters. The Government is progressively implementing a series of measures to tackle the odour and aesthetic problems along the coastal areas of Victoria Harbour. These measures and their respective progress are set out below.

IMPLEMENTATION PROGRESS

Pollutant Interception Projects

6. The Government has identified 11 priority areas that are relatively close to residential premises and harbourfront amenity areas on both sides of Victoria Harbour for phased implementation of large-scale pollutant interception projects at the downstream of stormwater drains (see **Figure 2**), so as to reduce the amount of pollutants entering the harbour and enhance the near-shore water quality and overall environment. Plans are in place to install newly designed dry weather flow interceptors (DWFIs) near the stormwater outfalls in five of the priority areas, namely, Hung Hom, Wan Chai East, Causeway Bay Typhoon Shelter, Shau Kei Wan Typhoon Shelter and Tsuen Wan Bay. The respective works projects have been included in the Public Works Programme, and the investigation and design work is underway. Subject to support from local districts and funding approval by the LegCo, these projects are expected to be completed gradually between 2026 and 2028.

7. Apart from the newly planned projects mentioned above, a number of on-going works projects at various districts in Kowloon will be completed in the coming two years (i.e. 2022 to 2023). By then, there will be 60 new or modified DWFIs located in different areas at the western side of Victoria Harbour, distributed in Cheung Sha Wan, Shum Shui Po, Tai Kok Tsui, Yau Ma Tei, Tsuen Wan and Kwai Chung etc.; and another 14 new DWFIs installed at Lei Yue Mun and Tsui Ping River of Kwun Tong at the eastern side. These projects will bring about early improvement to the coastal water quality along Victoria Harbour and their total project cost is about $3.1 billion (see **Table 1** for details).

8. For other areas with potential pollution sources, the Government will, taking into account actual site conditions and constraints, study the feasibility of targeted interception measures, including installation of compact facilities at the stormwater drainage systems near non-point pollution sources (e.g. wet markets, street-side eateries and back lanes) to intercept refuse, sediments and grease, so as to reduce pollutants draining into Victoria Harbour. The Government is planning the trial of these facilities to test their performance as well as the operational and maintenance requirements for assessing the feasibility of general application.

Odour-control Hydrogel and Desilting Works

9. Apart from implementing pollutant interception projects, the Government has also started in March 2021 the application of odour-control hydrogel at stormwater outfall locations within the 11 priority areas as well as other coastal areas of Victoria Harbour that have potential odour problems to be mitigated. Odour-control hydrogel is a new technology collaboratively developed by the Drainage Services Department (DSD) and the Hong Kong University of Science and Technology, and is proven through on-site tests to be effective in reducing odour in drainage systems.

10. Moreover, the Government has been continuously implementing other measures, including conducting regular inspection of public sewerage and stormwater drainage systems, initiating maintenance works when needed, as well as applying new robotic technology to carry out desilting works, which not only can prevent flooding and keep drains clear, but also help mitigate odour problem caused by silting.

Sewerage Works

11. To prevent leakage from sewers affecting the water quality of Victoria Harbour, the Government is carrying out replacement and rehabilitation works for ageing underground sewers. At present, there are about 1 800 kilometres (km) of underground sewers in Hong Kong, of which about 180 km are rising mains. A number of these rising mains have been in service for many years and are of single-pipe design, with the risk of pipe burst increasing over their service years. Depending on the extent of ageing and deterioration, we will rehabilitate aged rising mains progressively and upgrade them to twin-pipe system in order to enhance their operational reliability and prevent pollution caused by leakage. Currently, there are about 9 km of rising mains under replacement and rehabilitation, of which 3 km are within the Victoria Harbour Water Control Zone, and we plan to carry out similar works for another 75 km of rising mains in the coming 10 years.

12. The Government will also adopt a risk-based approach to conduct investigation for gravity sewers in phases, with a view to identifying timely those gravity sewers which have higher risk of structural failure, as well as

arranging and carrying out rehabilitation works in an orderly manner. Currently, there are about 55 km of major gravity sewers in the territory undergoing replacement and rehabilitation; and 260 km of pipes are at the investigation and planning stages. Out of these sections of pipelines, the lengths of the sewers under replacement, rehabilitation and investigation in the Victoria Harbour Water Control Zone are about 26 km, 10 km and 40 km respectively. In addition, the Government will conduct regular review on all high-risk gravity sewers for timely planning of subsequent rehabilitation works.

13. The Government is also implementing other works to upgrade sewage treatment facilities and extend public sewerage system to cater for the population growth, development needs and proper treatment of wastewater. Among them, projects aiming at protecting the quality of Victoria Harbour's coastal waters include the upgrading of Kwun Tong Preliminary Treatment Works and the enhancement works for Kwun Tong Sewage Pumping Station with an estimated cost of about $1.4 billion, and the provision of sewerage system for Ma Yau Tong Village costing about $180 million. These two groups of projects are expected to be completed in 2022 and 2024.

Control at Pollution Source

14. The Government continues to conduct on-site investigations and trace pollution sources in the stormwater system at more areas on both sides of Victoria Harbour (including Tsuen Wan, Kowloon City, Hung Hom, Yau Tong, Sai Ying Pun, North Point and Quarry Bay). The pollution information collected will be passed to relevant government departments for follow-up. If the pollution sources involve sewer misconnections in private buildings, the Environmental Protection Department (EPD) and the Buildings Department (BD) will take appropriate law enforcement actions against the persons who caused the illegal sewage discharge and the owners of buildings identified with misconnected sewers respectively, so as to cease the illegal sewage discharge and rectify the sewer misconnections to prevent pollutants from entering the coastal waters of Victoria Harbour. In the past three years (i.e. from 2018 to 2020), EPD and BD had followed up and rectified 139 cases of building sewer misconnections within the Victoria Harbour Water Control Zone.

15. Sewer misconnections often involve sewers in individual units and communal foul water drainage system of buildings, the causes and

responsibilities of which are complicated. If the buildings involved do not have owners' organizations or have not engaged property management companies (commonly known as "three-nil buildings"), a lengthy process will be involved in the resolution of the problems. Apart from making investigations and taking enforcement actions, the Government provides financial and technical assistance to building owners through different schemes, including the Urban Renewal Authority's one-stop Integrated Building Rehabilitation Assistance Scheme, and the Building Drainage System Repair Subsidy Scheme (Subsidy Scheme) which was open for the first round of applications from 1 May this year. The Subsidy Scheme aims to provide assistance to eligible owners in repairing and upgrading their building drainage systems, including the rectification of sewer misconnections.

16. The Government has also been carrying out investigation and rectification of public sewer misconnections. In the past 3 years (i.e. 2018 to 2020), the DSD and EPD had collaboratively followed up and rectified 62 cases of public sewer misconnections within the coastal districts of Victoria Harbour.

Publicity and Education

17. The Government has launched a TV Announcement in the Public Interest ("Never Discharge Wastewater into a Rainwater System") to educate the public on the separate rainwater drainage and sewerage systems and raise public awareness on the proper means of discharging rainwater and wastewater, so as to avoid causing pollution. Meanwhile, visits for the public to sewage treatment and flood prevention facilities, regular outreach educational programmes, as well as public activities and exhibitions have been organised by the DSD to introduce their rainwater drainage and sewage treatment services in Hong Kong to the public and raise awareness on environmental protection and pollution prevention.

18. To further promote the avoidance of pollutants from entering stormwater drains at source, the Government is planning to fund local non-profit making organizations through the Environment and Conservation Fund to promote proper building drainage connections and clean street-side commercial activities. The purpose is to remind building owners and property management companies to maintain drainage systems regularly and rectify

misconnected sewer pipes, and to educate operators of street-side stalls, markets and eateries etc. the proper way of discharging sewage for keeping Victoria Harbour clean.

Future Plans

19. The Government will actively promote the use of the "blue-green infrastructure" modern stormwater management concept in new development, redevelopment and enhancement projects. "Blue-green infrastructure" can reduce loading to the drainage system and enhance the flood resilience level of the city. The design elements of the "blue-green infrastructure" include flood storage tank, flood retention lake, river revitalisation, green roof, rain garden, porous pavement, rainwater harvesting system and other sustainable drainage system, for enabling in-situ infiltration, storage, purification and reuse of rainwater before discharge as far as possible. "Blue-green infrastructure" has been implemented in some new development projects on the sides of Victoria Harbour, for example, the Kowloon City Sewage Pumping Stations project, which adopts a number of stormwater management measures including green roof, porous pavement, rain garden and rainwater harvesting system, etc. Another example is the Anderson Road Quarry Development project, which involves the construction of Hong Kong's first artificial flood attenuation lake, which can reduce the burden of the downstream drainage systems in rainy days and provide public open space for leisure use for the rest of time. Harvested rainwater will be reused for irrigation so as to optimize use of resources and reduce surface runoff.

IMPLEMENTATION PLAN AND EFFECTIVENESS MONITORING

20. The implementation plan of the above-mentioned measures to enhance the coastal water quality of Victoria Harbour is summarised as follows:

Ongoing measures

- Tracing pollution sources
- Enhancing enforcement actions
- Rectifying sewer misconnections
- Applying odour-control hydrogel to mitigate odour problem of stormwater drains

- Clearing drains and conducting desilting works
- Progressive rehabilitating underground sewers
- Taking forward publicity and education on prevention of near-shore pollution

Medium-term measures (expected completion in 5 years)

- Completion of 74 new or modified DWFIs in Cheung Sha Wan, Shum Shui Po, Tai Kok Tsui, Yau Ma Tei, Tsuen Wan, Kwai Chung, Kwun Tong and Lei Yue Mun
- Completion of the upgrading works for the Kwun Tong Preliminary Treatment Works and enhancement works for the Kwun Tong Sewage Pumping Stations
- Completion of sewerage system for Ma Yau Tong Village
- Trial of pollutant interception facilities at areas with non-point pollution sources

Long-term initiatives

- Installation of newly designed DWFIs in Hung Hom, Wan Chai East, Causeway Bay Typhoon Shelter, Shau Kei Wan Typhoon Shelter and Tsuen Wan Bay
- Exploration of other suitable pollutant interception locations and engineering measures

Future Planning

- Adoption of "blue-green infrastructure" modern stormwater management design elements in new development, redevelopment and enhancement projects in Victoria Harbour areas

21. During the implementation of various measures, the EPD will monitor the near-shore water quality at 11 priority areas to assess their effectiveness and evaluate the long-term trend in water quality. Initial baseline surveys for near-shore water quality monitoring of Victoria Harbour had already commenced in the last quarter of 2020. In addition, the EPD and DSD will regularly evaluate the effectiveness of using hydrogel on odour control and make adjustments for achieving better result.

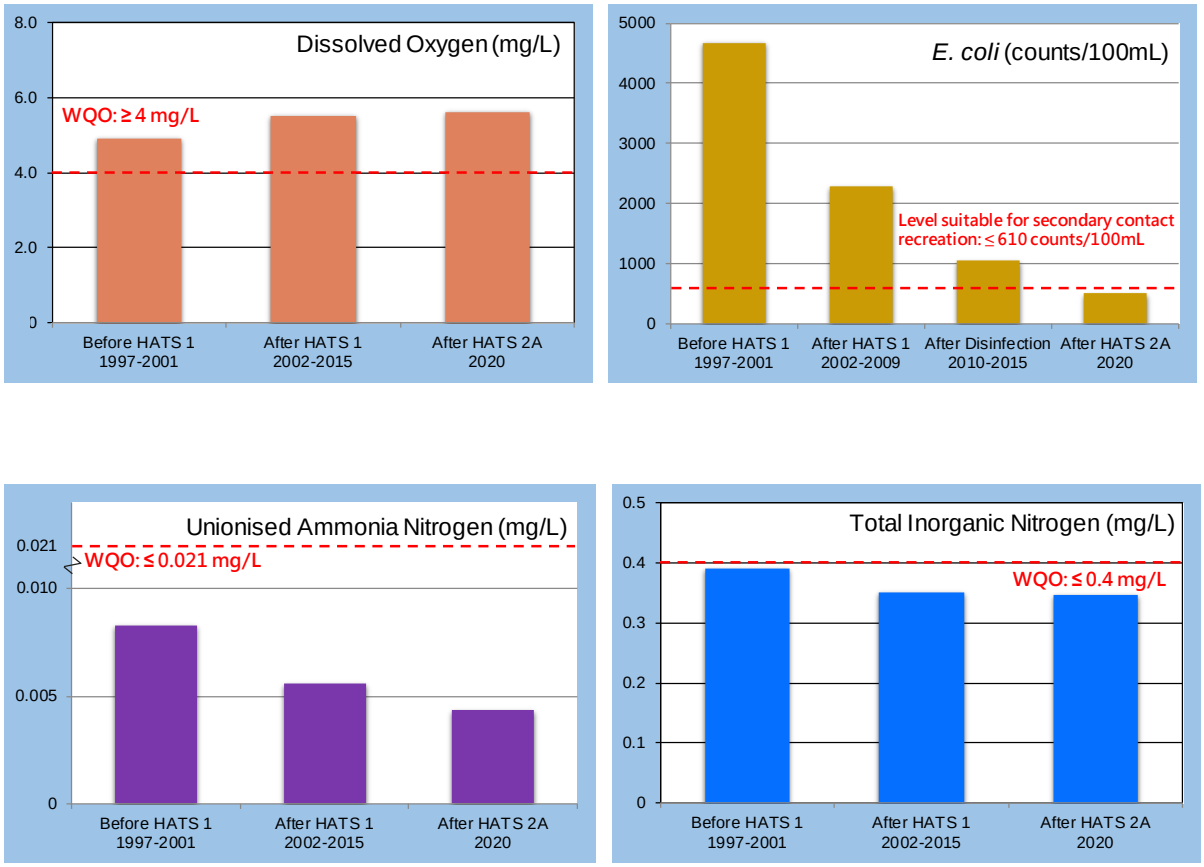
ADVICE SOUGHT

22. Members are invited to note and give views on the Government's work progress made in enhancing the quality of coastal waters of Victoria Harbour.

Environment Bureau
Environmental Protection Department
May 2021

Figure 1

Water Quality Improvement in Victoria Harbour after implementation of HATS



*(Note: (i) The above diagrams show the overall average water quality data collected from 10 monitoring stations in the Victoria Harbour Water Control Zone. (ii) WQO: Water Quality Objective)

Figure 2

Location Plan of Pollutant Interception Facilities and Works Projects in Victoria Harbour

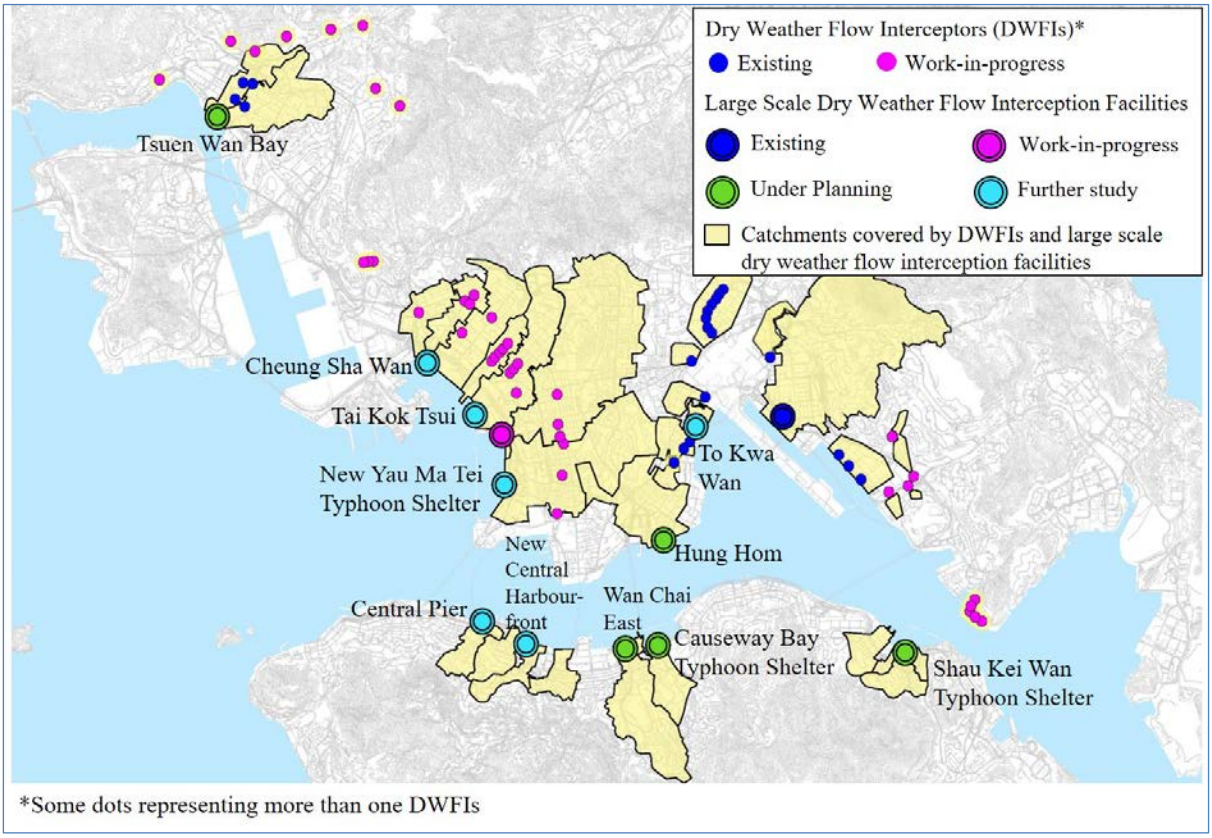


Table 1

DWFI Works Projects in Progress in Different Areas of Kowloon

Works project	Project scope	Expected completion year	Project estimate
Upgrading of West Kowloon and Tsuen Wan Sewerage - Phase 1	Construction of 8 new DWFIs and modification of 43 existing DWFIs in West Kowloon and Tsuen Wan	2022	$280 million
Construction of DWFI at Cherry Street Box Culvert	Construction of an underground DWFI at Cherry Street box culvert	2022	$660 million
West Kowloon and Tsuen Wan Village Sewerage - Phase 1	Construction of 8 new DWFIs in Tsuen Wan and Kwai Chung	2023	$100 million
Sewerage to Lei Yue Mun Village	Construction of about 1km of sewer and 9 new DWFIs, and 460m of twin-pipe rising main and 4 sewage pumping chambers	2023	$260 million
Revitalization of Tsui Ping River in Kwun Tong	Revitalization of about 1km of nullah and construction of 5 new DWFIs	2023	$1.76 billion