ADB

EVERY DROP COUNTS

LEARNING FROM GOOD PRACTICES
IN EIGHT ASIAN CITIES

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Abbreviations

ADB	–	Asian Development Bank
DTSS	–	deep tunnel sewerage system
GPOBA	–	Global Partnership on Output-Based Aid
ISO	–	International Organization for Standardization
IWK	–	Indah Water Konsortium
JUSCO	–	Jamshedpur Utilities and Services Company
MWA	–	Metropolitan Waterworks Authority
NRW	–	nonrevenue water
NWSDB	–	National Water Supply and Drainage Board
PPWSA	–	Phnom Penh Water Supply Authority
PRC	–	People's Republic of China
PPP	–	public–private partnership
PUB	–	Public Utilities Board
SYABAS	–	Syarikat Bekalan Air Selangor
SZWG	–	Shenzhen Water Group
SZWRB	–	Shenzhen Water Resource Bureau
UFW	–	unaccounted-for-water
WRP	–	water reclamation plants

NOTE:

The fiscal year (FY) of the Government of India and its agencies ends on 31 March. FY before a calendar year denotes the year in which the fiscal year ends, e.g., FY 2009 ends on 31 March 2009.

Foreword

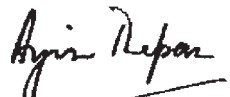
We have a strange paradox in Asia. Economies have grown impressively, poverty has been significantly reduced, and incomes have risen. But most of the continent's rapidly growing towns and cities remain without adequate safe drinking water. With pressures caused by rapid industrial and urban growth, already scarce freshwater resources are shrinking further. Efficiencies in urban water management are generally absent. The poor, still a large part of urban Asia, suffer most acutely.

Attempts have been made to deal with the chronic mismanagement and poor governance in the urban water sector. But these have been largely ad hoc and narrowly focused. Pricing of efficient water services remains an issue, and the concept of private management of public resources is still cloaked in dogma. Equity and service quality suffer, and the sector attracts little or no investments.

In all of this darkness, are glimmers of hope. The Asian Development Bank has commissioned case studies, through the Institute of Water Policy at the Lee Kuan Yew School of Public Policy in Singapore, that independently and comprehensively analyze good practice examples in urban water management systems in developing Asia. These studies highlight specific strategies that have translated good principles into practice, and have resulted in impressive development outcomes.

This report presents objective, critical analyses of urban water management practices in eight Asian cities over a 10-year period: Bangkok, Thailand; Colombo, Sri Lanka; Jamshedpur, India; Kuala Lumpur, Malaysia; Manila, Philippines; Phnom Penh, Cambodia; Shenzhen, People's Republic of China; and Singapore. In doing so, the report demonstrates how good practices have worked at the utility level, those that have not, and the constraints that the eight cities have faced and how they sought to address such constraints.

Big victories have little beginnings. We hope that this report shows conclusively that securing world-class urban water solutions in Asia is eminently doable. And that these cases inspire city managers and urban water leaders to craft their own solutions to deliver the kind of high quality water services their citizens deserve and are willing to pay for. If this report can provide that stimulus, it will have served its cause well.



Arjun Thapan
Special Senior Advisor (Infrastructure and Water)
Office of the President
Asian Development Bank

Acknowledgments

The report is the culmination of an 18-month research initiative, Case Studies of Good Practices for Urban Water Management in Asia, funded jointly by the Singapore Totalisator Board and the Asian Development Bank (ADB), through the Water Financing Partnership Facility.

The initiative was undertaken by the Institute of Water Policy, Lee Kuan Yew School of Public Policy, National University of Singapore, through a 17 September 2008 letter of agreement. Signatories were Kishore Mahbubani, dean and professor of public policy on behalf of the Lee Kuan Yew School of Public Policy, and Xianbin Yao, director general, Regional and Sustainable Development Department on behalf of ADB.

Many people provided invaluable support and contributions to make this report possible.

At ADB, support was provided by Woochong Um, deputy director general, Regional and Sustainable Development Department. Overall direction and guidance was provided by Anand Chiplunkar, principal water supply and sanitation specialist. Theresa Audrey O. Esteban, sector officer, provided technical and research support.

At Lee Kuan Yew School of Public Policy, Seetharam Kallidaikurichi, director of Lee Kuan Yew School of Public Policy's Institute of Water Policy, and Tan Cheon Kheong, research fellow at the Institute of Water Policy, led the study team.

In the course of the study, ADB and the Institute of Water Policy received valuable inputs from country participants, researchers, nongovernment organizations, private sector entities, and development partners, including at three workshops. These workshops comprised an inception workshop in October 2008, an interim workshop in June 2009, and a final workshop in December 2009. These workshops were organized by the Institute of Water Policy, Lee Kuan Yew School of Public Policy, with support from ADB.

While countless people were involved in developing the case studies, the team wishes to express their appreciation to those who developed each of the eight case studies, as well as the many reviewers who provided comments for the case studies. The team also thanks the organizations that provided information for the case studies and participated in the final workshop held at the Lee Kuan Yew School of Public Policy.

Bangkok, Thailand

Organizations:	Metropolitan Waterworks Authority Bangkok Metropolitan Administration
Authors:	Mukand Singh Babel, associate professor, School of Engineering and Technology, Asian Institute of Technology (AIT), Thailand Aldrin Rivas, research associate, School of Engineering and Technology, AIT, Thailand

Colombo, Sri Lanka

Organization:	National Water Supply and Drainage Board
Authors:	K. L. L. Premanath, general manager, National Water Supply and Drainage Board, Sri Lanka Mahesh Vilas Harhare, analyst, ICRA Management Consulting Services

Jamshedpur, India

Organization:	Jamshedpur Utilities and Services Company
Authors:	Anand Madhavan, head, Energy and Urban Infrastructure, ICRA Management Consulting Services Supriya Sahai, senior analyst, ICRA Management Consulting Services

Kuala Lumpur, Malaysia

Organizations:	National Water Services Commission (Suruhanjaya Perkhidmatan Air Negara) Syarikat Bekalan Air Selangor Indah Water Konsortium
Authors:	Kuppusamy Singaravelloo, senior lecturer, Department of Administrative Studies and Politics, Faculty of Economics and Administration, University of Malaya, Malaysia Tan Siew Hooi, director, LTL Resources, Malaysia

Manila, Philippines

Organizations:	Manila Water Company Maynilad Water Services
Authors:	Juan Miguel Luz, associate dean, Center for Development Management, Asian Institute of Management, Philippines; and executive vice president, National Institute for Policy Studies, Philippines Maria Lynn P. Melosantos, senior science research specialist, Philippine Institute of Volcanology and Seismology, Philippines

Phnom Penh, Cambodia

Organization: Phnom Penh Water Supply Authority

Authors: Asit K. Biswas, distinguished visiting professor, Institute of Water Policy, Lee Kuan Yew School of Public Policy, National University of Singapore; and president, Third World Centre for Water Management, Mexico
Cecilia Tortajada, visiting professor, Institute of Water Policy, Lee Kuan Yew School of Public Policy, National University of Singapore; scientific director, International Centre for Water; and president, International Water Resources Association

Shenzhen, People's Republic of China

Organization: Shenzhen Water Group

Authors: Chang Miao, associate professor, Division of Environmental Management and Policy, Department of Environmental Science and Engineering, Tsinghua University, People's Republic of China
Tian Xin and Li Dongwei, assistant researchers, Division of Environmental Management and Policy, Department of Environmental Science and Engineering, Tsinghua University, People's Republic of China

Singapore

Organization: Public Utilities Board

Author: Tan Cheon Kheong, research fellow, Institute of Water Policy, Lee Kuan Yew School of Public Policy, National University of Singapore

In addition, Jeffrey Bowyer, an ADB consultant, supported the preparation of this report. He crafted the final document, highlighting the main lessons learned and good practices from these eight case studies.

Gil-Hong Kim
Director
Sustainable Infrastructure Division
Regional and Sustainable Development Department

Introduction

Challenges in the Water Sector

In Asia's cities, common water supply problems are related to the sources and uses of raw water, the large proportion of water loss in distribution networks, intermittent supplies, and the quality of tap water. In addition, in some cities, the excessive use of groundwater resources has caused serious environmental problems, including rapid depletion of groundwater, deterioration of water quality, and land subsidence. Many cities also suffer from poor sewerage networks and wastewater treatment systems; a large majority still depends on septic tanks and other on-site sanitation facilities. As a result, pollution loads in freshwater bodies and groundwater sources have increased substantially.

Box 1: Common Utility Challenges

- Coverage of only a portion of the urban population
- Rapid urbanization
- Interrupted supplies
- High nonrevenue water
- Nonpotable water
- Lack of asset management
- Low tariffs that hamper connections for the poor

Source: ADB.

There are many reasons why cities struggle to provide clean and reliable water supplies to their residents, including physical scarcities of water, lack of availability of investment funds, unwillingness of authorities to charge poor consumers for water, and the lack of capacity of service providers in the public sector. All are symptoms of the fundamental reason for these problems, which is inadequate leadership and governance.

The global water crisis is, in fact, a crisis of governance.

Water Governance and Good Practices

To overcome these challenges in the water sector, policy makers and water agencies must first understand the underlying principles of good water governance, especially in the face of water scarcity and climate change. Sound governance can help create a favorable environment to increase both public and private sector investment and to ensure that much-needed investment is used correctly and efficiently.

Good governance is one of the three pillars of ADB's Poverty Reduction Strategy. ADB's approach to governance, established as a Core Strategic Area of Intervention under its Long-Term Strategic Framework (2008–2020), recognizes the importance of capacity development and identifies four key interrelated elements that are considered necessary to sustain efforts and ensure results.[1] All of these elements feature prominently in successful water utilities. It is here, at the junction where sound governance principles meet utility practices, that this report is focused. As shown in Table 1, good practices will be outlined in a number of areas, including the following:

(i) Fundamentals. Among other lessons, regulation is required to place water agencies at arm's length from governments and to make them accountable to the public. Ideally, these water agencies will cut across multiple agencies and maintain links with all stakeholders. In addition, well-functioning public utilities throughout the world indicate that a corporate approach to water supply—but not necessarily private ownership—is essential to reliable, efficient, and equitable operations. Such an approach can help ensure the financial sustainability of water systems and protect the long-term value of water resources. It can also open the door for external expertise and finance from the private sector.

(ii) Efficient, effective service delivery. Good water governance requires that utilities take an integrated, holistic service delivery approach that includes not only water supply management, but also demand management, wastewater management, research and development, and where applicable, public–private partnerships (PPPs). A robust system of reporting and monitoring is also needed to help set priorities in water policy interventions and to strengthen the responsiveness of institutions and processes.

(iii) Financial and human resources management. Improving internal governance is essential to providing efficient service delivery. This requires that utilities strive to be financially self-reliant by operating as independent, business-like institutions with an emphasis on improving their revenue and effectively managing their cash flow. It is also important for utilities to attract, nurture, and retain talent, so that they will have capable staff to carry out their responsibilities.

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[1] ADB. 2008. *Strategy 2020: The Long-Term Strategic Framework of the Asian Development Bank 2008–2020.* Manila.

Table 1: Summary of Good Practices Offered by City Case Studies

Good Practice	City or Utility Example
Fundamentals (Chapter 1)	
Leadership at the top	Bangkok, Phnom Penh, Singapore
Integrated water management policy	Shenzhen, Singapore
Corporatization of water utilities	Bangkok, Jamshedpur
Regulating private sector participation	Kuala Lumpur, Manila, Shenzhen
Efficient Service Delivery (Chapter 2)	
Increasing coverage and improving availability	Bangkok, Colombo, Manila, Phnom Penh
Reducing nonrevenue water	Jamshedpur, Manila Water Company, Phnom Penh, Singapore
Securing clean, safe, and reliable water supplies	Bangkok, Manila Water Company, Singapore
Improving service to the poor	Bangkok, Jamshedpur, Manila Water Company, Phnom Penh, Singapore
Demand-side management	Singapore
Wastewater and sewerage systems	Jamshedpur, Kuala Lumpur, Singapore
Monitoring and reporting	Bangkok, Jamshedpur, Singapore
Financial and Human Resources Management (Chapter 3)	
Staff productivity	Jamshedpur, Manila Water Company, Phnom Penh, Singapore
Pricing water for efficiency and sustainability	Jamshedpur, Manila Water Company, Phnom Penh, Singapore
Revenue collection	Bangkok, Phnom Penh
Wastewater tariffs	Bangkok, Colombo, Jamshedpur, Malaysia

Source: Compiled by ADB from referred case studies.

Case Studies that Highlight Good Practices

The following five case studies were comprehensive in their review of utility performance and lessons learned. From these case studies, several examples of good practices are offered.

Bangkok, Thailand

The Metropolitan Waterworks Authority (MWA), a state enterprise under the Ministry of Interior, has made significant improvements in water supply management in Bangkok and neighboring provinces in Thailand. These include improvements in service coverage, water quality, service efficiency, and financial performance. The Bangkok Metropolitan Administration, which is in charge of wastewater and flood management, has also enjoyed considerable success.

The pupils in Min Buri District, Bangkok drink water directly from the tap.
Photograph courtesy of the Corporate Communications Department, Metropolitan Waterworks Authority.

MWA's water supply improvement measures have been impressive. Presently, almost 100% of Bangkok's population receives reliable, safe tap water through the state-run utility, which has taken significant steps to advance its financial performance. However, further improvements are needed to address wastewater treatment and water quality perceptions in the city.

Jamshedpur, India

The Jamshedpur Utilities and Services Company (JUSCO) details a case of an integrated urban water system managed under a corporate framework. Set up as a wholly owned subsidiary of Tata Steel, JUSCO became operational in 2004 with the transfer of 1,375 employees from Tata Steel's Town Division.

JUSCO's vision is to be the preferred provider of water supply and other urban services throughout India. In a short time, it has evolved into a one-stop, integrated utilities provider in a range of areas, including water and wastewater, construction, municipal solid waste management, power, and integrated facility management.

This case demonstrates lessons for other utilities attempting to leapfrog from mediocre-to-moderate levels of performance to better service delivery standards. It offers encouraging insights for replication in governance, operations, and technology or

management practices to provide equitable, affordable services in a commercially and environmentally sustainable manner.

Manila, Philippines

In 1997, the privatization of the Metropolitan Waterworks and Sewerage System was the largest water privatization effort in the world. From a single water utility run as a government corporation (subject to government accounting, auditing, and civil service rules), the operation of Metro Manila's water distribution and sewerage system was bid out into two concessions: Manila Water Company for the East Concession Zone and Maynilad Water Services for the West Concession Zone.

By 2003, the two concessionaires' fortunes went in opposite directions. Manila Water Company did well, managing to become profitable as early as the fifth year of operation. In March 2005, it was listed on the Philippine Stock Exchange, a measure of the public's trust in its ability to deliver. Maynilad Water Services, on the other hand, declared bankruptcy and withdrew from the concession agreement by 2003. The government reclaimed the concession and, after a period of interim restructuring, carried out a successful rebidding process for a qualified replacement operator, which took over in late 2007. The privatization of water delivery in Metro Manila thus provides some useful points of comparison from which urban water management lessons can be derived.

Phnom Penh, Cambodia

The experience of the Phnom Penh Water Supply Authority (PPWSA) has been a valuable example for other urban centers of the developing world. From a near-bankrupt and totally demoralized institution, it has transformed itself to a viable, vibrant institution that can be compared to most of the world's best-performing water utilities.

Within just 1 decade (1993–2003), it developed a new mindset, modus operandi, and team spirit. It has continuously expanded its network, improved its management and operating efficiency, become financially self-sufficient, and progressively increased its net annual profit.

Its incredible progress within such a short time frame is perhaps unrivalled by any utility anywhere in the world. This rapid improvement shows that providing a clean, drinkable water supply is possible with political will, dynamic leadership, and noninterference in the policies and day-to-day management of utilities.

Singapore

After it obtained independence in 1965, the small city-state of Singapore faced the challenges of water scarcity and vulnerability. In response, the country adopted an integrated, innovative approach to water management, which, together with careful planning and hard work over more than 40 years, enabled it to implement sustainable, innovative, and cost-effective water management solutions. The Singapore experience shows that a publicly owned water utility, with a high degree of autonomy to carry out its role, can be as efficient as a private organization.

Singapore's water utility, the Public Utilities Board (PUB), is owned by the government. It is a statutory board under the Ministry of the Environment and Water Resources, the parent ministry that oversees environmental and water-related affairs, and enjoys a high degree of autonomy and strong government support to carry out its role. It was named the Water Agency of the Year in 2006 at the international Global Water Awards organized by Global Water Intelligence, and was also conferred the coveted Stockholm Industry Water Award in 2007 for being an exemplary model of integrated water management.

Cities that struggle with water scarcity and pollution can look to Singapore's experience in sustainable water management for solutions. For instance, Singapore's used water–reuse technology (i.e., NEWater) could help solve the need for high-quality water for industrial uses in countries around the world.

Case Studies that Focus on Specific Lessons

The following three case studies were more focused on specific lessons learned in one or two areas. Thus, from these case studies, two to four examples of good practices are offered.

Colombo, Sri Lanka

The National Water Supply and Drainage Board (NWSDB), the statutory body responsible for drinking water supply and sewerage systems in Sri Lanka, is among the few South Asian utilities that has achieved more than 99% metering as well as a continuous water supply in its service areas. NWSDB, which provides water supply services to a large part of the Greater Colombo area, offers end-to-end water value-chain service delivery, meaning it is responsible for planning, investigating, designing, supervising (both construction and operation), and maintaining water distribution and treatment systems.

NWSDB has planned various schemes of source augmentation, distribution network rehabilitation, and replacement and prevention of water pollution. Its ability to keep pace with the rapid growth in population in and around Colombo, as well as a substantial increase in its service area, is remarkable. However, efficiency improvements are still badly needed, considering that rates of nonrevenue water (NRW) are still high. Also, the low tariff structure and lack of periodic revision in tariff rates have been major constraints in generating revenues and recovering operation and maintenance charges.

Kuala Lumpur, Malaysia

Urban water supply in Kuala Lumpur is generally well managed, with infrastructure and facilities, operational efficiencies, and a level of service comparable to many major cities in developed countries. The city has a continuous water supply with minimal interruptions as well as full coverage for safe drinking water and sanitation.

In Kuala Lumpur and throughout Malaysia, privatization has clearly improved the level of services in the water industry. However, greater service efficiency could have been achieved had it been complemented by appropriate legal and institutional reforms. The government

has realized from its experiences that transferring the entire financial responsibility to the private sector may not necessarily be the best practice in managing the water industry. In response, the government is pursuing a new PPP model, and now shares the financial responsibility of infrastructure development.

Shenzhen, People's Republic of China

The city of Shenzhen is leading the reform of local water management in the People's Republic of China (PRC). It has established a relatively complete legal system for water management and is one of the first cities in the country to combine all water-related government functions into one government agency, the Shenzhen Water Resource Bureau.

It also completed market-oriented reform in the water sector, having successfully negotiated the first concession for municipal public utilities in the PRC on 23 August 2004. On this date, the Shenzhen Water Group completed its transformation from a wholly state-owned enterprise to a joint venture approved by the Ministry of Commerce. Today, it is the largest water supply and drainage service enterprise in the country.

Meanwhile, the integrated operation of water supply and drainage helped Shenzhen's sewage treatment improve substantially over a short period of time. The wastewater treatment sector in Shenzhen has made rapid development since the reform of 2001, and the sewage treatment rate in the Shenzhen Special Economic Zone has increased from 56% during pre-integration to over 88% in 2008, ranking first among large and medium-sized cities in the PRC.

Setting the Context

As the team embarked on this research initiative, its members were intrigued by the rapid progress in performance improvement and service delivery that the selected Asian water utilities achieved relative to their historical and national or regional contexts. At the same time, academic research on water utilities was largely focused on benchmarking and outcome dimensions, which provided limited insights on the underlying drivers for this progress.

Second, the heterogeneity of the socioeconomic contexts in which these utilities operate challenge the notion of a "one-size-fits-all" approach to defining good practices among water utilities. For instance, Singapore and Phnom Penh achieved significant reductions in unaccounted-for water (UFW) over the last decade, but they did so in very different socioeconomic contexts.

Third, even though these utilities have made impressive strides along certain dimensions, they still face challenges in other aspects of water management. For instance, some have not paid adequate attention to sanitation until recently. Therefore, the case studies were initiated with the following line of thinking:

(i) Certain Asian utilities have made rapid progress on selected dimensions of water management.

(ii) It is necessary to draw insights on the underlying factors driving this progress and on the socioeconomic and historical contexts in which these changes were taking place.
(iii) Rather than look at these successes as exceptions, a few crosscutting good practice themes should be identified from these relatively better-performing utilities for universal adoption and replication.

The cities and utilities for this research initiative were selected from wide-ranging contexts, i.e., Jamshedpur and Colombo from South Asia; Shenzhen from the PRC; and Bangkok, Kuala Lumpur, Phnom Penh, and Singapore from Southeast Asia. The objective was to reflect the striking socioeconomic diversity across Asian cities.

In this report, the performances of the utilities are compared. While the authors recognize that a cross-city comparison framework—particularly in Asia—tends to be simplistic, it is useful to evolve a threshold level of performance benchmarks for urban water and sanitation in Asian cities. More importantly, this report attempts to evolve a framework to define a set of good practices for wider adoption and replication across Asia and similar contexts worldwide.

Although the success achieved by some of these utilities in specific spheres of water management is amazing, much remains to be done. In a 2009 report, the United Nations stated that nearly 13% of the world's population still relied on unimproved water sources for its drinking, cooking, bathing and other domestic activities, and over 38% still did not have access to improved sanitation.[2] However, this report seeks to reinforce the positive actions taken by some utilities to bridge these gaps. Hopefully, these actions can lead the way for Asia and the rest of the developing world.

Table 2 provides a snapshot of key indicators in water management from among the eight cities and nine water utilities profiled. The idea is not to decipher what constitutes a well-performing or a poorly performing utility, but to evolve benchmarks for critical outcome indicators, based on the experience of what has been and can be achieved in the Asian context by the various utilities covered in this initiative.

[2] United Nations. 2009. *The Millenium Development Goals Report 2009*. New York. pp. 45–46.

Table 2: Key Indicators

	Unit of Measure	Bangkok	Colombo	Jamshedpur	Kuala Lumpur	Phnom Penh	Shenzhen	Singapore	Manila	
									Manila Water	Maynilad
Year		2008	2008	2009	2008	2008	2008	2008	2008	2008
Area	km^2	1,569	1,197	64	242	375	1,953	710	1,400	540
Population	'000	5,710	3,765	860	1,629	1,326	8,768	4,800	6,000	9,100
Water supply										
Piped coverage	% of population	99%	92%	81%	100%	91%	100%	100%	93%	72%
Average availability	Supply hours	24	24	7	24	24	24	24	24	18
Metered connections	% of connections	100%	100%	26%	95%	100%	not available	100%	not available	not available
UFW/NRW	% of total supply	30.2%	35.7%	9.9%	33.2%	6.2%	13.5%	4.4%	19.6%	63.8%
Staff	per 1,000 connections	2.2	3.9	4.0	2.0	3.3	not available	2.5	2.27	2.08
Operating ratio	Op. exp./Op. rev.	0.69	0.62	0.82	0.86	0.39	0.97	0.86	0.49	0.55

continued on next page

TABLE 2 *continued*

	Unit of Measure	Bangkok	Colombo	Jamshedpur	Kuala Lumpur	Phnom Penh	Shenzhen	Singapore	Manila	
									Manila Water	Maynilad
Wastewater										
Sewerage coverage	% of population	54%	14%	68%	90%	63%	not available	100%	44%	42%

km^2 = square kilometer, NRW = nonrevenue water, Op. exp. = operating expenses, Op. rev. = operating revenue, UFW = unaccounted-for-water.

1. Population—For Bangkok, data refers to its registered population. An estimate of the population including nonregistered population in Bangkok is 8.96 million. The total registered population of Bangkok, Nonthaburi, and Samut Prakan was 7.9 million.
2. Water Supply Coverage—(i) For Bangkok, data refers to the number of connections in MWA's entire service area of Bangkok, Nonthaburi and Samut Prakan. It was estimated that there were 1.32 million connections in Bangkok itself. (ii) For Colombo, data includes 4,208 public stand posts. (iii) For Singapore, data refers to the number of customer accounts for potable water and NEWater.
3. Unaccounted-for-Water (UFW) and Nonrevenue Water (NRW)—The data for Phnom Penh and Singapore are UFW. All others are NRW.
4. Sewerage Coverage—(i) The data for Kuala Lumpur and Phnom Penh are estimates. (ii) For Manila Water and Maynilad, the data is presented as the proportion of households with access to an urban sanitation system, including desludging of septic tanks.
5. Operating Ratio—(i) Operating ratio refers to the ratio of annual operation and maintenance costs to annual operating revenue. (ii) For Shenzhen, data refers to Shenzhen Water Group's operating ratio for its water supply business only.
6. Staff Members per 1,000 Connections—For Singapore, data refers to the number of staff members per 1,000 customer accounts for potable water and NEWater.

Source: Case Studies on Good Practices for Urban Water Management in Asia. Unpublished.

Leadership for Aligning Frameworks and Institutions

Leadership at the Top

Behind every successful water supply and sanitation system is committed leadership at the water utility, in the community, and especially in the government. While not the only requirement for success, unwavering commitment is the most important element that any government can bring to a water supply project, whether it chooses to retain public ownership or to pursue a partnership with the private sector. With commitment and vision at the highest levels of government, viable solutions can be more easily implemented at the utility level. Further, the government plays an important role in creating enabling policies, setting strategic objectives, allocating resources through the government's public financing policy, and providing incentives for increased investment through clear regulatory and institutional frameworks.

Regulation is also required to place water agencies at arm's length from governments and to make them accountable to the public. Such autonomy for utilities is a critical trigger for scaling up company vision and service delivery. The ability of water agencies to take control of pricing and revenue functions, such as billing, credit control, and meter reading, is especially important in determining their ability to improve their revenues. It is also important that the regulator give priority to human and financial resources so a utility can operate effectively.

Phnom Penh's phenomenal improvement in water services can be traced back to the leadership of Cambodia's Prime Minister Hun Sen. First, the Prime Minister, understanding the importance of improving water supply and sanitation, chose a competent and charismatic leader, Ek Sonn Chan, for the Phnom Penh Water Supply Authority (PPWSA). The Prime Minister then provided strong support when PPWSA faced initial challenges, such as making it clear that everyone—including government institutions and the rich and powerful—had to

pay water bills promptly or face the water supply being cut off. Just as importantly, he also stepped back and let Ek Sonn Chan perform his tasks without political interference.

Long-standing political commitment is also a strong contributor to success in Singapore. The nation's minister mentor, Lee Kuan Yew, was instrumental in ensuring that Singapore achieved water sustainability. When Mr. Lee became the Prime Minister, he gave water top priority, setting up a unit in his office to coordinate water and sanitation measures across government. Singapore then proceeded to make heavy investments in infrastructure and technology to achieve sustainability in water supply. As he recalled at a dialogue session with delegates of the inaugural Singapore International Water Week in June 2008, "This [water] dominated every other policy. Every other policy had to bend at the knees for water survival."[3]

In Bangkok, recent achievements can be traced back to a bold initiative by Dr. Arthit Urairat, a past Metropolitan Waterworks Authority (MWA) leader, who provided the foundation for the current management. This leader, who headed MWA from 1984 to 1987, introduced operation and management methods that turned the organization from a typical government or semi-government entity into a business organization committed to public service. He convinced the government of various necessary changes and then obtained their support for projects, activities, and management measures, some of which had not been previously supported. For instance, three revisions and adjustments to the water tariff were made during his tenure, and these contributed to the improved financial status of the utility.

Integrated Water Management Policy

During the last decades, the division of responsibility for water resources management has become a difficult issue in many countries. Without an integrated water management policy, it is much more difficult to allocate water resources properly and efficiently between urban and rural areas and between surface water and groundwater resources. Meanwhile, different facets of water management (e.g., water supply, drainage, water pollution control, water recycling, and water conservation) are often managed by different departments, making it impossible to plan and implement water systems holistically.

Such a situation has exacerbated water supply tensions in many cities. The segmentation of water resources management runs counter to the needs and the dynamic nature of water recycling, water transport, regeneration, and storage. It also prohibits the unified management of a resource that is vital to people's health and livelihoods. One lesson offered by the case studies is that there is a need for regulatory frameworks that bring about greater coordination, cooperation, and centralization of water resources management.

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[3] Y. S. Tan et al. 2009. *Clean, Green and Blue: Singapore's Journey Towards Environmental and Water Sustainability.* Singapore: Institute of Southeast Asian Studies. p. xxiii.

Singapore is a global leader in integrated water management. The Public Utilities Board (PUB) manages water supply, water catchment, and sewerage in an integrated and holistic manner. Integration also extends to institutional coordination and cooperation, as PUB works in close collaboration with the Urban Redevelopment Authority and the National Parks Board. The holistic approach facilitates sound decisions, as highlighted throughout this report.

Shenzhen also recognized the disadvantages of segmenting water resources management as well as the importance of unified management. In pursuing integrated water management reform, the city government decided to learn from successful experiences in Hong Kong, China, which is separated by Shenzhen by just a river. In Hong Kong, China, the Water Supplies Department manages water resources development, as well as designs, builds, maintains, and operates the water supply system.

Shenzhen became one of the first cities in the People's Republic of China (PRC) to combine all water-related functions in one government agency—the Shenzhen Water Resource Bureau (SZWRB)—helping the city avoid possible conflicts between agencies due to overlapping functions. The SZWRB is responsible for all water-related planning related to water supply, wastewater treatment, and reclaimed water, all of which came under the control of construction bureaus in the past. Although some government sectors retain several functions related to water management, the functions are unambiguous, and the coordinating mechanism is good enough to allow them to resolve water management problems cooperatively and quickly.

Regulatory reform has also allowed Shenzhen to become a model for market-oriented reform in the urban water sector throughout the PRC. It set up a clear regulatory relationship between regulatory departments and enterprises. This separation allows the SZWRB to regulate the industry without interfering with the normal operations of the water business.

Corporate Approach to Utility Management

The next challenge is to translate political will and sound regulation into good practice at the utility level. In most countries in Asia and the Pacific, this is a big challenge, as the market structure is typically decentralized and dispersed, with local utilities often assuming full responsibility for investment, financing, and operations.

Successful reform at the utility level requires that local decision makers view water supply as a long-term business proposition, albeit a unique one that involves careful political and social considerations. Doing so can help ensure the financial sustainability of water systems and protect the long-term value of water resources. It can also open the door for external expertise and finance from the private sector.

This approach, termed "corporatization," is gaining popularity in many countries around the world as an institutional model that promises efficiency gains. The eight case studies show that taking a corporate approach to water supply, whether fully owned by the government or with joint private ownership, is essential to reliable, efficient, and equitable

operations. A corporate approach also can improve accountability and transparency, which are important facets of good governance.

In Bangkok, MWA enjoys considerable autonomy and is operated and managed like a business entity committed to public service. It has adopted transparent management, taken measures to increase work efficiency, and pays bonuses to employees. As MWA covers three provinces and serves around 8 million people (based on the registered population), its responsibilities are complex. However, this is eased by the establishment of branch offices that are responsible for smaller areas.

Thanks to various measures, MWA has received several corporate governance awards from the Ministry of Finance, including the Best Practice on Corporate Governance Award (Transparency Management) in 2000. The award was bestowed on MWA in recognition of its transparent management practices, which were set up under its framework for good corporate governance.

One of the main features of transparency in MWA is its internal control system, which helps ensure that MWA personnel, units, and offices perform in accordance with regulations, operational evaluations, and financial and accounting audits. This system is implemented through an audit committee at the board of directors level, which has more freedom to cooperate with the internal auditors and certified public auditors. Through this and other policies and procedures, MWA has been able to minimize, if not eradicate, corruption in the utility.

Jamshedpur offers another interesting case. As stated previously, the Jamshedpur Utilities and Services Company (JUSCO) was carved out of the Town Division of Tata Steel in 2003. The Town Division ran a fairly reliable operation for more than 90 years. It operated as a cost-center under Tata Steel and provided essential services like water supply and waste management. During these years, the Town Division maintained a decent level of customer satisfaction and provided consistent quality of water to the city.

However, the autonomy of the new corporatized entity seems to have energized service delivery and improved orientation. This was backed by JUSCO's articulation of a larger vision to emerge as a national leader in the water and sanitation business. This vision provided an incentive to not just tackle local challenges in Jamshedpur, but to work toward gradually meeting international service delivery standards.

Of course, to succeed elsewhere, JUSCO had to first improve standards within. JUSCO ensured that its civic and municipal services were managed by a team of qualified professionals and monitored by its board of directors. Thus, in just a few years, JUSCO was able to transform the Jamshedpur water system, particularly relating to nonrevenue water (NRW) reduction, consumer service, and technology adoption.

JUSCO has since ventured beyond Jamshedpur to develop new water facilities, as well as to modernize and maintain existing ones, across the country. The range of services covers operation and maintenance of the entire water cycle, from intake to treatment to conveyance and distribution. JUSCO has now evolved into a one-stop integrated utilities provider whose gamut of services includes water and wastewater, construction, municipal solid waste management, power, horticulture, and integrated facility management. Most recently, JUSCO partnered with Ranhill Malaysia to win a 25-year concession contract for providing the water supply in Haldia City, West Bengal.

The general manager of JUSCO explains a planned water system to a local government official. Photograph courtesy of JUSCO.

Private Sector Participation in the Water Sector

The positive experiences of Bangkok, Phnom Penh, and Singapore notwithstanding, public sector provision of water services frequently face inefficiencies in their delivery systems. The inefficiencies are often attributed to inadequate manpower, insufficient financial allocations, cost overruns, huge infrastructure costs, and the absence of accountability in revenue collections.

For local water agencies, a well-structured partnership with a private investor through a public–private partnership (PPP) can provide much-needed finance, limit risks, and provide them with far more certainty, while helping ensure that quality water services will be provided quickly and efficiently. On the other hand, despite all the potential benefits of PPPs, there have been many well-publicized and unnecessary failures in planning, structuring, and implementing them. For instance, many water concession contracts signed by Asian cities in the 1990s have been plagued by legal disputes and renegotiations. In addition, private sector involvement in public services is sometimes perceived by the public to have undertones of political involvement and questionable motives (Box 2).

However, many PPP failures regarding water can be attributed to weak legal, institutional, and regulatory frameworks. A transparent framework helps govern both the pre-transaction stage (e.g., selection, screening, structuring, tendering, and evaluation) and the post-transaction stage (e.g., regulation and monitoring). Understanding the risks in the

Box 2: Public Opposition to Privatization of Water Services in Bangkok

Following the 1997/98 Asian financial crisis, progress was made in privatizing the Metropolitan Waterworks Authority (MWA) in Bangkok, including studies on how to go forward with the privatization and what kind of privatization arrangement would be implemented. However, these plans suffered a serious setback in early 2004 when thousands of striking workers protested the government's privatization policy. The privatization of MWA has been stalled since then, and MWA remains a state-owned enterprise, although the private sector has played an increasingly significant role in assisting MWA to implement its projects and to deliver its services. At present, private sector participation in MWA is mainly limited to activities in which private companies are not involved in investments, such as outsourcing activities like meter reading and new service connections. Other activities include the operation of mobile plants and water loss reduction projects.

Source: M. S. Babel and A. A. Rivas. 2009. Case Study on Water Supply, Wastewater, and Storm Water Management in Bangkok. Case Study Series. Good Practices for Urban Water Management in Asia Case Study No: IWP/GPUWM/No.1/2009. Institute of Water Policy. Unpublished.

regulatory framework and concession agreement will protect both private and public parties to the agreement.

Unfortunately, Malaysia learned the hard way that privatization unaccompanied by regulatory, legal, and institutional reforms has a fragmented impact on the water industry. Previously, the only form of federal regulation was provided by the Ministry of Finance to control how grants were to be utilized by the utility company. There was no official oversight of the concessionaires in terms of their performance, revenue generated, cost ratios, tariffs, and investment. Partly as a result, privatization has had mixed results. It did not work well in sewerage services, but has thus far been fairly successful in water distribution in Kuala Lumpur (Box 3).[4]

In addition, each state in Malaysia has its own water arrangements based on the premise that water is a land-related matter and that land is entirely under the jurisdiction of state governments. This has resulted in different water arrangements and tariff structures across the country. Some states have corporatized their water utility functions, while others have adopted privatization models based on a concession operation. Among other issues, this decentralization has led to many variations in water tariffs across states.

To address these and other challenges, the government has recently enacted reforms that regulate and standardize water services across the country. In the long run, the reforms are expected to provide a more uniform tariff structure and an avenue for transparent public consultation on increases in tariff rates. The centralization of water services is also expected to create greater uniformity in water supply across states and to enable the process of transfer of raw water from one state to another, which previously was difficult to accomplish.

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[4] Sewerage services were privatized in 1994, but that exercise failed, and sewerage services are now handled by a fully owned government company, Indah Water Konsortium.

Box 3: Privatizing Water Distribution in Kuala Lumpur

Regarding water distribution, the state of Selangor in Malaysia began by corporatizing its water utility arm, and when this failed to raise efficiency and revenue, it privatized the services to Syarikat Bekalan Air Selangor (SYABAS) under a 30-year concession agreement.

When SYABAS took over distribution in 2005, it encountered high nonrevenue water and complaints about poor water quality. Since then, Kuala Lumpur has gained full, year-round water coverage. Interruptions are minimal, and SYABAS has installed a 24-hour help line for public complaints, a service that was unavailable when water was under public management. In addition, SYABAS has increased its revenue collection efficiency ratio to more than 90% within the short span of its existence. Further, it has reduced its operating ratio from the previous high of almost 2.0 when water distribution was under the government-linked corporation. It has increased debt collection as well as actions to cut off water supply if bills are not paid.

SYABAS has incorporated a regular tariff hike into its concessionaire agreement with the Government of Selangor, but getting the hikes implemented according to agreed schedule is difficult due to political sensitivities. It managed to obtain a revision in tariffs in 2006; however, it was unable to achieve this in early 2009 when the next tariff increase was due. It also received a grant of only RM250 million ($71 million) from the federal government to reduce nonrevenue water, raising doubts whether SYABAS can fund its planned pipe replacement program, which will cost at least RM2.6 million ($740 million). The gap in funding must be met from both revenue and loans in the private bond market.

Source: Kuppusamy Singaravelloo and Tan Siew Hooi. 2009. Case Study on Urban Water, Wastewater, and Storm Water Management in Kuala Lumpur. Case Study Series. Good Practices for Urban Water Management in Asia Case Study No: IWP/GPUWM/No. 4/2009.

Meanwhile, the government has realized from its past experiences that transferring the entire financial responsibility to the private sector may not necessarily be the best practice to manage the water industry. Thus, the privatization model is changing from one that demanded that the private sector bear all costs of infrastructure investments to one that favors greater emphasis on PPP to improve services and to address public complaints.

The new PPP model encourages the private sector to do what it is best at—management, operations, and maintenance—and requires the government to share the financial responsibility of infrastructure development. Public sector involvement is also important to regulate the industry and to explore new water resources, including cross-state water transfer projects. These are significant moves, especially when the country is planning to invest heavily in improving and replacing aging water infrastructure. With the legal framework and financial commitment from the government now in place, the water industry should be better able to improve service delivery, including both demand and supply aspects.

Shenzhen also offers a model for market-oriented reform in the urban water sector, in the PRC and throughout the region. The city boasts one of the best regulatory mechanisms for the water sector in the country. It set up a clear regulatory relationship between regulatory departments and enterprises that separates government interventions from business operations and government functions from asset management. This separation allows the

SZWRB to regulate the industry without interfering with the normal operations of the water business.

With a solid regulatory framework, the government successfully negotiated the first concession for municipal public utilities in the PRC. In December 2001, the former Shenzhen Drainage Management Department combined more than CNY3 billion ($362 million) in assets into the original water supply company, thus formally establishing a new water group for water supply and drainage—the Shenzhen Water Group (SZWG)—in the Shenzhen Special Economic Zone,

In 2004, the SZWG completed its transformation from a wholly state-owned enterprise to a joint venture approved by the Ministry of Commerce. The joint venture represents the largest merger in the PRC water sector, with a trading volume of $400 million. Today, the SZWG is the largest water supply enterprise in the PRC, and by the end of 2007, it had assets totaling CNY10.7 billion ($1.53 billion) and net assets of CNY7.8 billion ($1.12 billion).

The case of the Maynilad Water Services concession in Manila offers both a cautionary tale and a positive story. With the concession financed from abroad, Maynilad Water Services was hit hard by the 1997/98 Asian financial crisis, which saw the peso depreciate against the US dollar by more than 100% by the end of 1998. Absorbing such losses affected its ability to service its pre-concession debts and pursue much-needed capital expenditures. Despite a successful petition for tariff increases, the concessionaire teetered on the edge of bankruptcy. By the end of 2002, the company returned the concession back to the Metropolitan Waterworks and Sewerage System, and a rebidding process ensued.

The failure of the concession agreement can be traced to the failure of both the government and the private sector to identify foreign currency adjustment as a risk factor in the original agreement. While this has been addressed since, it offers the painful lesson that a successful concession agreement requires risk mitigation provisions. It also shows that there is significant risk in a government deciding to forego regulated adjustments for political reasons to the detriment of the private concessionaire.

The Maynilad Water Services case also shows that renegotiating infrastructure concessions can offer hope to failing PPP arrangements, as long as the regulator addresses the problem fairly and a flexible contractual framework is available for both parties to deal with the changed circumstances. The weak regulation that led to unresolved disputes and eventually the withdrawal of the concession gave way to a successful re-bid with appropriate mitigation measures. Against a minimum bid requirement of $56.7 million, the Metropolitan Waterworks and Sewerage System obtained a bid of $503.9 million.

The rebid showed that if the process is done right—that is, it features good information, competent regulators, innovative risk management strategies, flexible provisions for foreign exchange fluctuations, and a government ready and willing to uphold the principles of private sector participation—investors are ready to bet even on an ailing water utility.[5]

[5] ADB. 2008. *Maynilad on the Mend*. Manila. www.adb.org/Water/Knowledge-Center/papers/default.asp

Efficient and Effective Service Delivery

Effectively managing water resources requires an integrated and holistic service delivery approach. This includes not only water supply management (e.g., protection and expansion of water sources and distribution systems), but also demand management (e.g., water pricing and public education programs on water conservation), wastewater management, storm water management, research and development, and, where applicable, PPPs. It must also encompass an effective legal, regulatory, and institutional framework, including close and efficient interagency cooperation, as discussed previously. By concurrently focusing on all of these issues, some Asian cities have managed to achieve efficient and effective service delivery, which most urban centers of the developing world have found difficult.

Increasing Coverage and Improving Availability

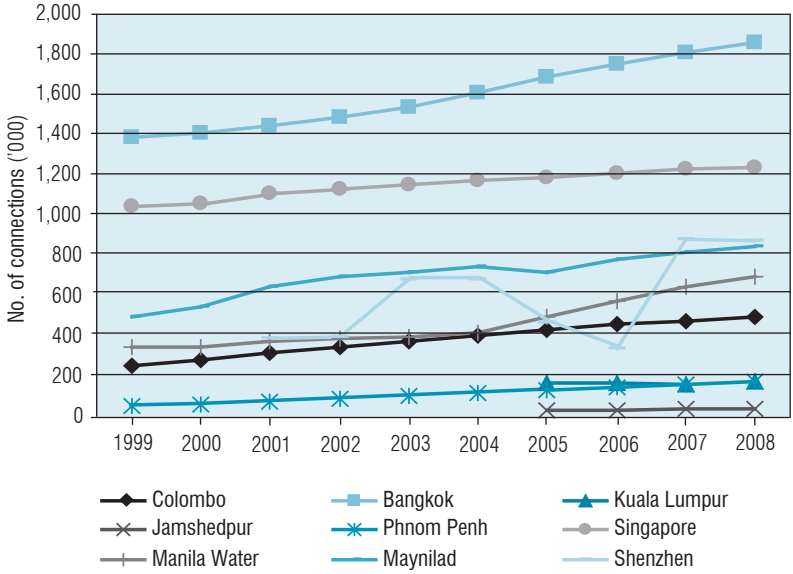
Providing a safe piped water supply to every individual is a goal that utilities continue to pursue. Indeed, a common denominator in the eight case studies is a commitment by the utilities to expand their consumer base by increasing production and expanding water distribution systems (Figure 1).

Several of the utilities achieved a high level of coverage despite high population growth in areas under their management.

- For instance, during 2001–2008, the Phnom Penh Water Supply Authority (PPWSA) expanded its services to new areas, including the suburbs of Phnom Penh, and the number of connections grew 138% during this period.
- During 1998–2008, the Manila Water Company more than doubled the number of household connections, from 305,000 to 629,000. At the same time, the number of commercial connections grew by 60%. This was accomplished as part of a growth strategy to expand into more densely populated new areas and aggressively connect households to generate more revenue.

- From 1998 to 2008, the National Water Supply and Drainage Board (NWSDB) in Colombo improved population coverage from 77% to 92%, and increased water connections by 120% even as the area under its management grew by 144 square kilometers and the population doubled from 1.6 million to 3.2 million.
- Finally, from 1998 to 2008, the service area coverage by the Metropolitan Waterworks Authority (MWA) increased from 35% to 70% of its area of responsibility comparing Bangkok, Nonthaburi and Samut Prakan. With a corresponding population coverage increasing from 6.4 million to 7.8 million, MWA increased its population coverage of its area of responsibility to 99%.

Figure 1: Continuing Growth in Connections



Notes:
1. For Singapore, data are expressed as number of customer accounts for potable and reused water.
2. For Shenzhen, data are for the entire city (i.e., all utilities), not just for the Shenzhen Water Group.
3. For Bangkok, data is for MWA's entire service area of Bangkok, Nonthaburi and Samut Prakan.

Source: The data are from the water utilities of Bangkok, Colombo, Jamshedpur, Kuala Lumpur, Manila's two water utilities, Phnom Penh, Shenzhen, and Singapore.

These examples show that expanding safe, reliable water access to 100% of the population and piped water supply access to over 90% of the service area are achievable goals.

From the cities highlighted in the case studies, there also appears to be a unanimous preference toward providing pressurized, continuous water supply as the default mode of service delivery. Several of these utilities have achieved this transformation in the last decade only, but this still shows that 24 × 7 water supply is achievable by utilities in developing countries.

Maynilad contractors at work during an interconnection activity in Sta. Mesa, Manila.
Photograph courtesy of Federico Juane, Maynilad Water Services.

Box 4: All Water Is Not the Same

Water can be of different quality, spanning a continuous spectrum that goes from ultra-pure water to potable water, to "gray water," to water that can only be used in agriculture, to water of impaired quality that is not fit for any use. Different types of water along the quality dimension are not necessarily fungible—water that is fit for agriculture may not be adequate for industrial use or human consumption and would require treatment to be used as such.

Similarly, reliability defines different types of water. Water that is available all of the time is different from water that users can rely on only 90% of the time. Water that is available year-round is different from water that users can rely on only in a single season.

Both quality and reliability differentiate water, as they distinguish between the activities that can be supported, and therefore the value that water can have. Low-quality, low-reliability water cannot be used for human consumption in a city, for example, although it may be used as supplemental irrigation in lower-value crops. High-quality, high-reliability water, on the other hand, is very valuable.

Source: 2030 Water Resources Group. 2009. *Charting Our Water Future: Economic Frameworks to Inform Decision-Making.* www.asiaing.com/charting-our-water-future-economic-frameworks-to-inform-decision-making.html

In pursuing a continuous water supply, cities in the developing world must ensure that their water systems become more efficient and effective by reducing water losses, gradually increasing water tariffs, improving revenue collection, increasing staff productivity, and securing safe and reliable water supplies. When efficiency gains are ensured, investments in new infrastructure will lead to more effective and efficient water services.

Besides being efficient and reliable, most utilities recognize the positive impacts of water quality and good health that can be provided by continuous water supply. Even in Jamshedpur, where the current water supply availability is only 7 hours, nearly 25% of the population now has continuous supplies, and there are plans to move to continuous water supply citywide in the next few years.

Reducing Nonrevenue Water

No business can survive for long if it loses a significant portion of its marketable product, but that is exactly what is happening with many water utilities. This situation is common in many Asian cities, as nonrevenue water (NRW)[6] averages 30% across Asia's cities. Often, it can reach much higher levels. NRW rates often depend on the state and age of water distribution networks and investments in rehabilitation.

High levels of water loss in distribution networks lead to low levels of efficiency. When a utility's product (treated water) is lost, water collection, treatment, and distribution costs increase, and water sales decrease. Also, since lost water yields no revenue, heavy losses also make it harder to keep water tariffs at a reasonable, affordable level. In these cases, water tariffs can, in effect, represent a subsidy borne by paying customers to cover NRW.

Therefore, before cities consider expanding their distribution networks, they should first look to reduce NRW. In turn, this will lead to greater overall efficiency and financial sustainability. With additional revenue and reduced costs, utilities will then be in a better position to consider expanding their water distribution network.

To address water losses, all eight cities in this study have focused on reducing unaccounted-for-water (UFW), which includes physical losses due to leaks, illegal connections, and incorrect measurements (Figure 2).[7] Reducing UFW can boost revenue by increasing the amount of water that can be billed, while reducing the waste of the product. This increases profitability and improves the return on investment. With a reasonable surplus, a utility can then reinvest retained earnings and improve its productivity.

While most cities are complacent about their performance if they keep their NRW levels at around 20%, the experiences of Phnom Penh and Singapore show that levels below 10% are possible (Figure 3).

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[6] NRW is the difference between the net production of water and the total amount of water that is billed.

[7] Compared to UFW, NRW also includes the portion of known legitimate consumption that does not earn revenue for the organization, including unbilled free supplies to tenement gardens and fire hydrants.

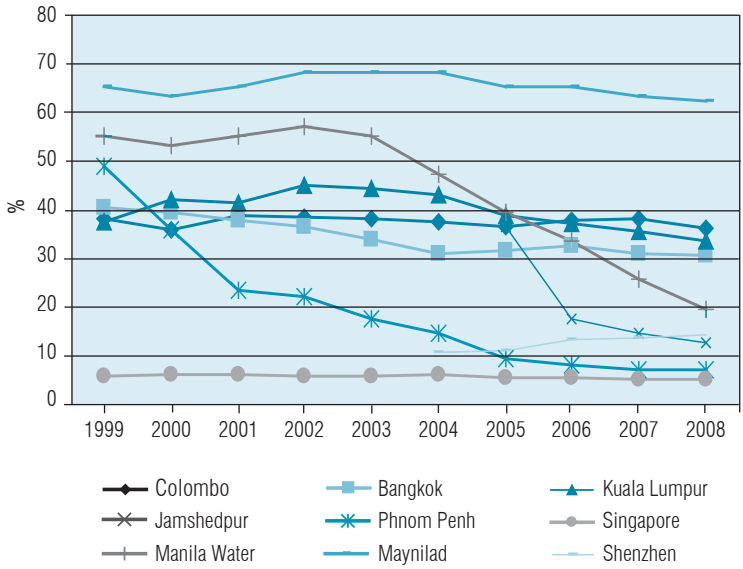
Figure 2: Unaccounted-for-Water versus Nonrevenue Water

<table>
<tr><td rowspan="4">Total Water Supply</td><td>Real losses</td><td>Physical losses due to leaks</td><td>Unbilled</td><td rowspan="2">Unaccounted-for-water</td><td rowspan="3">Nonrevenue water</td></tr>
<tr><td>Apparent losses</td><td>Illegal connections and incorrect measurements</td><td>Unbilled</td></tr>
<tr><td colspan="2">Metered and unmetered connections</td><td colspan="2">Unbilled</td></tr>
<tr><td colspan="2">Metered and unmetered connections</td><td>Billed</td><td colspan="2">Revenue water</td></tr>
</table>

Note: Unaccounted-for and nonrevenue water are usually expressed as a percentage from the net production.

Source: K. L. L. Premanath and Mahesh Harhare. 2009. Case Study on Urban Water, Wastewater, and Storm Water Management in Colombo. Case Study Series. Good Practices for Urban Water Management in Asia Case Study No: IWP/GPUWM/No. 2/2009.

Figure 3: Nonrevenue Water—Performance Across Asian Cities



Note: The figures for Phnom Penh and Singapore are unaccounted-for-water. All others are nonrevenue water.

Source: The data are from the water utilities of Bangkok, Colombo, Jamshedpur, Kuala Lumpur, Manila's two water utilities, Phnom Penh, Shenzhen, and Singapore.

Reducing NRW often involves heavy investments in technical solutions to reduce leaks, such as remetering, pipe laying, and pipe replacement. Many utilities must first determine the causes and locations of water loss before they can identify long-term measures to

Box 5: District Metering Areas

District metering areas are parts of a water distribution system generally separated from neighboring areas by means of closed sluice valves, commonly known as boundary valves. As a result, the quantity of water entering and the difference between that amount and quantity consumed can be measured to determine leaks. This narrows the area of responsibility, thereby cutting down inspection time to solve leaking pipe problems.

In Bangkok, the Metropolitan Waterworks Authority has established district metering areas covering all service areas, linked through an efficient communication network with the control rooms at all branches in both real time and daily data input modes. District metering areas are also a feature of the programs in Jamshedpur and Colombo. Colombo is divided into 12 zones, and each zone is divided into two district metering areas. In Jamshedpur, the city is divided into 74 areas. Over 124 electromagnetic meters log data at 15-minute intervals in distribution mains and 10-minute intervals in rising mains.

Sources: Metropolitan Waterworks Authority. 2009. *Annual Report 2008.* Bangkok; JUSCO. 2009. *National Urban Water Award, Technical Innovation: The JUSCO Experience.* Jamshedpur, India.

address NRW. Establishing district metering areas is also invaluable (Box 5). In cities where the distribution network is old (e.g., featuring dilapidated pipes, lack of metering, and poor maps), these technical measures can be especially challenging.

Accurate metering at the household level is also essential. Only after each connection is metered can consumers be sent an accurate bill that directly reflects the amount of water that they consumed during a specific period. This helps ensure a transparent, fair, and efficient system. Almost all utilities covered as part of the study have achieved or are moving toward universal metering. For instance, Phnom Penh moved from 12.6% metered connections in 1993 to 100% metered connections in 2001. Metered connections in Jamshedpur increased from 2% of connections in 2007 to 26% in 2009.

Relying on technical solutions, Singapore's NRW level is one of the lowest in the world. The country cut down UFW from 9.5% of total water production in 1990 to 4.4% in 2008.[8] In the city-state, the law prohibits illegal connections to the water supply system, and this is strictly enforced. Moreover, PUB reduces the number of leaks by minimizing the occurrence of leaks in the transmission and distribution network. To achieve this, the Public Utilities Board (PUB) ensures that its new water supply networks are made of good-quality materials and fittings, and for existing networks, PUB has implemented pipeline replacement programs to upgrade and renew the existing network.[9] PUB also has a comprehensive system that detects leaks, which enables it to fix leaking pipes quickly, and actively replaces meters to avoid inaccuracies arising from deterioration with age. All of these measures help reduce water wastage while also cutting operating costs.

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[8] PUB Singapore.

[9] T. K. Tay et al. 2008. Achieving Low Unaccounted-for Water through Reliable Supply to Customers and Efficient Network Management. *Water Practice and Technology*. International Water Association.

Ensuring accurate billing through replacement of aging meters in Kuala Lumpur.
Photograph courtesy of Abdul Raof Ahmad, Corporate Communications and Public Affairs Division, SYABAS.

Further, many cities that have been successful in addressing NRW have gone beyond technical measures to address community actions that drives illegal connections and pilferage. This is done with the understanding that water loss is not just an engineering problem, but also reflects a sociocultural situation that requires changes in community behavior and attitudes toward water use. As stated by Virglio Rivera, head of government and regulatory liaison at Manila Water Company:

> For many of these squatter communities, water was a life-and-death issue. And if it meant breaking your pipes, then they would do it and do it repeatedly even as we sent crews in to fix these pipes. In the end, no amount of engineering plus security would solve that problem. The solution had to be somewhere else. We saw the solution starting with our relationships with communities who were not our customers yet (at least not paying customers) but who were using the water [that] we were distributing. This made them stakeholders that we felt we had to address directly and not ignore.

The Manila Water Company concessionaire agreement developed a decentralized field operations structure based on district metering areas. The structure went all the way down to informal street leaders (*kasanggas*), who helped provide information about pipe bursts, leaks, and water outages. With the introduction of this community organization (Box 6), Manila Water Company's NRW rate dropped by over 50% at the end of the first decade of the concession agreement.

Box 6: Community Organization in Manila

In the East Concession Zone of Metro Manila, Manila Water Company is organized into 247 territories, each headed by a manager who oversees anywhere from three to five district metering areas. Each territory has from 1,500 to 5,000 connections. In addition, the district metering areas are broken up into meter reader units, with each meter reader having up to 200 connections to monitor and service. This flat organization allows Manila Water Company to operationalize management reforms quickly and to operate feedback loops from the field to the top.

The size of a district metering area is determined by water use volume. This is based on hydromodeling, an engineering concept combining efficiency and productivity. Within the organizational setup, a district metering area is a business unit. Area managers must be entrepreneurial and meet business targets, meaning that they can propose additional investment but must have a business plan to justify full cost recovery and the profitability of the new pipe investment. The principal concern of a territory and manager is both to reduce nonrevenue water and to increase billable water.

The Manila Water Company structure is designed to allow district metering areas to have a direct relationship with every customer within the area. Once an area's demographics reach a certain density or the character of the area changes, a district metering area is reorganized or a new one is formed. There is no single fixed model for a district metering area; instead, it is based principally on a reading of the social realities and hydromodeling carried out by the company.

Outside of the managers and meter readers, the most critical part of the structure is the identified *kasanggas* (street leaders) in the community. The managers have to develop anywhere from five to seven of these relationships in their areas. They help communicate problems on the ground and broadcast local plans and news to communities.

Source: Interview by authors with Rene Almendras, president, Manila Water Company. September 23, 2009 at Hotel Intercontinental, Makati City, Philippines.

In Jamshedpur, technical measures have been complemented by efforts to address illegal connections by walk-through surveys and to authorize illegal connections by legitimizing them and adding them to the network. About 1,600 disconnections have been made, and all of these consumers have been given authorized connections. As a result of these initiatives, NRW declined from 36% in fiscal year 2005 to 9.9% in 2009.[10]

In the case of Phnom Penh, many measures regarding NRW were taken almost simultaneously, requiring a strict system approach (Box 7). Through strong commitment and a comprehensive program, PPWSA was able to reduce UFW by 91% in only 15 years,[11] a level

[10] A. Madhavan and S. Sahai. 2009. *Case Study on Urban Water, Wastewater, and Storm Water Management in Jamshedpur.* Case Study Series Good Practices for Urban Water Management in Asia Case Study No. IWP/GPUWM/No. 3/2009. Institute of Water Policy. Unpublished.

[11] A. Biswas and C. Tortajada. 2009. *Water Supply of Phnom Penh: A Most Remarkable Transformation.* Case Study Series Good Practices for Urban Water Management in Asia Case Study No. IWP/GPUWM/No. 6/2009. Institute of Water Policy. Unpublished.

of improvement that no developed or developing country has managed to achieve in recent history.

Some of the measures taken by PPWSA were simple but unique. For example, if a meter reader of an area did not, or could not, find an illegal connection, but a colleague did, the colleague received a reward, and the meter reader was penalized. The public was also made aware of the problem of illegal connections. Those customers found to have illegal connections were heavily penalized, and anyone who reported an illegal connection was rewarded. Inspection teams were set up to search for and eliminate illegal connections.

Box 7: Reducing Unaccounted-for-Water in Phnom Penh

In Phnom Penh, unaccounted-for-water (UFW) was well over 70% in 1993. In response, a strict regime was implemented, which featured several interrelated components.

In 1996, the Phnom Penh Water Supply Authority (PPWSA) started to rehabilitate its network with funding support from the Asian Development Bank, the World Bank, and the governments of France and Japan. This included the construction of a new 16-kilometer water transmission line, and a maintenance and repair team was organized on a 24-hour standby basis. The public was encouraged to report all leaks, which were promptly repaired.

With a policy decision to move to a system of all metered connections as soon as possible, the number of meters installed increased steadily, and the number of unmetered connections started to decline. By 2001, all connections were metered. In addition, over time, more accurate Class C meters replaced less reliable Class B meters, which further increased the credibility and income of PPWSA.

Once the rehabilitation process was completed in 2002, PPWSA started to control and manage its UFW level. By 2008, it had successfully managed to reduce UFW to about 6.2%. This represented a phenomenal decline from 72.0% in 1993. In fact, it is currently assumed that if cities can keep their UFW levels at around 20.0%, they are considered to be performing quite well. The UFW levels of PPWSA are already at one–third of this good practice level.

Source: Biswas and Tortajada 2009.

As a result of these and other actions, the number of illegal connections discovered dropped from an average of one per day to less than five per year by 2002. At present, it is highly unusual to find even one illegal connection.

Unfortunately, in many cities, NRW still hovers over 30%. This is the case in Bangkok, Colombo, Kuala Lumpur, and the Western Concession Zone of Manila that is overseen by Maynilad Water Services. In all of these cities, the slow progress is partly due to dilapidated legacy networks.[12] From an engineering point of view, building new infrastructure can actu-

[12] SYABAS in Kuala Lumpur has been also able to reduce NRW from a high of 45% in 2002 to 33% in 2008, against a backdrop of old pipelines across a network area of almost 8,200 square kilometers (including 242.2 square kilometers for Kuala Lumpur). To meet its goal to reduce NRW to 15% by 2015, SYABAS has to implement a RM2.6 billion-pipe replacement program that, unfortunately, is now on hold pending the finalization of restructuring of the water industry in Selangor.

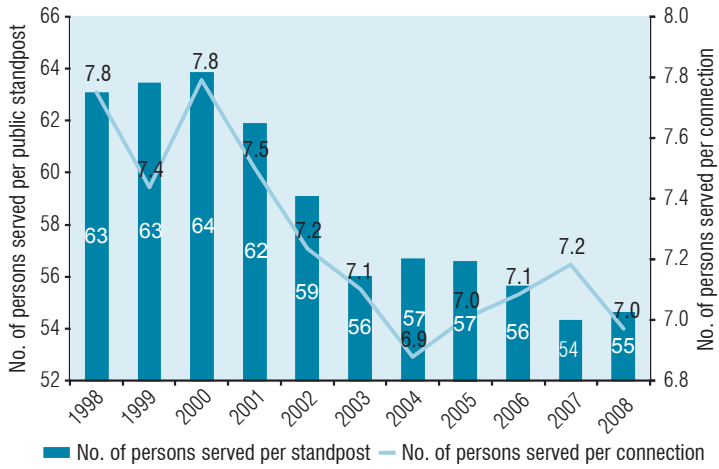
ally be easier and less costly than replacing old infrastructure. Both involve digging, but laying new pipes is cheaper and more controllable than trying to locate and replace old pipes. Time and money are lost with each delay in locating buried pipes.[13]

With enough time and investment in replacing old and dilapidated pipe networks with new pipes of larger sizes, as well as to allow for the hydraulic isolation of networks, NRW levels should eventually decline to under 20% in these cities. However, it should also be noted that, once a city is able to reduce its NRW, efforts must still be made to maintain this level. As networks age and maintenance complexities and expenditures increase, maintaining low levels can be as challenging as the initial reduction.

Colombo, for instance, has a very old distribution network with dilapidated pipes. The interconnected network with more than one supply point was a major constraint in hydraulically isolating the network. Due to this situation, NWSDB has been unable to plan district metering areas to implement the leak and loss reduction program.

To tackle this problem, NWSDB has started focusing on NRW reduction programs with measures like replacement of public standposts with household connections in densely populated, low-income group areas (Figure 4). Also, other measures were taken, such as the replacement of old and dilapidated pipe networks with new pipes of larger sizes to meet future demand and to ensure hydraulic isolation of networks for the formation of district metering areas.

Figure 4: Population Served Per Public Standpost in Colombo, 1998–2008



Source: National Water Supply and Drainage Board.

[13] Interview by authors with Fiorello Estuar, former president, Maynilad Water Services. September 16, 2009 at Benpres Building, Pasig City, Philippines.

Box 8: Challenges in Finding New Water Sources

- Pollution of water sources
- High cost of treatment
- Competing water demands and rights
- Environmental and social impact
- Impact of climate change
- Saline intrusion
- Nonrevenue water reduction
- Desalination option for the future

Source: ADB.

Securing Clean, Safe, and Reliable Water Supplies

In many places throughout Asia, the best and cheapest sources of water are already over-extracted due to population pressures, intensive irrigation, and erratic weather patterns brought on by global warming. Rivers have been diverted, lakes have been tapped, and aquifers have been depleted. As a result, water is increasingly emerging as a scarce commodity.

Compounding the problem of water quantity is one of quality. Water quality in many places in the region is deteriorating due to industrial discharge, municipal sewage, and overload of fertilizers and agrochemicals. Poor water quality reduces the usable quantity of water even further, so addressing water quality must be a key strategy in addressing water supply. In addition, most water projects are designed without considering energy efficiency and their impact on climate change. Because of this, it is likely that these projects, despite being financially viable, are wasting energy and money, emitting carbon dioxide, and adding to the country's carbon footprint.

To meet growing demands for water in urban centers, greater focus should be given to reusing wastewater, recycling, and managing surface water, along with maximizing potential energy efficiency-related benefits (Box 9).

The water situation in Bangkok is indicative of problems in other Asian cities. In the recent past, the Metropolitan Waterworks Authority (MWA) relied heavily on groundwater to supplement surface water sources. This led to a number of negative impacts, such as groundwater depletion, land subsidence, water quality deterioration, and saline water intrusion in aquifers.

In response to these problems, MWA curtailed its use of groundwater starting in 2005. Despite the fact that providing tap water from surface water tends to be more costly than providing it from groundwater, it did so without substantial effects on its operations and finances. This was achieved by gradually increasing the capacity of water treatment plants using river water, along with a gradual reduction in groundwater withdrawal.

Box 9: Water Systems and Energy Use

Energy is used to move water from a bulk reservoir—usually a river, lake, or similar bodies of water or underground sources—through treatment processes and transmission and distribution pipes to end-users. Energy is also used to convey wastewater generated at the customer end to wastewater treatment plants to clean it prior to discharge back to the river systems.

Potential measures to improve energy efficiency in water systems include installing or replacing pumps and motors, reducing nonrevenue water, and lessening water use through demand-side management. Site- and technology-specific energy efficiency improvement opportunities can also be considered.

Potential benefits include water and energy savings, reduced carbon dioxide emissions, and possible Clean Development Mechanism credits. Together, these benefits can reduce operating costs and capital cost financing, thus improving projects' viability and minimizing—or in some cases, avoiding—water tariff rate increases.

Source: ADB.

The Big Walk through Singapore's first reservoir in the city.
Photograph courtesy of the Public Utilities Board.

At present, groundwater levels have recovered in many areas (although not up to the levels in late 1980s), resulting in a reduction in the rate of land subsidence. Nevertheless, MWA is still relying too heavily on a supply-oriented approach, and a stronger emphasis on demand management practices is required.

Of the eight cities in this study, Singapore has gone furthest in diversifying its supply of water. Before 2003, the city-state relied on rainwater collected in local catchments and water imported from its immediate neighbor, Malaysia, to fulfill its water needs. Today, the Public Utilities Board (PUB) has diversified the country's water sources through a strategy known as Four National Taps, which comprises water from local catchments, imported water, reclaimed water, and desalinated water. This has been achieved with effective use of new technologies bolstered by research and development, especially related to membrane technologies.

Perhaps most notably, Singapore began to produce reclaimed water, branded as NEWater, on a large scale in 2003. The lower cost, together with the purity of NEWater, has attracted a steady increase in the take-up rate of NEWater among industrial and commercial customers, since its introduction in 2003. In 2008, the sale of NEWater reached 180,000 cubic meters per day.[14] The success of NEWater shows that high-quality reclaimed

Watershed management through reforestation is among many programs exemplifying the Manila Water Company's commitment to environmental sustainability and climate change mitigation in every level of the water supply chain.
Photograph courtesy of Dexter M. Quibuyen, Manila Water Company.

[14] PUB Singapore. 2009. *Financial Report 2008/2009*. pp. 8–9.

water can be produced economically for human consumption and nondomestic use. Despite this progress, the main challenges to reuse schemes are public perception issues and the high energy requirements associated with water reuse. Experiences from Singapore show that effective policies to manage reuse systems must be in place before developments are constructed to ensure that policy recommendations are implemented.

Further, PUB's water network is designed in loops with alternative feeds to its customers. This ensures that should one feed source become unavailable, another source can be fed into the same network to meet customer demand. The loop system, together with water storage tanks at the customers' end, help to ensure reliability of PUB's water supply network (footnote 9).

The Manila Water Company has set up a watershed management program to improve the quality of raw water within watershed areas, and also to use the same watersheds as carbon sinks. The company's Adopt-a-Watershed Program at the Ipo and La Mesa watersheds are carried out with various stakeholders.

Improving Service to the Poor

Ensuring that water connections reach low-income communities is a social obligation. The poor suffer more than the rich when public utilities are unable to fund expansion programs, as their coping costs relative to income are substantially higher. However, serving the poor also makes good business sense in that it helps protect the network. A water connection is a sign of ownership. With ownership comes a vested interest, or stake, in the network, which should translate indirectly into protecting the distribution system.

By finding a way to help low-income communities pay for the high entry cost of household metering, installation, and piping, the problem of pilferage can be controlled and the network protected. At the same time, utilities can help the poor reduce their water expenditures, because many low-income communities are forced to pay private vendors for water, at prices much higher than utility tariff rates.

Programs for the poor often require a utility to understand the unique circumstances of low-income communities and then design a flexible program for them. Most, if not all, programs involve some kind of subsidy. However, since installation is a one-time cost, no recurring subsidy should be necessary. The key is to ensure that the subsidy for connection is productive and creates value (e.g., creates a direct connection that can provide continuing access to potable water).

Finally, addressing the needs of urban poor need not necessarily conflict with a utility's financial sustainability. There are innovative mechanisms to address both these goals. A number of studies have pointed to the fact that the poor are more willing to pay for better services than political leaders are willing to charge.

An example of a flexible and innovative approach is offered by Phnom Penh. In 2001, the Phnom Penh Water Supply Authority (PPWSA) discovered that poor families found it financially difficult to pay connection fees in 10 monthly installments, one of the requirements

Over 300 public service institutions largely patronized by urban poor communities like public schools, hospitals, orphanages, and city jails have benefited from Manila Water Company's program on the rehabilitation of water reticulation systems and installation of wash facilities and drinking fountains.
Photograph courtesy of the Manila Water Company.

of the PPWSA water program for poor households. In response, PPWSA offered a more affordable program. After an evaluation carried out by a PPWSA committee, with direct help from the local communities, poor households are entitled to receive subsidies of 30%, 50%, 70%, or 100% of the connection fee, depending on their need level. In addition, those households that consume a maximum of 7 cubic meters of water per month have to pay only 60% of the real cost of providing water. This new program, funded in part through grants from the World Bank's International Development Association and the City of Paris, have helped poor households save KR130,000 ($33)–KR380,000 ($97) each year.

As a result of these improvements in pro-poor policies, the number of poor households that were connected to the system increased steadily each year. At the same time, the water expenditure of the poor declined by nearly 80% compared to what they were previously paying to private water vendors.

Although PPWSA now supplies water to poor households directly, other utilities have opted to use community representatives to supply water to low-income communities. In Bangkok, for instance, regulations state that in order for the urban poor to be served with piped water, at least 30 households must associate and apply for a connection represented by five individuals. MWA provides financial support from its own funds, amounting to

Box 10: Output-Based Aid

Output-based aid is a method for supporting the delivery of basic services—water, sanitation, electricity, telecommunications, transport, health, and education—where policy concerns would justify explicit performance-based subsidies to complement or replace user fees. The key to the success of the output-based aid approach is the contracting of service delivery to a third party, where payment of public funding is tied to the actual delivery of services.

In 2008, the Manila Water Company entered into an agreement with the World Bank's Global Partnership on Output-Based Aid (GPOBA) to provide subsidized connection rates combined with a 3-year installment payment plan for the balance of connection fees. GPOBA supported the Manila Water Company through subsidies to pay for actual water connection and by providing funds for subsidies, project design, and related dissemination.

From household surveys undertaken by the Manila Water Company, it was established that poor households could not afford to pay the full cost of new connections. However, the feedback was that these households could afford the meter and guarantee deposits amounting to P1,620 ($36) if this could be paid in installments over 36 months. The GPOBA subsidy was thus set at P5,911.73 ($131 at 2007 prices) and paid directly to the Manila Water Company as a single payment after it has been independently verified that water service has been delivered to the household satisfactorily over a 3-month period.

The target number of households to be served by the GPOBA program was 21,000, or 105,000 beneficiaries. Twelve months after setting up the program, the project had implemented 10,642 connections serving a population of over 53,000 individuals (50.7% of target).

Sources:

1. S. Tremolet and J. Halpern. 2006. Regulation of Water and Sanitation Services: Getting Better Service to Poor People. *Output-Based Aid Working Paper Series No. 8.* June. Washington, DC: World Bank.
2. I. Menzies and M. Suardi. 2009. Output-Based Aid in the Philippines: Improved Access to Water Services for Poor Households in Metro Manila. *Output-Based Aid Approaches, Note No. 28.* July. Washington, DC: World Bank.
3. Manila Water Company. 2009. *Annual Report 2008.* Quezon City.

B15,000 ($461), to cover new connection fees (including pipe materials and meters), with the balance being borne by the consumers and/or petitioners, who also have to pay a deposit for the meter size, i.e., B400 ($12) per house.

Another good example is offered by the Manila Water Company, which introduced two business models, output-based aid subsidies for water connection (Box 10) and interest-free amortization, to pay for installation costs over an extended period of time. The latter was introduced by an ADB-funded small piped water network demonstration project[15] and expanded through the *Tubig Para sa Barangay* (water for the village) Program, which reached 1.5 million beneficiaries, or about 300,000 households, from 1998 to 2008.[16]

Singapore does not artificially lower the price of water to subsidize lower-income households. Instead, the government provides direct and targeted financial assistance, in the form of Utilities Save (U-Save) rebates, to those living in public housing, as these tend to be low-income and middle-income households.

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[15] ADB. 2005. Technical Assistance for Implementing Pilot Projects for Small Piped Water Networks. Manila.

[16] Manila Water Company. 2009. *Annual Report 2008.* Quezon City.

The rebate is credited to the household's utilities account with the bill collector, Singapore Power Services. The household can use the amount to pay for its monthly utility bills, which include electricity, gas, and water. If the rebate is not used completely within 1 month, the household can still use it in subsequent months, giving it an incentive to conserve water and energy. The amount of rebate that a household receives depends on the type of public housing that it resides in, with households living in smaller apartments receiving larger rebates, as these households tend to be the poorest. The government also gives additional rebates during economic downturns; in 2009, S$125 million ($94 million) of U-Save rebates were given to households.[17]

Moreover, low-income households receive help from PUB in other ways. For instance, PUB set aside S$600,000 ($451,519) to implement a nationwide program from April 2009 to install water-saving devices in needy households with above-average water consumption to help these families reduce their water consumption and water bills.[18]

As another example, in Jamshedpur, the Jamshedpur Utilities and Services Company (JUSCO) initiated a unique shared cost model to expand coverage and to address the needs of unserved customers and low-income households. At its own cost, JUSCO undertook the back-end investment, covering the enhancement of treatment and pumping capacity and the conveying facility to the nearest water tower at the target site. Low-income consumers bear the investment in local networks on the basis of actual cost, which is converted to a connection charge per consumer by dividing the total actual cost among the total number of consumers. Consumers thus pay for an initial water connection and subsequently on the basis of metered water use.

The partnership is built through several engagement processes between the company and community stakeholders. Following citizen buy-in, a memorandum of understanding is signed with representatives of the areas.

This initiative has provided close to 13,000 water connections since 2005–2009 (Figure 5), covering a population of 90,000 people across slum pockets of the city that have been deprived of such service for more than 50 years.[19] Further, a metered tariff regime has enabled demand management and water conservation. The success of this venture has also encouraged JUSCO to replicate this model across other low-income parts of the city.

Demand-Side Management

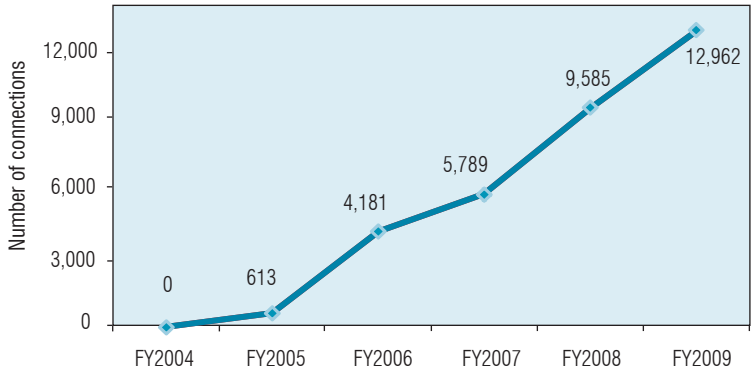
The water business is only as good as the quality and quantity of the resource. Yet, many utilities tend to focus primarily, or even solely, on the supply side. In Kuala Lumpur, for

[17] Government of Singapore, Ministry of Finance. 2009. More than 780,000 HDB Households to Receive $60 Million of Utility Rebates in July 2009. Press release. 29 June.

[18] Public Utilities Board. 2008. PUB Boosts Measures to Help Needy Families and Nondomestic Sector. Press release. 26 November.

[19] Jamshedpur Utilities and Services Company. 2009. National Urban Water Award, Private Public Partnerships: The Jamshedpur Perspective.

Figure 5: Growth in "Unserved" Connections in Jamshedpur through Public–Private Partnership



Source: Jamshedpur Utilities and Services Company.

instance, the government has mainly taken a traditional supply-driven approach. When water shortages are expected, new sources are found and developed. At the time of the 1998 water crisis, water conservation campaigns were launched, but since then, in the absence of any major drought, efforts have been minimal. Although reforms in the water industry are now in place, they do not do enough to encourage water conservation, especially through changing consumer behavior. Furthermore, political leaders and state governments are generally reluctant to adjust water tariffs upwards.

Given the problems in many areas related to groundwater depletion, water shortages, and growing concerns about the impacts of climate change, utilities are being forced to pay more attention to demand management. In the process, they are finding other ways to protect the long-term status of their operations and networks. Common measures include enacting progressive tariff rates, undertaking public awareness campaigns, and promoting water conservation through technical measures.

However, in many cities, such measures do not go far enough, and per capita water consumption remains high. Demand-side management is constrained by the fact that utilities need to keep their revenues high while also providing water at partly subsidized rates. This is because utilities' performance is evaluated based on profit, which is in turn dependent on revenue and water consumption by users. However, demand-side management may still be vigorously pursued without compromising financial performance through further increasing revenue and reducing costs.

Of the eight cities in this study, Singapore has gone the most to implement demand-side management. Recognizing the importance of managing water demand in the country's drive toward achieving water sustainability, PUB established a water conservation unit in

Installing water-saving devices in residents' homes in Singapore.
Photograph courtesy of the Public Utilities Board.

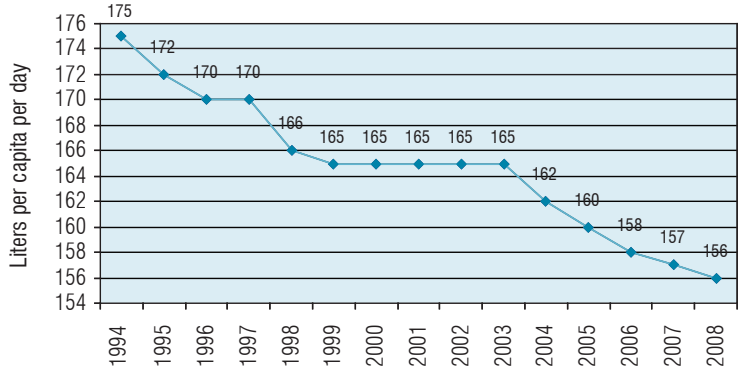
1981. The unit is responsible for managing water demand, as well as promoting water conservation to domestic and nondomestic customers.

PUB uses water pricing, mandatory requirements, and public education to manage water demand. Regarding water pricing, the government's policy is to price water to recover the full costs of producing and supplying it, as well as to reflect the scarcity of water in Singapore and the higher incremental cost of additional supplies (e.g., desalinated water, which is more expensive than local catchment water as desalination is energy-intensive). On top of the tariff, the government levies a water conservation tax, which was first introduced in 1991 to encourage water conservation.[20]

The water tariff goes to PUB, while the water conservation tax is channeled into a government-consolidated fund managed by the Ministry of Finance, which can then be used to fund national projects. As the water tariffs reflect the true cost of water production, supply, and treatment, revenue can be used for research and development to identify innovative and more efficient ways of treating and distributing water, and to construct new water supply sources to meet future demand.

[20] Government of Singapore. 1997. Press statement. 10 June.

Figure 6: Decline in Per Capita Domestic Water Consumption in Singapore, 1994–2008



Source: Public Utilities Board.

Besides using pricing to manage water demand, PUB has also imposed mandatory requirements to achieve the objective of water conservation. For instance, PUB limits the maximum allowable flow rates at water fittings, and this extends to all domestic premises. Over the years, PUB has implemented various public education and other water conservation programs. The first nationwide campaign, with the tagline, "water is precious," was launched in 1971, and several campaigns targeted at different water users continue today.

All of these efforts have yielded positive results. Per capita domestic water consumption declined steadily from its highest historical level of 175 liters per day registered in 1994, to 156 liters per day in 2008 (Figure 6). In 2008, each person in Singapore used 19 liters (or 11%) less water a day than in 1994.[21]

Singapore aims to further reduce per capita domestic water consumption to 155 liters per day by 2012,[22] 147 liters per day by 2020, and 140 liters per day by 2030.[23] To achieve these goals, the city-state will step up public education on water conservation. This is consistent with the commitment of its Ministry of the Environment and Water Resources to ensure that Singapore uses its energy, water, and other resources efficiently.

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[21] C. K. Tan. 2009. *Case Study on Urban Water, Wastewater, and Storm Water Management.* Case Study Series Good Practices for Urban Water Management in Asia Case Study No. IWP/GPUWM/No. 8/2009. Institute of Water Policy. Unpublished.

[22] Public Utilities Board. 2008. *Annual Report 2007/2008.* Singapore. p. 44.

[23] Government of Singapore, Inter-Ministerial Committee on Sustainable Development. 2009. A *Lively and Liveable Singapore: Strategies for Sustainable Growth.* Singapore. p. 35.

Box 11: Benefits of Wastewater Treatment

- A $1 investment could yield a return of $3–$34
- Increases productivity and income levels
- Attracts more investments and tourists
- Improves living conditions, and provides more amenities
- Results in cleaner environment
- Results in higher land values
- Lowers clean-up costs

Source: ADB.

Providing Adequate Wastewater and Sewerage Systems

In most cities in developing Asia, sewerage and wastewater treatment is substandard. Sewerage systems, if they are even available, commonly suffer from poor maintenance, which leads to overflows of raw sewage. Wastewater treatment capacity is also woefully inadequate, as many cities have neither enough water to flush out city effluents nor enough money to set up sewage treatment plants. As a result, millions of liters of wastewater pour into local rivers and streams each day. The impacts on human health are significant.

In many cities, an immediate priority should be to increase the sewerage network coverage from the existing low levels. While doing this, integrated planning should be undertaken to coordinate water supply and sewerage projects. Experience has shown that returns on investments in water and sanitation and sewerage together are three times higher than investments in either one sector alone.[24]

Lacking proper coordination, some investments in wastewater and sewage systems can become wasteful and redundant. For instance, the disposal of contaminated wastewater in densely populated areas is both expensive and technically challenging, while the prospects for charging for this service are limited. Thus, if water services are introduced in an area without a proper drainage and sewerage system, there will be no way to take away the volumes of dirtied water.

For wealthier communities, it may be possible to leapfrog lower-cost options by connecting toilets to a sewerage or a combined sewer–drainage system with wastewater treatment facilities. In those cases, user fees for capital, plus operation and maintenance costs, must be built into the project cost and approval process so that the wealthy pay for services that cannot be provided universally otherwise.

In addition, it is important to consider the new business opportunities in sewerage, sanitation, and wastewater treatment, particularly in wastewater byproducts. The investment

[24] United Nations Economic and Social Commission for Asia and the Pacific. 2009.

A tunnel of the Deep Tunnel Sewerage System: The system was conceived as a long-term solution to meet Singapore's needs for used water collection, treatment, and disposal through the 21st century. Photograph courtesy of the Public Utilities Board.

in sewerage, sanitation, and wastewater treatment is capital-intensive. However, there are byproducts that can generate new cash flow, including bio-solids, methane gas for electrification, and recycled water. While these may not match operating costs for water treatment, they can generate additional cash flow that can help achieve profitability and contribute to a healthy income stream for the utility.

In Singapore, wastewater management is an integral part of the country's water policy as it completes the water cycle. Used water is collected through a network of underground sewers that leads to sewage treatment plants, known in Singapore as water reclamation plants (WRPs) to reflect that used water is a resource to be reclaimed. All used water is collected and secondary-treated. There were five WRPs in 2009. Used water is first treated to international discharge standards at the WRPs. Much of the secondary-treated used water is then piped to the NEWater plants as feedwater for the production of NEWater. Treated effluent that is not used to produce NEWater to meet demand is discharged into the sea.[25]

Although 100% of Singapore was already served by a modern sanitation system since 1997, the country continued to evaluate the efficiency and cost effectiveness of its

[25] Tan, Y. S., T. J. Lee, and K. Tan. 2009. *Clean, Green and Blue: Singapore's Journey Towards Environmental and Water Sustainability*. Singapore. p. 158.

wastewater infrastructure. A deep tunnel sewerage system (DTSS) was conceived as a long-term solution to meet Singapore's needs for used water collection, treatment, and disposal. The plan is to centralize used water treatment at two large WRPs using the DTSS. Two large, deep tunnels criss-crossing the island would connect the two WRPs.[26] The other WRPs will then be progressively phased out. This will allow the land that sites these WRPs and pumping stations to be freed up for other developments in Singapore, where land is scarce. The centralization of used water treatment at two WRPs will also allow for greater economies of scale and is more cost-effective in the long run.

In Jamshedpur, JUSCO maintains what it calls "river-to-river" management, which starts with the treatment of raw water and continues through to the treatment of effluents and wastewater, both of which meet international effluent quality standards.[27] JUSCO takes pride in being among the few utilities in India to assure and meet a "drink directly from the tap" level of potable water quality in its network.

It is also among the few cities in India to have a fairly comprehensive sewerage network, with about 20 million liters per day of treated effluent being recycled for industrial reuse. With the river-to-river philosophy, sewerage network coverage improved from 57% to 68% of the population during 2005–2009 for both Tata-leased and peripheral areas.[28] JUSCO is also one of the few utilities to charge for sewerage services. Furthermore, an extensive storm water drain network facilitates water harvesting, groundwater recharging, and draining off of excess water into the river stream.

Use of modern technology, such as cleaning machines, is necessary to maintain the network and to keep street drains clean. The use of this technology has resulted in a declining trend in the number of sludge blockages over a period of time. Moreover, efforts are made to provide prompt resolutions to customer complaints as witnessed by the reduction in the number of sludge blockages in 1 year.

In Malaysia, Indah Water Konsortium (IWK) has been acclaimed as one of the most effective sewerage management companies in the developing world.[29] A fully owned government company, it operates and maintains sewage treatment plants nationwide, in areas that were formerly under local government control (and after a privatization exercise failed).[30] Previously, the sewerage system in the country was deplorable. Many local authorities

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[26] Tan, Lee, and Tan. 2009. p. 188.

[27] A portion of the treated recycled water is reused within the industrial units in Jamshedpur, and the balance is released into the river. A portion of the solid sludge is sold as fertilizer to serve the adjoining rural and agricultural areas.

[28] A. Madhavan and S. Sahai. 2009. *Case Study on Urban Water, Wastewater, and Storm Water Management in Jamshedpur*. Case Study Series Good Practices for Urban Water Management in Asia Case Study No. IWP/GPUWM/No. 3/2009. Institute of Water Policy. Unpublished.

[29] ADB. 2006. *Country Water Action: Malaysia—Water Treatment Success Overshadows Solid Waste Management*. Manila. www.adb.org/water/actions/mal/water-treatment.asp

[30] Privatization efforts failed because many people refused to pay fees to IWK. They believed that they did not need sewerage services. There was also no legislative framework for IWK to impose and collect charges. As a result, the federal government had to cancel the privatization scheme and take over the company.

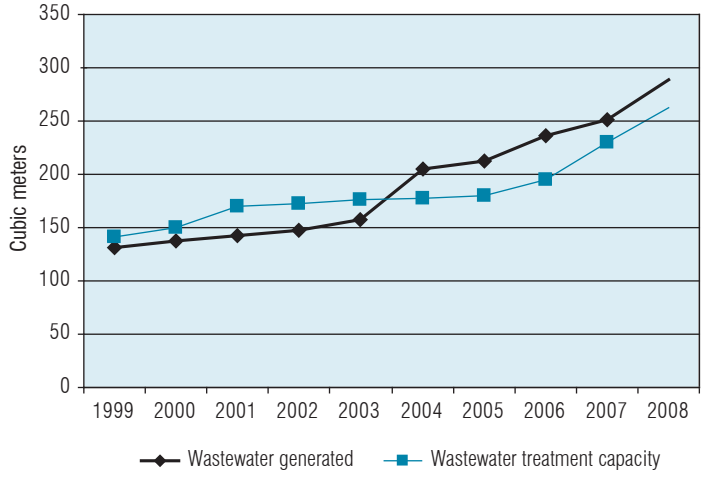
performing this function did not have the manpower and financial resources to carry out their role effectively. Some had borrowed from the federal government to upgrade and improve their sewerage systems but faced difficulty in repaying the loans.

In Kuala Lumpur, IWK has eight regional plants, 227 multipoint plants, and 57,232 individual septic tanks. IWK plants in Kuala Lumpur, which come in the form of oxidation ponds, aerated lagoons, and mechanized activated sludge plants, are now operating at full capacity. IWK provides 90.0% of sewerage services in Kuala Lumpur (up from 73.5% in 1998), with the difference of 10.0% attributed to independent private treatment plants and individual septic tanks that have yet to be linked to the IWK centralized sewerage system. In 2008, the wastewater treatment capacity of IWK was estimated at 91% of the total wastewater generated in Kuala Lumpur, indicating that existing capacity still needs to be increased to match the volume of wastewater generated in the city (Figure 7).

Under a renewed mandate and with access to federal funds, IWK continues to upgrade and improve its treatment and sewerage services and to develop new treatment plants, with four new plants initiated in 2006 for Kuala Lumpur. However, recovery of costs from fees charged to consumers is still a major impediment.

Moving forward, IWK must expand the public sewer network and replace aging sewer pipes, requiring heavy capital investment. Eventually, IWK wants to concentrate all sewerage services in Kuala Lumpur into a centralized system to improve wastewater management and to address river pollution, while increasing operational efficiency and reducing operational costs. To do this, it needs a legislative and regulatory framework to operate effectively.

Figure 7: Wastewater Treatment in Kuala Lumpur, Capacity versus Generation



Source: India Water Konsortium, Central Planning Unit, 2008.

Monitoring and Reporting

To ensure transparency, accountability, and efficiency, utilities must develop, monitor, and report on a host of data. To accomplish this, robust indicators are needed that can monitor and assess trends spanning water pressure, NRW, and water meters to financial performance and customer satisfaction. The development and application of such indicators can be used for setting priorities in water policy interventions and for strengthening the responsiveness of institutions and processes.

Responsive and transparent management must also include reporting performance to the public. At a minimum, utilities should publish an annual report that contains highlights of operations in the fiscal year, service performance, policies and work plans for the future, financial statements, and data and statistics.

In Bangkok and its suburbs, MWA conducts real-time monitoring of water quality at 20 locations. Water quality analyses are continuously made at every stage, starting at the raw water sources until the final stage at the customer's premises. MWA strictly follows World Health Organization standards, both on the number of samples required and the concentration limit for water quality parameters.[31] Results of the analysis in treatment plants and the distribution system are publicly available on the MWA website (www.mwa.co.th).

MWA also started conducting annual customer surveys in 2005.[32] From 2008, the annual survey of customer satisfaction has been included as part of the MWA management strategy plan. The surveys allow MWA to better understand what it is doing well (e.g., new connection and payment services, pipe repairs, and maintenance) and what areas need improvement.

For instance, the survey revealed that only a very small percentage—less than 5%—of MWA consumers drink water directly from the tap, indicating to MWA that more attention needs to be given to water quality (particularly taste and smell) and drinking tap water campaigns. To address this problem, MWA now conducts programs to inspect the quality of water at the taps of institutional establishments and houses, and assists them in implementing appropriate corrective measures to maintain the quality of water.

MWA has also established standards for its services, and these standards appear to be satisfactorily enforced. Almost all of the complaints registered in 2006 and 2007 (facilitated through a 24-hour call center) were resolved within the duration set by MWA's standards (i.e., an average of 99.8% for 2 years). In addition, the quality of water treatment and monitoring measures of MWA are notable, as reflected in the certifications it received. Two of the four MWA water treatment plants are International Organization for Standardization (ISO)

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[31] Results of the analysis over recent years show that values surpassed World Health Organization standards.

[32] Surveys in 2005 and 2006 were conducted by MWA, whereas surveys in 2007 and 2008 were conducted by consultants following the suggestion by the MWA board that surveys should be conducted by independent entities or consultants.

JUSCO's managing director personally meeting individual customers.
Photograph courtesy of Amal Kumar Chakravorty, JUSCO.

certified, its laboratories received ISO/IEC 17025[33] certification in 2004, and several of its branch offices received ISO 9002 certification[34] in 2001.

Another indication of MWA's commitment to transparency is the preparation and publication of its annual reports, which provide information on highlights of operations in the fiscal year, service performance, policies and work plans for the future, financial statements, and data and statistics.

In Jamshedpur, JUSCO undertakes several unique measures to monitor its performance. It does so primarily through three initiatives as described below. Collectively, these initiatives have enabled JUSCO to monitor complaints and to identify the operational inefficiencies in many of its service departments.

(i) Tracking customer satisfaction through a customer satisfaction survey. International market research company ACNielsen ORG-MARG conducts an

[33] International Organization for Standardization/International Electrotechnical Commission 17025 is the main standard by testing and calibration laboratories.

[34] International Organization for Standardization 9002 falls within the family of standards for quality management systems of ISO 9000. ISO 9002 is the model for quality assurance in production, installation, and servicing but does not include the creation of new products.

independent annual survey at Jamshedpur to capture the satisfaction level of JUSCO customers. The responses are then benchmarked against other well-managed utilities to calculate a customer satisfaction score. The overall score for Jamshedpur has improved consistently since 2004. The survey results also analyze the customer satisfaction score separately for different services provided by JUSCO, such as piped water supply, wastewater, power supply, street lighting, and road maintenance.

(ii) Providing service delivery standards and service level guarantees. JUSCO has well-defined service delivery standards for various aspects of its performance, which are defined in terms of the parameters (Table 3). JUSCO's customer management and complaint redress system define explicit service delivery standards that are time-bound, relevant, accurate, measurable, and specific. Furthermore, JUSCO has service-level guarantees against a range of service requirements. A survey is conducted to find the service level expectation against each of the services. Based on the findings and service delivery capabilities, service-level guarantees are determined on an annual basis. Even though many guarantees have become more stringent, compliance with them has increased from 77% to 99% between 2005 and 2009. During the same period, repeat complaints (as a percentage of the total) dropped from 3.2% to negligible levels.[35]

(iii) Tracking and resolving customer complaints through the JUSCO *sahyog kendra*. The JUSCO *sahyog kendra* (assistance center) goes beyond being a simple complaints center. It acts as an interface between the customer and service provider and aids in the creation of a centralized database that stores information about service levels, so any service shortfall can be isolated and then improved. It enables effective follow up of customer complaints, along with constant tracking of feedback so that continuous improvements can bring about a reduction in the time it takes to redress complaints.

In addition to the above three measures, JUSCO also undertakes monthly internal benchmarking of operational performance through a balance scorecard framework. This helps JUSCO monitor its performance of five key aspects: finances, service delivery, internal business processes, learning and growth, and community concerns. Each aspect is defined through an objective that is to be achieved on a yearly basis as part of a business operating unit, with specific indicators or strategic measures to be monitored. Each indicator or benchmark is monitored against the previous year's data and also against target levels that are set by JUSCO on a yearly basis.

[35] A. Madhavan and S. Sahai. 2009. *Case Study on Urban Water, Wastewater, and Storm Water Management in Jamshedpur.* Case Study Series Good Practices for Urban Water Management in Asia Case Study No. IWP/GPUWM/No. 3/2009. Institute of Water Policy. Unpublished.

Table 3: JUSCO's Standards for Service Delivery

Indicator	Definition
Service-level guarantee (SLG)	Expected compliance time by a service department
Service-level performance (SLP)	Actual performance against SLG: SLP = No. of complaints within SLG / Total complaints with defined SLG
Service-level expectation (SLE)	Average time customer can tolerate before complaints get addressed
Actual turnaround time (ATAT)	Time taken by JUSCO to resolve a complaint
Capability gap (CG)	Inability of JUSCO to promise service level matching customer expectation CG = SLG – SLE
Service gap (SG)	Gap between ATAT and SLG, compliance beyond time SG = ATAT – SLG
Quality gap (QG)	Sum of capability gap and service gap QG = ATAT – SLE

Source: Water and Sanitation Program. 2006. JUSCO: Improving WSS Services through Private Sector Partnerships.

Children enjoying clean water from sprinklers at the Marina Barrage.
Photograph courtesy of the Public Utilities Board, Singapore.

In Singapore, in addition to a strong commitment to water quality monitoring (Box 12), PUB emphasizes customer satisfaction. To measure the satisfaction of customers who have used PUB's services, its employees give out feedback forms, which customers can complete and post to PUB at their convenience. In the form, customers are asked to rate PUB on the quality of its service, and to provide feedback and suggestions for improvement. A customer satisfaction index is then computed based on the ratings.

Customers can also contact PUB directly to provide feedback. In August 2002, PUB implemented PUB-One, an initiative that brought together the handling of reports or feedback on water supply services, sewerage, and drainage to a single point of contact. The 24-hour contact center, which operates 7 days a week throughout the year, is manned by PUB staff members. The initiative frees customers from having to call different hotlines to give feedback on different kinds of services, and therefore enhances service quality and efficiency. Through PUB-One, customers can contact PUB through six channels, a 24-hour toll-free telephone line, fax, e-mail, SMS, web chat, and VoIP. The multiple channels increase the contact center's accessibility.

Box 12: Singapore's Stringent Water Quality Monitoring

It is safe to drink Singapore's water straight from the tap. To ensure that the water supply is clean, water samples are regularly collected and analyzed at the water-testing laboratory of the Public Utilities Board (PUB). Samples of water at various stages of treatment—at waterworks, raw water from all sources, and treated water from service reservoirs and selected points in the distribution network—are collected for daily or periodic analysis.

The quality of the country's tap water is well within international guidelines. Tests are conducted to ensure that the quality of treated water is within drinking water guidelines set by the World Health Organization. Typical values for PUB's potable water are well within these guidelines.

More than 80,000 tests are conducted monthly, based on more than 290 parameters, surpassing about 130 specified by the United States Environmental Protection Agency and the World Health Organization. Independent checks are conducted by the National Environment Agency, which is another statutory board in Singapore. In addition, PUB's management of water quality is reviewed twice a year by an independent external audit panel comprising foreign and local experts.

Source: H.C. Chong. 2009. They're Safe, Replies PUB. *The Straits Times*. 18 July.

Financial and Human Resources Management

To operate as independent, business-like institutions, water utilities must be financially self-reliant. Financial sustainability and sustained service delivery go hand-in-hand. Toward this effort, managing capital investments, cash flow, and subsidies is critical for ensuring the creation of assets for service coverage and delivery, and ensuring enough funds are available for operating and maintaining them efficiently. While capital requirements for a water utility are large, entry costs may not be as high as originally anticipated, because investment may be bridged by cash generated by the utility itself. Subsidies can be grants for capital investments or for targeted revenues impacting the adequacy of cash flow for operation and maintenance when tariffs cannot cover the full operation and maintenance and capital costs. A well-run sustainable utility is, after all, a business that must manage cash flow prudently.

Water utilities can implement many different measures to help generate adequate income to cover operation and maintenance expenses and, if possible, capital servicing. These may include

(i) reducing unaccounted-for-water (UFW) so that much of the water produced can be sold to consumers;
(ii) setting a tariff structure and implementing it with a social conscience;
(iii) restructuring the billing system so that bills can be produced for all consumers and delivered on time; and
(iv) improving the bill collection ratio with appropriate incentives, with disincentives for late payments.

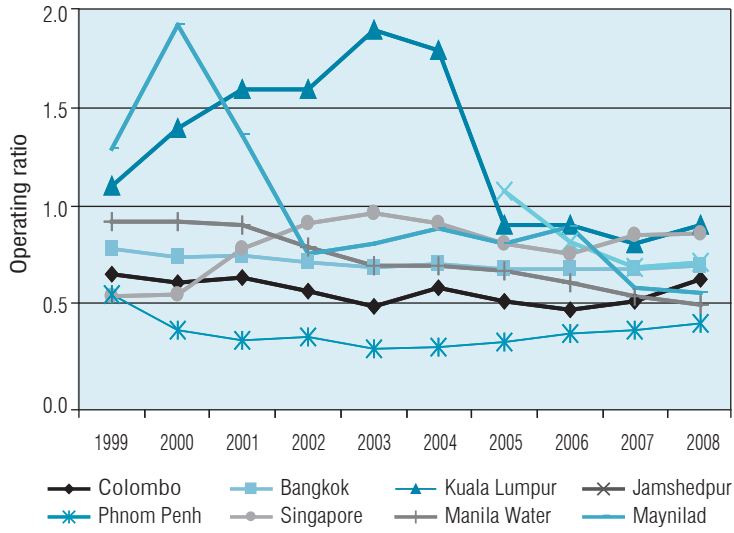
Along the way, utilities must also keep a database of all households that have connections. Without one, it is impossible to collect revenue from all consumers and to target subsides to those who need it. Such a list is always dynamic, and needs to be continually updated to ensure correct and appropriate billing.

As shown in Figure 8, the overall financial performance of all of the utilities in the case studies has been on a positive trend over the decade, with operating ratios (i.e., the ratio of annual operation and maintenance costs to annual operating revenues) all between 0.4 and 1.0. Such commendable financial performance is due to reduced operation and maintenance costs (e.g., through reduction in nonrevenue water [NRW] and outsourcing of some functions), increases in water pricing, and consistently high revenue collection efficiency.

The fact that all of the utilities have operating ratios under 1.0 indicates that they can all at least cover their operating costs, with enough left over to perhaps provide subsidies to low-income consumers. When operating ratios get down to the 0.5 range, as is the case with the Manila Water Company, utilities are then able to start covering the full water supply cost, including capital charges, depreciation, and infrastructure replacement. Thus, keeping operating ratios low is essential for a utility to ensure a system's long-term financial sustainability, operation, and maintenance, without relying on subsidies or donor funding.

The two biggest improvements were experienced by Maynilad Water Services and Kuala Lumpur. In the case of the former, operating costs far outpaced collected revenues in the initial 5 years of the concession agreement, but performance has since drastically improved. Regarding the latter, privatization helped lead to a rapid reduction in the operating ratio. This suggests that partnership with the private sector can serve as an impetus to realize efficiency gains. With the provision of private sector financing, water systems must

Figure 8: All Utilities Are Able to Cover Operations and Maintenance Costs



Note: Shenzhen Water Group's operating ratio was 0.97 in 2008. Data for 1999 to 2007 were unavailable.

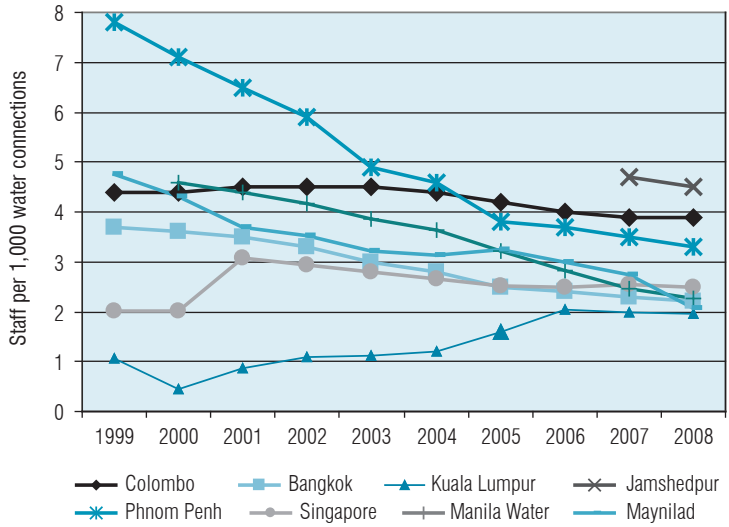
Source: The data are from the water utilities of Bangkok, Colombo, Jamshedpur, Kuala Lumpur, Manila's two water utilities, Phnom Penh, Shenzhen, and Singapore.

be structured in a way that makes them bankable, meaning that they must look attractive to bankers and other providers of financing. Thus, utilities must repay most of the financing for the investment, a rigorous approach that forces them to look for efficiency gains to increase their revenues.

Human Resources Management and Staff Productivity

To improve efficiency, utilities must attract, nurture, and retain talented staff members. Leading utilities have progressive human resources policies, including higher salaries and promotions that are based on performance, training, and leadership programs. As shown in Figure 9, many utilities are seeing an increase in staff productivity over time, which points toward an overall improvement in the efficiency of human resources.

Figure 9: Continuing Improvement in Staff Productivity



Notes:
1. For Singapore, data is expressed as staff per 1,000 customer accounts for potable and reused water.
2. In 2001, the newly constituted PUB was established. Hence, data before 2001 are not comparable.
3. Data are not presented for Shenzhen, because the Shenzhen Water (Group) Company did not disclose its number of water connections.
4. For Bangkok, data is for MWA's entire service area of Bangkok, Nonthaburi, and Samut Prakan.
5. For Kuala Lumpur, data is for SYABAS' entire service area of Kuala Lumpur, Selangor, and Putrajaya.

Source: The data are from the water utilities of Bangkok, Colombo, Jamshepdur, Kuala Lumpur, Manila, Phnom Penh, Shenzhen, and Singapore.

In Phnom Penh, the current general director of PPWSA, Ek Sonn Chan, has a long-term vision for his staff. First, he got rid of corrupt and incompetent staff members. If any of the staff abused their power, especially in terms of corrupt practices (e.g., providing illegal connections, reading meters incorrectly, or accepting financial contributions for unofficial purposes), abusive staff were dismissed after a transparent, quick review. This continuing practice has ensured that corruption is a thing of the past.

Second, with the good people left over and recruitment of new staff members, the general director made continuing investments in building and updating capacities in all areas. This was helped by incentives for good performance. For example, between 1994 and 2004, salaries of PPWSA staff increased by more than 10 times. Currently, good financial packages have allowed PPWSA to attract and retain talented, committed staff members. Simultaneously, there have been serious and immediate sanctions for those engaging in corrupt behavior, including speedy dismissals. This approach has been remarkably successful, especially in a developing country like Cambodia, where no other public sector institution can match the performance and efficiency of PPWSA.

In Jamshedpur, JUSCO has implemented several measures to improve staff productivity. Since it is a private utility, JUSCO is not governed by government pay scales, which are lower than the compensation of its managerial staff. Thus, JUSCO is able to use compensation as a tool for attracting, retaining, and motivating talent.

To foster a committed and engaged workforce, JUSCO also employs progressive human resources practices. The utility identifies training needs based on the gap between competency needs of the position and competency of the employee, along with the employees' desires. In addition, senior officers are provided external training programs, management development programs, seminars, and workshops, as well as conferences and industry visits where they acquire knowledge and share it with employees at different levels. This helps in importing best practices and understanding competitive practices. Internal rotations, including postings at out-locations, provide officers with challenging assignments, which helps develop their competencies and careers.

In Singapore, PUB has been successful in attracting and retaining talent due to its comprehensive human resources policies,[36] thus allowing it to enhance sustainability in human capital. Staff salaries at PUB are benchmarked against the salaries in the Singapore Civil Service, which are in turn benchmarked against the remuneration packages of the private sector. Competitive remuneration packages help PUB attract and retain capable employees, as well as to avoid corruption. In 2004, PUB moved from a fixed salary scheme to a performance-based salary structure that rewards better performers with higher salary increments and bonuses. Moreover, promotions are based on work performance and potential, further motivating staff to perform.

PUB also has programs to identify and develop employee talents. It sponsors its staff to further upgrade their skills through postgraduate studies, leadership programs, and other courses. About 96% of its staff (2,978 individuals) attended training in 2008. Employees are

[36] Its resignation rate of 1.2% in 2007 was relatively low compared to the rates of other public sector organizations (mean of 7.2%–11.9% in 2007) in Singapore. Information was kindly provided by PUB's Human Resource Department.

also given exposure through challenging assignments, such as attachments to other organizations, which allow them to develop their potential. In addition, to nurture the next generation of water leaders, PUB offers scholarships to students with strong academic achievements and a passion for the environment, to pursue university studies in water-related and other relevant fields, such as environmental engineering and economics.

To retain quality staff, the Manila Water Company offers a compensation package competitive with similar organizations in the private sector. In addition, it provides employees with local and international training programs and a host of incentives and rewards schemes.[37] International training programs are offered in partnership with United Utilities, the company's international partner.[38] Its Cadetship Program is one of the more unique programs offered by a utility (Box 13).

Box 13: Manila Water Company's Cadetship Program

"At Manila Water, every new employee at all levels has to 'walk the line'," explained Rene Almendras, president, Manila Water Company. "This is literally an immersion program in looking at the real-life water situation in a district metering area."

"Walking the line" is literally walking throughout the entire district metering area on foot to check each water connection. Cadets—management trainees and other new hires—conduct both day and nighttime walks to hone their skills in identifying problems on the ground and in developing and nurturing relationships with stakeholders, including paying customers, local government, and the commuting public. "They need to know this last group," said Carla Kim, head of sustainable development. "If we are digging up streets in a local neighborhood to lay new pipe, the commuting public will see this as an inconvenience. We need to deal with them even if they are not a paying public for us."

Cadets follow a "walk-design-walk-redesign-walk-refine" process that is, in Mr. Almendras's words, a combination of textbook engineering and a study in social reality. In addition to daytime walks, cadets also do up to 48 hours of night flow reading. "Nighttime is the best time to check for leaks," according to Mr. Almendras. "At night, most service connections are not drawing water. That is when you can see if there are service connections that are not drawing water but where there are differences in water supply and demand figures. It is also a good time to learn to listen for water flowing where it shouldn't be flowing."

Source: Luz, J.M. and M.L.P. Melosantos. 2009. *Case Study on Urban Water, Wastewater, and Storm Water Management in Manila.* Case Study Series Good Practices for Urban Water Management in Asia Case Study No. IWP/GPUWM/No. 5/2009. Institute of Water Policy. Unpublished.

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[37] An annual performance-based incentive program provides for rewards and awards at three levels. The Chairman's Circle is an award for senior managers, the President's Pride is awarded to middle managers, and the *Huwarang Manggagawa* (Model Employee Award) is for rank-and-file employees.

[38] In 2008, 31 managers attended international training in Australia, Bulgaria, Dubai, Estonia, and the United Kingdom.

Pricing Water for Efficiency and Sustainability

Long-term sustainability of water supply services depends to a large extent on the financial viability of water operations. In turn, this depends on the eventual success of an appropriate tariff policy that balances affordability, equity, and sustainability. The uniform global experience has been that if consumers want to receive a 24-hour, uninterrupted water service, they have to pay for it.

In some places, this can be a difficult concept, as water is often viewed as a human right rather than as a commodity. Indeed, an inability to drive user charge reform continues to inhibit provision of water access in large parts of Asia, particularly in South Asia. However, experiences from cities throughout Asia and the world show that free water will invariably lead to an unacceptable service. That being said, while utilities should lessen their dependence on subsidies while increasing their reliance on user charges and tariffs, governments also have to be mindful of keeping water tariffs at reasonable and affordable levels.

In Singapore, for instance, the price of water is set at a level to recover the full costs of producing and supplying it, as well as to reflect the scarcity of water in the country and the higher incremental cost of additional supplies, which are more expensive than local catchment water. By making people pay for every drop of water consumed, there is no distorted incentive to overconsume water. In addition, by having water tariffs that reflect the true cost of water production and distribution, the revenue collected can be used for research and development to identify innovative ways of treating and supplying water and for investments in infrastructure. At the same time, PUB has endeavored to make water affordable for the poor, as previously discussed.

However, in most cases in the developing world, full cost recovery of operation and maintenance costs (and later capital costs) should not be the only feasible option or starting point. In many cities, the populations may not be willing, or even able, to pay high enough tariffs to fully cover financial shortfalls, at least initially. That means that most utilities will not fully succeed on a commercial basis, and that is to be expected.

In many cases, a two-pronged solution is needed to ensure that sufficient funds are available for sector development and operation. First, a tariff policy is needed that allows an increase, where justified. Tariffs will need to rise but preferably after demonstrated improvement in service delivery to increase users' willingness to pay. Such policies also call for a flexible, imaginative use of targeted subsidies for the truly poor to make cost recovery acceptable, affordable, and sustainable.

Second, there must be predictable and reliable sources of gap financing available to cover initial operational shortfalls.[39] For this purpose, public spending often needs to be increased. This is vital since water utilities can be victims of periodic budgetary crises given the strong competition for public budgets from other social and economic sectors.

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[39] ADB. 2008. *Special Evaluation Study: ADB Assistance to Water Supply Services in Metro Manila.* Manila. www.adb.org/Documents/SES/PHI/SST-PHI-2008-31/SST-PHI-2008-31.pdf

Considering the above aspects, a mix of options should be considered in ensuring the financial sustainability of water supply services, while cushioning the water bills of the poorest customers. Options include user charges, grants and output-based subsidies, cross-subsidies among various user categories (to be gradually reduced), and taxes.

In Phnom Penh, PPWSA offers a successful example of how to approach tariffs in more of a developing country setting. When it sought loans from both ADB and the World Bank to rehabilitate its old infrastructure and construct new infrastructure, the government pledged that they would put in place a responsible, financially viable, and socially sensitive tariff structure. This followed a decision by the government in the 1990s to view water as an economic and social good. While many other countries have made similar commitments, the difference in the case of Cambodia was the actual implementations of this commitment. As a result, PPWSA had adequate income to be financially self-sufficient and was able to operate in a business-like manner.

PPWSA embarked on a comprehensive strategy to achieve higher revenues and financial self-sufficiency. One of the most difficult components was to increase water tariffs so that all costs could be recovered without generating social or political unrest. By ensuring that its customers first witnessed and appreciated a much better quality of reliable service before the tariffs were increased, the tariff increase ended up being socially and politically acceptable.

The increase in the tariff was very carefully planned. The initial tariff plan proposed three increases in 7 years, along with continuous improvements in service delivery. First, a socioeconomic survey of Phnom Penh measured consumer willingness and capability to pay higher tariffs. Once that was established, the tariff was calculated after considering the total expenses of PPWSA, including operation and maintenance costs and the depreciation of all its assets.[40]

The process was designed to ensure there was no sudden huge jump in tariffs, which consumers would find economically difficult and thus make them reluctant to pay. The first increase, introduced from June 1997 along with other measures to improve operational efficiencies, immediately doubled the income of PPWSA. The second increase came in 2001. Then, because of PPWSA's efficiency improvements, which surpassed all expectations, the third planned tariff increase was unnecessary.

In the end, the tariff increase was not a difficult choice for the public, who witnessed huge improvements in service, including water quality. Customers considered the increase very reasonable. This included the poor, whose water bills actually declined by a factor of five to six for a vastly improved service. As a result, private water vendors have virtually disappeared from the PPWSA area.

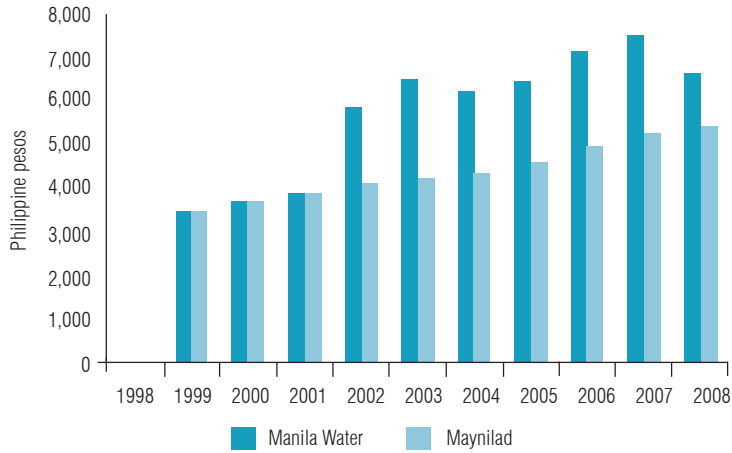
In Jamshedpur, JUSCO already has differential tariffs, based on the area of the property of the household served by the connection, to reflect the economic status of the connection

[40] Under the national water policy, the utility is expected to recover all of its operating costs with tariffs, as well as the depreciation of all its assets, except land, which generally increases in value over time. The value of its assets must be revised every 5 years.

owner. This ensures cost recovery, as well as lower tariffs for the urban poor through a cross-subsidy from other higher-paying residential connections and commercial connections. JUSCO is also the first utility in East India to move toward metering and volume-based tariffs to help drive water conservation, including a "lifeline supply" tariff rate for the first 10 kiloliters per month. Wherever customer-level metering is not in place, JUSCO uses an area-based differential flat tariff for water supply. To overcome resistance to metered volume-based tariffs, JUSCO priced the lifeline supply in such a manner that households consuming lifeline levels of supply actually get a monthly revenue that is comparable or less than under the flat area-based user charges that were otherwise in place.

In Manila, the divergence in the fortunes of the Manila Water Company and Maynilad Water Services can be partly explained by their differencing pricing policies (Figure 10). Starting in 2002, the Manila Water Company began charging the real cost of connection, amortizing this over a longer period of time to make it affordable to lower-income groups. Meanwhile, Maynilad Water Services continued to subsidize the rate as part of their effort to connect similar groups. The result was the opportunity loss of additional revenues that could have helped the company's financial position.[41]

Figure 10: Connection Fees in Manila (in nominal pesos)



Source: Luz, J.M. and M.L.P. Melosantos. 2009. Case Study on Urban Water, Wastewater, and Storm Water Management in Manila. Case Study Series Good Practices for Urban Water Management in Asia Case Study No. IWP/GPUWM/No. 5/2009. Institute of Water Policy. Unpublished.

[41] Over that period of time, assuming that the connection fee of the Manila Water Company represented a truer picture of the real cost of making a water connection, Maynilad Water Services would have left close to half a billion pesos on the table.

In the case of the Manila Water Company, loans were also contracted in smaller amounts and linked to subprojects rather than to financing for the entire system, the preferred route for Maynilad Water Services. With cash flows in local currency, the Manila Water Company matched its capital needs by borrowing more from local banks. In this way, it minimized the foreign exchange risk that goes with long-term borrowing for immediate investment, as in the case of many public infrastructure projects.

Revenue Collection

Seven of the nine utilities highlighted in the case studies have a revenue collection efficiency of 96% or greater. This reflects targeted efforts by these utilities to collect revenues through various incentives and disincentives.

In Bangkok, for instance, the high collection efficiency rate and falling accounts receivable achieved by MWA is due to two concurrent strategies. First, strict penalties are imposed for late payments, and second, there are now many different and convenient options for customers to pay their water bills (e.g., counter service at least 153 post offices, bank account deductions without charges to customers, and well as through the internet, by telephone, and by mobile phone).

Water connection application and payment at the community level in Phnom Penh.
Photograph courtesy of Oeur Luxe, PPWSA.

In Phnom Penh, the amounts billed and amounts collected have become almost the same during the post-2000 period due to several innovative measures. For example, the last resort for late-paying customers is to disconnect them and then ask them to come in to discuss their problems. Nearly 70% of the households come, discuss the problem, and a solution is found. Reconnection to the water supply is an expensive process, since they have to pay their outstanding water bill plus a penalty of 1% per day for their delinquent bills and a reconnection fee of about KR60,000 ($15).

To further ensure high collection efficiency, PPWSA's bill collectors receive an incentive for collecting a higher percentage of the bills. The higher the percentage of bills that are collected, the higher the bill collector gets paid. If they collect less than 97% of the bills for three consecutive periods, they are either penalized or dismissed. This system works because of its transparency and the strictly enforced system of incentives and disincentives that are in place.

Wastewater Tariffs

The imposition of a wastewater tariff is a potential measure for addressing the financial constraints that hinder wastewater treatment efforts. The challenge for local governments is to make the bold political decision to pursue such tariffs in the face of inevitable public resistance.

The case of Indah Water Konsortium (IWK) in Malaysia is typical of organizations that have attempted to levy wastewater tariffs. After privatization of sewerage systems in 1994, IWK tried to recover costs by imposing sewerage fees, but many customers simply refused to pay, and there was no legal framework to compel them to do so. Over the years, the government reviewed the sewerage charges on a downward trend three times without compensating IWK. Such moves affected IWK cash flows; subsequently, IWK was taken over by the government in 2000.

Recently, IWK has been also able to start a program to educate the public, create awareness, and take proactive actions to upgrade and improve their sewerage services. It currently issues half-yearly bills to consumers whose sewerage services come under its purview. However, IWK is still experiencing budget deficits, as it continues to face nonpayment of bills and defaulters. A shortage of funds will limit its ability to develop new facilities and to modernize and upgrade the sewerage system throughout the country.

In Jamshedpur, customers pay a one-time deposit for a sewer connection. For a new sewer connection within the lease area, a customer can request JUSCO to provide an estimate of the cost involved. This estimate is not fixed and depends on local conditions and proximity to the existing sewer network. After the consumer pays the deposit, JUSCO provides the sewerage connection. No additional user charges are imposed for provision of sewerage services; however, sewerage service costs are built into overall water costs and, accordingly, water-user charges. Similarly, sewerage service charges in Colombo are based on the monthly water consumption levels (Table 4).

Table 4: Sewerage Service Charges in Colombo

Monthly Water Consumption (in cubic meters)	Monthly Sewerage Service Charge (in SLR per cubic meters)
Domestic	
Up to 10	1.0
More than 10 and up to 15	1.5
More than 15 and up to 20	2.0
More than 20 and up to 25	2.5
More than 25 and up to 35	4.0
More than 35 and up to 40	6.0
More than 40 and up to 50	8.0
Commercial	
1 to 10,000	12.0
More than 10,000	15.0

SLR = Sri Lanka Rupee.

Source: National Water Supply and Drainage Board.

In Bangkok, a wastewater tariff has already been approved by the Ministry of Interior. Surveys have indicated the willingness of Bangkok residents to pay for wastewater discharge, but it has yet to be implemented by the Bangkok Metropolitan Administration. A bold political decision is now needed to move forward with it. A wastewater tariff would help provide the funds needed to cover operation and maintenance costs and expand the coverage of the sewerage system to improve water quality in the canals and the Chao Phraya River.

Gearing for the Future: A Framework for Success

Rapidly developing urban centers in Asia will continue to increase their demand for water and wastewater services. If cities do not keep pace with development, they will face a number of difficult issues, such as deteriorating environmental conditions due to pollution and increased extraction of groundwater.

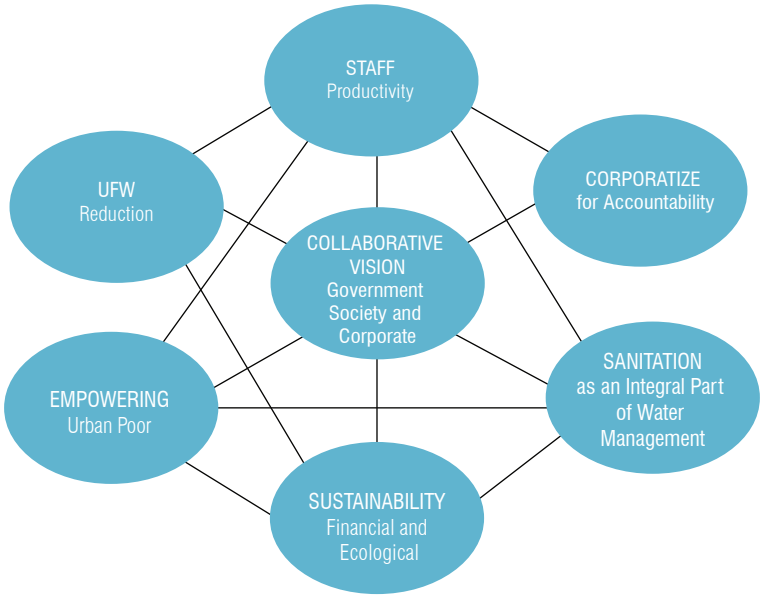
Conceptually, there is no reason why urban centers cannot make rapid progress in improving water and wastewater services. Knowledge, experience, and technology have been available for years, so the availability of these (or lack thereof) is not the core issue. Unavailability of funds is also not an insurmountable issue, as the private sector, along with donors, can provide the necessary financing for committed utilities. The constraints are mostly institutional- and governance-related issues, including regular political interference in the work of water utilities, which can be corrected if there is political will to do so.

Decoding Good Practices: A SUCCESS Framework for Replication

No one single model of urban water management will be suitable for all urban areas. Cities are not homogenous and are at different stages of economic, social, legal, and institutional development. In addition, at least in terms of water supply, climate conditions may vary from one city to another, even within a single medium-to-large country, and the availability of water infrastructure is seldom similar. Under these conditions, there is no question that one size does not fit all, and a solution-in-search-of-a-problem approach will mostly fail.

Rather, this report focused on a few crosscutting good practice themes culled from the insights provided by the eight highlighted case studies. Figure 11 presents the SUCCESS framework as a way to conceptualize seven universal themes for possible replication by water utilities in Asia and in the developing world.

Figure 11: Good Practices: The SUCCESS Framework



UFW = unaccounted-for-water.

Source: Institute of Water Policy. 2010. Good Practices for Urban Water Management Evolving Good Practices: A Cross Comparison Framework. Unpublished.

The seven themes are distinct yet interrelated. For instance, the likelihood of staff empowerment improves when a utility has a ring-fenced corporatized structure that drives accountability.

Staff Productivity

Leadership and commitment at the highest political levels are often explained as the critical ingredient for successful utility reform. However, sustained performance over a period of time will require leveraging this commitment at the highest level to create an empowered and highly motivated staff across various levels of the utility.

The vision and leadership provided by Lee Kuan Yew in Singapore and Ek Sonn Chan in Phnom Penh are often cited as key factors in mobilizing commitment and maintaining a steadfast focus toward improving the performance of water utilities in these cities. In both cases, this vision was backed by decisive efforts to build a motivated and capable workforce that was fully empowered to translate the vision at the operating level.

Initiating results in early stages of reform often requires a political commitment and champion to drive the vision, but sustaining performance over a longer term will require an effective organization and empowered staff.

Unaccounted-for-Water Reduction

Low UFW is a common factor among all high-performing water utilities and is critical for efficient service delivery. Particularly in the Asian context, where ability to pay for services is suspect, water wasted through losses in the system signifies a lost opportunity to service users better and at lower cost.

While Singapore and Phnom Penh stand out with respect to this dimension of good practice, there is clearly a lot to take from other utilities like Manila Water Company and JUSCO, which have also achieved rapid progress on this count. The solutions to achieve UFW reduction require a combination of technical interventions (Singapore and Bangkok provide insights here) and involvement of the community (as the Manila Water Company, Phnom Penh, and JUSCO cases have demonstrated).

Corporatize for Better Accountability

Better accountability and empowerment of staff members are achieved when water utilities function autonomously. Thus, regulation is required to place water agencies at arm's length from governments and make them accountable to the public. Such autonomy for utilities, whether they are under public control or operated through public–private partnerships (PPPs), is a critical trigger for scaling up company vision and service delivery.

With such autonomy, utilities must view and structure water supply as a long-term, sustainable business proposition. This approach, termed "corporatization," is critical to balance the powers and duties of a water utility and to drive greater accountability. While reforming water utilities, getting this balance right is among the crucial first steps.

All eight water utilities covered as part of this research have a corporatized structure that has supported their relatively autonomous functioning. The case of Jamshedpur is especially interesting; upon corporatization, the performance of the utility dramatically improved in a very short span of time.

Collaborative Engagement among Government, Corporations, and Society

Clearly, there is no one answer that emerges when it comes to whether the solution for rapid performance improvement is public or private. Both Phnom Penh (a completely public-run utility) and Manila Water Company (a privatized water utility) have achieved success on different dimensions of water supply, including addressing the needs of urban poor.

Singapore's PUB, while managing all end-user services as a public utility, has successfully used PPPs in its water-recycling program and other large-scale expansion initiatives. The JUSCO and Manila Water Company cases demonstrate the importance of engaging with the community to achieve wider service delivery goals.

There is clearly a need for a new paradigm to address integrated water management, namely engaging the government, corporations, and society in a three-way collaborative

The kids of Barangay 123 in Tondo, Manila now enjoy a cheap, reliable supply of drinking water after Maynilad mobilized the community for water under the Samahang Tubig Maynilad Program.
Photograph courtesy of Federico Juane, Maynilad Water Services.

effort toward defining and driving service delivery. As many have pointed out, the three-PPP approach requires strengthening by adding a fourth "P": people. Greater involvement of the community is clearly a critical requirement for successful utility performance.

Empowering the Urban Poor

Ensuring that water connections reach low-income communities is not only a social obligation, it is also important from the viewpoint of protecting the network. A water connection is a sign of ownership. With ownership comes a vested stake in the network that should translate indirectly into protection of the system.

However, the upfront fee for installation and connection is an expensive one-time cost for the urban poor and low-income communities. Programs for the poor often require a utility to understand the unique circumstances of the poor and then design a flexible program for them. Most, if not all, programs for the poor involve some kind of subsidy for obtaining a water connection and, in deserving cases, for the use of water as well.

Several of the utilities studied had interesting approaches to deal with water access for the urban poor. While the Manila Water Company managed to obtain external aid for subsidizing connection fees for the poor, JUSCO's intervention to involve the poor through

funding the tail-end network through a connection fee is even more interesting. There is also Singapore's direct household-level subsidy model. Most utilities also have a telescopic tariff, with tariffs for a lifeline supply kept at subsidized levels.

Overall, Asian water utilities need to show innovation with respect to a more inclusive approach, while at the same time ensuring sustainable access. The models discussed above demonstrate that sustainable provision of water supply access to urban poor is definitely within the realm of possibility.

Sustainability: Economic and Ecological

Operational autonomy needs to be backed by an ability of the utility to be financially independent with clear and well-defined revenue streams. For a long time, user charges in the Asian context have received a mixed response. Often, a sudden and drastic shift in user charge principles has evoked a strong backlash.

However, the merits of user charges are becoming more apparent, particularly in the context of their role in demand management. User charges are becoming mainstream among water utilities, as there are now successful models of universal metering and differential tariffs based on volume of consumption and on the ability to bear cross-subsidies for the poor. Also, a gradual yet consistent shift in policy toward consumption-based user charges, along with a progressive increase in service levels, appears the most logical way forward.

As issues relating to climate change become more prominent, city-level water utilities will also need to plan a healthy water balance to preserve ecological and environmental sustainability. The next good practice relating to sanitation and integrated water management is critical in this regard.

Sanitation

Effectively managing water resources requires an integrated and holistic approach. This includes both supply management (e.g., protection and expansion of water sources and distribution system) and demand management (e.g., water pricing and public education programs on water conservation). Integrated components must also include wastewater management, storm water management, research and development, and where applicable, PPPs. It must also encompass an effective legal, regulatory, and institutional framework, including close and efficient interagency cooperation. By concurrently focusing on all these issues, some cities have managed to achieve their visions, which mostly all urban centers of the developing world have found impossible to reach.

Singapore probably has moved the farthest in this direction. It has a holistic vision for water, including recycling and preservation, backed by an integrated organization (PUB handles both water and wastewater planning and execution) for water management. Shenzhen also has an apex-level organization that has complete accountability for integrated water management. Jamshedpur has outlined a river-to-river philosophy to capture the essence of integrated water management.

In many cities, the immediate focus should be to increase the sewerage network coverage from the existing low levels. While doing this, integrated planning should be undertaken for proper implementation of wastewater management projects, thus highlighting the need for better hygiene and environment. At the same time, the river-to-river approach for water supply and wastewater disposal should be adopted to ensure minimum groundwater pollution and compliance with pollution control norms.

Operationalizing the SUCCESS Framework

To operationalize the SUCCESS framework, some cities will undoubtedly face greater difficulties than others in translating political will into immediate change down to the utility level. This might be especially true in larger countries and/or in countries where the market structure for water service provision is decentralized and dispersed, as is commonly the case in Asia and the Pacific.

Countries with a high level of bureaucracy may also struggle to allow utilities enough flexibility to be successful. For example, in India, the heads of utilities in all major cities are officers belonging to the Indian Administrative Service, who serve only 2–3-year terms. Unless competent utility managers can be selected on the basis of merit and given adequate time to show results, cities cannot hope to fully solve their water problems in the foreseeable future.[42]

At the city level, each utility will also face its own unique circumstances that may slow their progress. For instance, many utilities may be stuck with old, dilapidated water supply networks, making reducing NRW and improving water quality more difficult. While these problems might be a result of poor management and neglect by previous utility managers, utilities facing this challenge must push forward with solutions to ensure their financial success.

In this effort, many cities in the developing world make the mistake of letting capital expenditure—rather than improvements, efficiency gains, and savings—drive the implementation of water projects. This supply-oriented approach yields hardware improvements, which are vital to keeping up with expanding demands in urban centers and generating more revenue.

However, two problems often emerge from focusing too intently on investing in new systems. First, expenditures for operation and maintenance are not adequately considered. Second, service delivery does not improve, because of lack of attention to improving management and technical capacity and inadequate finances to fund operation and maintenance.

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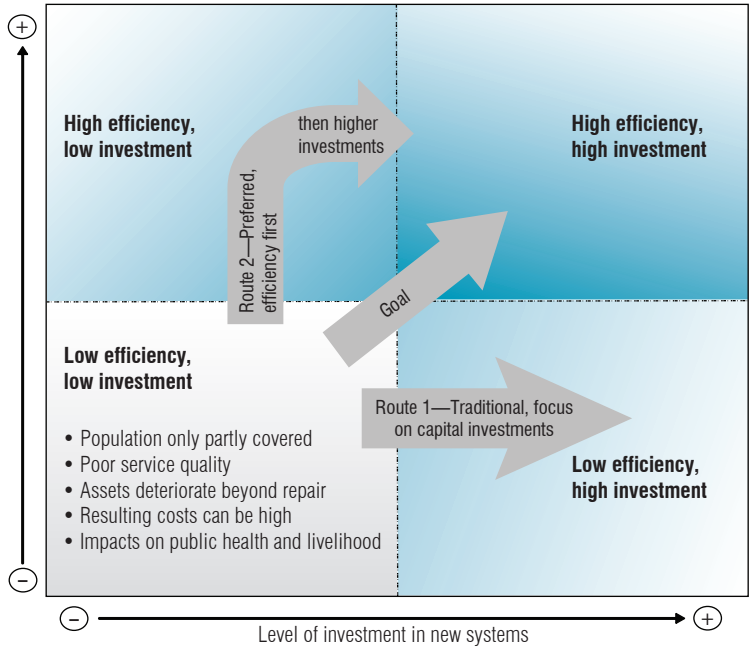
[42] Recent data on 20 water utilities in India confirms this. While average coverage among these utilities was 81%, UFW stood as high as 32%, with 14 of the utilities having less than 10% metered connections, and only one-third recovered their operations and maintenance costs in full. Source: ADB. 2007. *2007 Benchmarking and Data Book of Water Utilities in India.* Manila.

Poor service makes it much more difficult to convince customers to pay more for their water, which is a hard sell to begin with due to the persistent belief in many places that water should be heavily subsidized, if not provided for free. With low willingness to pay by customers, there is often little political will to raise tariffs, even to cover operation and maintenance expenses. Even in situations where customers are prepared to pay more for better service, unsustainable supply-oriented approaches sometimes persist.[43]

Consequently, water systems cease to function effectively due to financial shortfalls. Utilities struggle to maintain their level of service, and infrastructure deteriorates much faster than it should. The solution to these nonfunctioning systems is often the infusion of more capital investment for presumably better services—but at very little or no incremental charge to the customers. Since the core problems remain unsolved, such inefficient investment can sometimes make problems worse, with negative impacts on public health and the environment. As shown in Figure 12, cities that take this route have a harder time reaching their goal.

Figure 12: Balancing Investment and Efficiency in Water Supply Systems



Source: ADB.

[43] ADB. 1996. *Project Performance Audit Report: Faisalabad Water Supply, Sewerage and Drainage Project in Pakistan.* Manila. www.adb.org/Documents/PERs/PE-459.pdf

Rather than pursue this pathway, cities in the developing world should look to make their water systems more efficient and effective by reducing water losses, gradually increasing water tariffs, improving revenue collection, increasing staff productivity, and securing safe and reliable water supplies. This pathway is shown by "Route 2" in Figure 12, whereby a city reaches a limit of efficiency improvement by improving institutional systems and putting in place good practices. When efficiency gains are ensured, further visible improvement is possible only by enhanced investments.

It is essential that the success of the utilities highlighted in this report be equaled in other urban areas of Asia and the Pacific. The economic and social costs to cities of not receiving clean, drinkable water supplies are now quite high and growing.

Every Drop Counts: Learning from Good Practices in Eight Asian Cities

This report summarizes the good practices that were culled from a case study series on successful Asian water utilities. The case studies presented objective, accurate, and critical analyses of urban water management practices in eight Asian cities over a 10-year period. Other local leaders throughout the developing world can use these cases to help craft their own solutions, taking into account specific local circumstances. What is most important for cities is to find some common base elements for success and then replicate these, albeit with appropriate modifications, to suit their own special conditions.

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