

Total Water Management in Hong Kong

Introduction

This paper briefs Members on the concept and approach to be adopted by the administration in the formulation of the Total Water Management, and reports on the progress of the pilot desalination plant and trial effluent reuse scheme.

2. Hong Kong is a vibrant city with a population of 6.8 million. The estimated fresh water consumption in 2003 is about 960 million cubic metres (mcm). Although efforts on conservation in the past have been able to curb rapid growth in the unit consumption of various uses, the overall total water consumption is expected to experience a mild growth of about 1.3 per cent per annum in the coming 10 years commensurate with population growth and increase in economic activities.

3. The lack of local fresh water resources, which are rainfall-dependent, has long been a matter of concern. The fresh water demand is currently met largely by importation of Dongjiang water. The maximum capacity available through the Dongjiang water supply system will be sufficient to cope with the projected demand in the coming two decades under a rapid demand growth scenario.

4. Utilisation of different types of water resources, from their abstraction to their final disposal, will have different degrees of impact on the environment. From a sustainable perspective, rational utilisation of water resources in a holistic manner, both for the existing ones and the new resources to be explored, would significantly reduce impacts on the environment and is thus important for the long-term development of Hong Kong.

5. The Administration, therefore, pledged in the 2003 Policy Agenda that a Total Water Management (TWM) programme would be implemented as the major initiative to enhance water conservation and water resource protection. The TWM involves optimal utilisation of water resources in the whole water cycle. On the demand side, effective measures are taken to use the most appropriate types and quantities of water available for different purposes, with minimum wastage. On the

supply side, the existing water resources are protected in both quality and quantity, while the feasibility of developing alternative water resources will be examined through the implementation of pilot schemes.

Demand Side Management

6. The Water Supplies Department (WSD) has long been promoting water conservation. It is recognised that the success of TWM requires the support of the community. WSD has therefore launched on-going education and publicity programmes to raise the public awareness and appreciation of the benefits of water conservation.

7. On promotion and publicity, WSD has arranged annual open days of water treatment works attracting more than 5,500 visitors to date. Regular visits to waterworks installations are also activities welcomed by the public, and on average about 150 group visits are arranged each year. To promote students' knowledge on water supply in Hong Kong, WSD launched the Ambassador programme in 2001 and up to the end of 2002, 51 talks were delivered to schools, building management offices etc. and attended by more than 18,000 people. Roving exhibitions, seminars, forums and publicity programmes through the mass media are organised each year on a regular basis. All these activities are well received by the public.

8. The year 2003 is the International Year of Fresh Water. A comprehensive publicity programme has been rolled out starting from June 2003. The programme will last until March 2004. The programme aims at promoting water conservation in the community to reduce the overall water consumption.

Salient Conservation Measures

9. The use of seawater for toilet flushing in metropolitan areas and most of the new towns in Hong Kong, which are easily accessible to the seawater, is an effective way to save fresh water. At the moment, about 650,000 cu.m. of seawater is used for flushing every day, equivalent to some 25 per cent of the daily fresh water consumption. This practice also saves energy as seawater is abstracted near the consumer centres, whereas most fresh water supplies in Hong Kong have to be pumped through long distances and have to go through sophisticated treatment processes before reaching the consumers' premises. WSD will continue to provide seawater for flushing and will consider extending the salt water supply system to further areas whenever it is economically justified.

10. Another key initiative taken by WSD on water conservation is to embark on a 20-year plan for large-scale replacement and rehabilitation of aged pipelines throughout the Territory. Funds in the order of \$2.0 billion for the more urgent works involving 370 km of water mains have been secured. Upon completion of the first stage replacement and rehabilitation works by 2007, it will help conserve precious fresh water significantly by reducing leakages in the water supply and distribution systems. The remaining stages of the 20-year plan will be reviewed and programmed taking into account the experience gained from the first stage of the works currently under implementation.

11. Employing the latest leak detection and reduction technologies such as continuous pressure monitoring and pressure management is also one of the key activities of WSD to curb leakage through the water supply and distribution systems. The adoption of continuous pressure monitoring will enable an early detection of pipe leakage so that the required repair work can be carried out more promptly. Pressure management involves controlling water pressures in the supply systems in response to the varying demand pattern, thereby reducing water losses through pipe joints or cracks during low demand hours and maintaining normal supply pressures during peak demand hours of a day.

12. By employing the latest leak detection and reduction techniques, and replacement and rehabilitation of aged pipes, it is expected that the current water mains leakage rate of about 25 per cent could be reduced to a level in the order of 15 per cent.

13. We have also developed a tiered tariff structure to encourage water conservation. Recognising that water is a basic necessity, the first tier is free. However, the charges increase progressively to discourage lavish uses.

Water Resources Protection

14. Over the years, the Administration maintains a proactive approach in the protection of water resources. For local water resources, we include a clear message on water quality protection in the publicity programme. To protect our water resources, stringent pollution control measures are imposed by WSD, either directly or indirectly, together with other departments concerned through relevant legislations to control activities and developments within the water gathering grounds.

15. The existing water gathering grounds in Hong Kong cover about one-third of the land area in the Territory from which an average of 295 mcm of surface water can be collected annually. Proper maintenance of the water gathering grounds in particular the catchwater systems and their adjacent slopes is essential for safe and effective collection of surface water. This is being carried out currently by WSD both as minor routine maintenance works and major capital projects depending on needs.

16. To improve the quality of Dongjiang water delivered to Hong Kong, the Guangdong Authorities have carried out a number of improvement measures to protect the water quality. Many water pollution control schemes are being implemented in Guangdong, and the water quality at the abstraction point of the Dongjiang water supply system has been continuously monitored. The commissioning of the Biological Nitrification Plant at the Shenzhen Reservoir since early 1999 has greatly improved the quality of the Dongjiang water. The closed aqueduct from the abstraction point at Dongjiang to Shenzhen Reservoir just commissioned in June 2003. With all these improvement measures, the Dongjiang water quality has shown marked improvements. It is expected that the improvements will be maintained and the water quality will be more stable in meeting the agreed water quality standards.

Alternative Water Resources

17. Taking into consideration the development potential and the water demand of the whole region covered by the river basin of Dongjiang, there is a need for Hong Kong to explore alternative water resources to reduce the reliance of Dongjiang water. In this connection, WSD completed 3 desktop feasibility studies in 2002 separately on extension of local water gathering grounds, reuse of treated sewage effluent and desalination of seawater. The findings of the studies indicate that all these options are technically feasible to provide additional fresh water for Hong Kong.

18. The unit cost of extending water gathering grounds is the highest among the three alternatives. Its great impacts on the natural environment are also more significant. As a result, the development of this alternative resource does not warrant a high priority for the time being.

19. Effluent reuse and seawater desalination are more economically attractive alternatives. Both of them involve the application of advanced water treatment technologies. In view of the world-wide decreasing trend in both capital investment

and operation costs of applying these advanced water treatment technologies such as membrane filtration, the Administration has taken the opportunity to include, as part of the TWM programme, further studies on seawater desalination and effluent reuse.

Pilot Desalination Plant Study

20. A pilot desalination plant study using membrane technologies has already started in mid 2003. The focus of the study includes the running of pilot desalination plants of a nominal capacity of 200 cu.m. per day at two locations with different seawater characteristics. The pilot plants will employ membrane technologies in both pre-treatment and reverse osmosis processes, and also appropriate post-treatment processes to determine the optimum process design under local conditions. The operational cost data using the optimum process design for different coastal waters will be determined to assess the cost-effectiveness of implementing desalination facilities in Hong Kong.

21. An extensive water quality sampling and testing programme will be adopted to ensure that the product water will fully comply with the required standards.

22. It is expected that preliminary results will be available by end 2004 and the findings will facilitate the formulation of the long-term strategy for developing new water resources in Hong Kong.

Effluent Reuse Pilot Scheme in Ngong Ping

23. A pilot scheme for effluent reuse is being planned for implementation in conjunction with the Cable Car Project at Ngong Ping. To cope with the anticipated increase in sewage arising from tourism-related activities and the stringent requirements in the discharge of effluent in Ngong Ping, a tertiary sewage treatment plant will be constructed. The plant will be able to treat a daily range of 1,500 to 2,900 cu.m. of sewage to cope with anticipated flows generated in weekdays and on holidays.

24. An inter-departmental Working Group has been set up to oversee effluent reuse at Ngong Ping. The Working Group has closely liaised with the Mass Transit Railway Corporation Limited (MTRCL) with a view to promoting the use of the treated sewage effluent at the cable car development. Apart from the agreed use for flushing, discussions are actively underway to facilitate other reuse options, such as landscape irrigation, cleansing, water features and water-cooled air-conditioning

systems in the cable car development. The water quality standards for such reuse options have been established with due consideration to the associated health risks. To meet these standards further treatment processes are necessary and MTRCL will soon confirm their proposed reuse options.

25. It is estimated that about 600 to 900 cu.m. per day of treated sewage effluent from the tertiary treatment plant will be supplied for flushing in public toilets and toilets in the cable car development. The reuse quantity for other purposes will depend very much on MTRCL's final decision.

26. The Ngong Ping effluent reuse scheme is scheduled for commissioning in 2005 in conjunction with the cable car project. The degree of its success will depend on the acceptance of the general public in the pilot applications; how far the scheme can help reduce effluent discharge into the environment; and how much potable water that can be saved by the reuse of effluent. The pilot scheme will enable a more detailed assessment on the cost-effectiveness of reuse of effluent as a source of water supply to meet non-potable uses. Preliminary results are expected to be available by 2006.

27. The results of the pilot scheme at Ngong Ping will also provide useful information and data to enable the Administration to consider further reuse options in other parts of the Territory. The reuse options can also greatly reduce the amount of effluent to be disposed of and is therefore more promising for areas where there are stringent requirements on effluent disposal.

28. Making reference to overseas experience in effluent reuse, it is certain that a well-planned publicity programme supported by robust data from a pilot scheme is the pre-requisite for gaining public acceptance. In order to build public confidence in effluent reuse, a comprehensive sampling and testing programme will be carried out in the pilot scheme to monitor water quality and health-related data. Various publicity and education programmes will be launched and the views of the general public will also be collected.

Total Water Management Strategy

29. We have adopted a two-pronged approach in TWM. On one hand we encourage the public to reduce consumption through education and publicity programme while reducing non-effective uses such as leakages and system losses and the use of fresh water for flushing through the implementation of capital projects.

On the other hand, we will explore alternative water resources to increase the flexibility and versatility in securing adequate and reliable water resources for sustaining the long-term development of Hong Kong as a world-class city in Asia.

30. In formulating the strategy for implementing TWM programme, the overall cost-effectiveness of various water resources will be taken into account together with demand-side management. Advanced technologies will be adopted as far as possible to capture the benefits. We consider that better utilisation of different water resources and their better management in an integrated, multi-sectoral and sustainable manner will be the crucial factors for the successful implementation of the TWM programme.

Future Review

31. With the preliminary results of the pilot schemes on desalination and effluent reuse to be available by end 2004 and 2006 respectively, the TWM programme will be reviewed and its implications on the environment will be assessed. Reference will also be made to overseas experience on how to gauge the public acceptance on the effluent reuse options.

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