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Panel on Environmental Affairs

Meeting on 26 February 2024

Background brief on water quality monitoring in Hong Kong

Purpose

This paper provides background information on water quality monitoring in Hong Kong. It also gives a brief account of the views and concerns expressed by Members when related issues were discussed by relevant committees of the Legislative Council ("LegCo") in recent years.

Background

Water quality monitoring in Hong Kong

2. The Water Pollution Control Ordinance (Cap. 358) provides the main statutory framework for the declaration of water control zones and the establishment of water quality objectives ("WQOs"). WQOs describe the water quality that should be achieved and maintained in order to promote the conservation and the best use of the waters of Hong Kong. The Environmental Protection Department ("EPD") monitors the water quality of some 1 700 sq km of the territory's marine waters. There are a total of 10 water control zones in Hong Kong (including the Victoria Harbour Water Control Zone), and each water control zone has a set of WQOs.[1]

[1] The rates of annual compliance with the key WQOs (i.e. dissolved oxygen, unionized ammonia, total inorganic nitrogen and Escherichia coli (*E.coli)*) are assessed based on all the data collected at 76 marine monitoring stations during the year.

Measures to improve the marine environment

Sewerage Master Plans

3. Since the 1980s, the Administration has been striving to improve Hong Kong's water quality through the implementation of the Sewerage Master Plans in the territory and the enforcement of environmental laws. Priorities have been given to protecting sensitive waters including gazetted beaches and water gathering grounds, etc., and providing sewerage and sewage treatment facilities serving the densely populated areas on both sides of Victoria Harbour and in the New Territories. At present, over 93% of the population in Hong Kong is served by public sewerage facilities.

Harbour Area Treatment Scheme

4. For the purpose of improving the water quality of Victoria Harbour, the Administration implemented the Harbour Area Treatment Scheme ("HATS") 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 centralized chemically enhanced primary treatment ("CEPT") and disinfection, before being discharged to the western harbour waters through submarine pipeline.

5. To review the need for implementing HATS Stage 2B (which was to provide an underground biological treatment facility adjacent to the Stonecutters Island Sewage Treatment Works), the Administration conducted a consultancy study in June 2010. The findings showed that HATS Stage 2A had already provided adequate capacity to handle the projected sewage flow in the Victoria Harbour catchment, and the upgrading of treatment level from CEPT to biological treatment would not result in an observable improvement of the water quality of coastal waters. The review thus concluded that the implementation of HATS Stage 2B was not critical in terms of WQO compliance. According to the Administration, it would keep under review the implementation of HATS Stage 2B taking into account the water quality situation and the latest technological development in biological treatment.

Tackling the odour problem at coastal areas

6. The Administration has been implementing a series of measures to mitigate the odour problem of stormwater outfalls having regard to the results and recommendations of a consultancy study commenced in 2016. Targeted pollution control works projects, including construction and modification of dry weather flow interceptors ("DWFIs"), rehabilitation of ageing sewers are being carried out

progressively at various locations. The Administration also carries out inspection, maintenance and desilting of public sewers and stormwater drainage systems on a regular basis. Starting from March 2021, Malodour Control Hydrogel has been applied regularly and extensively at stormwater outfalls along the shorelines of Victoria Harbour and nearby locations to mitigate odour.[2]

Removal of marine refuse

7. In November 2012, the Administration set up an Inter-departmental Working Group on Clean Shorelines (which was later revamped and renamed as Inter-departmental Working Group on Marine Environmental Management) to co-ordinate and enhance efforts among the relevant government departments in tackling the marine refuse problem. A three-pronged strategy (including reducing waste generation at source, reducing the amount of refuse entering the marine environment, and removing refuse from the marine environment) is adopted to enhance the cleanliness of Hong Kong's shorelines. Relevant measures include providing support facilities to reduce the amount of refuse entering the sea, enhancing efforts to remove marine refuse, launching publicity and educational campaigns, and conducting enforcement actions. On regional collaboration, Hong Kong and Guangdong set up the Hong Kong-Guangdong Marine Environmental Management Special Panel in 2016 to enhance exchange and communication on various regional marine environmental matters.

<u>Environmental impact assessment system</u>

8. The Chief Executive announced in the 2021 Policy Address the initiative to review the Environmental Impact Assessment ("EIA") process under the Environmental Impact Assessment Ordinance (Cap. 499) to improve the EIA mechanism (which includes water quality assessment). After the review and relevant legislative amendments,[3] the EIA process has been enhanced by, among others, standardizing the water quality modelling requirements and assessment approaches.

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[2] Malodour Control Hydrogel is a new technology jointly developed by the Drainage Services Department and the Hong Kong University of Science and Technology, and has been proven through on-site tests to be effective in reducing odour in drains.

[3] The relevant legislative amendments to enhance the EIA mechanism were introduced through the Environmental Impact Assessment Ordinance (Amendment of Schedules 2 and 3) Order 2023 and the Technical Memorandum On Environmental Impact Assessment Process gazetted in May 2023. A subcommittee was formed to study the subsidiary legislation and technical memorandum. For details, please refer to the report of this subcommittee.

Application of innovative technologies

9. The Administration utilizes unmanned aircraft systems to conduct water sampling work for locations far away from the shore, and unmanned ships to conduct real-time water quality monitoring and obtain samples simultaneously, with a view to strengthening pollution source investigations. Other applications of innovative technologies in water quality monitoring include the use of:

(a) scientific buoys to collect real-time hydrological and water quality monitoring data;

(b) satellite remote sensing imagery for regional water quality monitoring;

(c) Delft3D Flexible Mesh technology to upgrade hydrodynamic and water quality model for EIA; and

(d) marine refuse computer alert system to forecast possible occurrence of marine refuse surge when a torrential rainstorm occurs in the Guangdong Province area.

10. To strengthen the development and application of smart technologies in water quality monitoring, modelling and data visualization, EPD established in 2021 an integrated smart technology centre, namely the Smart Water Science Centre ("SWSC"). SWSC is equipped with advanced computing servers and high-performance computing clusters, which allow integration of data and information acquired from smart monitoring system, modelling projects and the routine monitoring programme, into the SWSC database. To further enhance the capability of SWSC in responding to environmental and emergency incidents, EPD is working on various projects, such as developing simulation modules for spillage of oil and hazardous and noxious substances, and the Marine Refuse Computer Alert System.

Major views and concerns expressed by Members

11. Members discussed issues relating to water quality, EIA process and marine refuse at various meetings of the Panel on Environmental Affairs ("EA Panel"). Relevant issues were also brought up during the examination of the Estimates of Expenditure in recent years. Members' major views and concerns are summarized in the ensuing paragraphs.

Water Quality Objectives compliance situation

12. Members enquired about the WQO compliance rate of Victoria Harbour and how the Administration would facilitate public understanding of water quality monitoring data. The Administration advised that the overall compliance rate of WQOs in the past five years (2018-2022) had remained 90% or above. The overall compliance rate in 2022 was 93%, which was comparable to the five-year average of 95%. The compliance rate of individual years would vary due to the influence on marine water quality by weather conditions, such as sunshine, temperature and rainfall, as well as the seasonal fluctuations of background levels. The slight decrease in the overall WQOs compliance rate of Victoria Harbour in 2022 was mainly attributed to the relatively high background levels of total inorganic nitrogen in seawater associated with the impact of the Pearl River flow and the southwesterly monsoon in summer months. Nonetheless, the marine water quality of Hong Kong had still shown a noticeable improvement overall.

13. The Administration further advised that it endeavoured to provide water quality information to the public through annual water quality monitoring reports in forms that were easy to understand, such as indices, gradings and compliance rates of Water Quality Objectives. For example, a Water Quality Index was developed to classify river water quality into five categories (from "excellent" to "very bad") according to the level of organic pollution. EPD also used a similar method to provide predicted water quality grading for gazetted beaches via the Beach Water Quality Forecast System.

Pollutant interception and prevention

14. Members observed that despite the significant improvement in the overall water quality of Victoria Harbour over the years, there were still frequent complaints about odour problems along certain coastal areas. They sought elaboration on the cost-effectiveness of pollutant interception facilities to enhance water quality.

15. Referring to the DWFIs at Kai Tak Nullah and Yau Ma Tei Cherry Street, the Administration affirmed that DWFIs had been proven effective in intercepting polluted run-off at the downstream of culverts and resolving the near-shore odour problem. Nevertheless, it remained necessary to adopt a multi-pronged approach to tackle the odour and environmental problems in coastal areas, taking into account the various sources of polluted surface run-off. Certain measures such as desilting of public sewers and stormwater drains had to be carried out regularly to maintain their effectiveness.

16. The Administration further advised that 11 priority areas on both sides of Victoria Harbour (including the stormwater outfalls in Hung Hom, Causeway Bay

and Tsuen Wan Bay) had been identified for phased implementation of large-scale pollutant interception projects at the downstream of stormwater drains. There were plans to install DWFIs near the stormwater outfalls in Wan Chai East and Shau Kei Wan Typhoon Shelter whereas the remaining six locations were under study. Whether additional DWFIs would be needed in future would depend on, among others, the effectiveness of control at pollution source.

Enforcement against misconnection of sewers

17. Members enquired about enforcement against misconnection of sewers to stormwater drains and suggested increasing the penalty for related offences to raise the deterrent effect. There was also a suggestion that odour detectors be installed at different points along stormwater drains to enable early detection of illicit connections.

18. The Administration advised that it conducted on-site investigations to trace pollution sources in stormwater systems, and collected samples of drainage discharge at strategic locations in the systems for investigation. Closed-circuit television ("CCTV") cameras were installed inside the drainage systems for detecting and tracking illicit connections. Considerations would be given to installing such cameras at more strategic locations as appropriate. The Administration took note of Members' suggestion of studying the possibility of increasing the penalty for offences associated with misconnection of sewers.

Marine refuse

19. Members expressed concern about floating refuse trapped in seawalls as this might give rise to odour along coastal areas. They enquired about the Administration's latest efforts to remove floating refuse.

20. The Administration responded that pollutants discharged through the stormwater drainage system might accumulate along seawalls due to the weaker seawater circulation at those locations. The major strategy for preventing this was to intercept pollutants in stormwater drains, so as to reduce the amount of pollutants entering the sea. The Task Force on Marine Refuse under the Inter-departmental Working Group on Marine Environmental Management coordinated interdepartmental efforts to ensure timely removal of floating refuse and shoreline refuse. The task force also assessed the cleanliness of different coastal sites for implementation of targeted improvement measures, such as increasing cleaning frequency.

Council question

21. Members raised questions about quality of coaster waters of Victoria Harbour at various Council meetings in recent years. The questions and the Administration's replies are hyperlinked in the **Appendix**.

Latest development

22. The Administration will brief EA Panel on water quality improvement in Victoria Harbour at the meeting on 26 February 2024.

Relevant papers

23. A list of relevant papers is set out in the **Appendix**.

Council Business Division 1 and Public Complaints Office
Legislative Council Secretariat
22 February 2024

Appendix

Water quality monitoring in Hong Kong

List of relevant papers

Committee	Date of meeting	Paper
Panel on Environmental Affairs	24 May 2021	Agenda Item V: Enhancing quality of coastal waters of Victoria Harbour Minutes
	27 September 2021	Agenda Item IV: The use of smart technologies for environmental protection Minutes
	28 March 2022	Agenda Item IV: Review of the Environmental Impact Assessment Ordinance process Minutes
	12 December 2022	Agenda Item II: Review of the Environmental Impact Assessment Ordinance process Minutes
	27 February 2023	Agenda Item IV: Application of advanced smart technologies in water quality monitoring and modelling, and the improvements of the marine environment of Hong Kong Minutes
	17 October 2023	Agenda Item I: Construction of dry weather flow interceptors at Hung Hom, Causeway Bay and Tsuen Wan Minutes
Finance Committee	13 April 2021	Administration's written replies to Members' initial questions on the Estimates and Expenditure 2021-2022 (Reply serial numbers: ENB113, 141, 168 and 185)
	11 April 2022	Administration's written replies to Members' initial questions on the Estimates and Expenditure 2022-2023 (Reply serial number: ENB017)

Committee	Date of meeting	Paper
	13 April 2023	Administration's written replies to Members' initial questions on the Estimates and Expenditure 2023-2024 (Reply serial numbers: EEB(E)050, 067, 069, 070, 087 and 116)

Organization	Document
Environmental Protection Department	Marine Water Quality in Hong Kong 2022

Council meeting	Paper
11 May 2022	Council question 21: Improving the quality and odour of coastal waters of Victoria Harbour
31 May 2023	Council question 12: Improving the ancillary facilities at Tai Po Lung Mei Beach
31 May 2023	Council question 22: Improving the quality and odour of coastal waters of the Victoria Harbour
18 October 2023	Council question 18: Measures to cope with discharge of nuclear wastewater by Japanese Government
22 November 2023	Council question 14: Water quality of river channels and nullahs