MODERNISING HONG KONG'S WATER MANAGEMENT POLICY PART I

EXECUTIVE SUMMARY

June 2019

思匯 CIVIC EXCHANGE

WYNG FOUNDATION

CONSERVATION AND CONSUMPTION: TOWARDS A WATER-SMART HONG KONG

Hong Kong's water supply is coming under increasing pressure, with growing competition for the water it imports from Dongjiang River, while Hong Kong's ageing water infrastructure further wastes the supply it has through pipeline leaks. The growing population in Hong Kong adds to the strain, its high usage likely encouraged by low prices.

For Hong Kong to rise above these challenges, long-term solutions are needed. This new research project by Civic Exchange, *Modernising Hong Kong's Water Management Policy*, consists of two parts. This first part examines local demand and conservation challenges to recommend policy solutions and show how local demand can be reduced through responsible resource use. Its sister report assesses how local water infrastructure systems can be deployed to safeguard water security and accessibility for Hong Kong in the long run.

THE CHALLENGE

Hong Kong recognises that its local water resources are affected by rainfall patterns and increased urban demand under higher temperatures. Local legislative and government bodies have highlighted several key challenges to Hong Kong's water system:

- Local daily per capita water consumption is double the world average of 110 litres, once the use of seawater for toilet flushing is taken into account.
- Water prices are low, and have not been updated since 1995.
- Over 30% of fresh water went unmetered during 2006-16 due to mains pipe leakages, unauthorised consumption and inaccurate metering.
- Outdated information, incomplete records and data gaps significantly impair the monitoring of water consumption, pipeline repair efforts and accountability enforcement.

Hong Kong's main water source is imports from the Dongjiang River Basin, which is situated in Mainland China's most populated province of Guangdong. Imported water once accounted for 20-30% of Hong Kong's total water supply, but has gradually increased to 70-80%. Hong Kong's current annual supply ceiling for water from the Dongjiang River, under the new agreement established in 2017, is 1.1 billion m^3.[i]
While the arrangement provides Hong Kong with water security and affordability, it also means the quality and consistency of local water is dependent upon the resource usage of other cities in the Pearl River Delta. In the event that extreme climate conditions in Mainland China intensify competition for water, assurances that Hong Kong will always receive its desired share may not hold. Hong Kong needs to save water to ensure that its supply remains sustainable in the face of growing competition for water in the region, coupled with climate change. We have a duty to ensure reliable water supply for our future generations and for our neighbours.[ii] We also have a duty to contribute to China's national effort on safeguarding our country's long-term water security,[iii] and to the global ambition of ensuring availability and sustainable management of water for all as outlined in the United Nation's 2030 Agenda for Sustainable Development.[iv]

The Hong Kong government's Water Supplies Department (WSD) could adopt a more basin-wide perspective when modernising its water policies. Local conservation measures – from reducing pipe leakages to lowering domestic fresh water consumption – could ripple outwards to positively impact the Pearl River Delta. This will become increasingly necessary, given projections for growing demand among Mainland chinese families for medium- and high-income lifestyles from 2031-2050, and with it, the growing need for sustainable access to clean water sources.

WHERE DOES HONG KONG STAND?

To address the issue of water security, Hong Kong promulgated its city-wide Total Water Management (TWM) strategy in 2008. It focuses on containing the growth of local urban water use by promoting water conservation and identifying new water resources. A revised version of the strategy is scheduled to be released in late 2019.

The TWM strategy consists of replacing 3,000 km of ageing water mains, dividing Hong Kong's water distribution network into discrete district metering areas under an Intelligent Network Management System, and holding regular education programmes to promote water conservation in all sectors, with specific focus on younger generations.

Overconsumption of water

Hong Kong currently stands out as a big user of water resources among its international peers,[v] despite having little manufacturing and virtually no agriculture. Domestic users are by far the largest consumer group of local fresh water, indicating the importance of promoting conservation to change household behaviour. Together with services and trade, these two sectors consume nearly 80% of local fresh water.

There are several reasons for the high level of water consumption. The first is Hong Kong's low water prices, which have remained unchanged for more than two decades, even as the production cost and the lump-sum package cost of purchasing imported water from Guangdong have increased over the years.

Outdated pricing

Hong Kong residents spend a disproportionately small portion of their income on water bills. According to WSD, the average charge in 2016-17 was HK$48 per month, amounting to approximately 0.3% of the average monthly household expenditure.

Pricing rate structures are frequently used as conservation tools: in the European Union, using high water tariffs to reduce water demand directly is the most common price intervention tool. Research suggests that consumers who do not pay the full cost of water tend to use it inefficiently. However, utilities and policymakers must balance the concerns of affordability with efficient supply. Increasing prices can place a disparate burden on poor households, who cannot adjust the amount of water used for basic needs, whereas wealthier households can still fail to recognise the price signal designed to curb excess consumption.

Hong Kong's water pricing uses an Increasing Block Tariffs (IBT) scheme, in which pricing is divided into blocks depending on the volume used, so the marginal price increases with each successive block but remains the same within each block. Despite this pricing system, Hong Kong's water consumption rate has not meaningfully decreased over time.

All Hong Kong consumers – whether domestic, corporate or government – can use up to 12 m^3 every four months free of charge. To cover this, the government gives more than HK$1 billion to WSD every year. Consumers then remain on the second pricing tier until they use more than 43 m^3 of water every four months. WSD's punitive rate only kicks in once users consume more than 62 m^3 of water, which is meant to reflect the true production cost. However, even this highest tier only charges HK$9.05 per m^3 of water consumed: just 54.5% of the full cost of providing it.

Given the difference in price between supplying Hong Kong residents with water and how little users pay for it, the government should look into renewing its tariff scheme by reviewing the pricing and threshold of each consumption block to promote conservation via a user-pays principle.

These changes would mean raising the price per unit, as well as lowering the total volume of water users can enjoy on tiers 1 and 2 before reaching more punitive rates. This is particularly important given that the government already subsidises HK$36 per account every four months, and the average WSD customer only pays HK$48 per month for water.

Billing cycle frequency changes could also be explored through pilot schemes to examine whether Hong Kong users would conserve water if confronted with water bills more often. Currently, Hong Kong users only receive water bills every four months due to WSD policy. Since domestic households are the biggest group of water consumers in Hong Kong, policymakers should consider deploying these economic mechanisms to correctly value water and change behaviour. It is essential, however, that this should be done with policy provision to ensure that the underprivileged have affordable access to water.

Wasted through pipe leakages

The second reason for Hong Kong's high water consumption is pipe leakages. Users may be asked and encouraged to conserve water, but high volumes of water are being lost before they even reach households and taps, the vast majority of leakages occurring in pipes carrying fresh water.

By 2030, Hong Kong aims to reduce the leakage rate in public mains to below 10% (down from 15.2% in 2017). An investigation into WSD's maintenance of government water mains by the Hong Kong ombudsman's office found that if the amount of fresh water lost through government mains each year was saved, it could meet the demand of approximately 2 million people in Hong Kong.

Lack of data and ambitions

Another issue contributing to Hong Kong's high water consumption is the lack of systematic data granularity. To better monitor, address and pre-empt water losses, it is crucial that data on a variety of usage metrics is collected systematically. Increased monitoring of usage data can nudge consumers towards conservation, but this data - especially on pipe leakage volumes - is lacking in Hong Kong.

WSD could also review its targets strategy with a view to reducing water consumption. The department publicly lists its performance targets, and its October 2017 policy agenda stated an aim of reducing per capita fresh water consumption by 10% by 2030, using 2016 as the

base year. But it could begin to produce a more coherent overall strategy if it consistently compiled and updated key water consumption goals in a centralised and detailed location or website. This would demonstrate the will to meet more ambitious targets, and aspirations to methodically improve conservation on a quarterly or yearly basis.

Finally, Hong Kong could attempt to reduce water consumption by improving its Water Efficiency Labelling Scheme (WELS). Hong Kong launched its voluntary WELS as a conservation initiative in 2009. It covers a range of water-using devices, such as showerheads, washing machines, urinal equipment and flow controllers. WSD also has programmes to send households flow control devices to be installed on showers and taps in order to limit consumption.

The scheme is not compulsory, however, and even for products in Hong Kong that voluntarily adopt a WELS, the conservation thresholds they need to clear in order to be deemed most efficient are far more lenient than those in other cities.

In addition, WSD has promulgated numerous initiatives to standardise water usage across local industries in order to more widely distribute conservation practices in an institutional manner. The scope, however, is limited, with only two industries targeted: hospitality and catering, which in 2017, accounted for 16% of total fresh water consumption. In order to enhance water use efficiency in both sectors, WSD developed a set of best practice guidelines (published in both Chinese and English) to establish water-saving measures applicable to industry actors.

However, there is no auditing committee to review the commitments made, the degree of adherence or the tracking of compliance over time. Until formal evaluation procedures or enforcement mechanisms for the best practice guidelines are established, it will remain a voluntary act to promote these conservation efforts – let alone save meaningful volumes of water.

In light of the challenges outlined above, WSD has devoted resources and efforts to improving Hong Kong's water management. However, its actions represent a piecemeal approach to addressing water usage, and fall short of delivering a lasting impact on water usage and conservation.

OUR RECOMMENDATIONS

This report, therefore, makes the following seven policy recommendations:

i. Water pricing restructuring

With current water prices lagging behind the cost of full recovery, a reform of Hong Kong's 1995 tariff charges is sorely needed. An imminent review of the pricing and the thresholds of the IBTs (Increasing Block Tariffs) is needed to revive the user-pays principle and cement the value of a scarce natural resource with every consumer account in Hong Kong.

The threshold of each consumption block in the IBTs reflected the average household size in public housing, which was 3.7 persons when the scheme was last reviewed in 1995. As the average household size has now shrunk by 26% to 2.75 persons, the threshold of each consumption block should be reduced accordingly.

Hong Kong's current daily domestic use of fresh water is 130 litres per person. Based on the reduced household size of 2.75 persons, as well as the the latest figures on net unit production cost and full unit production cost of water supply released by WSD,[vi] the price of water following a user-pays principle for a three-people household would be HK$622 for a four-month period – 2.4 times higher than the current tariff of HK$255.

Updating the prices for water does not have to mean punitively raising costs for all societal groups – thus harming low-income groups – but it should prompt examination of whether certain pricing tiers and exemptions based on income and assets should be introduced.

The frequency with which domestic accounts receive bills could increase: a notification to pay once every four months may reflect a lack of urgency or value of the water to the consumer, whereas seeing them more often could solidify the connection between water consumption and cost.

Consideration should also be given to removing the first tier of free water for all accounts, except those that fall under a certain household income level. Alternatively, if Hong Kong policymakers decide to remove this free portion for everyone, they could follow what many other countries have done to support low-income families in their water payments.

ii. More ambitious targets

Hong Kong's current long-term goals through 2030 represent baseline improvements. There could be a series of targets representing more aggressive efforts to tackle water waste, and a more ambitious track that the city could aspire to reach.

For example, Hong Kong currently has an official target of reducing the government mains pipe leakages rate to less than 10% by 2030. As the leakage rate in 2018 was approximately 15%, this goal would constitute a reduction of one third, and would save enough fresh water (52,654,680 m^3) to supply close to 375,000 people annually. To meet the needs of a more substantial number of people (closer to half a million), the target for leaked water

should be more ambitious and closer to around 8%. That would save enough fresh water (72,906,408 m^3) to supply close to 540,000 people per year.

WSD's annual reports contain goals for metrics such as accuracy of water meters, duration of suspended water supply for planned works, and fresh water supply pressure. WSD should devote more space to showcasing its progress on these goals. In addition, these targets need to be consistently updated and modified. At the time of writing this report, WSD's TWM strategy had not been updated in 10 years,

Reduction targets on water consumption (whether per capita, or ideally with more granularity, such as broken down by each sector that WSD has data on) should also be included to demonstrate alignment with water conservation.

iii. Technology

As shown above, district council-level data on leaks and consumption is lacking, which impedes more rapid responses to resolving infrastructure failures.

With its high volume of water losses resulting from ageing pipes and chronic leakage, Hong Kong could benefit from an infrastructure that allows the accurate identification of leaks, and eventually the capacity to shut off water flow remotely. This would make the handling and maintenance of leakage sites much swifter and more effective, while also allowing consumers – who do not have precise and updated (let alone real-time) information on water consumption – to adjust their usage habits.

Initiatives are underway in Hong Kong to implement automatic meter reading (AMR) systems. In 2013, WSD launched a pilot scheme to evaluate the technical performance and data handling reliability of automated meter reading. Under the scheme, around 350 smart water meters designed to collect individual customer water consumption data remotely were installed in select blocks (one government quarter and two public rental housing estates).

WSD views the primary benefits of these AMR systems as improving water meter reading efficiency, enhancing the detection of leaks or abnormal consumption volumes, and engaging customers through more timely delivery of water usage data. The recognition of these technical solutions as ideal platforms for promoting water conservation is promising, and their continuing rollout could start to meaningfully address issues of chronic pipe leakage and overconsumption.

iv. Regulations

Legislative strategies to mandate certain restrictions on water use have seen certain success when it comes to specific applications, such as car washing or irrigation. However, the most obvious limitation to these initiatives is that they require policy intervention to be implemented, and may experience resistance from the community that then weakens the regulations.

Hong Kong could learn from London, Sydney and New York in areas such as achieving leakage goals, integrating water consumption reduction goals into new construction regulations, and cross-sector collaboration, as detailed in section 5.3 of this report.

v. Water-saving devices

Hong Kong could learn from Australia, whose government publishes statistics on how to effectively reduce water demand through water-saving devices. They make data publicly available on the financial consequences of toilet leakages, including litres lost on an hourly basis and how this translates into annual volumes and costs.

Hong Kong should also strengthen its WELS scheme. Equivalent Water Efficiency Labelling Schemes have seen widespread adoption around the globe. Not only do amenities such as toilets, washing machines and sinks have to use devices that meet a certain benchmark of water conservation; corresponding tiers of efficiency are far greater than the equivalent tier in Hong Kong. There is no reason for the weakest tier in other cities to match the strictest WELS tier used by WSD to indicate water savings. Ramping up what constitutes a valid water-efficient device in Hong Kong could produce substantial savings at the micro level, which would subsequently amount to significant levels at the aggregate level.

WSD's Let's Save 10L Water campaign requires residents to opt in on two fronts – sign a commitment pledge and also e-register to receive bills digitally – in order to receive two flow-limiting devices from the government, free-of-charge. Having to opt in to receive the essential tools to start conserving water is simply another step that could discourage adoption. Hong Kong should, therefore, consider having all or the vast majority of domestic consumers already opted in by default, so that a critical mass of the population receives the flow-limiting devices.

vi. Education programmes and school initiatives

Two public opinion surveys are available on WSD's website, conducted in 2011 and 2015. More frequent assessments could be produced to gauge a wider array of public attitudes on water, from overall pricing to the installation of flow-control devices. To produce meaningful action, there needs to be a purposeful, directed follow-up programme to the key findings of each survey.

A white paper or public consultation on what WSD learned from these insights, and how it plans to address the issue, would be important and helpful, and would be a step towards solving WSD's rather piecemeal approach to improving Hong Kong's water conservation.

vii. Robust and transparent data on water use

In tandem with the importance of using regulatory codes to publicise water use data, as outlined above, it is also crucial for such transparency to be applied to households. This would mean arming residents with composite information on their water usage, such as how much water is used in the kitchen or bathroom, and greatly facilitating user awareness on which household activities consume more water, as well as comparing their environmental impact.

Domestic households should have precise knowledge of how their water use compares to that of others in terms of their neighbours, building, estate and even district. This data could be anonymised and still contain useful benchmarks for residents to evaluate their own use.

CONCLUSION:

IT'S TIME TO MODERNISE LOCAL WATER MANAGEMENT

Hong Kong has been dealing with the same fundamental water issues for many years. Its consumption levels run high for a city its size, the current pricing structure distorts the value of water and the lack of available data keep policymakers in the dark about the districts where infrastructure is in greatest need of repair.

Hong Kong's wasteful water usage in its consumption habits, lack of ambitious conservation programmes and chronic infrastructure leaks not only reduce the availability of this scarce resource for the city's future generations, but also set a bad example for other cities in the Pearl River Delta.

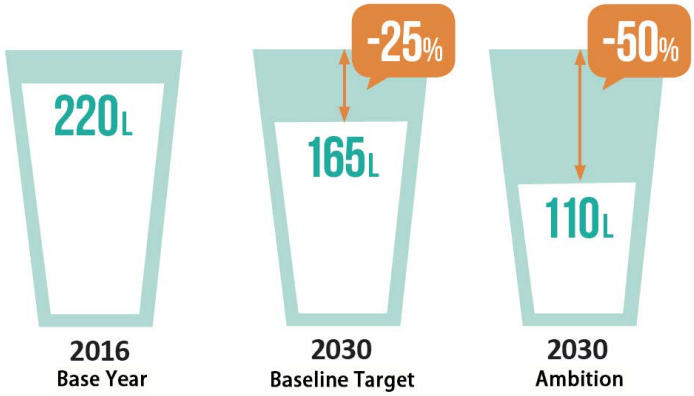
Given these challenges, Civic Exchange recommends that WSD and the Hong Kong government take specific policy actions to establish a bold directive for improving the state of domestic water control, and as a city take the initiative on effective resource management.

This study suggests that by 2030, WSD adjust two of its current goals to produce more meaningful water conservation goals in the next decade:

- Reduce **water lost** from leakages in government mains from 15% to 8% by 2030, which would save **72.9 million m³** of fresh water, or enough fresh water for more than 540,000 Hong Kong residents each year.
- Set a baseline target of reducing daily domestic water consumption by 25% by 2030, i.e. **from 220 litres to 165 litres per person**, which would result in an annual saving of **147.4 million m³** of water (fresh and seawater). A more ambitious goal would be seeking 50% reduction to bring our daily domestic water consumption to 110 litres per capita (an annual saving of 294.7 million m³), meeting international best practice as demonstrated by comparable international cities such as Berlin and Madrid.

Daily Per Capita Domestic Water Reduction Targets for 2030

Source: Using data from WSD Annual Report 2016-17



Together, these goals would result in total annual water savings of at least 220.3 million m^3 by 2030: a volume equivalent to 17.7% of the total amount of water consumed in 2016;[vii] or 367.6 million m^3 savings if we can achieve the more ambitious 50% reduction target, which would mean a 29.5% reduction in the total water consumed in 2016. Without these more ambitious targets, Hong Kong will only save around **72.3 million m^3** of fresh water

It is no longer sufficient to implement piecemeal solutions like water efficiency labelling schemes or offer flow-limiting devices if they are not part of a broader programme of frequent evaluation and data monitoring.

Should the city fail to modernise in a comprehensive, integrated and ambitious way, the longevity of its seemingly plentiful water supply will rapidly be called into question.

---

i. Legislative Council,*Supply of Dongjiang Water*, 28 Nov 2017, Hong Kong: HKSAR Government, https://www.legco.gov.hk/yr17-18/english/panels/dev/papers/dev20171128cb1-235-5-e.pdf (accessed 4 June 2019).

ii. Water Supplies Department,*Total Water Management in Hong Kong Towards Sustainable Use of Water Resources*, Hong Kong: HKSAR, 2008, pp.1, https://www.wsd.gov.hk/filemanager/en/content_1171/TWM.pdf, (accessed 23 May 2019).

iii. The State Council of PRC, 國務院關於印發水污染防治行動計劃的通知, April 2015, People's Republic of China: Central People's Government, http://www.gov.cn/zhengce/content/2015-04/16/content_9613.htm, (accessed 23 May 2019). (Chinese only)

iv. United Nations, "Sustainable Development Goal 6", https://sustainabledevelopment.un.org/sdg6, (accessed 23 May 2019).

v. The international peer cities were selected from the International Water Association's (IWA) database because their population exceeded 3 million but were less than 10 million, to provide some realistic comparison with Hong Kong. We focus on the domestic water consumption at these cities. The IWA defines domestic consumption as drinking, food preparation, bathing, washing clothes and dishes, flushing toilets, car washing, and watering lawns and gardens.

vi. Water Supplies Department, *Annual Report 2017-18*, Hong Kong: HKSAR Government, pp.65, https://www.wsd.gov.hk/filemanager/common/annual_report/2017_18/common/pdf/11_finance_and_water_charges.pdf, (accessed 4 June 2019).

vii. Total water (fresh + sea) consumed in 2016 was 1,247,220,000m^3. 367,601,000 m^3 of fresh water saved (if Hong Kong consumed just 110 litres per capita per day + reduced water leakages in government mains to 8%) is 29.5% of this total fresh water consumption volume. Total fresh water consumed in 2018 was 1,012,590,000 m^3.

Water Supplies Department, *Annual Report 2016-17*, Hong Kong: HKSAR Government, https://www.wsd.gov.hk/filemanager/common/annual_report/2016_17/common/pdf/wsd_annual_report2016-2017.pdf (accessed 17 Jan 2019).

© Civic Exchange, 2019

思匯 CIVIC EXCHANGE

23/F, Chun Wo Commercial Centre, 23-29 Wing Wo Street, Central, Hong Kong
T (852) 2893 0213 F (852) 3105 9713 www.civic-exchange.org