

投資基建 Investing in Infrastructure

確保濾水廠生產能力對維持一個有效的供水系統至為重要。本署已展開涉及濾水廠重置及擴建的大型工程計劃，以加強我們在運作方面的能力。

Securing treatment capacities is critical to maintaining an effective water supply system. Major projects involving the reprovisioning and expansion of treatment works have been launched to increase our operational capacity.



實例 Living Example

我們現正修復和更換全港的水管系統。在二零零八年六月三十日之前，已完成更換全港長862公里的水管，當中大部分工程使用了新的非開挖技術，以減少施工期間對鄰近地區所造成的阻礙，並使有關工程的協調工作更具效率。

We are rehabilitating and replacing the city's water mains systems. By 30 June 2009, 862 km of water mains had been completed across Hong Kong. Much of this work has involved new trenchless technology which has lessened the level of neighbourhood disruption during the construction programme and enabled the efficient coordination of work.



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投資基建

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得信賴的基建帶來高效、可靠、優質的供水。這種信念在150多年前香港的供水系統建立時已被廣泛接納。時至今日，這種信念依然正確，而水務署會繼續投放資源於保養及維修現有的基建，以及設計和開發新的元素。

提升供水網絡

為期十五年時間，我們正投放不少於200億元展開一個範圍遍及全港的計劃，以更換及修復本港3 000公里的水管。該計劃現正分期進行：第一期、第二期及第三期現已在進行中，而第四期，亦為最後一期，正處於研究及設計階段，建造工程計劃將於二零一一年啟動。截至二零零九年六月三十日，我們已完成了862公里的水管更換及修復工作，從而令供水更加可靠。

香港許多現有的水管已使用超過三十年，只能勉強應付現今的需求。因水管爆裂及其他因配水網絡老化而產生的事故，會對居民的生活及香港的交通網絡的運作造成干擾。水管更換及修復計劃將確保供水繼續安全、可靠及有效。配合其他積極的滲漏控制措施，到二零三零年，可望令每年的滲漏數量減少85百萬立方米。

Dependable infrastructure results in efficient, reliable and quality water supplies. The adage was accepted when Hong Kong's water supply system was initiated some 150 years ago. It remains true today and the Department continues to carefully invest in the maintenance and repair of existing infrastructure as well in the design and development of new elements.

Improving the Supply Network

Over a 15-year period, we are spending more than \$20.0 billion on a territory-wide programme to replace and rehabilitate 3 000 kilometres of water mains. This is a multi-stage programme. Stages 1, 2 and 3 are currently under the construction stage whilst the fourth being the final stage is at the investigation and design phase with construction works planned to commence in 2011. As at 30 June 2009, work on 862 kilometres of water mains had been completed, resulting in greater reliability of supplies.

Many of Hong Kong's existing mains are more than 30 years old and have been struggling to keep up with today's demand. Water main bursts and other incidents in the aging water supply distribution network cause disruption to the life of people and to the operation of Hong Kong's transport systems. The water mains replacement and rehabilitation programme will ensure that supplies remain reliable and efficient and together with the implementation of other active leakage control measures, the resultant reduction in water leakage could amount to 85 million cubic metres annually by 2030.



興建中的欣澳鹹水抽水站。
Sunny Bay Salt Water Pumping Station under construction.

在地點及時間許可的情況下，該計劃會使用非開挖的施工方法，包括內喉緊貼法、原位內搪喉管法、水管推頂法及定向鑽挖法，以減少對行人和交通造成的干擾。隨著非開挖技術不斷進步，本署會即時引進採納適合如香港般人口稠密地區使用的最新及經驗證的技術。

全新的水壓管理技術以適度調控水管壓力，令我們可大大加強對水管漏水的控制。我們透過小規模的試驗計劃已證實效果理想，因此本署現正將計劃推廣至主要供水區的層面，例如北角及筲箕灣供水區。我們在各檢測區域安裝了電磁流量計和電子數據記錄器，並透過移動電話網絡將水流量和水壓數據傳送至控制中心，旨在能藉此發出早期滲漏預警，使能更迅速地採取補救行動。

新工程項目

本署正在展開一系列工程項目，旨在進一步改善相關住宅及商業區的食水及鹹水的供應。

沈雲山食水抽水站的原地重建及其連帶水管，將會令將軍澳區的食水供應更加可靠。在沙田地區方面，配合新建的海傍抽水站及連帶的水管系統，以及在馬鞍山及多石興建的兩個鹹水配水庫，該區的鹹水系統供應能力將得以提升。

Wherever and whenever possible, the programme uses trenchless construction methods, including close-fit linings for pipes, cure-in-place pipes, pipe jacking and horizontal directional drilling to minimise disruption to pedestrians and traffic. Trenchless technology is constantly advancing and the Department adopts new and proven techniques that suit Hong Kong's densely populated areas as they become available.

Controls on water losses from the mains are further strengthened through the application of new pressure management technology that optimises water mains pressure. Small scale pilot schemes have proven successful and are now being extended into major supply zones such as North Point and Shau Kei Wan. Electromagnetic flow meters and electronic data loggers are used across district metering areas with flow and pressure data transmitted via mobile phone networks to control centres, providing early alerts of leakages and enabling faster remedial actions.

New Projects

A range of projects to improve the supply of fresh water and salt water to relevant residential and commercial areas are in progress.

The in-situ reprovisioning of the Shum Wan Shan Fresh Water Pumping Station and its associated mains will enhance the reliability of water supplies to the Tseung Kwan O area. In Sha Tin, the area's salt water supply system is being upgraded with the addition of a new seafront pumping station and an associated mains system as well as two salt water service reservoirs at Ma On Shan and To Shek.

在新界西北區，本署現正在樂安排與虎地之間的青山公路沿線鋪設8.4公里的鹹水管。與此同時，樂安排鹹水抽水站以及位於丹桂村的配水庫正在興建中。

確保食水處理能力

確保食水處理能力對維持一個有效的供水系統至為重要。在這方面，我們已啟動了原地重置沙田濾水廠以及擴建大埔濾水廠兩個主要工程項目。大埔濾水廠的每日處理能力將由現時的250 000立方米增至800 000立方米，估計成本為43億元。建造工程將於二零一零年初展開，並計劃於二零一四年底竣工。當該廠房的處理能力提升至400 000立方米後，沙田濾水廠南面部分的重置工程將隨即展開。這種雙重安排將保障了供水的可靠性，並確保兩個廠房的效率能夠達致平衡。

In the North West New Territories, 8.4 kilometres of salt water mains are being laid along Castle Peak Road between Lok On Pai and Fu Tei. A sea water pumping station at Lok On Pai and a service reservoir at Tan Kwai Tsuen are being built.

Securing Treatment Capacities

Securing treatment capacities is crucial to maintaining an effective water supply system. Major projects for the in-situ reprovisioning of Sha Tin Water Treatment Works and the expansion of Tai Po Water Treatment Works have been launched. The daily output of the Tai Po plant will be increased from the current 250 000 cubic metres to 800 000 cubic metres at an estimated cost of \$4.3 billion.

Construction will commence in early 2010 for completion by the end of 2014. Once the plant has been upgraded to 400 000 cubic metres, the reprovisioning of the south works of the Sha Tin plant will begin. This bi-fold arrangement offers supply reliability as well as a balanced output from both works.



一水泵的電動機在維修中。
An electric pump motor being maintained.



於一九六四年落成的沙田濾水廠是本港目前投產量最高的濾水廠。
Commissioned in 1964, Sha Tin Water Treatment Works is currently the largest in Hong Kong in terms of production capacity.



為全港3 000公里水管進行更換及修復工程，預計於二零一五年完成。
Replacement and rehabilitation works for some 3 000 kilometres of water mains in Hong Kong is expected to be completed in 2015.

資產管理

為了量度及了解本署的能力、做法及效率，本署參與了由國際水務協會 (IWA) 及澳洲水務協會 (WSAA) 共同籌辦的資產管理參照計劃，把我們的資產管理效能與澳洲、新西蘭、中東及北美41家水務機構互相比較。透過這重要的一步，我們了解到自身的優勢和弱點，同時得悉國際上在各方面的最佳運作方式。在比較基礎上，本署在企業政策、生產力規劃及資產擁有方面均屬於頂尖機構，而在資產管理中的其他職能範疇，表現也達到平均水平。由本署倡議而獲得認同的措施包括本署的人力資源管理系統、內聯網應用、保養工程管理系統、以及強大的標準化設計和規格。

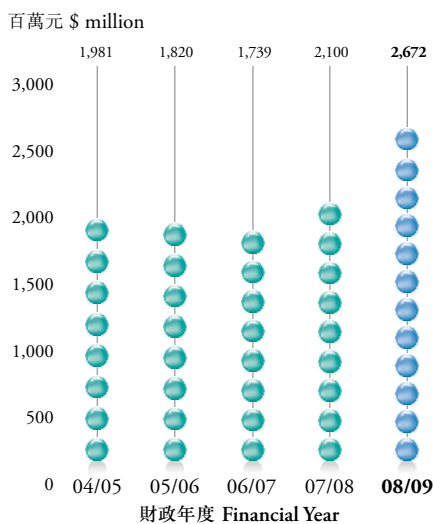
基於上述的認識，我們正在制定一套資產管理系統發展目標和策略，以填補現有的不足之處，並為未來的資產管理規劃制定方法。本署將建立全面的風險管理框架，以便有系統及貫徹的方式去量化及按優次地管理及降低資產的風險。

Managing Assets

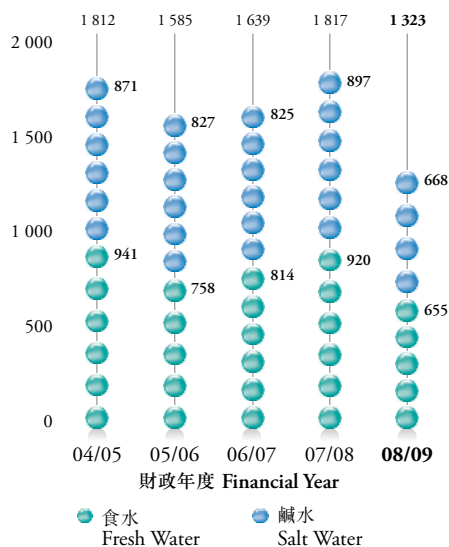
In an important move to measure and understand our capability, practices and effectiveness, the Department has completed an Asset Management Process Benchmarking project organised by the International Water Association (IWA) and the Water Services Association of Australia (WSAA). Our effectiveness in asset management was benchmarked against 41 water sector utilities in Australia, New Zealand, the Middle East and North America. Our strengths and weaknesses were identified and international best practices were appreciated. On a comparative basis, we were among the top performers in corporate policy, capacity planning and asset acquisition with average performance in the other functions of asset management. Our initiatives that won recognition include our human resource management system, intranet application, maintenance works management system as well as robust design and specifications standardisation.

As a result of this exercise, we are working on an asset management system that will develop objectives and strategies with a view to closing any existing gaps and formulating methodologies for future asset management plans. A full risk management framework will be established so that we can quantify, prioritise, manage and mitigate risks to assets in a systematic and consistent manner.

資本投資 CAPITAL INVESTMENT



水管爆裂修理個案統計數字 STATISTICS ON MAINS BURSTS REPAIRED



專注效率

濾水廠的效率是任何供水系統內的重要元素。過去一年，多個濾水廠的廠房和設備已進行提升。本署已安裝配備先進檢測、控制及數據記錄功能的配送控制系統，目標是全面實現自動化廠房操作，以配備先進的輕觸式面板及大型多屏幕液晶顯示監視器，取代傳統的按鈕式控制面板，讓資訊可以同步顯示。為了進一步提升運作效率，本署現正擴大濾水設施的現有閉路電視監察區域。這項措施，將會令操作員能夠更加密切地監察濾水廠的情況。本署亦已制定向內部使用者發放即時廠房運作參數的規定，以便他們能有效率地作出決策及前瞻性的規劃。

在本署機械及電動機械設備方面，本署已制定了以風險為本的保養策略，進一步增強抽水站和濾水廠的可靠性。本署已經在大埔鹹水抽水站及上水濾水廠以此策略實行試驗，結果均顯示該策略有節省運作成本的顯著潛力，而有關策略將會在未來一年推廣至其他設施。

Focussing on Efficiencies

Treatment plant efficiency is a key element of any water supply system. Over the past year, the plant and equipment in a number of water treatment works have been upgraded. A local distribution control system with advanced monitoring, control and data logging functions has been installed. The objective is to fully automate plant operations, replacing conventional push button type control panels with sophisticated touch-screen panels and large multi-screen LCD monitors to allow information to be displayed concurrently. To further improve operational efficiency, we are extending the existing CCTV coverage areas at water treatment facilities. This will enable operators to maintain a closer surveillance of the water treatment works. Provisions are also being made to disseminate real-time plant operating parameters to internal users for efficient decision-making and forward planning.

For the mechanical and electrical machinery at our facilities, we have developed a risk-based maintenance strategy that underscores the reliability of pumping stations and water treatment works. Pilot schemes have been undertaken at the Tai Po Salt Water Pumping Station and the Sheung Shui Water Treatment Works. In both cases, the results pointed to significant potential savings in operating cost and the strategy will be extended to other installations over the coming year.



上：牛潭尾濾水廠內的氧氣儲存設施。
Upper: Oxygen storage facilities at Ngau Tam Mei Water Treatment Works.

下：員工為在牛潭尾濾水廠內的臭氧生產機進行維修。
Lower: Staff doing maintenance for the ozone generator at Ngau Tam Mei Water Treatment Works.

上：就供水來說，設備操作是不可缺少的。
Upper: Plant operation is essential for the provision of water supply.

下：跟據《水務設施規例》規定，水錶的偏差程度不可超出 $\pm 3\%$ 。
Lower: Inaccuracy of water meters should not exceed $\pm 3\%$ according to the Waterworks Regulations.



抽水站和濾水廠的機械及電機設備，須定期進行保養和維修，確保供水穩定。

Mechanical and electrical equipment in pumping stations and water treatment works should be regularly maintained to ensure a stable water supply.

盡量採用新科技

數碼繪圖系統已在本署各個部門獲得普遍使用及備受重視。在過去一年，該系統已經擴大至涵蓋區域伺服器。與此同時，以數碼繪圖系統為基礎開發地理資訊系統的工作繼續進行。地理資訊系統已被成功地應用在若干服務範疇內，而當中一項——閘門隔離電腦程式的應用，更因其成本效益而獲二零零九年公務員優質服務獎勵計劃嘉許。

在本署的水管更換及修復計劃中，亦有效地使用了科技輔助。在工地辦事處工作的員工會透過專門為水管更換及修復計劃設計的數碼繪圖系統，更新已鋪設的水管記錄。這些更新資料加強了記錄的完整性，並帶來更有效及更準確的供水網絡、運作及保養資訊。

斜坡保養優化

斜坡管理系統是一個保存及管理斜坡檢查及工程記錄的綜合資料庫。該系統令部門內及部門與外間人士（例如在本署管轄下而在斜坡附近進行工程的私人公司及其他政府部門）的資訊流通更具效益及效率。

Maximising New Technology

The employment of a digital mapping system has gained both momentum and popularity throughout the department. Over the past 12 months, the system has been extended to encompass regional servers. At the same time, the GIS development based on the digital mapping system has continued. GIS applications have been successfully implemented in various service delivery areas and one application in particular, the valve isolation computer programme, was awarded a citation for its cost effectiveness in the 2009 Civil Service Outstanding Award Scheme.

Technology is also being used effectively in the Department's water mains replacement and rehabilitation programme. Staff working in site offices would update the as-built water mains records through a digital mapping system specifically devised for the water mains replacement and rehabilitation project. These updates enhance records and result in more accurate water mains network, operational and maintenance information.

Upgrading in Slope Maintenance

The Slope Maintenance System (SMS) comprises a comprehensive inventory for keeping and maintaining slope inspections and works records. It enables an efficient and effective flow of information within the Department and between the Department and outside parties such as private companies and other government departments planning to carry out engineering work in the vicinity of slopes under our jurisdiction.

目前的斜坡管理系統功能將會強化，並加入全新的格式和更多斜坡數據。由土木工程拓展署開發的強化功能將有助識別需要額外安全設施或行動的斜坡。

未雨綢繆

在發生任何異常事件時，危機處理及維持無間斷供水的能力是本署需要不斷應付的挑戰。目前，本署正檢查集水區，以確保因蓄意或其他原因引致污染的風險受到控制。

在二零零八年的奧運會及其後的殘奧會舉行期間，本署與民政事務局及保安局為香港舉行的馬術比賽進行緊密合作。我們在比賽場地為運動員及大會職員入住的服務式酒店鋪設新水管，以保障足夠的供水。本署亦加強了配送網絡，並密切監察滲漏水管或水管爆裂的風險。所有措施均證實有效，而奧運馬術比賽亦順利舉行，期間並無出現供水中斷的情況。

研究和發展

本署為提升轄下基礎設施不斷尋找不同方法，最近的研究及發展路向重點是有關配水連接水管的用料。根據一項研究的建議，露天的食水及鹹水配水連接位置可以採用不銹鋼及黑色聚乙烯水管。

確保水錶準確度

客戶對水錶讀數的投訴次數及密度都有所下降，原因是本署一項改善水錶讀數準確度的五年計劃已取得進展。本署正進行更換使用超過12年的水錶，截至目前為止，本署已更換了接近一百萬個水錶，並預期當計劃在二零一一年完成時，將會安裝了另外400 000個新水錶。我們現正在大型屋邨安裝更多總水錶，以幫助檢測無法被現存水錶錄取的用水量。不論無法被錄取的水是源於非法取水或供水系統滲漏，改善水錶裝置無可否認是記錄及節約水資源的寶貴工具。

The currently SMS will be enhanced with a new format and additional slope data. The enhancement developed by the Civil Engineering and Development Department will help identify slopes that may require additional safety features or action.

Preparing for the Unexpected

Crisis management and the ability of the Department to maintain an uninterrupted water supply should any extraordinary events occur are ongoing challenges. Currently, water catchments are being scrutinised to ensure risks of contamination – deliberate or otherwise – are limited.

The Olympic Equestrian Events and the Paralympic Equestrian Events which were held in Hong Kong in 2008 involved the Department working closely with the Home Affairs Bureau and the Security Bureau. New water mains were laid at competition venues and to service hotels used by competitors and officials to safeguard water supplies. The distribution network was strengthened and monitored closely for leaks and risks of main bursts. All measures proved effective and the Equestrian Events ran smoothly without supply disruption.

Research and Development

We are constantly looking at ways to upgrade our infrastructure. Various research and development studies were carried out. A study on materials for service connection pipes has recommended that stainless steel and black polyethylene pipes be used for exposed fresh water and salt water service connections.

Enhancing Meter Accuracy

The number and frequency of complaints from customers regarding meter readings have reduced as our five-year programme to improve the accuracy of water meter readings progresses. We are replacing water meters older than 12 years and, to date, almost one million meters have been replaced and another 400 000 new meters are expected to be installed by the time the programme ends in 2011. Additional master meters are being installed in large housing estates to help in the detection of water uptake that cannot be accounted for. Whether this is due to illegal draw off or leakage in the supply system, the improvement to water meters is proving to be a valuable tool when it comes to accounting for and conserving water.