

# **MANAGEMENT OF WATER SUPPLY AND DEMAND**

## **Executive Summary**

1. The Water Supplies Department (WSD) is responsible for supplying fresh water and seawater (for flushing) for consumption by Hong Kong's population of seven million for domestic and non-domestic use. In 2013, the WSD supplied 933 million cubic metres (Mm<sup>3</sup>) of fresh water, of which 611 Mm<sup>3</sup> (65%) were supplied from Guangdong (GD) Province under Dongjiang Water Supply Agreement (Supply Agreement), and the remaining 322 Mm<sup>3</sup> (35%) were collected from local catchments. In the same year, the WSD supplied 278 Mm<sup>3</sup> of seawater for flushing by 80% of the local population, while the remaining 20% used fresh water for the purpose. In 2013-14, the WSD received \$2,556 million water charges. As of December 2014, the WSD administered 2.87 million water accounts, comprising 2.59 million domestic accounts and 0.28 million non-domestic accounts.

2. In 2008, with a view to ensuring sustainable use of water in Hong Kong, the WSD promulgated the Total Water Management (TWM) Strategy which covered five main areas, namely water conservation, active leakage control, extending use of seawater for flushing, using new water resources (including water reclamation) and protection of water resources. The Audit Commission (Audit) has recently conducted a review of the WSD's management of water supply and demand.

### **Water supply management**

3. Under the 2008 TWM Strategy, for the purpose of strengthening its supply management, the WSD has implemented a number of initiatives, including carrying out pilot schemes and studies on using reclaimed water from treated sewage, protecting existing water resources, and developing seawater desalination (para. 2.3).

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4. ***Need to expedite using reclaimed water for flushing.*** Under the 2008 TWM Strategy, the WSD had planned to make use of reclaimed water from Shek Wu Hui Sewage Treatment Works, after going through additional treatment processes, for toilet flushing in the Northeast New Territories (NENT) region. According to the WSD, the proposed project would help save 21 Mm<sup>3</sup> of fresh water a year and that the cost of using reclaimed water (at \$3.8 per cubic metre (m<sup>3</sup>)) was lower than that of using fresh water (at marginal cost of \$5.6 per m<sup>3</sup>) and seawater (at \$10.4 per m<sup>3</sup>) for flushing. However, the WSD only commenced planning for the related infrastructure works in 2012 which was targeted for completion by 2022. In Audit's view, the WSD needs to expedite using reclaimed water for flushing. This would save around 3% of fresh water (paras. 2.4 to 2.12).

5. ***Delay in implementing Inter-reservoirs Transfer Scheme (IRTS).*** In 2004, the WSD and the Drainage Services Department (DSD) planned to implement the IRTS which would serve the dual purposes of flood control in the West Kowloon area and generating 2.5 Mm<sup>3</sup> of water a year. Under the IRTS, overflow from the Kowloon Group of Reservoirs (comprising Kowloon Reservoir, Shek Lei Pui Reservoir, Kowloon Reception Reservoir and Kowloon Byewash Reservoir) would be channelled to Lower Shing Mun Reservoir. In 2005, the DSD informed the Panel on Development of the Legislative Council (LegCo) that the construction works for the IRTS would commence in 2010 and was targeted for completion in 2012. However, up to December 2014, the WSD and the DSD had yet to seek funding for carrying out the IRTS construction works. In 2014, the estimated cost of the construction works was \$868 million (paras. 2.13 to 2.17).

6. ***Delay in improving priority catchwater systems.*** A catchwater system comprises catchwater channels which intercept surface water in water gathering ground and carry the water to reservoirs for storage. In October 2008, the Government informed the Panel on Development that the WSD would commence improvement works for four catchwater systems (namely Shing Mun, Beacon Hill, Golden Hill and Tai Lam Chung catchwater systems) by 2011. However, up to December 2014, the WSD had yet to seek funding for carrying out the construction works (paras. 2.18 to 2.22).

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7. *Need to closely monitor the supply of fresh water.* In June 2012, the LegCo Finance Committee approved funding of \$34.3 million for the WSD to carry out a planning and investigation study for the construction of a desalination plant at Tseung Kwan O. According to the WSD, the estimated cost of the desalination plant project was \$9.3 billion, which would produce 50 Mm<sup>3</sup> of fresh water a year, accounting for 5% of the total fresh water supply, and the plant capacity could be expanded to produce an ultimate quantity of 100 Mm<sup>3</sup> of fresh water a year. The first stage of the plant is expected to be commissioned in 2020. According to the WSD, the cost of desalinated water would be \$12 per m<sup>3</sup>, of which \$7 per m<sup>3</sup> and \$5 per m<sup>3</sup> were operation cost and capital depreciation cost respectively (paras. 2.24 to 2.27).

8. According to information provided to LegCo in May 2012, one of the justifications for constructing the desalination plant was that, based on a risk assessment of water resource adequacy under adverse scenarios (e.g. the occurrence of consecutive droughts and increase in water demand), the water shortage risk after 2020 would increase with a deficit of fresh water resources of up to 39 Mm<sup>3</sup> a year. Audit noted that this estimated water deficit was based on the WSD's Long-term Demand Forecast (2010) and an annual supply of Dongjiang (DJ) water of 820 Mm<sup>3</sup>, whereas only 611 Mm<sup>3</sup> of DJ water was actually supplied to Hong Kong in 2013. In the subsequent Long-term Demand Forecast (2013), and again assuming 820 Mm<sup>3</sup> of annual DJ water supply, the estimated water deficit in 2021 would be 33 Mm<sup>3</sup> for the upper-bound water demand and 7 Mm<sup>3</sup> for the lower-bound water demand. Audit notes that, under the Supply Agreement, GD Province has agreed to allocate up to an ultimate annual quantity of 1,100 Mm<sup>3</sup> of fresh water to Hong Kong, albeit the level of charges for the supply in excess of 820 Mm<sup>3</sup> is subject to future negotiation. Therefore, the occurrence of water deficits in future is subject to GD Province not being able to supply an annual quantity of fresh water in excess of 820 Mm<sup>3</sup>. In view of the significant capital and recurrent costs of adopting desalination to supply fresh water locally, the WSD needs to closely monitor the supply of fresh water from GD Province and the proposed desalination plant (paras. 2.23, and 2.27 to 2.32).

### Water demand management

9. Initiatives to reduce water demand under the 2008 TWM Strategy included retrofitting water-saving devices at government facilities, conducting water-efficiency audits at government departments and extending the use of seawater for flushing (para. 3.3).

10. *Some government facilities consumed more water after retrofitting with water-saving devices.* In December 2009, the WSD implemented a pilot scheme on retrofitting water-saving devices at 421 government buildings and schools at a total cost of \$104 million. The WSD's review conducted in 2011 found that the water-saving devices would generate an annual saving of \$21.43 million and the average payback period of the retrofitting works was 5.1 years. However, Audit examination revealed that, of the 421 government buildings/schools, 119 (28%) had recorded increases in fresh water consumption after being retrofitted with water-saving devices, with increases ranging from 0.4% to more than 100% (paras. 3.9 to 3.14).

11. *Some Leisure and Cultural Services Department (LCSD) venues consumed more water after implementing related best-practice guidelines.* In September 2012, after conducting a water-efficiency audit for the LCSD, the WSD issued the best-practice guidelines on water conservation to the LCSD. According to the LCSD and the WSD, after implementing the best-practice guidelines at six parks and five swimming pools, the water consumption at these 11 venues in 2014 had decreased by 7.2% when compared to that in 2011. However, Audit examination revealed that water consumption at 4 of the 11 venues had in fact increased from 2011 to 2014, with increases ranging from 5% to 63% (paras. 3.15 to 3.19).

12. *Many buildings at Pok Fu Lam not yet connected to seawater supply network.* Under the 2008 TWM Strategy, for the purpose of converting from using fresh water to seawater for flushing, a seawater supply system at Pok Fu Lam was substantially completed in July 2013. However, as of February 2015, of the total 570 buildings at Pok Fu Lam covered under the seawater supply system, the related conversion works for 378 buildings (66%) had not yet commenced (paras. 3.20 to 3.24).

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### Implementation of government policy on water charges

13. Under the WSD's tariff structure, fresh water supply for domestic use is charged by adopting a four-tier system. For the first tier, the first 12 m<sup>3</sup> of fresh water should be supplied free of charge for a domestic household in a four-month period, and the related net production cost should be met by the Government. For the second tier, water tariff for the next 31 m<sup>3</sup> of related fresh water consumed should be approximately in line with the net production cost (Note). For the third tier, water tariff for the next 19 m<sup>3</sup> of related fresh water consumed should be approximately in line with the full production cost. Lastly, for the fourth tier, water tariff for the remaining fresh water consumed should be approximately 40% above the third tier (para. 4.3).

14. ***Target rates of return on Average Net Fixed Assets (ANFA) not met since 1998-99.*** Pursuant to the Government's policy, water tariff was set to recover production cost and achieve a target return on ANFA. Since 1996, water charges had not been revised, and the Waterworks Operating Accounts had reported a deficit each year from 1998-99 to 2013-14. Accordingly, the waterworks operation had achieved negative returns on ANFA during the period. Notwithstanding such negative returns, the Government had continued to adopt positive target rates of return on ANFA of 6.5% from 1998-99 to 2011-12 and 3.4% from 2012-13 to 2013-14 (paras. 4.10 to 4.13).

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**Note:** *For the purpose of compiling the Waterworks Operating Accounts, in general, 15% of rates receivable in a year is accounted for as revenue in the Accounts. The net production cost represents the full production cost less the relevant contribution from rates.*

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15. ***No disclosure of target return on ANFA included in the unit production cost.*** Audit noted from a LegCo document that the net production cost of fresh water supply in 1994-95 was \$4.86 per m<sup>3</sup>. According to the WSD, owing to the need to achieve a target return on ANFA under the Government's policy, the net unit production cost had included such a target return. The net production cost (inclusive of target return on ANFA of \$2.61 per m<sup>3</sup>) in 2013-14 was \$10.76 per m<sup>3</sup>. Notwithstanding that the net and full unit production costs were significant factors in determining water tariffs (see para. 13), the WSD had not disclosed the amount of the target return on ANFA which had been included in the production costs. The WSD needs to publish in its annual reports the above cost information (paras. 4.14 to 4.20).

16. ***No disclosure of quantity of water supply for calculating unit production cost.*** In April 2014, in relation to the proposed construction of a desalination plant (see para. 7), the WSD informed LegCo that the estimated unit costs of fresh water produced from locally collected fresh water and DJ water were \$4.2 per m<sup>3</sup> and \$8.8 per m<sup>3</sup> respectively, compared to water produced from desalination of \$12 per m<sup>3</sup>. Audit noted that these unit costs were calculated based on the total quantity of fresh water supply before treatment (totalled 933 Mm<sup>3</sup> in 2013). However, the WSD had used the lower metered-water quantity (totalled 638 Mm<sup>3</sup> in 2013) to calculate net and full unit production costs for water-tariff setting purposes. The 32% difference  $((933 - 638) \div 933 \times 100\%)$  between the water quantity before treatment and the metered quantity was mainly attributable to water losses due to water mains leakages, water consumed during water treatment processes, unauthorised water consumption and inaccurate metering. In Audit's view, the WSD needs to publish in its annual reports the different bases of calculating unit water production costs (paras. 1.3, 4.21 to 4.23).

## Way forward

17. ***High per capita domestic water consumption.*** Audit noted that, despite the implementation of various water-saving initiatives by the WSD in recent years, the daily per capita domestic water consumption had been around 130 litres from 2009 to 2014, which was 18% higher than the world average of 110 litres. Notwithstanding that the WSD has set a target of achieving 10 litres of water saving per capita per day, no target date has been set for achieving this water-saving target (para. 5.5).

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### **Audit recommendations**

18. **Audit recommendations are made in the respective sections of this Audit Report. Only the key ones are highlighted in this Executive Summary. Audit has *recommended* that the Government should:**

#### ***Water supply management***

- (a) expedite actions to:**
  - (i) implement the project for supplying reclaimed water for flushing in NENT (para. 2.33(a));**
  - (ii) improve the four priority catchwater systems in Shing Mun, Beacon Hill, Golden Hill and Tai Lam Chung (para. 2.33(c)); and**
  - (iii) implement the IRTS (para. 2.34);**
- (b) closely monitor the supply of fresh water from GD Province and the proposed desalination plant (para. 2.33(e));**

#### ***Water demand management***

- (c) conduct a review to ascertain the reasons for water-consumption increases at:**
  - (i) 119 government buildings and schools after being retrofitted with water-saving devices and take remedial actions where necessary (para. 3.25(c)); and**
  - (ii) the four LCSD venues after implementing the related best-practice guidelines (para. 3.26(a));**

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- (d) **take measures with a view to completing works for supplying seawater for flushing to the remaining 378 buildings at Pok Fu Lam at an early time (para. 3.25(e));**

### ***Implementation of government policy on water charges***

- (e) **publish information in WSD annual reports showing that:**
  - (i) **the net and full fresh-water unit production costs have included a target return on ANFA; and**
  - (ii) **the calculation of the net and full fresh-water unit production costs for charging purposes is based on the quantity of metered fresh water consumed (para. 4.31(a)); and**

### ***Way forward***

- (f) **consider setting a target date for achieving 10 litres of water saving per capita per day (para. 5.8(a)).**

## **Response from the Government**

19. The Government agrees with the audit recommendations.