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For discussion on 14 December 2009

**Review and Development of Marine Water Quality Objectives
First Stage Public Engagement Exercise**

PURPOSE

This paper seeks Members' views on the key issues to be addressed and the proposed approaches and methodologies to be adopted in the review and development of marine water quality objectives (WQOs).

BACKGROUND

2. WQOs are established under the Water Pollution Control Ordinance (WPCO (Cap. 358)) for waters in Hong Kong. They specify the quality that should be achieved and maintained in order to promote the conservation and best use of waters in the public interest. They also serve as the objective and scientific basis for planning our environmental protection programmes and initiatives. Under the WPCO, the Secretary for the Environment may amend any WQO from time to time after consultation with the Advisory Council on the Environment (ACE).

3. The current set of WQOs was established according to the water conditions and scientific knowledge of the 1980s. At present, Hong Kong is divided into ten Water Control Zones (WCZs)¹. Specific WQOs have been established for each WCZ and/or its subzones. A map delineating our WCZs is at **Appendix A**, whereas a summary of existing WQOs for all WCZs in Hong Kong is at **Appendix B**.

¹ The Chief Executive-in-Council may declare by order any parts of Hong Kong to be a WCZ after consultation with the ACE. For each WCZ, the Secretary for the Environment establishes the WQOs or different objectives for different parts of a zone after consultation with the ACE.

4. When we briefed the ACE on 16 May 2008 concerning the bacteriological WQO for bathing beach waters in Hong Kong, Members were informed that an overall review of the marine WQOs would be conducted to keep pace with international developments. Members noted and supported the overall review of marine WQOs, and would like to provide inputs in the course of the review.

STUDY ON THE REVIEW OF MARINE WQOs

5. There is a need to review our marine WQOs. Over the years, there has been significant advancement in water science and technology. New beneficial uses² of our waters, notably marine parks and reserves, have emerged. The community is now more aware of the need to protect our environment. Owing to the increasing aspirations for better quality of life, the public expects a higher quality marine environment for recreational and marine conservation purposes.

6. A sustainable society also requires a sustainable marine environment. As a member of the global community, it is our responsibility to continue to contribute to the sustainability of the marine environment through international cooperation. We have implemented international agreements and treaties which aim at preventing pollution and conserving marine resources, and would continue to participate in international fora such as the Asia-Pacific Economic Cooperation Forum³.

7. In October 2008, we commissioned a consultancy study on the review and development of the marine WQOs. The objectives of the study are to review and develop the marine WQOs, taking into account the latest scientific information, the latest conditions in Hong Kong, the environmental needs, the technical attainability and the potential socio-economic implications of any proposed changes, as well as the views of the public. The key tasks of the study include the followings:

- (a) development of review methodology;
- (b) review of nutrient objectives;
- (c) review of physical and chemical WQOs;
- (d) review of microbiological WQOs;
- (e) development of biological objectives;

² Beneficial use is the planned use of a water body. A water body is deemed fit for a specific beneficial use if it satisfies the relevant WQOs.

³ An example is the Stockholm Convention on Persistent Organic Pollutants.

- (f) development of WQOs for protection of human health through consumption of seafood;
- (g) development of WQOs specific to identified beneficial uses; and
- (h) evaluation of technical attainability and socio-economic impacts, and assessment on sustainability and refinement of recommendations on WQOs.

8. The study would include two public engagement exercises. The first stage public engagement would be conducted after completing the review on the existing conditions and overseas practices. The second stage public engagement would be held after any proposed changes to the WQOs are formulated. An advisory committee comprising academics, professionals and representatives of various bureaux and departments has been set up to provide peer review of the technical findings.

KEY ISSUES IDENTIFIED

9. The study has so far reviewed the characteristics and quality of marine water quality in Hong Kong, the overseas approaches for water quality management and the corresponding methodologies for establishing WQOs. The following key issues and observations have been identified:

- (a) some WQOs might no longer be appropriate for today's conditions. For example, we only have one narrative WQO for toxic substances, whereas some other places have introduced numerical WQOs for individual toxic substances;
- (b) high background levels of some chemicals might have also led to non-compliance with some WQOs. For example, non-compliance with the WQO for total inorganic nitrogen has been observed in Deep Bay for a few years due to the high background level, although algal growth in the water body is at a surprisingly low level;
- (c) there are also some water bodies in which two or more beneficial uses co-exist. For example, Deep Bay is used for oyster culture and other sensitive marine uses, but it is also close to urban developments;
- (d) the existing WQOs might not be able to provide full protection for some beneficial uses (e.g. mariculture). New beneficial uses (e.g. marine parks and reserves) do not have WQOs;

- (e) we would also need to keep in pace with other overseas practices, such as:
 - (i) use of biological indicators;
 - (ii) establishment of nutrient-related WQOs with reference to background conditions;
 - (iii) more common use of numerical WQOs; and
 - (iv) use of other bacterial indicators for bathing waters.

10. The study has also identified a list of nutrient-related, physical, chemical and microbiological parameters (**Appendix C**) that should be reviewed further in the course of this study. A comparison of the types of water quality objectives or standards adopted in Hong Kong and overseas is at **Appendix D**.

OVERSEAS PRACTICES AND EXPERIENCES

11. According to the study findings, there are three main approaches adopted in the world for setting the quality standards of marine waters:

- (a) Technology-Based Approach: The approach is intended to apply the best available technology to meet the required standards for discharges into marine waters. It is commonly adopted in Germany, Japan, and Malaysia.
- (b) Use-Protection Approach: Under this approach, a suite of quality standards is developed to offer different levels of protection that are commensurate with the beneficial uses of the water body. Such an approach is largely adopted in Canada, the US, Europe, Australia, as well as in Hong Kong when we established our WQOs in the 1980s.
- (c) Non-Degradation Approach: This is the strictest form of Use-Protection Approach that does not tolerate any disturbance to marine life. It is usually applied to waters of high ecological value.

12. The following approaches and methods have been applied in various places to establish a variety of water quality parameters and indicators:

- (a) WQOs for natural parameters: The *Reference Site Approach* is commonly adopted to establish the WQOs for parameters such as pH, temperature, salinity and dissolved oxygen. Establishment of the numerical standard for each natural parameter is based on at least two years' data at a reference site. The biological make-up of the reference site should resemble that of the water body for which a WQO is to be established. Such an approach is common in Australia, the EU and the US.
- (b) WQOs for nutrient-related parameters: The primary purpose of setting WQOs for parameters such as nitrogen, silicate, and phosphate is to control excessive growth of algae. Australia, the EU and the US have also adopted the *Reference Site Approach* in this regard. It is also common to take into account site-specific factors contributing to excessive algal growth, such as water current and light intensity.
- (c) WQOs for chemical parameters (and toxicants): The *Risk Assessment Approach* aims to protect a certain percentage (e.g. 95% or 80%) of marine species in a water body. It becomes the *Full Protection Approach* if the aim is to protect 100% of the species at all times. Such approaches are common in Australia and the US. The *Assessment Factor Approach*, i.e., application of a “factor of safety” to the numerical standard derived from toxicity data, is commonly used if there are insufficient data.
- (d) Biological indicators: These indicators measure how resident species in a water body “behave” when exposed to pollution. Baseline or “normal” data of biological conditions, such as the types, abundance, distribution, composition and diversity of marine life in a certain water body, are collected and used for developing an index or grading scale to reflect changes in these biological conditions against the “normal” conditions.
- (e) WQOs for bathing waters: The World Health Organisation (WHO) issued the “WHO Guidelines for Safe Recreational Water Environments” (the WHO Guidelines) in 2003, in which WHO has identified intestinal *Enterococci* to be the most suitable bacterial indicator for the relationship between bathing water pollution and common bathing illnesses such as gastrointestinal illnesses and acute febrile respiratory illnesses.

PROPOSED REVIEW APPROACHES AND METHODOLOGIES

13. Based on the review of overseas practices and local conditions, the following general principles would be applied for the review and development of the WQOs in Hong Kong:

- (a) Application of the *Use-Protection Approach* taking into account existing beneficial uses;
- (b) Application of *Non-Degradation Approach* to waters of high ecological value; and
- (c) Application of *Risk Assessment Approach* to protect at least 80% of species.

14. Specifically, the following methodologies have been proposed for establishing the appropriate values for different types of WQO parameters:

- (a) the values of the natural parameters would be set with reference to site-specific background data;
- (b) the values of the nutrient-related parameters would be established with reference to both site-specific background data and the trigger points for algal blooms;
- (c) for chemical parameters (including toxicants), the Risk Assessment Approach would be used in establishing the values for chemicals with sufficient toxicity data, or otherwise the Assessment Factor Approach would be considered in the interim. Full Protection Approach would be considered when sensitive organisms are involved and as appropriate;
- (d) regarding the biological parameter, the baseline “normal” biological conditions for selected ecosystems would be assessed based on the data from our monitoring programme, and the results would be used to identify suitable indicators and parameters;
- (e) on the bacterial indicator for bathing waters, reference to the WHO Guidelines would be made and the use *Enterococci* as a bacterial indicator would be explored; and
- (f) with regard to mariculture (fish farming, shellfish cultivation, etc), the risk-based approach would be adopted and overseas and local references would be drawn upon as appropriate.

PUBLIC ENGAGEMENT

15. We issued the First Stage Public Engagement Document (**Enclosure 1**) and the Technical Note (**Enclosure 2**) on 25 September 2009. The first stage public engagement exercise will last until 31 December 2009. Public views are sought on issues such as:

- (a) whether any beneficial uses of the waters should be considered;
- (b) what the priority and level of protection for various beneficial uses and sensitive receivers should be;
- (c) whether the proposed review approaches are appropriate; and
- (d) what water quality management principles should be considered during the review.

16. To facilitate the public to understand the issues and formulate their views, a dedicated website (http://www.epd.gov.hk/epd/wqo_review/) has been set up to provide a wide range of information including water quality data, the various examples of beneficial uses, the previous water quality improvement cases and overseas practices. A public seminar was held on 31 October 2009 to listen to the views of the community. In addition, we have also organised focus group meetings and briefing sessions to actively engage various stakeholders.

VIEWS SOUGHT

17. Members are invited to offer views and comments on the key issues and the review approaches and methodologies set out in paragraphs 9 to 14 above and the public engagement document.

Environmental Protection Department
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