FORGING PARTNERSHIPS AMONG WATER AND WASTEWATER OPERATORS

ASIAN DEVELOPMENT BANK

50 YEARS

ADB

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ASIAN DEVELOPMENT BANK


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6 ADB Avenue, Mandaluyong City, 1550 Metro Manila, Philippines
Tel +63 2 632 4444; Fax +63 2 636 2444
www.adb.org

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Contents

Acknowledgments

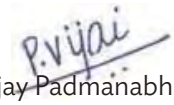
The Water Operators' Partnerships (WOPs) Program is well-liked by operators and project officers alike, and understandably so. Not only does it provide developing operators a chance to interact and learn from those who have advanced in the field, but also because it provides mentors a chance to think out-of-the-box, venture outside their comfort zones, and contribute to improving lives of those in the developing world. We at the Asian Development Bank (ADB) are happy to be the channel through which this wonderful kinship takes place.

More than just a capacity building initiative, the WOPs Program brings additional value in terms of influencing project design. Water utilities are at the forefront of a city's overall development, contributing immensely to sustained progress. Infrastructure investments in water supply and sanitation can only serve its purpose if assets are properly conceptualized, operated, and maintained. There is opportunity to improve these aspects from the operator's perspectives through a utility twinning program, wherein partnerships are directly linked to investment programs and implemented at an opportune time.

The case studies presented in this publication are but a sampling of what the WOPs has accomplished and can implement at a greater scale in the future.

I would like to thank the team for their invaluable contribution to the WOPs Program and this publication. The overall program has benefitted from the guidance of Alan Baird, senior urban development specialist; Ellen Pascua, water fund manager (consultant); and other urban water colleagues who have helped shaped the program. Consultants Lyn Almario, Tops Moster, and Robert Domingo were responsible for the compilation of selected water operator partnerships and the respective write-ups. Elga Reyes (consultant) assisted in editing the publication, while Gino Pascua (consultant) provided expertise in the design and layout. Pia Reyes, water resources officer, facilitated the overall coordination in production and publication. The publication benefitted as well from the support and encouragement of Gil-Hong Kim, senior director concurrently chief sector officer.

We are always grateful to our water operator mentors who have unselfishly shared their knowledge, and to their governments for making it happen. Our mentors are from all parts of the world: Asia, Australia, Europe, North America, and the Pacific. They prove that lessons from experience, when shared, multiply their value a thousand-fold. Most of all, we know we are privileged to be working with our water operator recipients, whose desire to do better amidst limitations inspire the implementation of the WOPs Program.



Vijay Padmanabhan
Technical Advisor (Urban)
Urban Sector Group, SDSC

Abbreviations

ADB	Asian Development Bank
BEWG	Beikong Water Group Company, Limited
BIWASE	Binh Duong Water Supply, Sewerage and Environment
BWSGC	Baotou Water Supply General Company
CMC	Colombo Municipal Council
CWW	City West Water
DMA	district metered area
DWSS	Department of Water Supply and Sewerage
EMASESA	Empresa Metropolitana de Abastecimineto y Saneamiento de Aguas de Sevilla S.A.
FSM	Fecal Sludge Management
HWA	Hunter Water Australia
KPI	key performance indicator
KWASA	Khulna Water Supply and Sewerage Authority
Lao PDR	Lao People's Democratic Republic
LSTWSSUC	Leknath Small Town Water Supply and Sanitation User Committee
MCDC	Mandalay City Development Committee
MWA	Maynilad Water Academy/Metropolitan Waterworks Authority
MWSI	Maynilad Water Services, Incorporated
NAWASCO	Nghe An Water Supply One Limited Company
NPNL	Nam Papa Nakhone Luang
NRW	nonrevenue water
PNG	Papua New Guinea
PWA	Provincial Waterworks Authority
SADCO	Sewerage and Drainage Company
SAWACO	Saigon Water Corporation
SWC	Sydney Water Corporation
URENCO	Urban and Environment One Member Limited Company
VEI	Vitens Evides International
WAF	Water Authority of Fiji
WOPs	Water Operators Partnerships
WTD	Wastewater Treatment Division
WUSC	Water Users And Sanitation Committee
YCDC	Yangon City Development Committee

Lao PDR – Lao People's Democratic Republic

 ASIA 17-1679 ABV

ADB WATER OPERATORS PARTNERSHIP

RECIPIENT COUNTRIES

Photo: ADB Photo Library

Introduction

Providing access to clean water and sanitation has perennially been a tough challenge for governments globally. Although significant strides have been made over the years, there is still much room for improvement. To date, at least 1.8 billion people use drinking water sources that are fecally-contaminated and an estimated 663 million people across the globe do not have access to improved drinking water sources. Sanitation paints a bleaker picture, with an estimated 2.4 billion people needing basic sanitation services.[1]

The Sustainable Development Goals (SDGs) has set lofty targets with regards to providing universal access and sanitation. Governments and water operators globally have explored nonconventional ways to try and respond to the daunting challenge set forth by the SDGs. Innovations in financing instruments, technology, knowledge partnerships and the like, have significantly contributed to speeding up improvements in coverage and levels of service.

Over the years, the definition of "innovations" has come to include not only those related to technology and engineering but also to skills and capacity-related interventions and those that improve enabling environments. Water utilities worldwide have come to better appreciate the value of equipping themselves and their environment with the right skills and conditions for more sustainable operations.

Infrastructure, coupled with the right capacity, in an environment that supports improvements, completes the solution puzzle towards providing a more holistic approach to water and wastewater service provision.

The Asian Development Bank's (ADB) Water Operators Partnerships (WOPs) Program is an example of an innovation focusing on building capacity of operators to complement engineering and technological advancements. This knowledge-sharing, experience-based twinning platform brings together experienced and efficient utility operators to mentor utilities (recipients) on specific aspects of their operations.

Initiated in 2007, the ADB WOPs Program has around 69 completed and ongoing partnerships in Asia and the Pacific, supporting around $2.3 billion worth of investments in water supply and sanitation.[2] It is a robust complement to ADB's Water Operational Plan.[3] Continuously evolving to better respond to the needs of the water sector, ADB, through WOPs, contributes toward improved urban services.

This publication provides a compendium of twinning arrangements successfully formed under the WOPs Program. Country experiences from Bangladesh, Fiji, Indonesia, the Lao People's Democratic Republic (Lao PDR), Myanmar, Nepal, Papua New Guinea (PNG), the People's Republic of China, the Philippines, Sri Lanka, Thailand, and Viet Nam are cited to highlight successful partnerships forged between local operators and recognized water utility experts in generating tangible results and significant improvements in service provision. Areas of operation covered include asset maintenance, nonrevenue water (NRW), operational efficiency, public–private partnership, and wastewater management. The examples clearly prove that the program is truly a cost-effective mechanism in building capacities and bridging the knowledge gap of water utility operators towards a more efficient and effective delivery of services to their customers.

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1 United Nations website. Sustainable Development Goals. *Clean Water and Sanitation: Why It Matters.* http://www.un.org/sustainabledevelopment/water-and-sanitation/ (accessed 10 October 2016).

2 ADB. 2016. *ADB's Sanitation Agenda*. Powerpoint presentation for video conference with Bill & Melinda Gates Foundation.

3 ADB's Water Operational Plan 2011–2020 outlines the basic principles and guidelines towards sustaining the Bank's water investments to $2–$2.5 billion annually through expansion of knowledge and analytical work, advancement of inclusive water policy reforms, and strengthening support to programs and projects in priority areas [Source: ADB Website. *Water Operational Plan 2011-2020.* https://www.adb.org/sectors/water/adb-water-policy-plan/operational-plan (accessed 3 November 2016)].


Photo: ADB Photo Library

ASSET MANAGEMENT

Photo: Quang Binh URENCO

The experience of pairing with an advanced utility gave Quang Binh URENCO a great idea on what a high performing utility is like. Seeing the operation, management and maintenance of sewers, pumping stations, and treatment plants in Seattle enabled Quang Binh URENCO to think of ways on how to apply better practices in Dong Hoi for further expansion of their facilities and improvement of their services.

Asset Management for Improved Service Delivery in Quang Binh, Viet Nam

Dong Hoi City is the capital of Quang Binh Province in Viet Nam. Situated in the north central coast of the country, it is home to more than 200,000 residents. The city's water and wastewater services are currently provided by the Quang Binh Urban and Environment One Member Limited Company (URENCO), a state-owned municipal environment service company. It caters to an estimated customer base of around 15,000 households.

In contrast, King County's Wastewater Treatment Division (WTD) of Seattle, USA serves 17 cities, 17 local sewer districts, and approximately 1.7 million residents. King County WTD is a used water agency responsible for ensuring the protection of public health, the environment, and the economy to its service area of King County and parts of south Snohomish County and northeast Pierce County. Its extensive experience in working with wastewater utility operators in developing countries particularly on areas covering wastewater system development and management made the twinning partnership a good fit.

One of King County's first impressions was the eagerness of Quang Binh staff to do well. In addition, they were pleased to see how well they have done thus far, and not only with their own operations but also in helping out the community, such as in times of flooding. This desire to do well made King County believe that Quang Binh can do great things and can even serve as mentor to other utilities in Viet Nam.

While the sewer network and treatment plant were relatively new, Quang Binh operators needed guidance on how to optimize their assets and how to move from a reactive mode of maintenance to one that is preventive. Unaware of how to go about establishing an asset management system, Quang Binh operators looked to King County counterparts to train them on how to initiate, implement, and sustain such a system.

To this end, an asset management inventory workshop was first conducted and it was an unqualified success. URENCO staff exhibited a high level of enthusiasm, understanding, and commitment in seeing through the successful completion of the sessions and move on to the next steps toward creating their own asset management program.

Other activities undertaken covered the review of contract specifications and a discussion on areas for improvement regarding URENCO's planned facility expansion and current operation of the Dong Hoi water treatment plant.

In late July 2016, one of the highlights of the site visit of WTD experts to Dong Hoi included the demonstration on the use of a commercial computerized maintenance management system software (MaintSmart) for asset management. This eventually paved the way for the procurement and training of Quang Binh URENCO staff on the use of the asset management program.

This water operators partnership (WOP) is consistent with Quang Binh URENCO's goal of being considered as a leader in selecting appropriate technology aligned with its community commitments and financial capability. It currently hosts frequent tours and numerous inquiries from its peer in-country agencies.

Planned reciprocal visits in the future will expand on the extensive progress already made during the partnership. A second visit by URENCO operating staff to King County will emphasize continued training on the asset management program MaintSmart and an in-depth review of laboratory management and practices. The final visit by WTD to Dong Hoi will focus on the importance of community engagement and planning for next steps in the evolution of the asset monitoring and maintenance program. The partnership arrangement is still ongoing and the final mentor visit to the city is expected to be conducted in the last week of April 2017.

Photo: City West Water

The WOPs Program has given mentors the opportunity to think outside-the-box. Operating in a fairly stable environment, CWW tends to forget there are other parts of the world faced with problems related to providing basic water and sanitation services. The program enabled CWW to return to their country armed with a renewed energy in finding ways to improve their services.

Managing Risks through Better Asset Maintenance in Colombo, Sri Lanka

Colombo in Sri Lanka is rapidly developing with upscale constructions along its main road, Galle Face, and the biggest and foremost development is the Colombo International Financial City. With all these, the Colombo Municipal Council (CMC) is gearing up to respond to the city's needs.

The Water Supply and Drainage Division of CMC's Engineering Services Department is responsible for providing wastewater treatment and sanitation services to the residents of Greater Colombo. The city's residential population is estimated to be around 640,000, with a floating population of about 400,000 residents.

Currently, there are about 30,000 sewer service connections recorded in Colombo, composed of residential and commercial users. The sewage goes through a centralized sewer system. This system will be rehabilitated and expanded under the ongoing ADB Greater Colombo Wastewater Management Project, which is one of the ways the local government is addressing residents' needs.

Complementing this project is a twinning arrangement with Australian City West Water (CWW), a recognized leader in asset management in Australia. CWW is one of the three retail businesses in Metropolitan Melbourne and is owned by the Victorian Government. It provides drinking water, sewerage, trade waste, and recycled water services to Melbourne's central business district including the Melbourne Cricket Grounds and its inner and western suburbs.

CWW mentored CMC to: (i) initiate Colombo's sewerage asset management plan, (ii) develop CMC's business plan, and (iii) introduce financial management practices. This will enable CMC to improve its asset sustainability.

Together the two agencies prepared a joint work plan, utilizing different knowledge sharing methods such as study visits, on-the-job training, and continuous communication (through e-mail and video chat) in between visits. Activities also included the provision of technical assistance to CMC in developing capacities in planning and meeting customer demands and optimizing sewerage maintenance activities through the implementation of a preventive sewerage system cleaning program.

The partnership spanned 2 years. At the end of which, the following results were achieved:

- Conduct of training on the identification and implementation of a simple key performance indicator (KPI) system to measure effectiveness of programs, data recording and management, and development of a preventive maintenance regimen (completed in August 2015);
- Adaptation of CWW practices on asset and financial management, customer standards, and decision-making process (completed in March 2016); and
- Conduct of training on financial management and the development of a simplified decision-making framework based on documented operational problems (completed in August 2016).

During the closeout workshop held in August 2016, a number of recommendations were presented by CWW to further improve CMC's delivery of wastewater services to its customers. These included:

- Establishment of an annual performance plan for management and a review of the agency's current organizational structure;
- Establishment of a maintenance account for condition monitoring and preventative maintenance activities of assets (for improved prioritization of resources, a breakdown of costs by asset class should be implemented);
- Continuous training of professional staff and identification of managers to handle customer complaints and asset management;
- Establishment of KPIs for customer service, asset performance, and operational performance; and
- Implementation of risk assessment and management, and information and knowledge management.

While the partnership has proven to be very valuable to CMC, it also proved fruitful to CWW staff who had renewed vigor in tackling their everyday challenges back in Melbourne, having been exposed to different problems in another part of the world.

Photo: ADB Photo Library

Asset management can never be ignored. It allows the operator to react well to any given situation, at any given time. It must be systematic and institutionalized in the operations.

Smart Water Management Systems Improve Efficiencies in Guiyang City, People's Republic of China

Established in 1938, Guiyang Water Company started out as a forestry and farming water resources company in the capital of Guizhou Province, the People's Republic of China. After more than seven decades, the organization saw several transformations until it became the Guiyang Beikong Water Group Company (BEWG).

BEWG, a publicly owned water utility, currently serves around 2.1 million people covering six districts (Yunyan, Nanming, Guan Shanhu, Wudang, Xiao He, and Huaxi). With nearly 1,500 personnel, BEWG operates eight water plants, 17 pump stations, and a distribution network of about 1,700 kilometers. Its operation is capable of producing around 600 million liters of water on a daily basis, serving 97% of its coverage area.

With such massive inventory of equipment and infrastructure under its responsibility, BEWG recognized the need to upgrade its asset management program in order to maintain and further improve the delivery of services to its ever-growing customer base. In coordination with the China Urban Water Association, ADB's focal partner for WOPs in the country, BEWG became a recipient of CWW's mentorship.

Both agencies held a series of study visits, remote consultations (through e-mail and video chat) in between visits, and training of personnel to facilitate technology and knowledge transfer.

Over 2 years (April 2013 to July 2015) the partnership also focused on implementing an asset inventory and maintenance program on all water supply assets of BEWG within a selected pilot area in the Wudang district. Through the introduction and development of a smart water management system (SWMS), information was collected on all the assets (location and prevailing condition) and maintained in a database, which later served as inputs in the development of a preventive maintenance program Pipeline Asset Management System.

Monitoring the success of the asset management activity was carried out through of a range of KPIs. The results were positive despite the protracted time over which it was implemented:

- Improved ability of technical personnel to know the exact location of BEWG's assets at any given time;
- Improved staff awareness on the importance of asset management and its practices;
- Reduced time allotted for network repairs and shorter periods of downtime;
- Increased awareness on potential construction standard issues particularly in areas where maintenance works are carried out;
- Establishment of a centralized team responsible for implementing and improving asset management across all of BEWG's six districts; and
- Establishment of performance incentives for field supervisors and maintenance staff to carry out repair works at the shortest possible time.

News of Wudang's successful asset management pilot testing eventually reached neighbouring districts. Huaxi district followed suit using the same system and format used in Wudang.

The partnership between BEWG and CWW has opened up new frontiers and opportunities. Convinced of the promising value of improving operations, BEWG management decided to expand the coverage of SWMS to its entire operational area. The roll-out is expected to be implemented within the next 3–5 years.


Photo: ADB Photo Library

NONREVENUE WATER MANAGEMENT

Photo: VEI

The professional dedication of both the mentors and recipients resulted in tangible results and a follow-up partnership to further assist MCDC in improving its operations.

Doing More with Less Water in Mandalay, Myanmar

Mandalay is the second largest city of Myanmar, with a population of over 1.2 million residents. Its water supply system, currently managed and operated by the Mandalay City Development Committee (MCDC), was built in the 1990s with financial assistance from ADB. The main pumping station is still operational but with limited coverage. Only a portion of the city core, or about half of the urban population, is served with an intermittent and untreated water supply. Meanwhile, water loss is on the high side at 52%. This means its significant customer base is only able to utilize less than half of the supposed volume.

MCDC recognized the need to enhance its water services and, thus, took the initiative to participate in ADB's WOPs Program. MCDC was partnered with Vitens Evides International (VEI), a Dutch company that specializes in providing technical support to urban water companies in improving their operational and financial performance.

A series of training sessions, remote consultations, and field visits was conducted involving selected MCDC staff and VEI experts. For nearly 2 years (mid-2013 to 2015), the twinning arrangement focused on the following areas: (i) conduct of a pilot study on nonrevenue water (NRW) management (identification and reduction of water losses) in the existing distribution network; (ii) conduct of a hydraulic survey to improve efficiency of deep tube wells; (iii) water quality monitoring improvement; and (iv) operational improvement of a surface water treatment plant.

During the final workshop held in December 2015, accomplishments from the twinning program were highlighted. Tangible results from the partnership include:

- Pilot NRW management. Activities conducted covered: (i) creation of a district metered area (DMA); (ii) installation of water and flow meters; (iii) conduct of zero pressure test; (iv) conduct of training and field visit on water meter management and operation and maintenance of distribution network; and (v) conduct of onsite training on leakage detection. These activities also led to the creation of a second DMA for further analysis
- Hydraulic survey of deep tube wells. This consisted of: (i) the measurement of actual capacity of the deep tube wells; (ii) identification of borehole clogging as the main cause of poor performing deep tube wells; and (iii) creation of awareness among MCDC staff on the necessity of better design, operation, and maintenance of deep tube wells.
- Water quality monitoring. Assessing water quality was previously done by testing for the presence of chemicals in the water samples. Through the program, MCDC laboratory staff were trained on sampling and testing for bacteriological presence (e.g., coliform and E-coli).
- Surface water treatment plant. VEI mentors provided useful recommendations on the proper design of roughing and slow sand filters as well as trainings for MCDC staff on the operation and maintenance of said treatment facilities. This allowed the existing water treatment plant to increase its volume production by threefold.

The promising results of this partnership prompted a second WOP. This currently focuses on: (i) increasing MCDC's water production capacity; (ii) enhancing the agency's laboratory services; (iii) training on network design; and (iv) financial management and investment planning. The second phase is expected to conclude by the end of 2017.

Photo: VEI

NAWASCO'S experience of working with Dutch experts was great but the greater experience was being able to benchmark the improvements made in their country's own city, Ho Chi Minh. It's encouraging to see the progress made in the bigger cities, which NAWASCO can also implement in their province.

Attaining Operational Efficiency through Better Nonrevenue Water Management in Viet Nam

Nghe An is considered the largest province in Viet Nam in terms of land area. Its capital, Vinh City, is the biggest city and an economic and cultural center of the province. Located in the North Central coast of the country, it is also considered as a vital transportation hub in the East–West economic corridor, linking the country with Myanmar, Thailand, and the Lao People's Democratic Republic (Lao PDR). Home to about 500,000 people, the city's economy is predominantly comprised of the service and industrial sectors. With a rapidly growing population and vibrant economy, demand for better and more efficient basic infrastructure and services is expected to increase over the coming years.

The water supply for the entire province is handled by Nghe An Water Supply One Limited Company (NAWASCO) and smaller utilities Cua Lo and Thai Hoa. A state-owned municipal water supply service company, NAWASCO is responsible for sourcing, treating, and delivering potable water supply to an estimated 94,000 customers, covering Vinh City and 10 district cities in the mountainous regions of the province. As part of its commitment to improve delivery services, NAWASCO has entered into a loan agreement under the ADB-funded Water Sector Investment Program to finance a NRW reduction project.

Complementing the investment program is a twinning arrangement with VEI. The Dutch firm is committed to supporting water companies in developing countries to improve service levels especially for the urban poor.

To drive the partnership forward, VEI focused on increasing NAWASCO's operational efficiency by managing its NRW. In a span of 16 months, NAWASCO personnel underwent intensive training on the various facets of NRW management. The first phase involved the formation of a pilot DMA, comprising: (i) selection of a pilot DMA (Branch 5), (ii) conduct of pressure measurements, and (iii) establishment and calibration of a hydraulic model.

The second phase included both classroom and onsite NRW management, which consisted of data collection and updating of billing system and assets of the pilot DMA; classroom trainings on NRW and DMA management; conduct of step tests; performing data analysis to calculate water balance;and hands-on training on leak detection and repairs, as well as meter reading and calibration of water meters.

The last phase involved a site visit to Ho Chi Minh City to interact with the five distribution companies of Saigon Water Corporation (SAWACO), which VEI was working with. These distribution companies shared the NRW reduction techniques they learned.

The WOP produced immediate results in such a short period. Aside from being able to establish a DMA and apply various NRW reduction methodologies, the twinning arrangement saw a marked improvement in NRW level in the DMA pilot. From a recorded 35.8% NRW level in July 2016, this was reduced to 26.5% in December of the same year.

The partnership encouraged NAWASCO to set bigger and more ambitious goals for them to achieve. Given the newly-acquired skill set of its personnel on NRW management, the establishment of more DMAs spread across its distribution system will be pursued based on a systematic approach to achieve operational efficiency on a grander scale.

Photo: SAWACO

The WOP is the beginning of a great friendship, not just between two utilities but among like-minded professionals with a common interest to bring better service to the public.

Improving Water Supply Services through Water Loss Management in Ho Chi Minh, Viet Nam

Located in the southeastern portion of Viet Nam, Ho Chi Minh City is the largest city in the country. It is an economic hub housing various export processing zones and industrial parks. The city also thrives in other industries such as mining, tourism, agriculture, and seafood processing. Sustaining the city's various economic activities demands that critical basic infrastructure and services are reliable.

Provision and maintenance of Ho Chi Minh's water supply rests on the shoulders of SAWACO through its subsidiaries. A government-owned and controlled corporation, SAWACO is responsible for sourcing, treating, and delivering potable water supply to an estimated eight million inhabitants in Ho Chi Minh.

Faced with the great challenge of coping with a rapidly changing city, SAWACO has made significant improvements in its operations, successfully reducing its water losses through its own efforts and other innovative means, such as partnerships with the private sector for operation and maintenance contracting on water loss management.

As a growing company looking for additional means to raise its productivity and to better cater to its customers' needs, SAWACO requested to be included in the WOPs Program with the goal of training a pool of trainers who can then train a bigger group within the organization. The training is focused on water loss management and improving water supply operations. While technical know-how is available, the skills to transfer this knowledge to other colleagues had to be developed.

Metropolitan Waterworks Authority (MWA) of Thailand served as their mentor under the program. This Thai organization is responsible for the water services of about 12 million residents in metropolitan Bangkok and the provinces of Nonthaburi and Samut Prakan. MWA is known for supplying good quality water and is recognized for its robust training program for employees and external partners. The program is managed by the MWA Waterworks Institute of Thailand (MWAIT).

The twinning partnership was a perfect fit. Guided by the structured methodology of MWAIT, coupled with MWA's and SAWACO's technical pool, and complemented by the keen coordination of the two utilities, it was a pleasant case of both parties learning from each other.

Through a series of site visits, on-the-job training sessions, continuous communication over a span of 2 years (August 2014 to August 2016), the partnership focused on:

- NRW management, particularly on methodologies for pipe rehabilitation, leak detection, and water meter installation in a DMA in one of the subsidiaries, Trung An;
- Introduction to various information technology applications specifically distribution monitoring through better and unified data updating and transfer, analysis, and management, and strengthened capabilities of the network operation center; and
- Design and conduct of trainors' training workshops to enable selected participants to become qualified mentors to local operators and subsidiaries of SAWACO.

For SAWACO, the exposure of its staff in working with MWA left a valuable imprint as to the direction the corporation wants to pursue. The partnership paved the way to develop a corporate-wide training program and to cultivate a new breed of trainers who will lead the implementation of the program. The testing of NRW management methodologies in real field conditions and appreciation of modern information technology applications and its potential to improve water supply operations have served well to develop the skills of the trainers, while improving their technical knowledge.

For MWA, the interaction with SAWACO helped them in their quest to continuously improve their craft and provided a sense of satisfaction and pride from being able to help out a fellow water agency improve its operations through sharing of actual working knowledge and experience.

Photo: MWSI

In Manila, all MWSI customers are connected and metered. In Khulna, it is not the same. MWSI, as mentors, needed to think outside-the-box to be able to help their recipients. The program challenged MWSI's abilities, helping them improve their work in the process.

Thinking Out of the Box Helps Khulna in Bangladesh

Khulna City, situated in the southwestern region of Bangladesh, is the third largest city in the country. It is home to an array of heavy and light industries, as well as port activities. The demands from sustaining these economic pursuits and population growth have, however, put considerable stress on the city's water supply reserves over the years.

The Khulna Water Supply and Sewerage Authority (KWASA) is in charge of addressing the city's water needs. A public entity established in March 2008, KWASA also handles wastewater and drainage operations in the metropolis. To date, its water production rate is estimated to be about 114 million liters per day coming from various groundwater sources such as production, mini-production, and handtube wells. This water supply is enough for about 1.5 million people in the city. KWASA's water network spans nearly 18,000 piped service connections but a bigger portion is unconnected at around 44,000 houses.

KWASA sought the assistance of ADB to obtain an operations-based mentoring approach to ramp up its operational efficiency. ADB, in turn, facilitated a partnership with Maynilad Water Services, Incoporated (MWSI), a Philippine-based company with extensive experience in providing technical support to water utility operators to better operational performance.

MWSI is the private water and wastewater service provider for 17 cities and municipalities situated in the western zone of the greater Metro Manila area. Since taking over operations from the government, MWSI has embarked on a NRW Management Program to address extensive water losses in its distribution network. The program, considered as one of the largest and most ambitious NRW reduction programs in Asia, has significantly contributed in reducing NRW from 67% (1997) to 31% (2015). The Maynilad Water Academy coordinates their knowledge-sharing efforts, of which includes the work done with the WOPs Program. Aside from Khulna, Leknath in Nepal also receives mentorship on NRW management from MWSI.

KWASA and MWSI developed a joint work plan consisting of remote consultations, study visits, and on-the-job training. The partnership focused on: (i) the formation of a DMA; (ii) improving data management and documentation for NRW monitoring; and (iii) adoption of a more effective standard procedure in customer meter service connection. This twinning was longer compared to other partnership arrangements, mostly because of travel limitations to Bangladesh during periods of *hartal*[4], and procurement issues.

While the partnership produced tangible results (creation of a pilot DMA in Ward 31 and establishment of a NRW Management Team), the program, however, encountered challenges that prompted the partners to redefine the objectives and activities of the twinning arrangement.

The installation of customer meters (including the meter chambers) proved to be a contentious issue among the lower-class households, particularly on shouldering the attendant costs it entailed. To quickly address this issue and avoid inordinate delays in implementation, the partners agreed that KWASA will shoulder all related expenses in the installation of the meter chambers initially and eventually charge it against the customers on an installment basis. MWSI, for its part, suggested the implementation of an Active Leakage Control activity within the pilot DMA.

The results of the partnership included:

- Completed metering of about 50% of connected customers (9,000 metered water service connections);
- Formation of three DMAs;
- Improvement in data management and documentation of NRW monitoring (use of Daily Production logbook and monthly consumption monitoring); and
- Adoption of a more effective standard procedure in customer service connection (customer connection runtime from 30 to 20 days).

[4] Hartal - political demonstration or strike.

Photo: ADB Photo Library

WASTEWATER MANAGEMENT

Photo: Steven Griffiths

There has been a practical knowledge gap in terms of what the theory means for the actual operation of the Yangon plant. To bridge the disparity, it is important to have people who are experienced in operating plants, and understand the practical limitations and what can be done on a day-to-day basis to improve and optimize the plant.

Upskilled Operators Lead Yangon's Improved Wastewater Services

Yangon is Myanmar's largest city and is considered as its most important commercial center. It is home to around six million people. Wastewater management is being carried out through its existing sewerage system, originally commissioned in 1888, and a treatment plant that was constructed in 2005, is still capable of achieving good treatment results.

Operations conducted in the plant and monitored at its laboratory, however, need improvement. Plant operators need to undergo training sessions to sharpen their technical competencies in performing their assigned tasks. For instance, while the laboratory has all the instruments and materials, no one uses any of the materials for water quality monitoring purposes.

Hunter Water Australia (HWA), the mentor for the partnership with Yangon City Development Committee (YCDC), was impressed on how well-maintained the facilities were, even though it was not performing at its peak capacity. They were also struck by the eagerness of the operators to achieve government effluent standards despite being quite stringent and far from current operating capacities. For HWA, this translated to a high sense of commitment, which is critical in any necessary change.

The partnership for the two agencies was designed for 13 months, beginning in mid-2014 to mid-2015, employing a stepwise approach for the training sessions. The program kicked off with a 5-day intensive training, mixing classroom lectures and hands-on practice on monitoring procedures in the plant laboratory. Two highly experienced and competent technical personnel from HWA were flown in to Yangon to train a select group of YCDC plant engineers.

Following this, the partnership work plan also consisted of a range of activities—those done separately by HWA and YCDC and those that require the collaboration of both entities. Topics covered included: (i) the review of monitoring data and analytical procedures; (ii) review of process modelling to identify plant modifications for improved performance; and (iii) conduct of offsite and onsite process engineering training sessions and plant modifications.

YCDC staff were trained on how to calibrate their instruments, collect water samples, test samples, analyze results, and adjust treatment scheme accordingly. Just as important, they were trained how to record data on a regular basis and use this data to improve the facility.

YCDC staff were given the flexibility and ample time to apply the procedures and techniques learned during each of the training sessions in actual day-to-day plant operations.

The language barrier did not in any way dampen the enthusiasm and lively atmosphere of the training sessions. Both student and teacher were committed to communicate. According to YCDC engineer Mar Mar Cho, "They are good teachers. At first we found it difficult to follow when they spoke too fast, due to our poor English. But with the help of drawings and demonstrations, we understood the lessons. Their training was very effective".

Indeed, the learning experience served YCDC well in terms of responding to the city's growing needs and its plan to expanding its facilities in the future.

In 2015, the YCDC Mayor inaugurated the upgraded laboratory of the treatment plant. And as further proof of the city's commitment to improvement, it approved the budget for purchasing chemicals for continuous water quality monitoring.

Photo: Jim Keary

Water PNG is facing major challenges and the twinning with Hunter Water has allowed Water PNG to make gains far quicker. The Hunter Water operations and technical specialists communicate easily with Water PNG staff and they will continue down this support path as it is the best way forward.

Developing a Water Master Plan for Lae, Papua New Guinea

Water PNG provides water and sanitation services to Papua New Guinea. Its service area covers 20 provincial towns, of which Lae is considered the biggest. With its close to 30,000 service connections, and an estimated served population of about 350,000 residents, it is considered a large utility in the Pacific.

Water PNG is confronted with a host of issues among which are water availability and quality, difficult hydraulics conditions, customers' low willingness to pay, and weak management information systems. The situation is further complicated given Water PNG's countrywide mandate and operation of several independent water systems.

Water PNG has the following priorities, namely: achieving consistent water quality testing, reduction of NRW levels, enhanced asset management, and development of a master plan for Lae. The partnership with HWA will help Water PNG to reach these goals.

Under the WOPs Program, the partnership was set for 2 years. It commenced on July 2011 with the issue of water quality testing as top priority. Water PNG staff from the Lae Operations Division was mentored by a water quality expert from HWA on conducting a quick diagnosis of water quality practices, facilities, and results.

The absence of a good laboratory for testing purposes was the first hurdle for Water PNG. This was quickly addressed through the generous offering of Unitech, a local university. With the guidance of HWA, Water PNG was able to implement a monitoring program that is fully compliant with World Health Organization and government guidelines. Procurement of new field test instruments was also carried out, which enabled operations staff to monitor results in real time and fine-tune treatment processes accordingly.

The city of Lae was selected as the priority project area for NRW management initiatives. HWA and Water PNG embarked on a remedial program which covered: (i) calibration of flow meters; (ii) survey and assessment of existing meters and replacement of failed ones; (iii) re-establishment of zone metering; iv) upgrading of operating procedures; and (v) training and mentoring of staff.

Within 3 months, Lae's NRW level was reduced to 35% from a previous high of 46%. Similar remedial programs were conducted in the provincial towns of Madang, Mount Hagen, and Wewak, which showed promising results in terms of minimizing NRW increasing revenues, and improving overall service.

As for working on asset management, HWA's review yielded the following observations: assets are unable to perform at optimal levels due to either inappropriate operational practices or poor maintenance, and absence of instrumentation and lack of data further complicated the situation. To remedy this, nonworking equipment were replaced and other assets were refurbished. In addition, a senior staff trained in asset inventory was hired.

To date, all assets in Water PNG's inventory have been recorded in an asset register. This asset register is used to progressively schedule and follow equipment maintenance activities.

Lastly, HWA and Water PNG prepared a technical brief for Lae covering areas such as water resources, water distribution, and wastewater management. This informed the preparation of Lae's master plan, which included the development of a hydraulic model and the procurement of two new low-pressure pumps, both for Water PNG's continuous efforts to reduce its NRW levels.

Photo: EMASESA

It is not enough that wastewater operators build the facilities. Facilities alone do not lead to better service for the public. If wastewater operators cannot sustain their operations, all their facilities will be wasted.

Making Septage Management Work in Indonesia

Tackling the issue of wastewater management takes various forms and interventions. What was previously thought of and widely accepted as an approach—putting up huge, centralized wastewater management systems—is slowly being challenged by decentralized, big impact interventions. Constraints such as the procurement of land for treatment plants and difficulties in laying new sewer lines compound the situation. Septage management is one solution to wastewater issues as it offers a viable alternative in expanding sanitation coverage to reach the non-sewered segments of society.

Under the ADB-funded Metropolitan Sanitation Management Investment Project, a capacity development technical assistance project was completed. The project resulted in the creation of a unit in the local government directly responsible for the integral sanitation management in cities particularly, septage management.

For cities such as Jambi and Pekanbaru in Indonesia, the responsibility of providing sanitation services fall on the shoulders of Dinas Kebersihan, Pertamanan dan Pemakaman Kota Jambi and Dinas Perumahan, Permukiman dan Cipta Karya Kota Pekanbaru, respectively. These operators have built new septage treatment plants in the two cities. However, these plants were not commissioned and not operational at the time, due to lack of operational capacity.

The operators' desire to participate in the WOPs Program was borne out of their need to learn from advanced utility operators in the field of septage management. They requested mentoring in maximizing and improving the delivery of septage services as well as guidance on starting operations of their septage treatment facilities.

The mentor under the program is Spain's Empresa Metropolitana de Abastecimineto y Saneamiento de Aguas de Sevilla S.A. (EMASESA), a public utility that provides water and wastewater services to over one million people living in Seville.

EMASESA started the collaboration with a diagnostic visit to the septage facilities of the two cities in 2015. This enabled them to gauge firsthand the sanitation situation, assess the current state of sanitation systems and infrastructure, and develop a proposal on possible courses of action to take during the twinning arrangement.

This was followed by a second mentor visit in January 2016, which focused on classroom discussions and training sessions covering: (i) improving laboratory, pretreatment, sampling procedures, and discharge and emptying of septic tanks; (ii) risk assessment and safety measures; (iii) septage management operation and process controls; and (iv) collection systems operation and control.

On November 2016, representatives from Dinas Kebersihan, Pertamanan dan Pemakaman Kota Jambi and Dinas Perumahan, Permukiman dan Cipta Karya Kota Pekanbaru were then invited to visit EMASESA's main office and observe how operations are being conducted. They toured the control center and wastewater treatment and purification facilities. These helped the participants understand and better appreciate the importance of continuous human capital development and technology-driven processes to improve service delivery.

EMASESA did a final visit during the first quarter of 2017. The activity highlighted specific recommendations towards improving treatment processes in the existing sludge treatment facilities (e.g., installation of new equipment and rehabilitation of components), proper maintenance of facilities, and an optimized design of septic tanks.

Photo: MWSI

It is not easy to implement a new program, particularly one that will introduce real or perceived inconvenience to the public. While pourashavas can get all the technical details from many other experts, nothing will beat hearing it from mentors who have done it themselves, faced the public, and able to turn the situation around into a win-win situation.

Operational Lessons in Manila Benefit Bangladeshi Pourashavas

In the provinces of Bangladesh, *pourashavas*[5] are at the forefront of handling the delivery of water and wastewater services to its constituents. However, they have not been fully effective in managing these undertakings due to weak governance, limited financial and human resources, and inadequate capacities to conduct proper planning.

Thirty of these municipalities are the recipients of ADB's Third Urban Governance and Infrastructure Improvement Project. The project aims to strengthen urban governance and delivery of basic services, including water and sanitation. It has a grant component on developing fecal sludge management (FSM) in these municipalities. To complement this and upgrade the skills of the operators in FSM, a WOP was forged between some *pourashavas* and Maynilad Water Services, Incorporated (MWSI).

MWSI is a private water and wastewater service provider based in Manila, the Philippines. It covers 17 cities and municipalities comprising the West Zone of the Greater Metro Manila Area. MWSI initiated and maintains a comprehensive FSM program, providing regular desludging services, septage treatment, and biosolids management. MWSI is a veteran mentor in the ADB WOPs Program, having guided several utilities on NRW management, including Khulna Water Supply and Sewage Authority in Khulna, Bangladesh.

Maynilad's WOP activities are handled by Maynilad Water Academy, the company's unit which offers capacity building programs to other water professionals in and outside the Philippines, including ADB staff.

Three *pourashavas* were chosen under the partnership: Chuadanga, Magura, and Jessore. Among the three, only Jessore has an existing septage management system comprising of three vacuum desludging trucks and a 950-square-meter septage treatment plant using reed bed technology. However, only one vacuum truck is in service and the treatment plant's operations are not documented and monitored. This became the starting point of the work plan—how to improve and sustain Jessore's septage management operations, with Magura and Chuadanga learning along the way.

While there is a notable difference in the scale of operations between MWSI and the selected municipalities, the former was able to adjust the twinning program to suit the latter's needs.

Together they focused on understanding the process of developing a septage management program. These included:

- Planning (database management, target setting, public awareness program);
- Establishment of process mapping from household desludging to disposal (programmed desludging and disposal);
- Collection and handling system (customer handling and safety); and
- Treatment and disposal system (plant operation and maintenance and sludge disposal).

This part of the partnership also involved (i) trainings on safety and vacuum truck unit operation, handling, and maintenance; (ii) preparation of operational procedures for customer handling, safety, and desludging operations; and (iii) implementation of a pilot public awareness program.

The social component of providing desludging services was emphasized during the formulation of the work plan. Acceptance of the program will redound to many positive effects including justification of tariff.

When representatives of the *pourashavas* visited Manila, they were exposed to how a systematic, professional septage management progam is ran. Based on what they learned, they were tasked to develop their own operational plan and initially implement it. For those without any existing systems, planning for septage management was required, including: target identification, budgeting, development of an information and education campaign, and organizational structuring. MWSI will soon visit the *pourashavas* to observe improvements made and recommend future steps.

[5] Pourashavas - municipalities

Photo: Sydney Water Corporation

Fiji's economy depends vastly on its waters. WAF must do everything to protect this most valuable resource.

Protecting Fiji's Waters through Better Wastewater Management Services

Climate change has affected the entire landscape of water and wastewater service provision globally. Fiji, a small country in the Pacific Rim, is no exception. Made up of an estimated 332 islands, its geographical location makes it highly vulnerable to the effects of climate change. Fiji has experienced prolonged dry spells in recent years, which have severely affected its agricultural and water sectors.

Aside from the high probability of severe drought, Fiji's waters is also threatened by indiscriminate liquid trade waste dumping from various nondomestic sources. This adversely affects the country's highest foreign exchange earner, tourism.

To help address these issues, the Water Authority of Fiji (WAF), the country's lead agency responsible for water and wastewater service provision, turned once again to the ADB WOPs Program, which has helped them improve their operational practices in the past. This time, focus is on developing the country's drought resilience through water conservation initiatives and establishing a commercial footing for implementing an industrial liquid trade waste management program. This partnership complements the ADB-funded Urban Water Supply and Sanitation Upgrading Project, which seeks to develop a new water source, expand water and sewage treatment capacities, reduce NRW levels, and assist in the implementation of water and sewerage tariff reforms.

Sydney Water Corporation (SWC), the mentor, is a state-owned corporation of the Government of New South Wales and is considered the largest water utility in Australia. It is one of ADB's long-standing mentors and a staunch supporter of the Pacific. SWC is responsible for the provision of water, recycled water, wastewater, and limited stormwater services to Sydney residents.

Aside from the usual remote consultations, on-the-job training sessions, and field demonstration activities between WAF and SWC, the Department of Environment (DoE) of Fiji also participated in the twinning arrangement. In its capacity as regulator of WAF, DoE was able to attain a better grasp of managing environment protection licensing for wastewater utility operators and managing trade wastes in general. The interaction between Fiji's DoE and the Environment Protection Agency of New South Wales gave the former invaluable insights on how to regulate operators and traders alike in a highly professional manner.

Over a period of 17 months, the partnership was able to achieve the following:

- A preparatory workshop for the development of a roadmap for trade waste management system, which involved the review of existing institutional arrangements and dynamics between relevant stakeholders;
- Integration of trade waste management with customer service management and consultations with commercial and industrial customers;
- Initial roll out of plans to implement liquid trade waste regulations;
- Drafting of Fiji's liquid trade waste policy,
- Benchmarking of SWC's water quality management and water conservation practices;
- WAF's Liquid Trade Waste Unit staff were able to understand the scope of operational challenges that may arise and how these are addressed from the perspective of SWC operations; and
- Audit of water conservation initiatives and efficiency programs, which determined the status of WAF's level of readiness in terms of policy implementation, trade waste policy adoption and managing a trade waste program.

From this, WAF identified steps towards a comprehensive liquid trade waste management system.

The partnership arrangement is expected to be concluded by mid-2017.

Photo: Haiphong SADCO

In WUSCs' quest to be free of open defecation, they have made much progress on providing basic sanitation services to their people. And now they need to look at the bigger picture, which goes beyond just toilets, but the whole sanitation value chain.

Paving the Way for Improving Sanitation in Nepal's Small Towns

Kathmandu Valley is Nepal's economic and political capital, and is the most populous and developed area in the country. Outside the valley, Nepal has many small towns with a population ranging from 5,000 to 40,000 inhabitants. Provision of water supply and sanitation services to these small towns is a responsibility of the water users and sanitation committees (WUSCs). WUSCs are supervised and supported by the Department of Water Supply and Sewerage (DWSS), under the Ministry of Water Supply and Sanitation, in terms of building their institutional capacities.

ADB's Third Small Towns Water Supply and Sanitation Sector Project was implemented in 2014. The project will fund physical investments in up to 26 small towns as well as soft infrastructure in the form of strengthening sector policy, regulatory and institutional capacity service delivery, and project management. A grant component supported by the Bill and Melinda Gates Foundation through ADB's Sanitation Trust Fund allows for the design and construction of pilot FSM facilities in four of these small towns: Kakarvitta, Mahendranagar, Chandrauta, and Charali.

To complement the grant component and specifically assist the small towns to anticipate the operational issues arising from the establishment of such facilities, the four towns were paired with an established FSM operator from Viet Nam, the Haiphong Sewerage and Drainage Company (SADCO).

SADCO is a publicly owned sewerage and drainage operator serving around 800,000 people in the third largest city of Viet Nam. It is responsible for operating and maintaining about 540 kilometers of sewer mains and providing desludging services to more than 160,000 septic tanks in four districts.

Being a former beneficiary of the WOPs Program, Haiphong SADCO expressed its keen interest and willingness to share its good operational practices to other water utility operators in the region. Specifically, Haiphong SADCO helped the four WUSCs to setup and initiate a sound and financially robust FSM operation in their areas.

Haiphong SADCO and the recipient WUSCs developed a joint work plan, which included remote consultations, study visits, and on-the-job training sessions. Exposure to operational and social conditions affecting FSM was a key component of the work plan. The active involvement of the Project Management Office of ADB's small towns project helped maximize the sharing of knowledge among the partners. The twinning arrangement covered the following areas:

- Building up working knowledge on FSM, which includes operational or technical, social, regulatory and financial aspects;
- Establishing the design standard for septic tanks;
- Completion of public septic tanks and toilet designs as well as establishing the required maintenance activities and tariff mechanism to implement;
- Designing information, education, and communication activities around FSM acceptance;
- Preparation of materials for the conduct public awareness campaigns; and
- Conduct of seminar to gauge public sentiments on the public awareness campaigns.

At the end of the partnership, significant progress on FSM was accomplished, and the twinning contributed to the following:

- Approval of the proposed institutional and regulatory framework to implement FSM in Nepal;
- Development of business models for the towns of Kakarvitta and Charali;
- Development of the operational manual and service level agreement;
- Development of a standardized design and guidelines for septic tank systems; and
- Integration of FSM in the Nepali government's Water, Sanitation, and Hygiene Policy Framework.

Going forward, the WUSCs expect to push through with the bidding out, construction, and commissioning of the fecal sludge treatment plants by mid-2017 to 2018. The FSM systems in Kakarvitta and Charali will be the benchmark for other small towns in Nepal.

PUBLIC–PRIVATE PARTNERSHIP

Photo: MWSS-RO

There is always room for improvement. This holds true in the regulation sphere of the public–private partnership environment of MWSS, where it is important to stay responsive with the needs of its customers and the private sector.

Making Private Sector Participation Work through Better Regulation

A strong regulatory environment is considered one of the major pillars in a successful public–private partnership (PPP) arrangement. Regulation protects consumers from unreasonable pricing and it also ensures a level playing field for the private sector so companies can operate in an efficient and prudent manner, while also encouraging more firms to invest.

The Metropolitan Waterworks and Sewerage System (MWSS) is mandated to deliver water supply and wastewater services in Metro Manila, the Philippines. After decades of lackluster service delivery and service coverage expansion, MWSS entered into a PPP arrangement with two private concessionaires in 1997. The Concession, bounded by an Agreement, was awarded to the concessionaires for 25 years, up to 2022 (update: extended up to 2037). The aim was to address and improve service levels while eliminating the fiscal requirement on government coffers. The Concession, touted as the largest water privatization in the world, led to the establishment of the MWSS-Regulatory Office (MWSS-RO) to oversee that commitments between contracting parties are duly observed and complied with.

In addition, MWSS-RO is responsible for monitoring the performance of the two concessionaires in accordance with the Concession Agreement. It also, reviews business plans, enforces rates and service standards, conducts regular performance audits, monitors the state of water infrastructure assets, and conducts a Rate Rebasing exercise every 5 years.

In light of the growing investment programs by the two concessionaires, the need to professionalize the Rate Rebasing exercise and ever-increasing demand from consumers, MWSS-RO sought to participate in the ADB WOPs Program to further strengthen its regulatory oversight capacity. While the program has traditionally only dealt with water utilities, it is cognizant of the fact that regulation is an ever-critical factor in sustaining water operations. For Manila, where the operators are quite sophisticated and successful, it is imperative that the regulations be similarly improved to sustain the water sector.

The mentor, Independent Pricing and Regulatory Tribunal (IPART) of Australia, is the regulatory agency of the New South Wales state. It reviews prices for several utilities in the state, including water, and decides how prices should change over a certain period of time. It is responsible for issuing operating licenses, which includes a customer contract indicating the service level commitments of the utility operator.

The pairing between MWSS and IPART is quite unique, as both partners are mature regulators, with extensive experiences in their respective areas of operations. The goal is to move the Rate Rebasing exercise from a concessionaire-led to a regulator-led one.

The work plan included conducting a review of the current regulatory framework to ensure adequate customer protection, evaluation of utility performance and incentives to improve operational efficiency, possible decoupling of the regulatory office, and lessons from various price review exercises.

Other components of the work plan covered:

- Sharing of Rate Rebasing information requirements imposed by the regulators to the concessionaires;
- Discussing the appropriate discount rate (ADR) computation framework and identifying the strengths and weaknesses of the ADR framework in the context of IPART's experience in calculating the weighted average cost of capital;
- Improving expenditure review for forecasting operating expenditures; and
- Improving conduct of review of historical and future capital expenditures.

The partnership is still ongoing but some results are already apparent. Thanks to the feedback on their ADR methodology and receiving the Submission Information Package, MWSS can impose on the concessionaires to mainstream business proposal submissions. The water operator partnership will be completed in 2018. It is expected that this will lead to the betterment of water services regulation for 12 million customers in Metro Manila.

SUSTAINABILITY

Photo: MWSI

LSTWSSUC appreciates the result of the WOPs Program, especially having made history in Nepal by improving water operators' capacity. As such, they have set aside a yearly budget for similar endeavors. In succeeding years, when mentors and ADB visit Nepal, they will see how LSTWSSUC's services have transformed because of the partnership.

Improving Operational Efficiency of Small-Scale Systems in Nepal

Outside Nepal's capital, Kathmandu, water supply and sanitation services are provided by small- scale operators called water users and sanitation committees (WUSCs). These WUSCs are supported by the Department of Water Supply and Sewerage (DWSS), the agency responsible for building institutional capacities of all water service providers in the country. This includes the National Water Supply and Sanitation Training Center (NWSSTC), formerly known as the Central Human Resources Development Unit (CHRDU), which designs and implements training programs for WUSCs with the goal to improve the latter's operational efficiency

Seeking to deviate from the usual training programs, DWSS participated in the WOPs Program and requested to receive mentoring in the fields of water loss or nonrevenue water (NRW) management and water quality management.

Leknath Small Town Water Supply and Sanitation User Committee (LSTWSSUC), which manages around 6,100 connections and provides drinking water services in Leknath, was chosen as the frontline operator to test out this unconventional, on-the-field type of training.

The mentor under this partnership is Maynilad Water Services Incorporated (MWSI), a private water and wastewater service provider in Manila, the Philippines. Its coverage area includes 17 cities and municipalities comprising the west zone of the Greater Metro Manila Area.

Though seemingly in contrast with the Leknath operator in terms of scale and customer base, MWSI has used a formula that is suitable for Leknath. It successfully improved its NRW levels from 67% in 1997 to 31% in 2015.

MWSI's Maynilad Water Academy (MWA), in coordination with NWSSTC, led the twinning partnership between LSTWSSUC and MWSI. The partnership focused on the development and implementation of a curriculum for NRW management and water quality management of small-scale water systems, as well as developing LSTWSSUC's capacity.

MWSI, DWSS, and LSTWSSUC developed a joint work plan spanning 27 months (from May 2013 to August 2015), which included a series of site visits, training sessions, continuous communication (through e-mail and video chat) in between visits, and training of trainers. The twinning arrangement also consisted of upgrading the CHRDU to NWSSTC to be more professionally managed and able to provide technical training courses in water loss and water quality management to local operators in Nepal, and training DWSS personnel on the establishment of district metered areas (DMAs) and its analysis.

The partnership was highly successful. By March 2016, at the concluding workshop, the noted accomplishments included:

- The formation of 10 DMAs, which served as "laboratory" for the operators;
- Training by MWSI experts on step testing, identification and installation of pressure points, and identification and documentation of reported leakages benefitting DWSS and local operators;
- Establishment of a customer meter inventory (around 7,000 meters profiled) and facilitating the installation and/or replacement of water meters and regular metering program;
- Improvement of institutional capacity of NWSSTC and acquisition of an ISO9001 certification;
- Development of a training course for local operators provided in the native language; and
- Improvement of laboratories, identification and installation of 18 sampling points, and development of a water quality monitoring protocol.

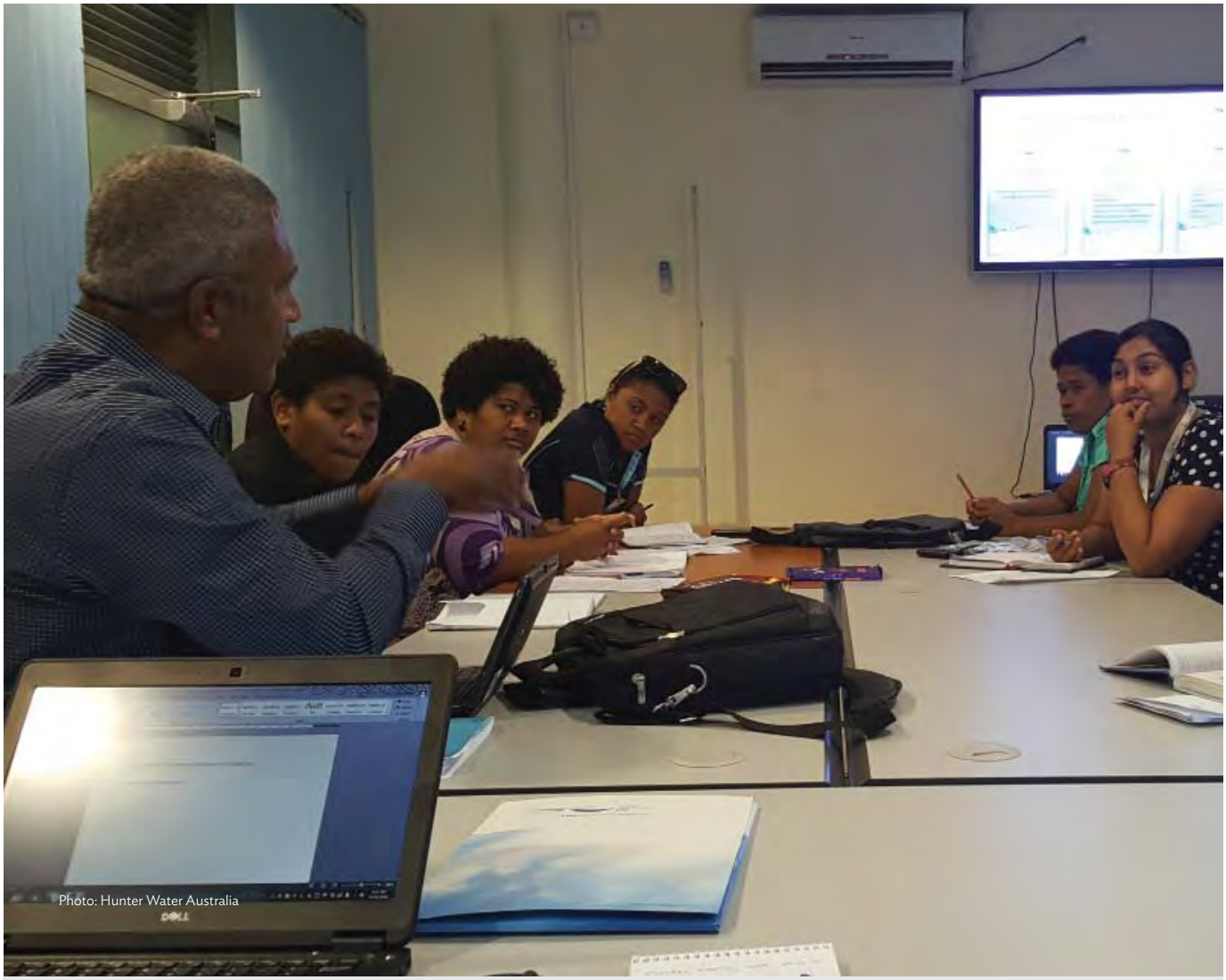

Photo: Hunter Water Australia

In the Pacific, although water operations are small, every problem is heightened and much more pronounced. WAF's unique situation makes them appreciate even more the value of a twinning program, where they can learn about operational best practices from more sophisticated fellow operators. For WAF, it's a privilege to get this kind of assistance.

Fiji and Australia's Partnership Resulting to a More Professionalized Water Operations

The Water Authority of Fiji (WAF) is the Pacific's largest and leading water utility. It provides water and wastewater services to over 144,000 residential and nonresidential metered connections in mostly urban areas and around 700,000 people in rural areas nationwide.

Given its considerable coverage and the demands of providing better and improved services to customers, WAF aims to pursue innovations that would help attain this objective. The operator decided to participate in the WOPs Program to improve its operational efficiency and key business functions. Specifically, WAF sought technical assistance on improving its wastewater operations and NRW management that is tailored to a business management training.

Hunter Water became their mentor under the program, which is supported by the Pacific Region Infrastructure Facility. Hunter Water refers to the group of companies comprising Hunter Water Corporation, the public water and wastewater provider for the lower Hunter region of New South Wales, Australia, and its subsidiary company, Hunter Water Australia (HWA), a specialist technical and operations firm in water and wastewater. An exhaustive list of topics were covered with Hunter Water's guidance:

- **Water quality.** A refresher course was given to WAF's National Water Quality Laboratory personnel, focusing on the HWA laboratory methods for analysis and suitability of techniques employed, equipment used, technical skills needed, and safety and quality assurance practices.
- **Service level and business case.** Sessions included accounting management, water loss management, and operational efficiency of treatment plants (i.e., exploring various energy- saving measures, energy audit, maintenance, etc.).
- **Water system modeling.** This consisted of meter exchange, data analysis of customer meter reading and consolidated consumption data, application of modeling software, data trimming, and familiarization exercise.

The mentoring program brought about tangible results in such a short duration. These included:

- Establishment of a NRW unit to focus more on water flow monitoring and the implementation of a meter management program (this unit was instrumental in the replacement of around 26,000 meters that contributed to bringing down NRW levels from 51% in 2013 to 46% in 2015);
- Institutionalization of the conduct of energy audits in WAF operations, which generated savings estimated to be around $1.3 million in less than 2 years;
- Reduction in the number of areas with intermittent water supply from 67 (2013) to 14 (2015) as a result of the water system modeling conducted;
- Generating additional income ranging from $2,000 to $6,000 per quarter as a result of the above, and reducing water carting cost of about $900,000;
- Increased capital funding from $33 million (2014) to $82 million (2015) as a result of the business planning exercise;
- Review and update of master plan; and
- Improvement of laboratory processes and procedures with the acquisition of new equipment and the integration of new methods.

The twinning engagement, which was initially set for only one year, was soon extended. WAF management, upon seeing the immediate results of the program and realizing the vast potential it can bring, requested to pursue a second phase of the arrangement. This was keenly supported by ADB. By the end of the extension, WAF and HWA were able to develop a capital expenditure works procedure manual and wastewater modeling using advanced software. The two also initiated methodologies for project delivery and detailed design.

Photo: BIWASE

The close relationship with NPNL encouraged BIWASE to pursue a twinning program supported by ADB. The twinning not only strengthened BIWASE's technical competencies but also their ties with fellow utilities experts.

Optimizing Water Supply Services through Improved Operations in Vientiane, Lao People's Democratic Republic

Vientiane, home to nearly 800,000 residents (as of 2015), is the capital and the largest city of Lao People's Democratic Republic (Lao PDR). It is the driving force of the national economy, in large part due to its thriving tourism industry, which attracts a steady influx of tourists annually thanks to its renowned temples and Buddhist monuments. The inflow of foreign investments in the city over the recent years has also contributed immensely to the country's overall economic development.

The provision and maintenance of the city's basic infrastructure and services are vital in sustaining the gains from this reinvigorated economic activity. Interventions that meet the public's growing needs must also be in place.

In terms of water supply, the responsibility falls on Nam Papa Nakhone Luang (NPNL), a state-owned and-controlled corporation. NPNL is responsible for sourcing, treating, and delivering potable water supply to the residents of six towns and two suburbs in Vientiane.

Water supply coverage is currently estimated at around 67%, comprising about 100,000 service connections. With continued rapid population growth and economic development, estimates point out that NPNL's daily water supply production rate of around 180,000 m^3 (from four water treatment plants) would be direly insufficient by 2030.

NPNL and their mentor, Binh Duong Water Supply, Sewerage and Environment (BIWASE) of Viet Nam, agreed to cooperate and seek assistance from ADB for a utility twinning program. Consistent with ADB's investment programs in the Lao PDR, the twinning program was started in 2015.

BIWASE is responsible for providing water and wastewater services to around 830,000 residents in Binh Duong Province. Its customer base is predominantly composed of residential and industrial users.

The partnership aims to capitalize on the good relations and proximity between Viet Nam and the Lao PDR (the former being the largest foreign direct investor of the latter). The operations of BIWASE is relatively comparable in scale with NPNL, making the twinning arrangement a perfect fit.

The two operators developed a joint work plan sufficient for 19 months, which included site visits, remote consultations, and technical training sessions. More importantly, it focused on increasing operational efficiency, working on:

- Leak detection and repair, network pressure management, and meter calibration and replacement;
- Data collection, updating and analysis of operations data (e.g., power consumption of plant equipment, water quantity, inventory of water meter installation);
- Establishment of pilot DMAs for NRW management and energy efficiency;
- Preparation of an operations manual for water treatment plants; and
- Billing collection system management.

BIWASE personnel trained NPNL staff in establishing three DMAs(Tatthong, BoO, and Thadeua Villages), providing the latter hands-on experience and better understanding on leak detection and management, computation of NRW levels, and the importance of data collection and management. After completing the twinning program, NPNL continued the practices it started with BIWASE in appreciation of the improvements achieved in its operations

Photo: ADB Photo Library

Customers will always demand for better services. As a water operator, BWSGC needs to rise to this challenge by continuously improving its ways.

System Improvements for a More Efficient Service in Baotou City, People's Republic of China

In the People's Republic of China, ADB closely coordinates its WOPs Program with the China Urban Water Association (CUWA). The first twinning partnership established in the country involved the Zheng Zhou Water Supply Corporation and City West Water (CWW) of Melbourne, Australia. As a result of continuous consultations with its member utilities, CUWA recommended the Baotou Water Supply General Company (BWSGC) as another beneficiary of the program.

Established in 1956, BWSGC provides water supply services to Baotou City in the Autonomous Region of Inner Mongolia. Currently, its service population is estimated to be around 1.4 million residents. With a water distribution network totaling 1,510 kilometers, BWSGC is constantly managing its water assets to ensure the continuous provision of safe water supply to its customers.

In its desire to improve operational efficiency and service delivery, BWSGC sought participation in ADB's WOPs Program since it offers a non-traditional way for operators to build capacities through peer-to-peer mentoring.

The selected mentor for the program, CWW, is no stranger to twinning arrangements with Chinese utility operators, having been a mentor to the Guiyang Beikong Water Group Company before. Its extensive experience in the provision of drinking water, sewerage, trade waste, and recycled water services in Melbourne is sure to help BWSGC attain its goal.

To set the partnership in motion, CWW and BWSGC developed a joint work plan for implementation. This covered remote consultations, in-country visits, and technical training session focusing on establishment of a DMA; development of key performance indicators (KPIs) to measure system performance; development of a hydraulic model; and understanding network pressure management.

Over a period of more than 2 years, the twinning arrangement was able to accomplish the following:

- **Pilot DMA**. A pilot DMA area was established by BWSGC in Tiexi district where a number of activities were undertaken to improve system efficiency. These included installation of bulk flow meters, installation of water meters in unmetered areas, improvement in meter reading processes, and replacement of poor performing water mains. This has significantly contributed to the reduction of NRW levels by half (31% in 2013 to 16.3% in 2014).
- **Development of KPIs**. BWSGC has demonstrated a working knowledge of KPI data capture and performance reporting. Three KPIs were developed: NRW, water main breaks per 100 kilometer, and average time to rectify water repairs. The analysis of KPI performance highlighted potential improvement areas and the results have been instrumental in assisting BWSGC in developing targeted asset management and maintenance activities. This, in turn, translated to reduced water losses and service interruptions.
- **Hydraulic modeling**. CWW provided specialized training on the use of freely available software to develop a simple hydraulic model for the selected pilot area. The training consisted of the basic development, calibration, use, and analysis of the hydraulic model.
- **Pressure management**. Considering that the current network distribution managed by BWSGC operates at relatively low pressures, CWW suggested that its initiatives concerning pressure management be put on hold.

The partnership has left a good and lasting impression on both parties. At the final mentor visit on August 2014, BWSGC and CWW entered into a memorandum of understanding to further bolster and sustain their cooperation and working relationship long after the mentoring program lapsed.

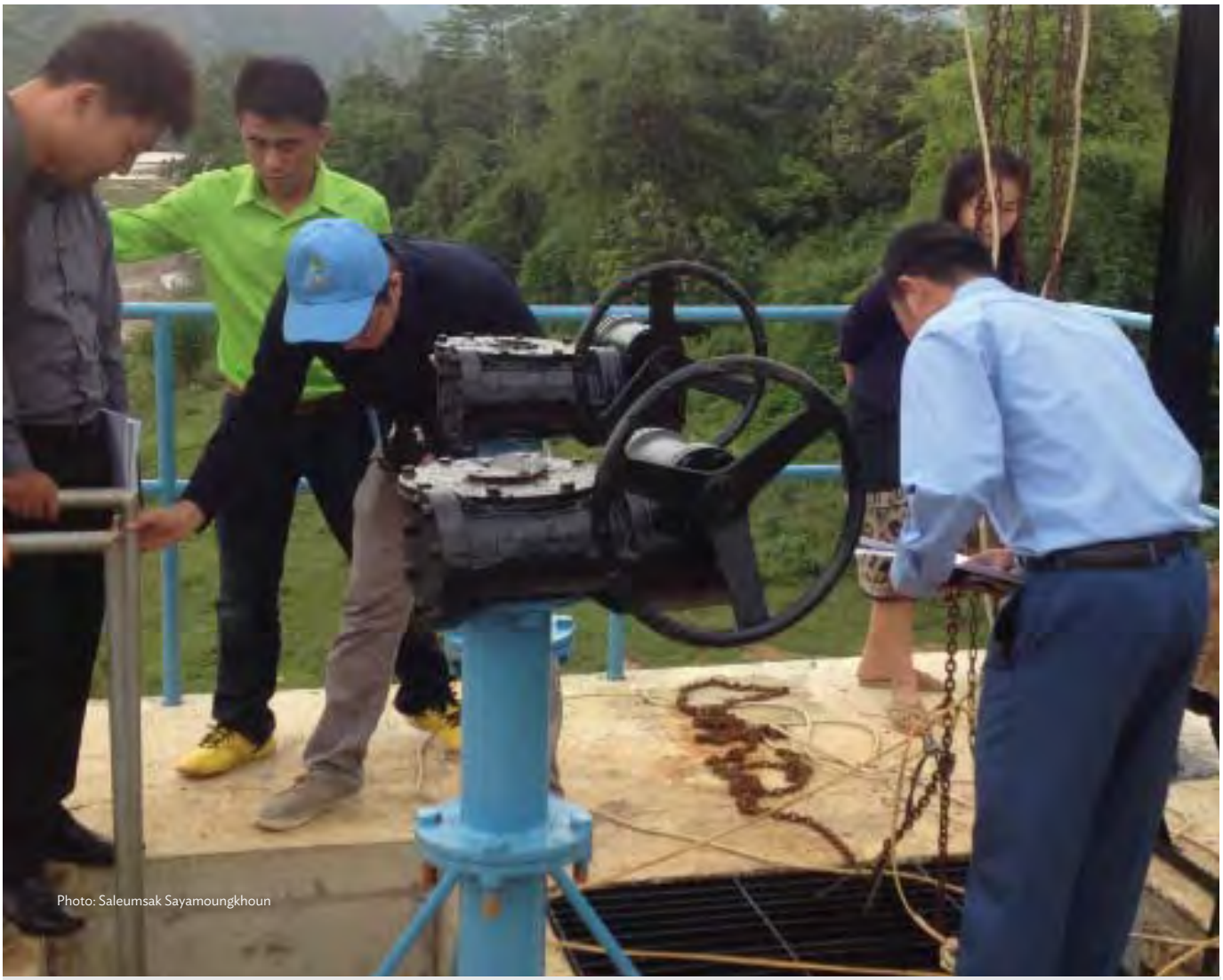

Photo: Saleumsak Sayamoungkhoun

There is always room for improvement if DHUP wants to deliver better services for the community. With its commitment and the kind assistance of experts, DHUP is confident that it can do its best under limited circumstances.

Focusing on Lao People's Democratic Republic's Provincial Nam Papas

The only land locked country in Southeast Asia, Lao PDR is home to about 6.5 million people predominantly residing in rural areas. However, urbanization is catching up with an estimated rate of about 5% each year. The country's development hinges on foreign direct investments in natural resource extraction and hydropower.

To sustain this growth and reap the benefits of an emerging economy, the government has committed resources to provide basic infrastructure and services to its people. Water supply provision, for one, is currently being handled by the Ministry of Public Works and Transportation. Meanwhile, operation of provincial water enterprises, known as provincial *nam papas*[6], is under the Department of Water Supply. This agency was only formed in 2016, focusing on the *nam papas* across Lao PDR's 17 provinces. Previously, the Department of Housing and Urban Planning (DHUP) oversaw these water enterprises.

At the time when it was still in charge, DHUP wanted to further improve water supply service to its customers. So, they joined the ADB WOPs Program, requesting mentoring in institutional capacity building specifically on improving operational efficiencies.

Their mentor was the Provincial Waterworks Authority (PWA) of Thailand, the agency responsible for providing water services nationwide in areas outside Bangkok Metropolitan, Nonthaburi, and Samut Prakarn provinces. PWA has extensive experience in achieving performance efficiencies in its operations, which has resulted in significant improvements in service delivery.

This operator is also a product of the WOPs Program, having been mentored by Australian utility WaterCorp. As such, PWA has that singular position to deeply appreciate the value of on-the-job training, and thus closely guided DHUP to develop a robust training program.

Unlike other twinning arrangements, their work plan was composed of several master classes. Each master class lasted for a week, and was a combination of classroom and field demonstration. Along with the standard remote consultations and study visits, their work also included refresher workshops both in Vientiane and Khon Khaen, Thailand and on-the- job training for the *nam papas*. It greatly helped that the Laotian operators can understand Thai well, which made the training sessions more effective. Over 8 months, they were able to tackle fundamentals in water supply production and treatment processes, asset management, network design, and managing NRW losses. They also trained select *nam papas* from the provinces of Oudomxay, Vientiane, Champasak, and Houaphanh (Add-Xiengkor District, Xay District, Pakbeng District, Vangvieng District, and Donthalath Village in Champasak District) on water quality testing and control, water sampling, proper use and maintenance of equipment, chemical dosing, backwashing rate, measurement of sand expansion, and measurement of water leakage rate.

The engagement between the two partners was highly successful. The participants, aside from refining their working knowledge on water supply production and treatment theories and processes, received practical hands-on experience on various facets of improved water quality management and service delivery. The success of the partnership was further validated by the overwhelming satisfactory ratings provided by the participants at the conclusion of activities.

Currently, one of the *nam papas*, the Luang Namtha provincial *nam papa*, is engaged in a partnership with WaterNet of Amsterdam, receiving assistance in improving information technology systems. This is a good continuation of enhancing capabilities, so they can better respond to the demands of their service areas. In the near future, as a sign of a virtuous cycle, Luang Namtha will serve as mentor to the nearby provinces of Luang Prabang and Bo Keo.

[5] Nam papas - water supply utilities/enterprise

Photo: PWA

PWA needs to accept that the climate is changing. There is no other choice but to adapt to extreme weather events and manage PWA's operations to be more resilient. The less inconvenience to the public, the better.

Improved Water Operation Resilience in Thailand

The advent of climate change has been a game changer for all. The anomalies in weather patterns across the globe have brought about severe conditions where areas are now exposed to either extreme flooding or extended periods of drought. In recent years, Thailand has had its fair share of the former, and with the worst occurrence affecting its economy tremendously. And sooner or later, this will also impact the operations of different sectors, including water.

PWA of Thailand is the agency responsible for providing water services across the country except in Bangkok Metropolitan and Nonthaburi and Samut Prakan Provinces. It supplies water to urban areas through 233 waterworks. Yet despite its extensive coverage area, the sustainability of the agency's operations is being threatened. Extended periods of drought and increased runoff in several service areas have resulted in the continuous degradation of the quality of its raw water sources as well as dwindling availability of supply.

While it has made significant strides in its operations and service provision over the years through various internal initiatives, PWA deemed it necessary to seek technical assistance to enhance its resiliency in handling the negative impacts of climate change. Specific areas of concern include water quality improvement, water losses management, and energy efficiency. As a result, PWA participated in the WOPs program.

The mentor, Water Corporation (WaterCorp), is an established water utility serving over two million people across Western Australia. It has vast experience in operating under water-stressed conditions and has instituted various innovations in water loss and water quality management and initiatives focused on energy efficiency.

Aside from WaterCorp, PWA also benefitted from the support extended by the United States Agency for International Development through WaterLinks. WaterLinks is a non-profit organization based in Manila, the Philippines, which actively promotes and facilitates water operator partnerships between water and sanitation service providers to build institutional capacities and improve operations.

PWA and WaterCorp developed a joint work plan, which covered remote consultations, technology demonstration visits, and on-the-job or classroom training sessions. The work plan focused on improving sustainability of operations even under extreme weather events. Over a 15-month period, the twinning arrangement covered:

- Training sessions on water quality improvement and energy efficiency focused on improving Chiang Rai waterworks;
- Training sessions on water quality improvement and water loss reduction focused on Udon Thani waterworks;
- Building climate change resiliency measures responsive to the concerns arising from the Chiang Rai and Udon Thani waterworks;
- Implementation of new protocols on water quality improvement and management, including installation and operation of polymer (Chiang Rai) and chemical dosing units (Udon Thani); and
- Meter replacement program in Udon Thani and energy efficiency assessment in Chiang Rai.

The engagement between the two partners was seen as highly productive. During the final visit of WaterCorp to PWA in January 2015, the former highlighted various opportunities for future collaboration and other areas for improvement. These included the procurement of state-of-the-art software to facilitate continuous monitoring of operations, which can benefit a service coverage as extensive as PWA, with its many assets and facilities. Other areas to look into are water quality data collection and plans for replication or scaling-up of activities to benefit other waterworks under the ambit of PWA.

ADB WATER OPERATORS PARTNERSHIP

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Forging Partnerships Among Water and Wastewater Operators

Providing access to clean water continues to be a challenge for governments. To date, at least 1.8 billion people use drinking water sources that are contaminated and an estimated 663 million people across the globe do not have access to improved drinking water sources. The selected case briefs provide an insight on the various partnerships created to improve local water utility operations and service delivery provision. Find out how peer-to-peer learning and mentoring can be used to spread expertise and best practices in the field of water utility operations to further improve sustainable water and wastewater service delivery.

About the Asian Development Bank

ADB's vision is an Asia and Pacific region free of poverty. Its mission is to help its developing member countries reduce poverty and improve the quality of life of their people. Despite the region's many successes, it remains home to a large share of the world's poor. ADB is committed to reducing poverty through inclusive economic growth, environmentally sustainable growth, and regional integration.

Based in Manila, ADB is owned by 67 members, including 48 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance.

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ASIAN DEVELOPMENT BANK
6 ADB Avenue, Mandaluyong City
1550 Metro Manila, Philippines
www.adb.org