Pioneering Water Solutions in Urbanising Areas:

Synthesis Report from 2011 IWA Development Congress

International Water Association

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Foreword

With the overarching theme of 'Pioneering water solutions in urbanising areas', the IWA Development Congress in Kuala Lumpur provided an opportunity to present, debate and understand the latest thinking and experiences as to how potential solutions can be tried, tested and scaled up. In doing so, it focused on issues ranging from appropriate technology solutions to broader enabling mechanisms such as governance, finance systems, capacity development and stakeholder mobilisation.

This report is a reflection of the high quality presentations, rich discussions and general sentiment carried throughout the week of the IWA Development Congress, and aims to distil and synthesise key points within broad thematic areas. This document is therefore an aide memoire for those who attended and moreover, a synopsis of where we are today in relation to applying solutions that work in low and middle income countries.

The IWA Development Congress provided IWA members and partners with a vehicle to challenge the current conditions, work collaboratively and develop real solutions for the future. Through these efforts, IWA aims to create a positive impact on poverty reduction, economic growth, human health and environmental sustainability in cities throughout the world.

I would like to take this opportunity to thank the Congress strategic partners, including the Water and Sanitation Programme of the World Bank, UN-Habitat, World Health Organization, The Nature Conservancy, WaterLinks, USAID, Asian Development Bank, Stockholm International Water Institutes and IUCN, and the Congress sponsors including Miya, Salsnes Filter and the OPEC Fund for International Development. Lastly, I would like to thank the 600 international delegates who arrived in Kuala Lumpur with their own unique contributions, ideas and solutions. Their enthusiasm, professionalism and willingness to share and learn made the 2nd IWA Development Congress a great success.

Paul Reiter,
IWA Executive Director

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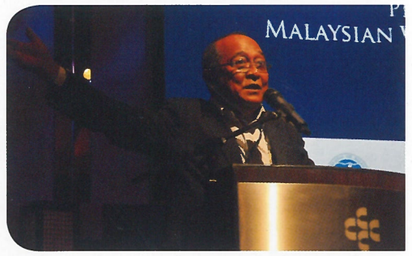

Introduction

The Malaysian Water Association (MWA) and entire Malaysian water sector were proud to welcome the IWA family to Kuala Lumpur to organise the 2011 edition of the Development Congress, the first time this prestigious event is staged in East Asia. Over 600 delegates from 63 countries representing government officials, water and wastewater utilities, donor agencies, multi-lateral agencies, universities and NGO's discussed lessons learned and success factors from across the spectrum of low and middle income countries.

We were particularly grateful to our international keynote speakers, Ek Sonn Chan, CEO, Phnom Penh Water Supply Authority, Cambodia and Jae So, Manager of the Water and Sanitation Programme of the World Bank. Also our own Secretary General for the Ministry of Energy, Green Technology and Water, YBhg Datuk Loo Tok Gee, provided the delegates with an insight to how the Malaysian water sector has developed in the past decade and how it will continue to do so in the future.

Staging this biennial event provided Malaysian water professionals with a unique opportunity to network with leading practitioners, researchers and policy makers to understand the challenges, solutions and development opportunities in other regions of the world. We were proud to showcase our country and provide ample opportunity to enjoy our culture, cuisine and hospitality. We look forward to 2013 and the third edition of the IWA Development Congress to be organised in Africa, where we hope to see continued progress in bringing solutions that work to the international water community.

Ahmad Zahdi Jahil,
President, Malaysian Water Association

Cities of the future: delivering sustainability

Urbanisation around the world has brought a sharp increase in domestic, municipal, industrial and environmental water use in both existing and newly developed urban areas. Over the next 40 years, approximately 800,000 new urban residents will be added every week to existing and new cities around the world. This will mark the second wave of urbanisation, with just over 50% of humanity living in urban areas today. The majority of urban population growth will occur in smaller cities and towns, and not in the megacities as many might think, and particularly in lower and middle-income countries.

Paul Reiter, the Executive Director of the International Water Association, says: 'This would be a big enough challenge on its own, but it is even more profound when one considers that of the 3.5 billion people living in urban areas around the world today, less than 50% have access to adequate water and sanitation services.' At the same time, poorly targeted programmes, underinvestment, lack of awareness of existing alternatives and insufficient innovation in conventional water and sanitation have resulted in a world where:

- **15% of people** have no access to an improved water source (0.9 billion)
- **40% of people** have no access to improved sanitation (2.4 billion)
- **50% of people** have no potable in-house tap water (3 billion)
- **60% of people** have no continuous access to water (3.6 billion)
- **70% of people** have no sewerage connection (4.2 billion)
- **80% of people** have no wastewater treatment (4.8 billion)

In addition, we are facing a world in which more and more competition for limited water resources will be the rule rather than the exception. The sources and management of water for cities will of necessity change a lot – dramatically in some cases. For rapidly expanding cities in arid areas, this scenario is not a distant future but a reality of today. In China, for example, between 40 and 70% of surface water cannot be used as source water for drinking water due to pollution. This will require cities to turn to alternative sources of water supply.

> **"The majority of urban population growth will occur in smaller cities and towns"**

Xiaochang Wang, of the Xian University of Architecture and Technology, China, indicates that reuse of wastewater is one of the most viable options for augmenting supplies: 'In 2005, 11 billion cubic metres of wastewater was treated. With a need for at least a six billion cubic metres increase in supplies for 400 cities in northern China, re-using wastewater provides a real solution.' According to Professor Wang, this requires the building of sustainable urban water environmental systems. Such systems would be best organised in a 'semi-centralised' manner with independent collection systems covering a small service area, on-site treatment and on-site re-use. It would avoid long distance transfer of the collected wastewater and treated wastewater, and could potentially reduce energy costs considerably.

In developing countries where it is predicted 80 to 90% of future urban growth will occur through 2050, there are the twin challenges of building highly efficient water systems capable of absorbing growth in population and rising per capita use, and delivering services at a much lower per capita cost than that of the conventional systems found in the US and Europe today. Semi-centralised solutions that enable wastewater reuse, generate energy and capture nutrients have great potential in lower and middle income countries. Kala Vairavamoorthy, of the University of South Florida says: 'We need to work towards water and wastewater systems that are easy to maintain, are low cost and generate safe water, energy and nutrients that can all be used and re-used at the local level.'

Scarcity of locally available water supplies, competition for water between agriculture and energy, and climate change impacts, amongst other pressures, will require cities to use water far more efficiently. To achieve this we will need to optimise both water use within cities and at the basin level with other uses such as agriculture, energy and nature. As towns and cities of all sizes expand, they usually do so without due regard for efficiency or urban planning and infrastructure.

A key challenge for urban water and sanitation is serving the unserved. The technical and institutional approaches used in service delivery often follow a 'one size-fits-all' pattern that is increasingly seen as inappropriate and not cost effective. Graham Alabaster, UN-Habitat, says: 'A whole set of differentiated service approaches and wastewater management systems at different levels is needed to reach the poor.' Such a 'patchwork' of urban water supply and sanitation services will need to form the conceptual backbone for planning at the city level. Innovation will have to come through working within the 'jigsaw' of opportunities and constraints, tailoring solutions to local conditions and opportunities throughout the city. We have to create affordable, incremental steps that over the long run lead to a growth in drinking water and sanitation service levels in line with the community's ability to pay.

> **"We are facing a world in which more and more competition for limited water resources will be the rule rather than the exception"**

City leaders in lower and middle-income countries are increasingly aware that they have to increase the efficiency of water use and service to the unserved. To do so, an Integrated Urban Water Management (IUWM) approach to planning and managing the water supply, sanitation and other environmental services, in close integration with both the city's urban development and management of the surrounding basin, could well be part of the solution. Michael Jacobson, of the World Bank, notes: 'An IUWM approach addresses the entire urban water and wastewater cycle and takes into account the availability of quality water resources for different needs and users and safe reuse or disposal of wastewater. We need to focus on how we can operationalise IUWM to address challenges in developing countries.'

> **"We need to focus on how we can operationalise Integrated Urban Water Management"**

Establishing more integrated approaches to urban water and sanitation planning and delivery is increasingly relevant with rapid urbanisation unfolding in the coming decade. To reduce the increasing pressure on water resources, such planning approaches must not only address the water cycle but also ensure a positive impact on energy efficiency and enable income generation. Creating the sustainable 'Cities of the Future' in lower and middle income countries will require a paradigm shift in both the design of cities and the conception of their water and wastewater management, treatment and service provision systems.

Utility efficiency and effectiveness: beyond boundaries

Water utilities play a pivotal role in the delivery of services to urban populations. They are a great enabler of prosperity, providing essential public services that underpin citizens' livelihoods. At the same time, many utilities in lower and middle income countries are unable to provide adequate service levels, including to the poor, and so undermine city development and sustainability. To overcome this situation requires the development and operation of efficient and effective water utilities: utilities that use resources intelligently and ensure that all urban residents are served.

Roland Liemberger, Regional Director of Asia for Miya, says: 'We need to define efficiency in a more comprehensive way and look beyond utilities' boundaries.' This implies we should look at the internal water utility efficiency, which is defined by all the functions performed by a water utility, and seeks to answer the question, 'How efficient is the water utility as an organisation?'. We further need to look at 'external' water utility efficiency, which is defined by the water service provided by a water utility to its customers. This provides a much broader perspective on efficiency and effectiveness, and takes into account the context in which a utility operates.

> **"We need to define efficiency in a more comprehensive way and look beyond utilities' boundaries."**

Jan Janssens, Managing Director of JJC Advisory services, indicates that the context for utilities is changing and there is a need to be responsive to the changes. Mr. Janssens explains: 'The implications of a utility's decisions and accountabilities now stretch well beyond company structures to the public, regulators, consumers and shareholders alike.' Nowadays there is an increasing degree of scrutiny of the underlying basis and processes for decision-making. For any utility, delivering safety, acceptability and reliability within a multi-stakeholder, multi-institutional context is not easy. And doing so as a healthy public or private business with increasing expectations is even more of a challenge.

To improve the efficiency and effectiveness of water and wastewater utilities means extending these concepts beyond the technical elements to include government policy, strategies, accountability and effective infrastructure. Approaches that provide a more integrated view are taking the lead in achieving improvements in management and operation, as well as delivering against wider socio-economic targets. Managing risk from catchment to consumers through Water Safety Plans (WSPs) is seen as a mainstream approach for utilities looking beyond a narrow utility perimeter.

Utilities need to become much more dynamic and action orientated, far too often we see utilities completing plans – such as WSPs, Performance Improvement Plans (PIPs) – and not implementing them, thus not bringing about service improvements as intended. Furthermore, these more systematic approaches to planning provide a reliable and robust framework to inform capital investment requirements that are orientated towards sustainable service expansion.

Utility best practices – such as WSPs, Strategic Asset Management and Non-Revenue Water (NRW) management – can be quite data intensive approaches; however the rewards for data collection and analysis are high. The ability of a utility to monitor and chart its progress towards more efficient and effective service levels is paramount both for its own purposes, but also for regulators, financiers and consumers. To achieve service efficiency and effectiveness it is necessary for a utility to step outside of the comfort zone, look at the delivery system as a whole, take steps, make progress and improve incrementally.

Equitable access for the urban poor

The poor represent a growing and significantly underserved proportion of urban citizens in lower and middle income countries. Very often, they pay much more for water and sanitation services than middle and high income residents, yet the services they receive are often of a poorer quality than those with higher incomes. Maarten Blokland, Associate Professor at UNESCO-IHE, says: 'The poor are two to five times less likely to use improved facilities than the rich.' Whilst the MDGs and the human right to water and sanitation have drawn attention to the needs of the urban poor, large-scale, sustainable interventions are required to meet the growing numbers of unserved urban populations.

The inherent challenges to serving the poor are well known. And yet water utilities are often hindered in overcoming these challenges by a range of obstacles including weak governance, unclear land tenure and inappropriate tariffs. Says Ian Banda, Managing Director of Kafubu Water, Zambia: 'Due to a lack of access to formal water and sanitation supply systems, the consumer is faced with paying a premium for these services, often from illegal vendors.' Where formal systems do exist, the water utility will often face difficulties in recovering its costs to adequately cover operating expenditures. This often creates a vicious cycle of underinvestment in the water supply system, which in turn disincentivises consumers from using and paying for a deteriorating service.

> **"We have realised that the informal settlements give us a big opportunity for customer growth and reduction of non-revenue water."**

Philip Gichuki, Managing Director of the Nairobi City Water and Sewerage Company (NCWSC), Kenya, describes his company's strategy for serving populations in informal settlements: 'We have realised that the informal settlements give us a big opportunity for customer growth and reduction of non-revenue water.' In the case of Nairobi, this has led to the establishment of an Informal Settlements Department (ISD) specifically to coordinate development of water and sanitation infrastructures in informal settlements. Within this context, NCWSC is focusing on extending its services to informal settlements through close cooperation with civil society groups. This includes the implementation of joint programmes and wider and more vigorous stakeholder involvement focused on pro-poor initiatives.

Tariffs and subsidies have a role to play in improving service delivery to the urban poor. Sénégalaise Des Eaux (SDE), for example, attributes water supply service level improvements to greater operational efficiency. This has allowed the utility to keep affordable tariffs: it has maintained a social tariff at the same level since 2004. SDE Director General, Mamadou Dia, comments: 'In Senegal, we have managed to increase access from 80% coverage in 1996 to 98.5% coverage in 2010 and at the same time improve water quality compliance levels. The social tariff we have in place has been an important contributing factor in helping us to achieve this.'

However, for sanitation, Isabel Blackett of the World Bank Water and Sanitation Programme suggests that the 'business-as-usual' subsidies to services for the poor will not create improved urban sanitation outcomes. She indicates that a move towards output-based incentives could provide a new, innovative and targeted approach. She notes: 'We have seen that in Morocco output-based aid in unplanned urban settlements has helped to connect 11,300 poor households to water and sewerage. In Indonesia, so far 3200 out of a target of 10,000 connections have been installed.'

Traditional subsidies are not always the most effective way to accelerate the delivery of sanitation services. The fragmented nature of sanitation service delivery and over-spending on wastewater treatment compared to sewer connections often means alternative incentives need to be developed. In Jakarta, for example, Palyja has connected 400,000 of the poorest among the population in 12 years using output-based aid as well as establishing a master metering systems and water kiosks.

Achieving the enabling environment, including strong institutions, effective policies and appropriate tariffs, is paramount. Philip Giantris, Director of ValueAdd, Albania, says: 'It's difficult to find a well-run utility in a country that lacks the fundamentals of good governance.' In countries where good governance exists, poorly-performing utilities tend to be the exception to the rule. This observation is supported by Maarten Blokland, who is leading an international research study into pro-poor benchmarking: 'The benchmarking system we are now piloting appears to yield internally-coherent results, suggesting linkages between deficiencies in enabling processes on the one hand and service quality on the other.'

With continued population growth and rapid urbanisation, serving the urban poor is a moving target that requires service delivery mechanisms which are flexible enough to accommodate growth, but robust enough to offer sustainability. A portfolio of approaches for serving the urban poor is needed, which can include incentives for establishing and sustainably using formal supply systems, better access to finance and credit, effective regulation and professionalisation of the sector as key interventions. Global policy is moving beyond securing 'improved access' and towards the attainment of context-specific service levels, with a great impetus from implementing the human right to water and sanitation.

Frontiers in urban sanitation

In most lower and middle-income nations, urban sanitation services remain rudimentary. While progress is being made in improving access to and delivery of urban water supplies and sanitation, including wastewater treatment, the sector continues to lack the necessary investment. While the situation is widely recognised as acute in larger cities, it is deteriorating even more rapidly in smaller urban centres where population growth is highest. As a consequence, public health and environmental impacts in and around cities are widespread, and increasingly culminate in economic impacts with significant repercussions at both the local and national level.

Innovative and appropriate technologies designed to transform waste streams into reusable products and energy need to become a cornerstone in tackling the lack of sanitation. With increasing pressures and demands on limited natural resources, there is an urgent need to provide additional incentives for investing in sanitation. The reason is that often demand for reuse water is distorted by subsidies that influence market forces, and existing standards that place undue preference on conventional technologies.

Results from South-East Asia based on research undertaken by the Water and Sanitation Program show that economic benefits vary substantially between technology options and also between countries. In his presentation, Guy Hutton stresses that poorly functioning systems fail to deliver services efficiently and therefore fail to achieve optimum economic benefits. This proves that management arrangements, supply chains for spare parts, and operation and maintenance-related services need strengthening to ensure sustainability. This is also illustrated by Innocent Tumwebaze, of the Makerere University College of Health Sciences, School of Public Health, who explains that most access to sanitation in slums is through shared pit-latrines, and a connection to sludge emptying services is vital to the sanitary condition of these facilities.

A number of case studies illustrated the symbiosis between technological development, management and financing arrangements in achieving sustained sanitation service delivery at scale. Innovative technologies to transform waste streams into reusable products and energy need to be applied at scale. Pierre Flamand, from the Japanese Sanitation Consortium, describes the range of technology options to achieve sustainable sanitation in urban areas, focusing on experiences from Japan and explains the demands for reuse water are often distorted by subsidies that influence market forces and the inflexibility of existing standards, which often constrain the adoption of new technologies.

Ken Ushijima from Hokkaido University, Japan, says: 'While we need more investment in sanitation, this will not automatically lead to thriving sanitation markets.' With increasing pressures and demands on limited natural resources, there is an urgent need to provide additional

incentives for investing in sanitation. Commercialisation of new technologies that promote resource reuse through market reforms was considered to be critical in achieving sanitation at scale.

Chris Buckley from the University of KwaZulu-Natal explained that decentralised wastewater systems (DEWATS) and urine separation at source may provide a way of exploiting the water, sanitation, energy and food security nexus. However, there is a need to further investigate the economic valuation for environmental protection and resource recovery. Scaling-up DEWATS requires different management models and a market for sanitation services that can be stimulated by regulatory instruments. An example of how this can be achieved is explained by Edkarl Galing from the Manila office of the Water and Sanitation Program, who described how enforcing standards for septic tanks in Santos City in The Philippines has resulted in considerable improvements to septage management operations.

> **"While we need more investment in sanitation, this will not automatically lead to thriving sanitation markets."**

As well as economic incentives, strong political leadership from governments in defining policy and regulatory frameworks was recognised as fundamental to the success of national programmes. Datuk Abdul Kadir Mohd Din, CEO of the Indah Water Konsortium, provided an excellent example of this, describing the spectacular development of sewerage in Malaysia over the past 20 years through public–private partnerships. This approach has led to impressive improvements in wastewater services from both customer and environmental perspectives. However, it is also recognised that over-regulation may lead to problems for utilities in terms of cost recovery, as appears to be the case in Malaysia.

Another exemplary example is from Indonesia. Nugroho Tri Utomo, Director of Housings and Settlements from the National Development Planning Agency, described how access to improved sanitation and the proportion of wastewater being treated have increased significantly in the past five years. He emphasised the importance of city sanitation planning and the role of champions in motivating others through their leadership and actions.

Participatory decision-making in sanitation options can be aided by various. These approaches demonstrate the value of incorporating a combination of quantitative and qualitative assessment. Markus Starkl from the Centre of Environmental Management and Decision Support in Vienna described how the results from applying these decision support tools show that technology selection is dependent on a wide range of context- specific factors including land availability, effluent standards and the level of expertise available for system operation and maintenance.

Both centralised and decentralised options have pros and cons, and their relative merits will depend upon the location. But, as outlined by Dr Juliet Willetts from the Institute for Sustainable Futures, University of Technology, Sydney, results from Vietnam show that DEWATS can achieve environmental standards and might be a better option even in high-density areas because of their lower costs.

Optimising water use beyond urban boundaries

Cities and urban centres are closely intertwined with their surrounding river basins. Leaders of water-sensitive cities appreciate the connection between their city and its upstream water sources, the groundwater beneath their conurbations and the downstream uses of urban water drainage, including agriculture. However, many cities in low and middle-income countries are increasingly water-constrained and compete for water with surrounding agricultural producers, energy providers and the environment. Harmonising water relationships between cities and their surrounding basins in a way that provides multiple benefits to a range of stakeholders is a key challenge.

Cities need infrastructure, both within their boundaries and beyond, to manage their water supply, drainage and wastewater treatment systems. Infrastructure can be defined as the stock of facilities, services and equipment that is needed for the economy and society to function properly. Increasingly, there is a notion that the river basin in which an urban area is located contains a range of both 'man-made' and 'nature-made/natural' infrastructures. The latter are the services provided by ecosystems that perform infrastructure functions that benefit people. 'Upland soils store water, wetlands purify water, floodplains attenuate flood peaks, and rivers provide for citizen's sports and recreational areas' explained Mark Smith from the International Union for the Conservation of Nature (IUCN). Citizens and city managers are increasingly aware that cities do not exist in isolation, but are tightly connected to their surrounding basins and 'hinterland', and depend on 'natural infrastructure' for their economy and wellbeing.

More and more, people are asking how to operationalise the notion of 'natural infrastructure' available in a river basin to benefit urban areas. A number of cities have worked out that investing in maintaining upstream river basins pays off. For example, paying farmers to reduce erosion through reforestation and farmland management reduces siltation of drinking water reservoirs. Reducing fertiliser application on agricultural land can prevent groundwater used for drinking water becoming contaminated with nitrates.

> **"More and more, people are asking how to operationalise the notion of 'natural infrastructure' available in a river basin to benefit urban areas."**

Cities around the world are setting up funds to invest in upstream natural infrastructure. Qiaoyu Guo of The Nature Conservancy (China) says: 'City Water Funds help in making strategic investments in catchments for water security. It is often a combination of the government and industry partners that capitalise the fund from tax income or revenue.' This is particularly true in Latin America, where a number of successful funds have been set up, including in Colombia and Ecuador. For many utilities this is a fairly new approach, but one that provides promising solutions for their engagement with other river basin stakeholders. Phillip Gichuki of Nairobi Water felt this could well become part of Water Safety Planning, providing utilities with a better idea of how to engage in watershed issues to safeguard drinking water supplies.

A key aspect of basin management both within cities and beyond urban boundaries is water quality. Increasingly sanitation is a primary concern for urban areas, with a focus on public health, but both within and outside the city environmental concerns are also being increasingly addressed. A key question is whether the approach to sanitation should be of central design and management, or whether a more decentralised approach should be advocated and promoted.

In Malaysia, for example, catchment strategies are used to ascertain the best sanitation strategy for a given urban area and beyond. A patchwork of rudimentary on-site systems, septic tanks, small-scale communal facilities and regional sewerage systems has emerged, the latter being more challenging to build in an existing city. According to Dorai Narayana from the Indah Water Konsortium, Malaysia, these systems are 'capital intensive and expensive to build, operate and maintain'. Mr Dorai said: 'Moreover, building such systems in an existing city and connecting all the sewage sources is extremely challenging.' The big question is how to let the sanitary system evolve throughout a river basin with policy priorities not only focusing more on public health, but also increasingly including environmental protection and wise resource management.

> **"The combination of both centralised and decentralised systems enabled Japan to achieve full sanitation coverage in a relatively short period of time, and also protect water resources, as demonstrated by the constant quality improvement in water bodies."**

To do so requires that various strategies be staged, as is the case in Malaysia, allowing the flexibility to cater for changing conditions. The performance of different wastewater management options and their water quality impact is a key aspect. A study in the Melana catchment, which is located in Johor Bahru in south Malaysia, indicated that the water quality impacts of centralised and decentralised options are very similar. However, according to Zulkifli Yusop from the Technical University Malaysia: 'Modelling showed that the centralised option is cheaper by about 15% compared to the decentralised options.'

In Japan, both centralised and decentralised technologies (the so-called 'johkasou') can achieve the same level of treatment. According to Pierre Flamand from the Japan Sanitation Consortium, this is a specific and important feature that is not found in many countries. Mr Flamand said: 'The combination of both centralised and decentralised systems enabled Japan to achieve full sanitation coverage in a relatively short period of time and also to protect water resources, as demonstrated by the constant quality improvement in water bodies.'

The advantages and disadvantages of decentralised and centralised sanitation solutions remain an issue for discussion. Often a preference for more decentralised systems seems to surface, but economies of scale and the capacity to operate the system could well favour a more centralised approach. Therefore, the type of solution chosen very much depends on the context. A feasibility study should be carried out to compare centralised, decentralised and mixed solutions, which is key for planning and implementing the right kind of sanitation solutions both within and beyond city boundaries at basin scale.

Outreach: learning from customers and engaging with communities

Learning from customer suggestions is crucial in becoming more effective. As Rose Kaggwa, Senior Manager of External Services at the National Water and Sewerage Corporation (NWSC) in Uganda states: 'Customers are the reason for our existence.' There are some important factors that utilities need to consider. The context is important in understanding the situation being discussed with customers. The operator also needs to determine its accountability, both towards the regulator and the customer. The areas where customers want to be involved, and in which the operator wants the customer to be involved, then become crucial. A strategy is required to determine how to achieve this.

An understanding of customers' needs in terms of how and when they make payments can significantly impact collection rates. Additionally, it can be interesting to understand the willingness to pay for the diverse areas of service. In South Africa, where there is free basic water (25L/day), this may not be sufficient. In addition, huge financial deficits mean it could be beneficial to identify the willingness to pay in order to adjust tariffs accordingly.

Service providers need to communicate clearly with their customers in a two-way stream. The service provider needs to clearly communicate messages about water quality, such as warnings, and also educate its customer base in order to change their behaviour. This can relate, for example, to in-house water treatment and storage, hygiene promotion or water usage awareness raising. The means of communication need to consider the local context, language, traditions, cultures and power imbalances. Understanding the traditions, culture, gender and religion of customers can be important in the decision-making process, and can significantly impact usage and satisfaction levels.

Communication from the customer is achieved by establishing feedback mechanisms, reporting malpractices and leakage, dealing with requests for help with bills and ensuring that complaints are registered and acted upon. The cost of the service, as well as its quality, can be significantly enhanced through customer feedback. It is therefore important to ensure a service provider's responsiveness to its customer on these issues.

Community-based solutions can promote source protection and sustainable water and sanitation management. 'Source to tap and back again' speaks to the imperative that all people understand the relationship between upstream and downstream users, and that both women and men be involved in watershed management at all levels.

Women and men alike have a basic human need for water. However, women and men have different stakes in water use and water management. Women play important roles as consumers, as managers of resources and facilities, as caregivers and individuals who carry the burden when

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services are inadequate, and as expert providers of solutions to many of our water and sanitation challenges. Women use water to serve their reproductive as well as economic roles, using water for cooking, bathing, cleaning, maintaining health and hygiene, raising small livestock and growing food. As consumers, they are ideally placed to identify the best ways for sanitation and water services to be delivered and maintained.

An example from Morocco offered by session participant, Jawad Hilali from ONEP, Morocco, expertly illustrates this point. 'There was a project undertaken in the late 1980s. Professionals were responsible for installing a public fountain in a small village and they observed that the local mosque was a vibrant area, where large numbers of people came five times per day, and thus chose to locate the stand post nearby. After some time, however, they realised that only small children were using it. Women were still going to the river, some five miles from the village. On reflection, the reason was obvious. The women, for cultural and religious reasons, didn't want to be exposed to men, who were the ones attending the mosque on a regular basis. The moral to the story is that if the professionals had consulted women early in the process, the decisions would have been better informed and the success and sustainability of the project increased.'

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Women are also managers of sanitation and water resources, on behalf of their families and communities, and as professionals. Although women regularly face stumbling blocks in terms of land tenure, access to water, resource control, affordability of privatised resources, participation and capacity, they play influential roles in water management at all levels, and thus, in the long term, may hasten the achievement of sustainability in water resources management.

At a household level, women maintain facilities. They also tend to be the caregivers – of the young, the elderly, and those who are sick. This means that when services are inadequate and sickness results, women tend to bear the burden. Within communities, women often play important roles and the provision of microfinance is, in many cases, allowing them to take on significant roles in managing facilities, thus creating jobs and revenue-generating activities. As leaders within communities, women are crucial, and often younger or shy women will feel more able to approach a female community leader than a male.

The need to build the capacity of all professionals working in the area of sanitation and hygiene in developing countries, including women, was acknowledged. This applies to a range of professional skills including research and development. Gerard Payen, of Aquafed, explained: 'We [as an organisation] are interested in this topic as we acknowledge that involving women in decision-making leads to well-designed and successful projects.'

Closing remarks

The urban environment is rapidly evolving, being shaped by increased migration, population growth and the impacts of industrialisation. Within this setting, social well-being, economic growth and environmental health are constantly challenged by a diverse set of sometimes competing demands. Public services, such as water and sanitation, must react to these demands in such a way that uses resources efficiently, safeguards public health and is affordable.

Some of the options and pathways we need to take have been laid out for us to see. What we know is that we need to rethink the way we provide sanitation services to the billions of people who currently lack access and the many more who will join the planet in the years ahead.
We need to empower and mandate utilities to be at the forefront of providing services to urban citizens, with a particular emphasis on the poor.
We need to foster a broader understanding of urban water management that considers catchment wide interactions between stakeholders and the opportunities for green infrastructure.

Services need to be orientated to the growing demands of consumers that reflect local circumstances and engages with communities in a participatory manner.

The sum of these parts can contribute to creating cities of the future that not only meet existing demands with robust and resilient services, but are able to respond to future scenarios that change the dynamics of urban areas.

Water professionals are at the forefront of driving the changes required; we need to have the courage to take risks and innovate. We need to be more engaged with other sectors and disciplines: urban planners, sociologists and economists, for example.

The Development Congress is an important biennial event that allows us to critically analyse the progress we are making as a community of practitioners, researchers and decision makers working together to realise an ambition of universal access to safe drinking water and adequate sanitation.

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