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FEATURES

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Rainfall warning for Australian utilities

The Water Services Association of Australia's annual report warns that average rainfall is down by 80% in a number of instances compared to the long-term average, and every state capital except Hobart, Tasmania, will have to find new sources of water.

The annual report card, which covers all urban utilities, shows Melbourne and Canberra as the worst hit, suffering 'near record low inflows' of 80% below average. Cities have traditionally relied on surface runoff into storage, which the report says is an 'increasingly high risk option'.

The report notes: 'Although Australian cities have experienced dry and highly variable weather patterns before, this particular dry period is the first time the spectre of climate change has hung over our heads. This has introduced a sense of fear in the community that Australia may never return to the rainfall patterns of the past, and new ways need to be found to secure water supplies for our cities.'

Utilities are vigorously chasing leakage, the report says, citing the average Infrastructure Leakage Index for major water utilities as 1.4, down from 1.8 the previous year. The 'lower performers' were equal to the best in Europe, North America and South Africa.

WSAA executive director Ross Young said that even with conservation measures in place, population growth and climate change would mean alternatives were needed. 'The solutions are going to vary from city to city depending on a range of things. There's no silver bullet, but there's no doubt that supply-side solutions will be needed as well as ongoing water measures, by themselves, won't allow Australian cities to grow as they're predicted.'

(See Analysis, p4) ● **Lis Stedman**

CSIRO issues report on triple bottom line management

CSIRO has produced a report for AwwaRF on triple bottom line (TBL) reporting of sustainable water utility performance.

The report is intended to help US utilities to move towards sustainability by providing guidance on how to report on and manage their environmental, social and economic performance.

The work builds on previous AwwaRF projects and has been developed with input from a project advisory committee and over 15 utilities that took part in a workshop in Los Angeles in late 2005.

The report is intended to show how reporting on TBL performance helps to manage it, and is a tool to help address the challenges that utilities face. It will also help stakeholders more generally to understand and give meaningful input to the challenges utilities face.

The document explains how TBL assessment can help identify alternatives to current practices by clarifying the impacts of utility activities and the related actions of its customers, which have an associated effect.

'TBL assessment can help identify more efficient alternatives,' the report explains. 'It can also help establish the necessary rating or funding base on which sound management can be built and it can help to simplify complex regulatory arrangements that often entangle water utilities. TBL approaches can also help depoliticise decision-making and relationships between staff, stakeholders and the wider community.'

Guidance on producing a report is also provided, and lessons learned are outlined. The report also contains three detailed case studies, looking at Seattle Public Utilities, Yarra Valley Water and Sydney Water, where solutions have been found that simultaneously improve or optimise all three aspects of TBL performance, and makes recommendations for further development by the industry. ● **LS**

Malaysia introduces regulatory and licencing reforms

Malaysia's National Water Services Commission is due to issue guidelines shortly to all water and sewerage asset owners and operators in the peninsula, requiring them to register and subsequently apply for operating licences by early next year.

Any operator not applying within three months can be penalised. The announcement added that under the new regime there would be one regulator, uniform legislation, rules and regulations, tariff setting principles and procedures as well as standard KPIs and operating procedures.

Licences to operate will be provided by SPAN, the new regulator of water supply and sewerage services created in the National Water Services Commission Bill, which passed through parliament in June last year. Most of the country's states will also cede their assets to the federal government, leasing them back under this major restructuring process.

Pengurusan Aset Air Bhd (PAAB), a Malaysian federal government company, will provide MYR 2 billion ($580 million) to fund the takeover of the water assets. Additional funding would be needed to take over the assets of the remaining two states, Sabah and Sarawak, and more if PAAB decided to disenfranchise any of the operators, PAAB has said. (See Analysis, p5) ●

water utility management INTERNATIONAL

EDITORIAL

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Water Utility Management International focuses on the needs and interests of senior water utility managers. The aim is to provide those heading water and wastewater utilities with an international reference point on the strategic issues affecting their organisations. Water Utility Management International will also be of value to consultants and others following developments in this area.

Presented in a newsletter format, Water Utility Management International contains news, interviews, and in-depth briefings on topical issues. Other articles take an executive briefing approach or be based on landmark case studies. Regular themes for articles include financing, investment, regulation and personnel matters. There is also be a central theme of achieving efficiency in water utilities, encompassing topics such as benchmarking, billing, tariffs, IT and service standards.

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Queensland approves plans to streamline water assets

Following its presentation in May of a model to streamline its water assets, the Queensland government has given the go-ahead for the plans. The state currently has 23 bulk water supply and treatment bodies, plus 17 retailers owned by 25 separate organisations.

Under the new model, a single state-run bulk supply body will own the dams, pipe networks, treatment works, water sources and weirs by 1 July next year. Councils will be responsible for supplying and selling treated water and wastewater services. A separate body will take ownership of 'manufactured water' facilities such as desalination and recycling plants and major water transportation infrastructure will be under the control of another body.

A water grid manager – a state-owned entity – will be responsible for state water flows. On or before July 2010, the retail side will be split from distribution.

As part of the process, the Queensland Water Commission was established to take responsibility for regional planning and developing a consistent framework for any water usage restrictions that had to be put in place.

Although the Commission has refused to comment publicly on the amount of compensation that might be provided to councils for ceding their assets, speculation suggests a figure of AUD$2 billion ($1.7 billion), likely to be in the form of debt relief and possibly funding for ongoing capex projects. (See Analysis, p6) ●

Saudi cities pave way for water contracts

Saudi Arabia is progressing its water and wastewater sector privatisation by beginning the process of entering a public-private partnership (PPP) for Jeddah.

The Ministry of Water and Electricity (MOWE) has already prepared and put out to bid a management contract for the capital, Riyadh.

This contract will manage and operate water production, treatment and distribution services as well as wastewater collection. Bids are currently being evaluated and the contract is expected to be let shortly.

A wastewater concession for Riyadh is also being prepared and it is expected this will be let in the third quarter of 2008.

The first of the two Jeddah contracts is a management contract covering production of groundwater, the supply of potable water and collection of wastewater. Under the contract, a private management contractor will manage the Jeddah City business unit, but not provide investment for the water and wastewater systems.

The second contract is a wastewater contract covering the wastewater treatment works. Further PPP contracts for other cities will be tendered after the tendering process for Riyadh and Jeddah is finished.

The contracts are being implemented as part of an overall reform process in the Kingdom's water and wastewater sector, aimed at enabling it to operate along commercial lines and with substantial private sector involvement. Divesting regional water and wastewater companies is the ultimate aim.

One of the first steps in the process was establishing the National Water Company in early October 2006. NWC is the organisation that will sign the PPP contracts with the successful bidder and is a government-owned statutory joint-stock company. ● **Lis Stedman**

GLOBAL: Cranfield and IWA announce global resource 'toolbox'
Cranfield University is helping the global fight to deliver safe drinking water to less developed countries by producing a new global resource 'toolbox'. The project – in partnership with the IWA – focuses on the application of risk-management approaches to ensuring safe drinking water through Water Safety Plans (WSPs). Until fully trialled, the toolbox will only be available to founding members of the Bonn Network, a group of water suppliers committed to the principles of the Bonn Charter.

PAKISTAN: Contamination rises sharply in drinking water system
Bacterial contamination in Islamabad's drinking water was found in 74% of supplies in 2006 compared to 48% the previous year, a new report warns. The report, leaked to local press ahead of publication, is the result of a five-year survey that analysed quality and levels of contamination in the country's water supply. Broken water pipes or leaks are thought to be the cause as the intermittent water supply means that polluted matter can be drawn in during inactive periods.

CHINA: Association reveals vast number live without wastewater treatment
Over half of the 1.3 billion population of China, including residents of 278 cities, have no form of wastewater treatment, the country's association of city planning has revealed. Eight of the cities concerned have populations of over 500,000. An estimated 5,000 'administrative towns' and 20,000 smaller market towns also have no facilities, the association noted.

NEW ZEALAND: Government considers compulsory metering
New Zealand is mulling compulsory water metering, one of a series of recommendations from an independent inquiry into local government rates. Some councils in the country have adopted metering, but many have not.

US: ASCE report card gives wastewater plants a D-minus
The American Society of Civil Engineers' latest report card on the country's infrastructure gives the nation's wastewater treatment plants a D-minus, down from a D in 2005. The problem of ageing sewers is growing worse, as federal funding for repairs has reduced, ASCE noted.

MEXICO: Commission gives permission for Bajagua project land
Mexico's Water Commission has agreed to grant the use of federal land for the much-delayed Bajagua project, which would see a private US company building a wastewater treatment plant in the border city of Tijuana, to reduce the amount of sewage polluting the nearby South Bay over the border in the US. The Commission is also reported as expressing 'great interest' in seeing the $170 million construction project move forward. Local Californian senator Dianne Feinstein and the San Diego Regional Water Quality ➥

➡ Board favour an alternative, upgrading an existing plant at San Ysidro, on the US side of the border.

KUWAIT: Ministry reports treated water waste
Kuwait's Ministry of Public Works has reported that 40% of the country's treated water goes into the sea because there is no effective water treatment system. The ministry also revealed plans to remove various malfunctioning water pumping stations, and to coordinate with the Public Authority for Agriculture Affairs and Fish Resources to solve the problem.

UK: Ofwat proposes water efficiency target
Ofwat is proposing a water efficiency target for each of the water companies of England and Wales for the remainder of the current asset management plan period. Each company will be set the target of reducing the amount of water delivered by 1%, 0.5% or 0.25% of the average volume of water delivered in the years 2005-06 to 2007-08, th e percentage reduction depending on how water-stressed each company is judged to be.

US: AwwaRF publishes report on endocrine disruptors
AwwaRF has published a new report on endocrine-disrupting compounds, pharmaceuticals and personal care products, one of the first to systematically investigate how well the contaminants are removed by the different treatment processes used by utilities. The research is currently only available to AwwaRF subscribers, but will become publicly available later this year.

Business

SOUTH AFRICA: Report highlights growing equipment market
A new Frost & Sullivan report looking at municipal end users in the water and wastewater treatment equipment market in South Africa indicates that the market is growing and there are significant opportunities for new installations. In addition, the emerging market for upgrading, expansion and maintenance of ageing water treatment plants is anticipated to offer extra scope for growth. The research showed that municipalities held strong views on desired product attributes and the type of suppliers they looked for to meet their requirements.

GLOBAL: Survey reveals water prices continue to increase
NUS Consulting Group's 2006-07 International water report and cost survey has revealed that water prices around the world have increased over the last 12 months, and that in most markets even higher prices can be expected in the coming year. Denmark remains the most expensive country in terms of water prices, with the US the least expensive. The single largest increase year-on-year, 17.8%, was in Australia, and other countries with significant increases included Belgium, Canada, Denmark, South Africa, the UK and the US. The reasons differ, NUS says: some countries are driven by environmental issues such as drought and others are driving to increase efficiency and promote conservation.

TURKEY: Istanbul announces desal project
Istanbul has announced that it is starting a desalination project to end the city's water shortages. Mayor Kadir Topbas said that the city would launch tender studies and that the plan was to begin with a facility that could produce 350m^3/day, ultimately providing 10 to 15% of the city's water supply. This will be in addition to the 750m^3/day provided by the Melen river project, which is due to start in October.

UAE: Veolia wins desal contract in Fujairah
Veolia Water Solutions & Technologies, through its subsidiary SIDEM, the thermal desalination specialist, has been chosen to build a new desalination plant in the Emirate of Fujairah in the United Arab Emirates. The plant will be in Qidfa and will produce 590,000m^3/day of desalinated water to meet growing demand and strengthen the region's development potential. Veolia Water's share of the contract represents $805 million (€596 million) of revenues over the project term.

SINGAPORE: PUB announces fifth NEWater plant plans
PUB, Singapore's national water agency, is advancing plans to build a fifth NEWater plant at Changi. With a capacity of 50 millon gallons of NEWater a day (223 MLD), the Changi NEWater plant will be Singapore's largest. In anticipation of this increased output, and to allow it to serve even more customers, PUB is also expanding the NEWater network of pipelines.

CHILE: Pension plan set to buy Esval
Ontario Teachers' Pension Plan has announced that it will acquire up to a 100% stake in Esval, the third-largest water company in Chile. The organisation has said it will pay $384 million for insurance company Consorcio Financiero's 49% stake in Esval and subsidiary Aquas del Valle, which together serve some 16% of the country's regulated water market. The remainder of the stock will be acquired by public tender as required under Chilean securities law.

ALGERIA: Keppel Seghers wins DBO wastewater contract
Singapore's Keppel Corp has announced that its Keppel Seghers unit has won a S$22 million ($14.5 million) contract to design, build and operate a wastewater treatment facility in the city of Ain Beida in Algeria. When operational in 2009, the plant will treat 25,260m^3/day of wastewater, which will be used for irrigation. This is the second such project secured by Keppel Seghers in Algeria within two months, the company added. Keppel has six projects under way in the country.

AUSTRALIA: Deerubbin jv wins Sydney recycled water contract
The Deerubbin WaterFutures Consortium, which consists of GE Betz, United Group Infrastructure and McConnell Dowell Constructors, has won the contract for the Replacement Flows Project, part of the Westerm Sydney recycled water initiative, which will provide 27 billion litres/year of recycled water for the western side of the Australian city.

Loans and tenders

BANGLADESH: ADB and Japan to aid MDG compliance efforts
The government of Japan and the Asian Development Bank are to help Bangladesh to ensure effective monitoring and evaluation of development projects meant to bring the South Asian nation closer towards achieving the UN's Millennium Development Goals. Japan will provide $800,000 and the government of Bangladesh will supply the balance – the ADB has already provided funding. The project is expected to lead to improved accountability and enhanced performance in delivering development programmes.

MANILA: EIB funds water system expansion works
The EIB has provided €60 million ($83 million) to Manila Water for the expansion and improvement of water source and water distribution projects. Positive social and environmental effects are expected to result. It is anticipated that the improved water supply service in the East zone will enhance the quality of life and reduce the health risks stemming from water-borne diseases, by including people living in areas not yet or not properly served. Overall, the project will provide access to safe water to a population of more than 600,000 (some 100,000 households) that currently obtain water from a combination of private wells, vendors and by buying bottled water.

MOZAMBIQUE: World Bank approves water services credit
The World Bank has approved a $15 million IDA credit to Mozambique in support of its water services and institutional support project. The objectives of the project are to increase water service coverage in the cities of Beira, Quelimane, Nampula and Pemba, and to establish an institutional and regulatory framework for water management in smaller cities and towns. This work is also supported by an additional $15 million grant from the Africa Catalytic Growth Fund.

The drought driving Australia's water industry reforms

The Water Services Association of Australia's annual report card describes the country's water industry as 'the canary in the coal mine' for climate change, with the drought spurring water companies to achieve world-leading efficiency gains. **LIS STEDMAN** presents the report's key findings.

The Water Service Association of Australia's 2006/07 report card on the country's water industry paints a picture of an industry working hard to respond to climate change.

The report covers a number of key challenges facing the industry. It concludes that climate change, which is reducing inflows into storage, and rapid population growth 'present significant challenges to the Australian urban water industry' and are key issues driving change.

WSAA notes: 'Growing concerns over water reliability are the key reason that climate change has become such a "lightning rod" issue in Australia and the water industry is regarded as the "canary in the coal mine" for climate change.' The reality of the drought has instilled a 'sense of fear' into the community, it warns – fear that Australia may never return to the rainfall patterns of the past.

Population growth continues in all major urban areas, with a predicted increase of over 8.5 million people by 2030, the equivalent of two Sydneys, requiring an extra 1036 gigalitres per year of water on current consumption trends.

The industry is responding, WSAA explains, by diversifying its portfolio of water supply options to include sources that do not depend on rainfall, such as desalination and recycled water.

It adds: 'The new sources of water developed for each of our cities and towns will vary depending on a range of factors. There are no silver bullets.'

This message underlines a particularly tough year for the industry – rainfall in catchments serving urban Australia was reduced in a number of instances by 80%, compared to the long-term average. This catastrophe followed close to a decade of reduced rainfall and runoff that has left many of the country's storage systems severely depleted.

The need to diversify sources and build water grids will bring about an AUD$30 billion ($25.9 billion) investment in urban water infrastructure over the next five to ten years, the report card predicts.

The WSAA notes: 'The ability to deliver capital investment programmes of this magnitude could be constrained by the ageing of the workforce in the industry and the more general skills shortage.'

Another difficult issue is that the new sources being developed are more technologically sophisticated and energy-intensive compared to traditional water retaining methods such as dams.

'Higher energy use will need to be offset through the use of greenhouse gas-neutral energy sources and the introduction of energy conservation programmes,' the report recommends.

Another conclusion is that, 'given that protection of public health is a key driver for the industry, risk management will be imperative so that the community can continue to have the same confidence in the quality of the water produced by these new technologies as they currently have in the water that comes from rivers and dams.'

In this context, rural-urban transfers 'will remain an attractive option for a number of cities,' the report adds.

A further major issue is public acceptability, when it comes to assessing options for the way forward. As the report notes, 'experience over the last several summers indicates that ongoing harsh water restrictions will not be accepted by the community and the challenge is to develop reliable supplies of water for our growing cities in a sustainable manner'.

For instance, the restrictions in Melbourne were so severe that the visual amenity of the city was severely impacted, and the city struggled to keep important historic trees alive. However, the water conservation programmes that have been initiated have produced, the report says, 'staggering results'.

For instance, Sydney now uses the same amount of water as in 1974 despite having a million more people. Impressive results have been achieved right across the industry – the population served by major urban water utilities increased by 2.2% from 2004/05 to 2005/06, but over the same period total urban water supplied decreased by 3.2%. Both residential and personal consumption continue to decrease.

In terms of leakage, the industry leads the world. As the report notes: 'A comparison in 2005 showed that the lower performers in leakage in the Australia urban water industry were equal to the best performers in leakage in Europe, North America, the UK and South Africa.'

Despite the supply issues, the WSAA rejects calls for price hikes, noting: 'There are often calls for water prices to be dramatically increased to ensure water is used more efficiently. However, care is required to ensure that the purity of the two part tariff pricing model (where the fixed charge recovers the costs associated with the existing infrastructure and the volumetric component signals the long run marginal cost of the next augmentation) is not distorted too greatly as this could lead to perverse outcomes such as "cherry picking" by new entrants.'

The report also issues praise to the industry on more standard issues relating to service delivery, such as upgrading wastewater treatment works, and connecting properties to sewers to eliminate poorly-performing septic systems.

This will be important in future – the WSAA notes that 'given the ever-growing use of recycled water, the management of the sewerage system is pivotal to ensuring reliable water supplies, as this is the source water that becomes recycled water.

However, quantity is important for reliable recycling as well as quality, and the report warns of 'a significant reduction in flows experienced in some sewerage systems' over the past few years, probably because of a reduction in infiltration due to reduced rainfall and lower groundwater tables. Greywater recycling at household level and water-efficient appliances might also be contributing.

The report recommends: 'a watching brief is required on this topic as our sewerage system is designed on the basis of adequate flow velocities to transport waste to sewage treatment plants and to provide self-cleansing to reduce septicity and odours.

The report concludes that there is still scope for further water conservation, possibly introducing mandatory minimum efficiency standards for domestic appliances. In a continent where drought is becoming the norm, radical approaches such as this report outlines are logical, and will be watched closely by other drought-affected countries. ●

The asset transfers at the heart of Malaysian reform

A Malaysian federal government company, PAAB, will fund the takeover of water assets in 11 of the country's 13 states in a move to improve water quality and efficiency. **LIS STEDMAN** reports on the $580 million deal.

Pengurusan Aset Air Bhd (PAAB), a Malaysian federal government company, is to provide MYR 2 billion ($580 million) next year to fund the takeover of the water assets of several of the country's states and address their mid-term capital requirements.

This will be achieved, according to this year's recent federal government budget statement, by PAAB taking over water-related loans worth MYR 7.6 billion ($2.21 billion) from the state governments.

Prime Minister Datuk Seri Abdullah Ahmad Badawi's budget 2008 speech explained that PAAB was established to develop the country's water-related assets. With its creation, he said, efforts will focus on reducing non-revenue water, improving water quality and increasing efficiency in water supply service provision.

PAAB's establishment was a sequel to the creation of Suruhanjaya Pengurusan Air Negara (SPAN) as the water supply regulator (see box).

PAAB CEO Suhaimi Kamaralzaman said: 'For now, we need MYR 2 billion and we expect to go to the banks by year-end. Initially, we will seek borrowings but later convert them into bonds. That amount should be adequate to pay for the water assets in the nine states and Labuan.'

Additional funding would be needed to take over the assets of the remaining two states, Sabah and Sarawak, and more if PAAB decided to disenfranchise any of the operators. Mr Kamaralzaman said: 'In whatever we do, future capital expenditure is paramount to us.'

He added that by 2010, PAAB would have water and wastewater assets worth more than MYR 15 billion ($4.35 million) in the 11 states that it manages. It will take over all treatment plants, reservoirs and distribution networks and lease them back to the state governments.

The move is part of a major restructuring of the water and sewerage sector in peninsular Malaysia and Labuan, which is intended to ensure uniformity in tariffs, legislation, rules and procedures throughout the 11 states.

Prime Minister Badawi said he hoped all the state governments would cooperate to enable an 'expeditious implementation' of the restructuring scheme.

The new Water Services Industry Act has gained parliamentary approval and will come into force on 1 January 2008.

Most of the state-owned water departments will be corporatised when the Act comes into effect, and will need to apply for a license to operate from SPAN.

PAAB will also be involved in future water development projects such as the Pahang-Selangor inter-state raw water transfer scheme, and SPAN will coordinate and regulate future developments in the water and wastewater sector.

As well as commercial loans, PAAB will be able to access government funding in the form of soft loans to fund future capital expenditure requirements. Money is urgently needed to reduce the high-levels of non-revenue water, introduce a GIS system and put in place a comprehensive asset management system for the operators.

Much needs to be done. A report for the ADB from Dr Lee Jin of the Malaysia Water Partnership shows non-revenue water at 38%, down 2% over the 2000-2005 period after replacement of 3380km of old pipes. The water pricing system for both domestic and non-domestic supplies does not reflect the costs of developing and providing the supply.

A privatisation policy introduced in 1991 led to state water supply services being operated by a mix of public and private organisations. But fragmented management and accountability issues arising from the large numbers of bodies managing different elements of operations, as well as water resource, quality, reliability of supply and accountability challenges, remain of concern, the report concluded. The thrust of the current reform process is aimed at addressing the highlighted issues. ●

Malaysian water sector reforms

The Malaysian water sector has undergone extensive reforms, key among which, in 2005, the federal government amended the constitution to enable it to regulate water supply services.

Two bills, the Water Services Industry Bill and the National Water Services Commission Bill, passed through parliament in June 2006. The latter created a regulator for both the water supply and sewerage services, SPAN (Suruhanjaya Perkhidmatan Air Negara), which will license the service providers and owners of water service systems and lay down service standards and key performance indicators that they will have to comply with. The SPAN Act came into force on 1 February this year, while the Water Services Industry Act is scheduled to be enforced in the last quarter of 2007.

A water asset management company will be established to build infrastructure and lease it to service providers. The providers' performance will be evaluated against their annual three-year rolling business plan, an emphasis that it is thought will focus providers on operations and maintenance.

SPAN policy objectives include:

- The establishment of a transparent and integrated structure for water supply and sewerage services that delivers effective and efficient service to consumers
- Ensuring long term availability and sustainability of water supply including the conservation of water
- Promoting the protection and preservation of watercourses and water catchments
- Facilitating the development of competition to promote economy and efficiency in water supply and sewerage services industry
- Establishing a regulatory environment that facilitates financial self-sustainability amongst industry players in the long term
- Regulating for the long-term benefit of the consumers
- Ensuring the provision of affordable services on an equitable basis
- Improving the quality of life and environment through effective and efficient management of water supply and sewerage services
- Establishing an effective system of accountability and governance between industry players
- Regulating the safety and security of water supply and sewerage systems

SPAN will advise the relevant minister on matters relating to national policy objectives for the water supply and sewerage services legislation, and implement and promote these objectives, as well as the water supply and sewerage services laws. It will also consider and recommend reforms to the laws in addition to the more traditional elements of its regulatory role.

Queensland moves to relieve local councils of water assets

The Australian state of Queensland is moving to take control of what state premier Peter Beattie described as a 'shambolic' water and wastewater system run by local councils. **LIS STEDMAN** reports.

The state of Queensland, Australia, has moved to take control of all council-owned water assets in the south east of the state

The move caps an unhappy relationship that has seen state premier Peter Beattie accuse councils of profiteering from water rates but failing to re-invest the money in infrastructure.

The south east of the state is suffering from a severe drought and level five water restrictions – the strictest – are in place. The new move will see the state government take over all council-run pipe networks, treatment works, dams, weirs and water sources. Councils will jointly own the distribution and retail businesses.

Sources speculate that the federal government will pay an estimated AUD$2 billion ($1.7 billion) in compensation.

Describing to the state parliament the current system, in which 22 bulk water assets are owned by 12 different bodies, with 17 water retailers and a total of 25 organisations involved in water provision, Beattie dubbed the situation a 'spaghetti mess' and said 'that has got to be described not only as bizarre but inefficient and indeed it would have to be described as a shambles'.

Mr Beattie noted that the new model 'will deliver a properly planned, reasonably focussed water supply system that clarifies the roles of state and local government.'

A grid manager will be appointed, said deputy premier Anna Bligh, to set 'fair and consistent' prices for bulk water. The Queensland Water Commission has recommended that the changes take place within the next two years.

The move is the culmination of a process that has been under way since 2005, in which the state government and councils have looked for ways to improve the system. As part of this, the Queensland Water Commission was established, to take responsibility for regional planning and developing a consistent framework for restrictions.

The Commission also produced a report recently that outlines serious failings in the existing system and backs the proposed move.

In detail, the report criticises the existing institutional arrangements for south east Queensland's water supply as: 'a fragmented system that was developed in an ad-hoc fashion over the past 100 years'.

The report criticises the existing institutions for Queensland's water supply as 'a fragmented system that was developed in an ad-hoc fashion over the past 100 years'

The report also notes the 'confused accountabilities in terms of the roles and responsibilities of state and local governments for water security', and a 'lack of regionally integrated approaches to supply, where councils are focused on issues within their own local government boundaries'.

There is no means by which the costs of new infrastructure and the water from it can be fairly shared across the beneficiaries, it observes, and limited regulation of asset maintenance has resulted in varying service standards across the region.

In some cases not enough is being spent on maintaining assets, the report found, and water prices and their regulation are not managed consistently. It added: 'there is no opportunity for consumers to enjoy the benefits of a competitive market particularly at the retail level'.

The report notes that the new urban water supply arrangements will 'provide an industry model that streamlines the management of water delivery and ensures consistent water security for the region'. As part of this, the existing 25 water-providing bodies will be reduced to just nine.

The new model is intended to provide a framework for supporting competition, which the Commission strongly recommends should be introduced in future at the retail level to improve customer service.

'This model will also increase water security for the region through the establishment of the water grid manager', the Commission explains. This will be a non-profit state government-owned entity responsible for maintaining regional water security in a 'sustainable and efficient' manner.

The Commission predicts that the reforms will bring security and sustainability to the provision of water services. It also believes that over time there will be 'significantly improved services to consumers arising from improved asset management, specialist entities with a clear focus on service delivery and consideration of the potential for a fully contestable retail market in water'.

It also argues that at all market levels there will be opportunities for competition, 'except where there is a public benefit in centralised service provision, such as the water grid manager'.

The Commission predicts that 'transparency of value of individual assets' will form the basis for pricing. It foresees 'grouping of assets to achieve economies of scale and the development of management specialisation leading to efficiencies and higher standards of operation of assets'.

Other benefits will include a 'critical mass of technical skills which will enhance employee opportunities to further develop their skills in the increasingly resource constrained water industry,' the Commission argues, as well as strengthened asset management arrangements and transparent budgeting, which will lead to 'timely and appropriate' upgrading and maintenance of assets.

For local councils, the Commission argues that the changes will remove exposure to market and volume risk at the wholesale level, and take some debt from their balance sheets. In some cases, the Commission suggests that additional funding could also be provided for agreed ongoing local government capital expenditure requirements.

Councils will be given the opportunity to maintain joint ownership of the water distribution network with 'appropriate returns payable based upon a regulated access pricing arrangement'. They will also be allowed to keep 'an ownership position' in one of three water retail businesses, in a regulated market subject where competition may be introduced in future.

The councils will also be allowed over time to retain or to sell ownership in their distribution and retail businesses.

Ultimately the Commission envisages 'the creation of market trading opportunities at both wholesale and retail levels for a range of water products differentiated by type of water, price, volume, quality, reliability and location'. ●

Output-based aid: *targeted funding to help close the water and sanitation gap*

The poor struggle to gain access to water supplies, because of the gap between ability to pay and full cost recovery. **YOGITA MUMSSEN** and **CLEDAN MANDRI-PERROTT** look at output-based approaches to solving the problem and the work of GPOBA – The Global Partnership on Output-Based Aid.

Over one billion people in the developing world live without access to safe drinking water, 2.2 billion people without adequate sanitation, and four billion live in conditions where their wastewater is discharged untreated into local water bodies.[1] Even these estimates understate the extent of the access gap because they do not account for poor service.

The Millennium Development Goals (MDGs) aim to reduce by half the proportion of people without sustainable access to safe drinking water and basic sanitation by 2015. To meet this target, annual investments in water must increase from $9 billion to $12 billion – and for sanitation, from $4 billion to $18 billion.[2] Governments, public and private service providers as well as donor agencies are seriously grappling with how to fund these investments.

The challenge is to provide access to these basic services, but at the same time ensure their sustainability. Typically, poor households cannot afford the full cost of investments in order to gain access and connect to water and sanitation services – and if they do, they would be sacrificing other essential services (such as electricity and education).

Service providers including private operators/investors recognise that once connected, the poor may be willing to pay for the ongoing costs of usage, since alternative sources (such as water tankers) are often more costly than a piped water supply. But they also know that poor households usually cannot afford the cost of connection. So how can this 'gap' between user ability to pay and full cost recovery be addressed?

What is an output based approach and what are its advantages?

Decades of development support have led to traditional input-based schemes being revisited to internalise efficiency, transparency and accountability more clearly. Output-based aid (OBA) is a means of supporting the delivery of basic services where a policy decision has been made to justify the use of subsidies to complement or replace user fees.

Under an OBA approach these subsidies must be performance-based and thus linked to previously-agreed results. Figure 1 provides a stylised example of how input- and output-based schemes differ, demonstrating, under an output-based scheme, how payment to the service provider is withheld until after delivery of the agreed output, with pre-financing by the service provider. These providers can be private operators, non-governmental organisations, community-based organisations, or even public service providers or public institutions.

The main potential advantages of an OBA approach include:

- enhancing transparency through the explicit use of subsidies that would allow for better targeting, tying the delivery of subsidies to a specified output, and defining who provides the subsidy, who receives the subsidy, what is being subsidised, and for how much
- increasing the accountability of service providers by shifting performance risk by paying them mostly after the delivery of the agreed output
- providing stronger incentives for innovation and efficiency through competition or bench-marking, and by leaving technological solutions largely to the service provider, who will get paid the amount agreed ex-ante regardless of cost incurred ex-post if outputs are delivered to required quality standards
- factoring sustainability into the design by firstly forcing the question of who finances what for how much

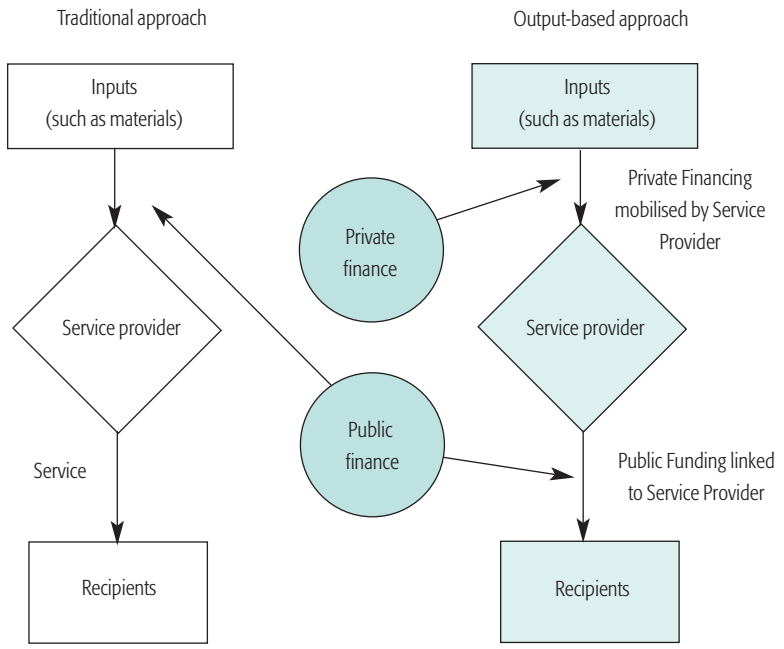

Figure 1 Diagram showing how input and output-based schemes differ.

(and for how long), secondly by the fact that this approach lends itself relatively more easily to targeted one-off and transitional subsidy schemes, and thirdly by linking subsidies to a sustainable service through appropriate contractual mechanisms
- internalising the monitoring of results, since payments are made against agreed outputs and because outputs are by definition as close to the desired outcomes (that is, the results) as is feasible in any given circumstance
- encouraging the re-engagement of private sector capital and expertise by encouraging the private sector to serve customers (usually the poor) whom they might otherwise disregard, and providing an opportunity to leverage private finance and expertise for non-subsidised customers as well

Clearly, the degree to which an OBA project achieves these objectives will vary depending on local circumstances and, of course, the quality of the project's design.

Why use OBA approaches in the water sector?

Improved subsidy design through explicit (and targeted) subsidies is one reason to consider the use of an OBA scheme in the water and sanitation sector. For example, there is increasing evidence that subsidies implicit in tariff structures, such as the increasing of a water block tariff that is intended to provide initial blocks of consumption at lower cost, are actually very ineffective in reaching the poor. This is, inter alia, because the poor are not connected to the network.

Subsidised water connections are now seen as a better way to target the poor.[3] Another method that has been suggested as potentially more effective in targeting the poor involves 'self-selection', that is, targeting subsidies for services the poor are more likely to use (or, that the non-poor are less likely to use), for example, public water points and yard taps.

OBA and its possible applications

Possible applications of OBA in the water and sanitation sector include one-off subsidies, transitional subsidies, and ongoing subsidies.

One-off subsidies are the most common application of output-based approaches and usually involve capital subsidies for access (for instance, connecting targeted beneficiaries to a water network). Typically a large portion of these subsidies is paid after the connection has been made and verified to work to minimum required standards. Notably, in order to ensure sustainability of service delivery, a further portion of the subsidy is commonly withheld until verification of a period of satisfactory service delivery.

Transitional subsidies can be used to support tariff reforms, and can fill the gap between what the user is deemed able and/or willing to pay and the cost recovery level of the tariff.[4] The subsidy is phased out after a given number of years, as the user contribution increases (and possibly as the cost recovery level decreases with efficiency gains). The output against which the subsidy is paid in these cases is the service delivered and billed by the provider.

On-going subsidies may be required in cases where there is a permanent gap between affordability and cost recovery. Life-line tariffs targeting low-income groups for consumption of discrete quantities of infrastructure services involve on-going subsidies which, as with transition subsidies, are paid against services delivered. One example of the use of on-going output-based subsidies can be found in Chile's urban water sector.

Figure 2 shows a typical OBA project. The main aspects include:
- pre-financing from a provider that is

OBA in action – bringing safe water to India's poor

In the Indian state of Andhra Pradesh, output-based aid is helping to bring safe drinking water to 75,000 poor villagers. The Naandi Foundation (a charitable NGO), in cooperation with Water Health India (a private operator), will use output-based subsidies from the World Bank's Global Partnership on Output Based Aid to construct 25 UV water treatment facilities.

Under the terms of this arrangement, subsidy payments are directly linked to community involvement and to the provision of clean and safe water. In addition to ensuring the level of water quality at each plant, these criteria will ensure local ownership and the long-term viability of each new facility.

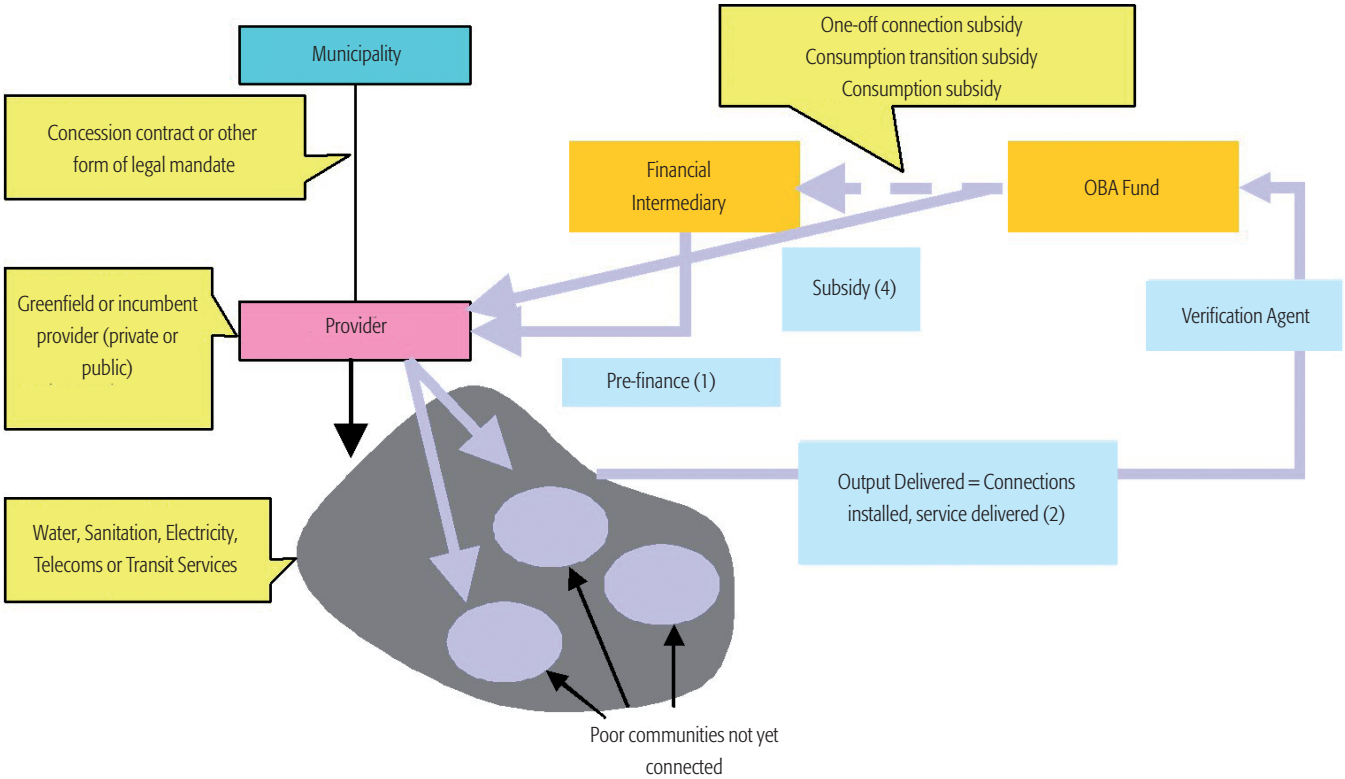

Figure 2 Schematic of a typical OBA project.

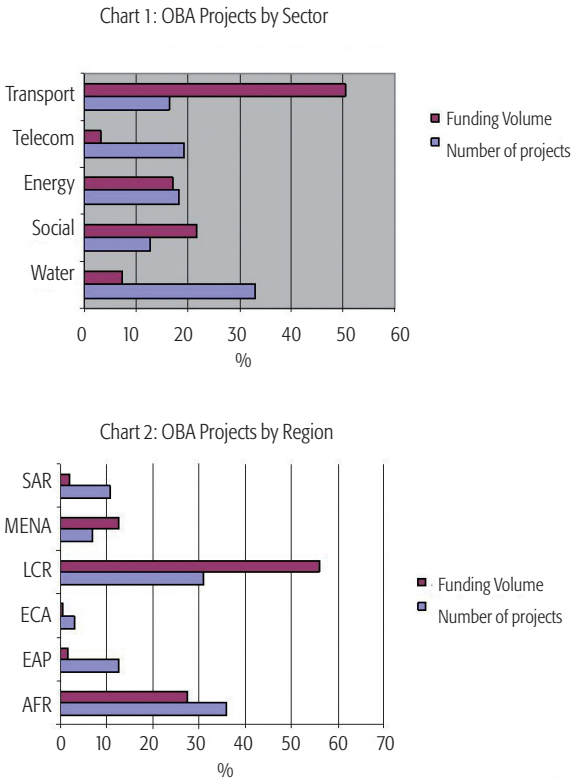

Figure 3
Bar charts showing funding for OBA projects by region and sector.

separate from the entity that contracts out the service
- outputs that are delivered and verified by an independent entity
- payment of the subsidy possibly to a financial intermediary. Not all OBA projects are structured in this manner, but most involve similar transparency and accountability mechanisms.

OBA applications in infrastructure

The Global Partnership on Output-Based Aid (GPOBA)[5] was set up by the UK's DFID (Department for International Development) and the World Bank to fund, design and document OBA approaches. GPOBA has identified more than 100 OBA projects in the infrastructure and social services sectors being undertaken by the World Bank.[6]

Most of these projects are in design stage or under implementation – that is, in their relatively early stages and their impact is still to be fully measured. Bar chart 1 (Figure 3) demonstrates that water (at 33%) is leading all other sectors in terms of the number of OBA projects being implemented. However, by funding volume, projects in the water sector are very small compared to projects in the transport and social sectors.

Chart 2 shows that the vast majority of OBA projects are in sub-Saharan Africa or Latin America. Again, most of the OBA projects being piloted in sub-Saharan Africa are in the early stages of design or implementation.

The total subsidy volume for all World Bank OBA projects identified to date is about $2.4 billion. The median project size is about $6.1 million. The total population reached through all projects where population data is available is over 55 million, with an estimated subsidy per person of about $21.[7]

Although there may be several ongoing pilots, OBA is still fairly new to the water sector. As large international operators and investors have retreated from the sector[8], small local and regional private providers as well as public service providers have been stepping in to fill the gap. However, these providers have limited experience and/or access to finance – a critical condition under an OBA approach, where the provider must pre-finance the outputs. Experience to date has shown that this constraint has been addressed in a pragmatic way by, for example, relaxing the 'O' in OBA – by phasing in some initial inputs – in projects with challenging environments. Other projects are linked with strong local (micro) financial partners – a relationship cultivated over a number of years.

The challenge of access to finance is even greater for public sector providers with no credit history, credit rating, and in many instances no recourse to loans without a sovereign guarantee. In these instances, GPOBA is exploring ways to meet this challenge. For example, in some projects loan guarantee structures are being developed with local banks. Other efforts include working with relatively credit-worthy public sector entities to test the OBA approach. Also, sub-national facilities are being explored to better enable public sector providers to take on appropriate levels of risk.

These and other solutions need to be delved into further. For now, what is clear is that the constraint of access to finance requires a pragmatic approach, and must be addressed in order to increase local, regional and public sector participation in the water sector through OBA approaches.

The future

Evidence to date suggests that OBA appeals to both governments and the donor community including the World Bank, while the attractiveness to service providers depends on the availability of affordable financing and the appropriate mitigation of payment risk.

For example, some governments that have been sceptical about increasing the role of the private sector in infrastructure service provision have welcomed OBA as a way to target service to the poor and hold private operators accountable for agreed outputs. From the World Bank's perspective, experience with OBA shows that projects of this nature may involve a learning curve, but that they provide a degree of certainty regarding project outputs.

The success of OBA will ultimately depend on the interest and capacity of (usually private sector, including NGO and Community Based Organisation – CBO) providers to invest and operate in systems for which they will be compensated only after verification of delivery of agreed outputs. OBA thus poses additional financial and payment risks for these providers.

In the water sector, as local and regional private operators have in

OBA in action – Paraguay's *aguateros*

The government of Paraguay is using an output-based subsidy payment scheme in conjunction with competitive bidding to enlist private sector involvement and increase piped water access to poor peri-urban and rural communities.

Under this programme, *aguateros* (small scale private water companies) compete with one another based on the lowest total connection cost or subsidy required to bring new services to households. This system minimises the cost of each new connection and maximises the impact of each subsidy dollar spent. Moreover, because subsidy payments are contingent on working connections and a number of quality standards, the positive effect of each subsidy dollar is clearly evident.

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many places stepped in where (often larger) international players were once active, the success of OBA will depend on the ability of such service providers to obtain adequate and affordable financing as well as the availability of payment risk mitigation mechanisms.

Beyond that, OBA subsidy packages should ultimately compensate service providers for those risks transferred from the donors/public sector to the (mostly private) providers. Thus the extent to which individual OBA projects will lead to improved aid effectiveness will vary depending on a multitude of factors, including local and sector circumstances, as well as, of course, the quality of the project design. ●

Footnotes

[1] World Bank, March 2003, Progress report and critical next steps in scaling up: education for all, health, HIV/aids, water and sanitation

[2] World Bank, 2005, Global monitoring report. Millennium Development Goals: from consensus to momentum.

[3] Komives et al (Water, electricity and the poor: who benefits from utility subsidies)

[4] In the long term, cost recovery tariffs would be expected to recover long-run marginal costs

[5] The Global Partnership on Output-Based Aid (GPOBA), a World Bank administered multi-donor trust fund, is attracting significant donor funding, including a $47 million contribution from UK's DFID, a $35 million contribution from IFC's Performance Based Grant Initiative, $28 million from the Dutch government, a contribution from the Australian government, and additional donor funding expected (for instance, from SIDA) in the near future.

[6] GPOBA has also identified several OBA projects external to the Bank Group – and expects that there are a lot more not yet identified.

[7] Population and subsidy per capita excludes transport projects, since population figures were not obtained. Other sectors: 6 persons/household or connection assumed, when this figure is otherwise unknown.

[8] See PPI database, PPIAF World Bank 2007. The landscape of sponsors has changed significantly in projects implemented in 2001-05. Apart from a couple of sponsors, the list of top ten sponsors has changed from the top sponsors in 1990-2001. Developing country investors have emerged as a major source of investment finance. Six of the top ten sponsors are from developing country companies.

Water pricing: from theory to practice

Approaches to water pricing can differ considerably, as a conference in Beijing last year observed. **FRANCESC HERNÁNDEZ-SANCHO, NICOLAS RENARD** and **HEIMO THEURETZBACHER-FRITZ** review the debate, with references to the policies in Austria and Spain.

Last September at the IWA World Water Congress in Beijing, the IWA Specialist Group on Statistics and Economics organised a workshop titled 'Water pricing and tariff structures: trends and case studies towards more efficient water use'. One of the conclusions of this was that the approaches of economists and practitioners diverge with regards to pricing policies. This article extends the debate that was opened in Beijing.

Reconciling theory and practice would be too ambitious an objective, so the aim of this article is to illustrate and explain, through case studies, why approaches designed by economists and approaches implemented by decision-makers in the field are sometimes so different.

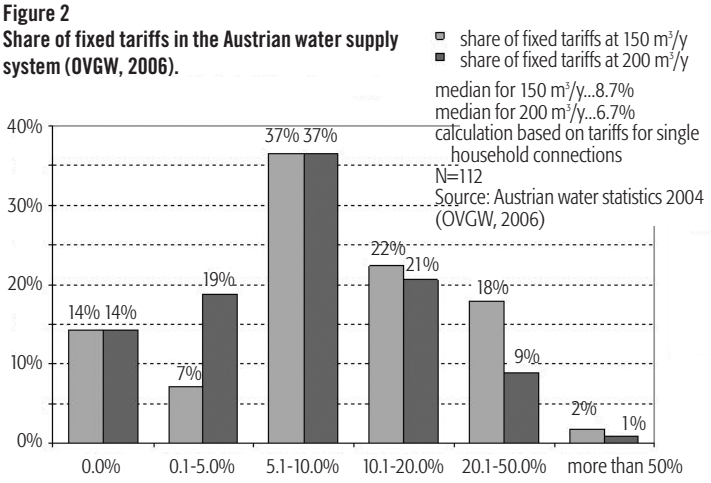
This article is arranged in three sections exploring the issues of:

- The fixed and variable components of costs and tariffs in Austria, as water is predominantly a fixed costs business where the product – the cubic metre – is mainly priced at variable tariffs.
- 'Marginal cost' theory, how it is implemented – or not implemented – in the field when defining the price of water.
- Regenerated water, using a specific example in Spain, since it is an alternative resource with an enormous potential to help states and cities satisfy their water demand. On a global scale, it is forecast that within the next decade, the installed capacity for wastewater reuse will treble in scale.

Fixed and variable components of costs and tariffs

The tariff structures of water services should reflect their cost structures in order to achieve sustainable cost recovery. Of course, this general premise, which is part of the economic element of sustainable development, is superposed by socio-economic aspects (affordability) and socio-political

Figure 2
Share of fixed tariffs in the Austrian water supply system (OVGW, 2006).



aspects (willingness to pay), particularly with regard to the world-wide water service context.

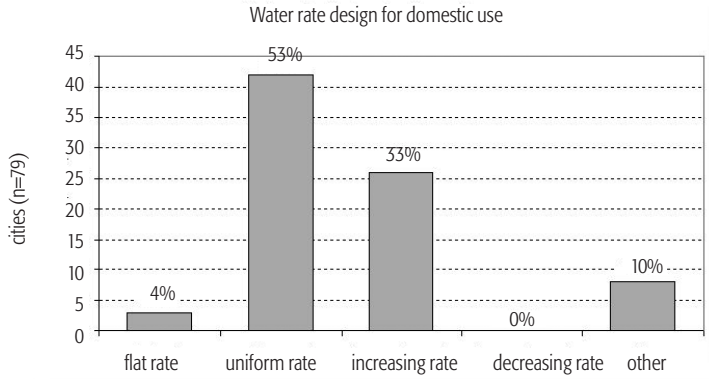
From the international point of view, each country is affected by different water service contexts and developments. An overview is given in the IWA leaflet 'International statistics for water services' edited by the IWA Statistics and Economics Specialist Group (Parena *et al*, 2006).

The relationship between fixed and variable tariff components is manifold and varies between different countries, but also within countries (Figure 1). The uniform price rate is based on a constant price per cubic metre, whereas increasing and decreasing price rates involve having different prices for a number of consumption blocks. The flat rate has a fixed price regardless of the amount of water consumed. In such situations, consumption is usually also not metered. For each of the price rates, the curves for the average prices are shown in Figure 1. The small chart envisages that uniform and increasing rates are most common.

The following statements are derived from figures for Austria's central water supply. Austria is both a rich and water-rich country. The majority of utilities are publicly-owned and operated and fulfil high technical service standards. They usually apply tariff systems based on uniform rates, where the fixed tariff components (such as metering and service charges), cover less than 10% of the total tariff compound (Figure 2).

Cost figures were derived from the benchmarking activities of OVGW, the Austrian Association for Gas and Water. In all, 70 to 80% of the total costs are represented by fixed costs (such as asset depreciation and interest) or quasi-fixed costs such as personnel, administration and so on (Theuretzbacher-Fritz et al, 2006).

Figure 1
Annual water price and average unit price of different tariff structures (Sanclemente, 2006, amended) and their distribution (small chart, Parena *et al*, 2006).



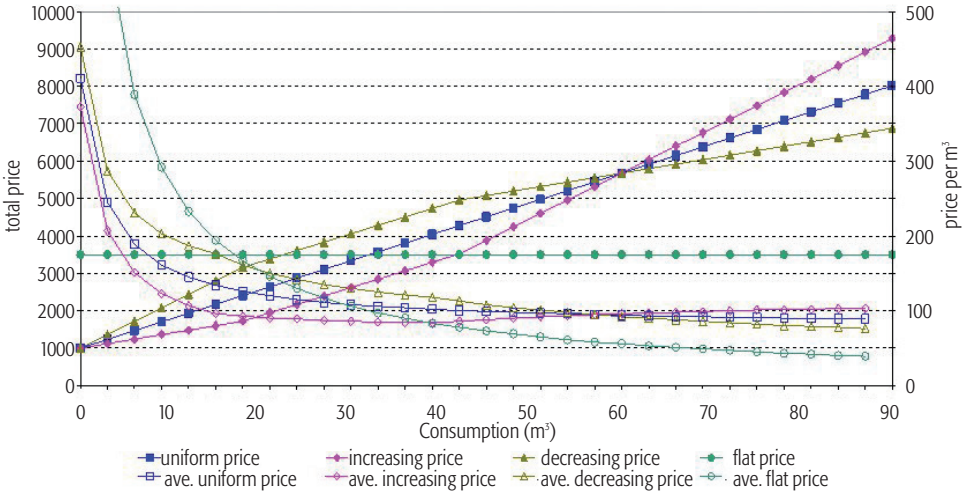
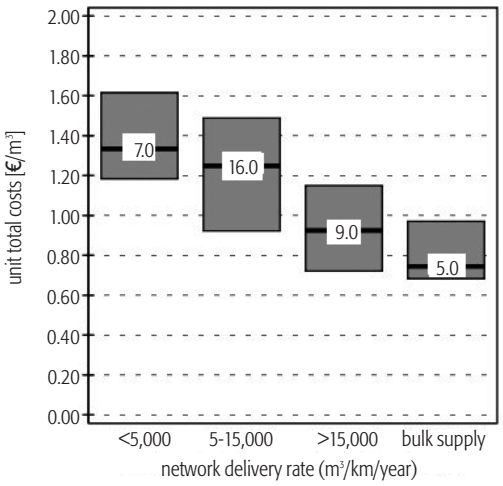


Figure 3
Austrian benchmarking result for unit total costs, grouped by network delivery rate (Theuretzbacher-Fritz *et al*, 2006).



In addition, around 60% of total costs are ascribed to transmission and distribution (Neunteufel et al, 2004). For this reason, the variable network length is typically the main cost driver, which is considered by different groups of network delivery rates when financial indicators are compared (Figure 3).

Figure 4 (over) shows the long-term development of the Austrian water supply sector. Normalised to 1978 values, the total network length nearly doubled within three decades due to including rural areas covered by the central water supply. Despite the higher connection rate, water production remained at the same level because of a decrease in per capita consumption.

Increasing network lengths generates higher fixed costs, whereas reduced consumption leads to lower variable revenues. This gap is not only occurring throughout the Austrian water sector, but also within each utility wherever peripheral areas are connected to the water distribution system.

This means that fixed costs have to be minimised by enhanced settlement policies that lie beyond the competencies of water services. Moreover, benchmarking activities should focus on more than running costs, by including long-term capital costs, for instance by carrying out benchmarking for planning and construction processes to optimise the physical assets over the long term. It must be noted therefore that a rise in the share of fixed tariff components will lead to more cost transparency and result in more stable cost recovery.

From an international perspective, the opposite situation will also arise, seeming to contradict and challenge this statement. This can be seen in increasing block rates, with higher variable components, fitted into regions of water scarcity. Whereas physical assets define cost structures in humid regions, the availability and efficient allocation of water is of crucial interest in arid regions. In any case, tariff design should be dedicated to the most valued cost components.

The theory of the 'marginal cost' and the price of water

The long-term marginal average cost

According to economists, utility services should usually be priced at their marginal cost. To avoid huge fluctuations in short-term marginal costs, economists prefer to use long-

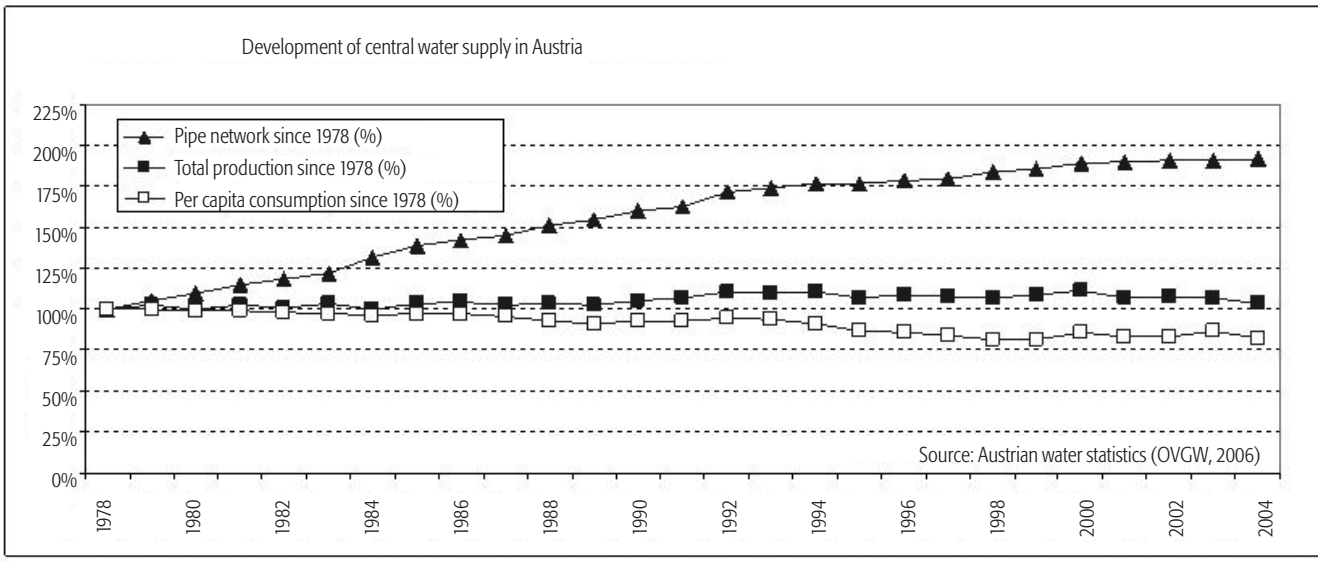


Figure 4
Long-term development of the Austrian water supply sector.

term marginal costs calculated over a minimum of five or 10 years. 'Strict LRMC (long run marginal costs) may be defined practically as the incremental cost of optimum adjustments in the system expansion plan and its operation, attributable to a small increment of demand which is sustained into the future,' (CH Green).

There are many ways to calculate long-term marginal costs, but this depends firstly on the type of costs included in the calculation. Economists insist that individuals and companies should pay for all their marginal costs. For instance, Cyprus, which experiences regular water shortages, should 'take into account the scarcity cost, that is, the fact that when you use one unit of a limited amount of water, then you have less left for other needs,'(S Metaxas).

The IWA Statistics and Economic Specialist Group published a survey on water services regulation in 2006. The outcome from this survey of water regulatory regimes, as observed in 11 European countries (Belgium, Cyprus, Denmark, England and Wales, Finland, France, Greece, Italy, Romania, Spain and the Netherlands) and five Asian countries (Taiwan, China, Mongolia, Japan and South Korea), were presented at the IWA Beijing Congress in September 2006.

Although this survey did not aim to provide detailed and exhaustive information about each water system, it was noticeable that the use of marginal costs was not a common way of calculating the price of water. In France, for instance, private operators supply 79% of the population with water. According to the IFEN newsletter published in March 2007, the average price of the cubic meter is €3.01 ($4.24) – water supply, sanitation and all taxes included. In Austria, 600 to 800 calls for tenders are organised every year to choose private firms, but the long-term marginal average cost of the service is almost never calculated during the competitive process.

Why isn't the marginal approach a determining factor in fixing the price of water? When local authorities are considering investing in order to extend, upgrade or modernise their water infrastructure, they decide the price of water and the tariff structure after having undertaken a master plan and pricing studies.

A lot of these studies include the calculation of long-term marginal average costs. But in practice, once this step is completed, the results from the marginal cost calculation are set aside. Other calculations are performed and political and social issues are taken into account in fixing the price of water.

In fact, the marginal approach has serious shortcomings. When marginal costs are decreasing, they will result in lower than the average costs. And if the entire cost of the service is not recovered from the subscriber, it is then necessary to find other sources of finance such as subsidies from local or national taxpayers. In other words, applying the marginal approach is not a guarantee of collecting sufficient revenues to cover either the average full costs or global financial needs of water services

In addition, experience proves that water demand varies considerably from one category of consumers to another. Although industrial water demand is more or less elastic, domestic demand is quite inelastic. If the price rises, this sector will not reduce its needs and will pay higher bills. This means that the price paid by households for their consumption does not represent the benefits they attribute to the service – precisely the objective of the marginal approach.

Wastewater collection and treatment

With regards to sanitation, economic theory recommends internalising pollution costs through a specific tax that should be fixed at the level of the marginal cost of wastewater treatment. Such a tax would also contribute to making polluters, of whatever type – manufacturers, domestic users and so on – responsible, since a tariff policy is also used as a financial tool to educate customers about taking care of the environment.

But in practice, in countries such as Spain or Italy, taxes are established at a lower level to avoid high increases in the price of water paid by inhabitants, or to avoid restricting economic development. As a consequence, the polluters pay principle is not strictly applied, however pollution costs are calculated – with or without a marginal approach.

This is not the case in Germany or Finland, where taxes were set at a higher level. In France, the system is quite different: there is an aggregation of investment costs that is set within the framework of the six water agencies that cover French territory.

Service users pay their water agency taxes on each cubic metre consumed and, in compensation, local authorities can benefit from grants or loans at low interest rates to finance improvements to their wastewater systems. The economic information given to consumers is not directly linked to

their own costs, but is based on partly-aggregated costs.

The specific case of the farming world

Agriculture consumes more water than any other sector; far more than industrial or domestic use. It also wastes the most: in many irrigation systems 60% of the water is lost before serving its purpose. And it is no coincidence that agriculture is spared regulation – agricultural policies, such as the Green Revolution that enabled India to achieve food independence, are based on more-productive varieties and abundant water at a very low price.

But these veiled subsidies eventually lead to shortages because they do not encourage rational use. Over-exploitation of aquifers and rivers ends up in the 'tragedy of the commons': if government does not intervene to set conditions and limit use, the communal resource will inevitably be over-exploited.

For thousands of years we lived without paying much attention to water, except in arid regions. But today, water resources appear to be dwindling. In Southern Europe, in France and even in England, usage restrictions are imposed every summer in many areas and aquifers are not refilling. We are seeing a resurgence of the problems of quantity that we thought had been solved. There are ever-increasing withdrawals from finite resources. The carefree era of profusion is coming to an end and with it, poor water management must also be brought to a halt, in particular in agriculture.

If environmental cost recovery (whether marginal or not) was organised sector by sector, most European, American and Asian farmers would go bankrupt. They would not be able to pay for both the cost of withdrawing raw water and the cost of pesticides and nitrate treatments.

Because of this, in most countries, taxes have been established at very low levels to encourage food production. As a consequence, water resources are contaminated and industrial and domestic customers bear the cost of treating nitrates and pesticides in drinking water treatment plants using activated carbon, biological denitrification, anion exchanges resins or membrane technologies.

Is this gap between theory and practice surprising?

The low degree of implementation of the marginal approach is not synonymous with disrespect. Elected officials decide the price of water, not economists. The outcome always results from a consensus between various legitimate but diverging objectives: collecting sufficient financial resources to guarantee the long life of the service and its quality; making sure that low-income households have access to such basic services as water and sanitation; educating customers about appropriate ways to use a common asset in order to avoid wasting water resources; promoting economic development and food autonomy.

The costs and price of regenerated water

Population growth, less water resource availability, surface water and aquifer pollution, the competitive use of water and frequent droughts have created a need to develop alternative criteria aimed at achieving integrated water resource management (Tsagarakis, 2005ab). This is particularly important in Mediterranean countries.

While the urban use of water is a small percentage of total demand in the majority of countries, it is considered the most important part of water management policy. This is because urban water is closely linked to public health and protection of the urban environment. Although water is recognised as a public good, it also has an economic value that should be recovered.

According to the EU Water Framework Directive, member states should ensure that:

- Their water price policy provides users with an adequate incentive to use water resources effectively and to achieve the environmental objectives in the Directive itself. Therefore, the instrument to be used should affect water consumption and, at the same time, reduce pollution
- Water costs are recovered in key sectors such as industry and agriculture, and for some domestic uses.

As far as the first objective is concerned, it is worth pointing out that water prices have been mainly looked at as a way of promoting an efficient use of water. Numerous studies have analysed the impact of prices on demand, particularly through use of econometric techniques, aimed at obtaining price elasticity in the demand for water in urban areas (Arbués *et al*, 2003).

Some of these studies have taken in account the pricing structure to quantify their influence on water consumption for each group of users. This issue is normally approached simply by using average or marginal prices, despite the fact that the structure of water prices can be highly complex. Equity, recovery of costs and the efficient use of resources are often taken into account when choosing a price structure. However, these goals can end up contradicting each other.

Following the EU Water Framework Directive, price policies are also essential in recovering the total cost of water services. According to Tsagarakis (2005b) and Genius et al (2005), it is also important to tackle the issue of regenerated water prices. However, establishing a suitable price for water is a prerequisite for correctly fixing the price of regenerated water, as users will not buy recycled water for irrigation while conventional water remains cheap. When it comes to recovering the total cost of water, the economic, natural resource and environmental costs should be taken into account. The price of water normally only includes the economic cost of abstraction and distribution, but not the remaining costs.

Efficiency in price fixing for both regenerated water and for the rest of sources should guarantee balance between supply and demand, generating the lowest possible cost to society in the long term. Therefore, regenerated water prices cannot be analysed separately without taking into account their effects on the reduction of both the pressure on conventional resources and also their negative impact on the environment.

Usually the price for regenerated water is lower than that of conventional water to encourage its use. This means that very few water reuse projects achieve financial sustainability through recovering total costs. For example, a recent study carried out on 79 projects on an international scale found that only 12 recovered their total costs (Morris, Lazarova and Tyrrel, 2005).

Notwithstanding, the fact that total costs are not covered by user contributions does not mean that these projects are not viable, as they can be amply justified by their social and environmental benefits, as well as economic development.

Subsidies are seen as very important incentives as there is a certain conviction that the use of regenerated water is hindered by the presence of other heavily-subsidised alternatives. It seems logical to deduce that if eliminating these subsidies is not viable as a first solution, that is, if the external costs stemming from the use of conventional water cannot be internalised, a second option would be to subsidise regenerated water as well, so the choice between the various alternatives is efficient and not distorted. The disadvantage of this option is that a policy based on the mass application of

subsidies on all sources of water does not encourage saving or the efficient use of resources.

Regenerated water has a series of characteristics that must be taken into account when fixing prices. On one hand, it involves wastewater management and, on the other, an alternative source of water. The externalities related to its use must also be taken into consideration. The value of regenerated water also depends on a series of attributes:

- the presence of certain nutrients that can benefit farm production
- the guaranteed availability of these resources, which is particularly important in the case of certain users such as golf courses. Guaranteeing long-term availability is also vital, especially when users need to invest substantial amounts in order to use regenerated water
- user mentality and perception of this type of resource also have an impact, particularly on willingness to pay. Perception of health risks or favourable environmental externalities is important.

It is a well-known fact that regenerated water is a heterogeneous product both in terms of use and the cost of offering a certain quality. Capital and operating costs in wastewater treatment processes depend on factors such as the characteristics of the water to be treated, the quality required, the technology used or needed to provide an adequate level of treatment, and the presence of economies of scale. It is also important to take into account distribution costs according to how near or far the source of treated water is in relation to the final place of use.

Users' willingness to pay for regenerated water of a certain quality depends on a series of factors (Woolston and Jaffer, 2005), such as:

- the value of the product or activity for which regenerated water is used as an input. Any regulations restricting its use must be taken into account. Normally, agricultural users represent the lowest market prices compared to urban and industrial users
- the consideration of the costs necessary to guarantee compliance with regulations in terms of risk
- it is also worth taking into account the price of alternative resources. As regenerated water is usually of lower quality than drinking water, the price of the latter emerges as the upper limit of willingness to pay for regenerated water as an alternative substitute for certain uses. When the cost of using surface water and groundwater is low, so is the willingness to pay for regenerated water. Users would be more willing to pay if the alternatives were scarce or if the supply could not be guaranteed.

From a demand viewpoint, knowing how much the various users would be willing to pay for regenerated water in each case would be fundamental. Under this premise, regenerated water rates would be based on what the market could uphold, without taking into account the costs required. That is, the aim would be to charge users the value they assign to regenerated water. This commonly results in price discrimination among users, as their willingness to pay varies. Additionally, willingness to pay is supposed to change over time with a growing acceptance of regenerated water.

Another simpler and more practical option is to set an arbitrary percentage of the price of drinking water as a rate for regenerated water, in light of the fact that the latter is of lower quality. Problems of a lack or excess of demand will emerge depending on the user's perception of the price that is set. In addition to this, there is no guarantee that supply costs will be covered.

In short, efficiency and guaranteeing financial viability aside, the price fixing structure must also be fair and equal. In this scenario, efficient prices for both regenerated water and also other alternative sources would achieve equilibrium between supply and demand at a minimum cost in the long term.

There are many theories about how to define the price of water, and there are also many practices. Therefore a better title for this article would have been 'Water pricing: from theories to practices'.

It is a common practice not to apply economics, even smoothly. The reason is that water is a field where all interests converge. Defining the price of a cubic metre based solely on economic theories would deny the many objectives of water supply and sanitation policies. In fact, decision makers have to take into account numerous objectives when choosing a tariff structure and the price of water. These objectives are environmental protection, husbanding of scarce resources, public health, economic development, and the solidarity required to make water services universal.

Water is a complex business, and water pricing also. ●

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China's urban water sector reform

China's urban water sector has seen major changes, with many contracts having been awarded to involve the private sector. The government is pushing ahead with further market-based reforms, and the contracts to date provide valuable lessons for this further development. **LIS STEDMAN** sets out the key messages of a new report that evaluates progress and sets out recommendations for the future.

China's urban water sector is in the middle of an extraordinary transformation. Against the backdrop of the country's booming economy, the provision of water is undergoing a fundamental and profound change in focus, with a shift to introducing market-based approaches.

The changes began when the country embarked on a reform process called marketisation – not privatisation, though the private sector can be, and is, involved. It is defined as bringing market principles and pressures to bear on the water sector, as part of wider market reforms to increase investment and stimulate improvements in performance.

Marketisation also provides for a change in the function of the government, from being a deliverer of services to becoming a creator of policy and regulation, with operations separated out from government and managed by specialists in efficient water service provision.

In the intervening few years since embarking on this process, China has made considerable progress, with its many cities experimenting with different visions of marketisation that have introduced a wide range of financing and structural choices. 'May you live in interesting times' is said to be an ancient Chinese curse, and the results so far have certainly been interesting, ranging from excellent and inspiring to outcomes that can, at best, be seen as learning experiences.

A forthcoming report from IWA Publishing, 'China's urban water sector reform', outlines the remarkable story of China's water reforms to date, with experiences from case studies and an analysis of the situation that identifies key reform issues and puts forward suggestions for policies and reform.

One of the main issues identified is that reform has happened so fast that much of the key preparatory work is being undertaken without sufficient forethought. Those projects that have been notable successes are distinguished, as the report shows, by the care and thought that went into the fundamental building blocks of the contracts in question.

China's cities have adopted one of two basic reform models, which are classified in the report as either 'competitive concession' or 'licensing'. The competitive concession model is defined as including lease/management contracts for fairly short terms of five to eight years, longer-term 15 to 20 year BOT (build-operate-transfer, used for new build projects) or TOT (transfer-operate-transfer, used for existing projects) contracts, and regional concession contracts. In this model, the government remains responsible for the water service, but consigns some or all of the service provision element to commercial enterprises through commercial contracts or agreements – somewhat similar to the common situation in France.

The licensing model covers full privatisation, PPPs and state-owned enterprises. The key difference is that a cost-recovery pricing system is required, with government solely regulating the operational processes, which means an independent regulator is needed. The commercial enterprises offering the services own the assets – this is more akin to the model found in England and Wales.

Competitive concession is the leading model, mainly because the concession policies issued to date have been formulated according to its requirements, which has given this a better policy base. The licence model also requires strict regulation, which is hard to achieve over a short period.

Within these umbrella groupings are a number of ownership models – post-reform solely state-owned projects, where asset management has been detached from the government; stock transfer, in which some stock changes hands to create a joint-stock company; joint ventures and partnerships, where a private company partially or wholly operates the enterprise; private operation, where all assets are privately owned and operated; and BOTs and TOTs, where a limited right of ownership is granted over an asset such as a treatment plant.

Assessing progress

One of the most fascinating elements of the report is its objective dissection of the main problems with progress so far. One key issue is that despite the fast pace of reform, much of the water sector has been slow to introduce business system reforms, so the functions of government and the water enterprises are still often combined. When cities move to meet the requirements of marketisation, there is a need to have appropriate laws, regulations, policies, and economic and administrative support.

One of the main lessons from the case studies is that BOT and TOT contracts that cover treatment plants alone have severe limitations. If the contracts are set up in a rigid way, based on initial assumptions of demand and other factors that impact on operations, the results can be catastrophic for the project.

Another major stumbling block has been the perception of marketisation among local governments, and their own role in the process. Cities have sometimes seen the reform as simply a way of obtaining investment, focusing on initial high cash receipts without sufficient consideration of the public nature of the sector and the need to foster operational efficiencies and improve service.

This problem is the opposite of that which arises from the sector being overly closely intermixed with government functions. By focusing on the investment aspect, some governments have allowed themselves to believe that marketisation gives them the ability to withdraw completely from the sector, with their final task simply the process of attracting investment. This inevitably means that, given the sector's public welfare aspect, they are neglecting their social responsibilities.

The governments' true duties are underlined by a key piece of legislation, Opinions of the Ministry of Construction on strengthening the regulation of municipal public utilities, issued on 10 September 2005 and commonly referred to as 'The

Opinions'. This stresses that marketisation does not remove municipal governments' responsibility in respect to water services being an important part of social welfare.

Issues also surround the choice of concession model and type of competition. Entrance competition is achieved through choosing an operator through a public bidding process, which is particularly suitable for BOT and TOT projects as they are usually well-defined, and capital and operations can be clearly separated.

Another approach is to establish competition in the operational process. This is seen as more appropriate to the licence model, where assets and enterprise property rights for existing plants are closely interwoven. This involves performance comparison systems, for instance, introducing comparative competition through price adjustments (as, for instance, in Ofwat's RPI-X regulation).

Governments also need to consider the implications of what they transfer to the new operator when they marketise, because asset transfers and transfer of operating rights bear different relationships depending on the reform model chosen. In the licence model, asset rights transfers relate to the entire system, and the operator assumes all service functions and risks. Such projects are influenced by fluctuations in water prices and consumption, so the price of the assets has no fixed correlation with the price of water.

In concession models, where the operations are separated from the supply system and one component such as a treatment plant may be transferred to the operator, there is a definite relationship between the value of the operating rights and the asset transfer price – assets are freed from the influence of supply and demand, so any asset transfer will influence the transfer of operating rights.

Asset valuation

Valuing a concession properly is another key stage in the reform that some governments have got badly wrong. The report explains that the concession transfer price, solely in terms of financial results, 'can be seen as the whole rent for the rental operation of the project property, fully paid in one payment'.

Problems have arisen with TOT projects in particular in terms of overvaluing asset transfers in projects such as those involving share transfers in existing enterprises and full transfers of treatment plants. For instance, the Berlin Water group won the contract for the Hefei Wangxiaoying wastewater treatment plant project with a transfer price that exceeded the bid by $14.76 million, and Veolia won the Shanghai Pudong water supply contract with $260 million in cash, close to three times the appraised asset value. Such deals, the report notes, have 'placed subtle pressure on the increase in water prices'.

'Overvalued asset transfers are a violation of the public interest,' the report concludes. Overpriced water risks project failure, and there are various examples of this within some of the early marketisations.

One of the sector's problems is that it has huge sunk costs in underground assets. In successful projects such as Ma'anshan, these have remained in state hands and are rented out at a low price to the operator, which only invests in new infrastructure. Indeed, what could be typified as the French concession model has been very successful in China, including in Macau, over the past two decades. This holistic approach extends to system optimisation, which the report notes lies not in improving the performance of one plant but in effective control and supervision of the whole system.

The report concludes that 'BOT and TOT water treatment projects should not be used in water supply systems as they destroy the completeness of the system. They are more suitable for wastewater treatment projects, since wastewater tends to be gathered in specific areas and is hard to divert over long distances because of the characteristic gravity system. Nonetheless, priority should be given to marketisation models that consider the whole system and process.'

BOT projects are seen as particularly problematic, in part because of the high costs incurred in the preparatory stages.

BOT projects are seen as particularly problematic, in part because of the high costs incurred in the preparatory stages. This has led some cities, including Beijing, to bundle several small projects together, though the bundling was only partial – the government procedures were bundled together but the projects remained independent, with four organisations ultimately winning the five bids.

This has led to problems for the projects, and for other cities that followed Beijing's example: the projects were hard to finance because of their small scale. The high price paid in the early stages made them uneconomic, and because each was in itself a complete operation, the projects had high operating costs regardless of scale. 'The industry must reflect on and reconsider its use of the BOT model', the report warns.

Unfortunately the BOT model has been particularly attractive to governments as it relieves them of a great deal of financing pressure – statistics suggest around 100 such wastewater projects began in 2005, concentrated in the affluent coastal areas. Many of these are still in their infancy, and the results remain to be seen, but it looks very much as if BOT will remain the dominant model in the Eleventh Five-Year period.

As with most things, timing is everything and this is particularly true in China. The country's vastness means that its many provinces, and even individual cities, are at very different stages of economic growth and require thought to achieve an appropriate marketisation model.

The problems lie not just with government perceptions, though, but run deeper, within the legal framework of marketisation. As the report notes: 'Current policies and laws lack rounded, medium and long-term systematic considerations and arrangements. Legal and policy procedures rely on improvised behaviours to fill the holes in the law and policies. This brings about a looseness and lack of integrity in the system of laws and regulations, which overlap and even conflict with each other.'

A lack of clarity exists in many areas: water tariff policy, water pricing and fee collecting mechanisms, ambiguous stipulations about the composition of investment in the pipe network, a lack of policy guidance in assessing management of state owned assets, unfulfilled incentive systems and ambiguous preferential policies. Complaint and response mechanisms are also imperfect, and there is a lack of implementation and operation of policies and regulations.

Regulation in particular has not been effectively established, although healthy regulation of entrance, cost, prices, service and information is seen as key. Sometimes regulatory departments overstep their limits, and there are 'flaws and confusion' in the regulatory system teamed with a lack of ability and the measures needed to regulate.

Case studies

The report authors underline their conclusions with 17 case study examples, both of great successes and considerable failures. Among the successes is the contract for the water supply in Chongqing, run by the Chongqing Sino-French Water Supply Company (50% owned by Suez subsidiary Ondeo and 50% by the Chongqing Water Company).

Responsible for three water treatment plants in this flourishing industrial city on the Yangtze River, in the Three Gorges area, the transfer has created an 'efficient and high-quality client service' with a long list of achievements.

The reasons are many: the design of the joint venture made full use of the expertise of the international water group involved, areas of responsibility were clearly defined, and the innovative funding model reduced shareholder risks.

However, the project is not without issues. The government-controlled water tariff has a vague concept of a 'reasonable return', for instance, which could affect the project's viability. Government policies such as having a water meter for each household and adopting advanced treatment processes, enacted after the contract was signed, have also added to costs, and are not reflected in the tariff. In addition, the city's growth has far outstripped government projections, increasing demand beyond the original plans and creating unforeseen risk.

A negative example given is the Shenyang water supply industry marketisation. The story began in 1995, when ownership of the city's No 8 plant was transferred. Since then the industry has gone through a variety of stages – joint venture, BOT, government repurchase, overseas IPO and a delisting and entrust operation.

Shenyang, the capital of Liaoning province in the north east of China, is home to heavy industry and has a population of 6.9 million. Restricted by its industrial structure, its economic growth was sluggish but the national strategy of revitalising the north east gave it the impetus to move to marketisation.

In 1995, half of the equity in the proposed No 8 plant was sold to Sino-French Water Development Company, with the project set as a 30 year BOT. The next year, the government decided to construct No 9 plant, also as a BOT, with Hongkong Huijin China Company providing investment and the city's Shenyang Tap Water Company constructing and operating the works for 20 years.

However, the No 9 contract hit immediate problems, with inadequate managerial experience leading to serious losses. At the end of 2000, both sides agreed to change the contract: STWC bought 50% of the equity in the plant, reducing HHCC's return on investment.

In 1999, a government vehicle acquired all of Sino-French's foreign-owned stake, with the foreign partner gaining the right to operate and manage the eight subsidiary water plants. One major problem was that water consumption was much lower than that set out in the contract, so STWC made huge losses. Because of this it could not pay its fees, which in turn meant the government could not finance any construction projects. In the end, in 2002, a state-owned and government-controlled company repurchased a 99.37% stake in the operating Shenyang Water Service Company.

The case studies exemplify both the triumphs and disasters of China's water sector marketisation thus far, and provide a fascinating glimpse into the complexities, successes and pitfalls of shifting from a command economy to a market-oriented one.

Consideration of the problems in the report observes that the lines between government and enterprise functions were blurred, that there was insufficient regulation, a lack of scientifically-based decision-making mechanisms, no systematic mapping of the sector's reform and a lack of knowledge of its characteristics, among other issues.

One huge problem was that in the agreements the foreign partner was usually granted a fixed return, or some variation on this, which meant the contracts unfairly favoured this partner. Whenever the contracts began operating, the government would realise this and terminate the agreements to cut its losses. However, constantly doing this destroys governments' reputations.

The case studies exemplify both the triumphs and disasters of China's water sector marketisation thus far, and provide a fascinating glimpse into the complexities, successes and pitfalls of shifting from a command economy to a market-oriented one.

Policy issues

The third section of the report provides an analysis of the general situation, outlining the major relevant policies and looking at any issues that have arisen from them. The extent of the guidance, regulation and other legislation underlines both the complexity and the ongoing learning process that is taking place, with documents being issued to counter weaknesses in previous measures.

The process is ongoing: the first two phases of marketisation, opening the market and creating competition, are now seen as completed. 2005 was the 'year of regulation', when regulation of the water market finally became part of the official agenda. The goal of this stage is improving performance and efficiency, shifting the focus towards regulation, operation, quality of service, public interest and security. This third phase is called 'market standardisation', and will be regulation-led, something the sector sorely needs. Although the entire country is not at this stage, it is nevertheless an important long-term step, involving reinforcing the governments' new role as market regulator, and developing and improving financing tools.

However, given the size of the country, the reform process still has a long way to go and in relative terms there are still few marketisation projects. This slow progress is exacerbated by a reluctance on the part of some governments to reform, the report explains, because of misunderstandings about the importance and necessity of such action. Governments are afraid of 'unexpected and uncontrollable problems that may surface after opening their long-held water supply and wastewater treatment industries to reform,' and so hesitate to do so, it notes.

Many public service agencies and state-owned enterprises like being in a state where they have a fixed income and no competitive pressures, so they are very loth to reform. The extent of the problem is revealed in a recent city planning association assessment that said 1.3 billion people, including the residents of 278 cities, have no form of wastewater treatment. An estimated 5,000 'administrative towns' and 20,000 smaller market towns also have no facilities, and the central province of Henan also suffers from an acute lack of clean water.

The report illuminates these disparities, characterising the north east as having 'slow reform, small and medium projects', the middle and western areas as having 'inadequate capital, anxious local government', and coastal areas as being the 'pioneer of marketisation reform'. For this reason, a clear understanding of what marketisation means and implies, and good illustrations of the best ways (and the wrong ways) to implement it, across the varied economic situations of China's cities and provinces, is vital. Because of this, the new report should make interesting, enlightening, and, one suspects, sometimes uncomfortable reading in its home country. ●

China's urban water sector reform

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Rediscovering risk management

Balancing an effective risk management strategy with the need to manage risk to public and environmental health is a key aspect of best practice for water utilities. **SIMON POLLARD, ROLAND BRADSHAW** and **JEN SMITH** set out the challenges.

Managing risk is the central imperative for water and wastewater service providers, because their business is at heart a public health and environmental protection service. The key operational paradox is that in delivering this goal, we operate and therefore put at risk physical assets in order to deliver effective water and wastewater treatment.

Utility managers must manage the reliability of their asset base without compromising risks to public and environmental health. Given this overriding public health imperative, this requires maintaining effective margins of safety within treatment and distributions systems in an operational context of asset maintenance and replacement.

Private sector utilities must also raise money from the capital markets for onward investment and be able to demonstrate solid returns on investment. This need to balance risk-based asset management with the delivery of safe drinking water and the protection of utility 'licences to operate', both in a regulatory and reputational sense, has prompted a redefinition of the utility manager's primary role – better risk management.

The recent move, since 2000, from implicit to overt risk management within the sector is also being driven by modern risk-based regulation, investor requirements on corporate governance, by a reaffirmed commitment to the safe drinking water and sanitation agendas and by the hard lessons of recent water quality incidents and tragedies. The biosecurity agenda and with it, issues of business recovery and organisational resilience are providing additional impetus.

Whilst numerous tools and techniques for assessing risk are forever at hand, managing risk is, at heart, an issue of organisational and individual competence, coupled with clear accountability and active vigilance on the ground. Credible, risk-based decisions demand a wide understanding of the corporate objectives of an organisation by all employees and an ingrained commitment to managing non-negotiable risks alongside business opportunities.

The evidence for this rediscovery of risk management is present in the risk training programmes of the leading utilities, in the water safety and river basin management plans of others and an increased focus on risk-centred asset maintenance, capital prioritisation and the in-house organisation of corporate risk governance.

The leading utilities are integrating risk management across their business functions and benchmarking their implementation of risk management against 'best in class' competitors within and beyond the water sector. For water suppliers at the forefront of good practice, a visible corporate commitment to risk and opportunity management is critical.

There is a substantive research literature on risk analysis tools for the water and wastewater utility sector, but also a gulf between the over-sophisticated design of some tools and the institutional capacity to utilise them. For practitioners, risk tools need to be straightforward, easily communicated, integrated with other business and information technology processes, supported by skills-development and rooted in a positive organisational culture.

Further, given the extensive asset networks of the larger utilities and the tremendous volume of risk data produced by even modest asset bases, the issue of how this knowledge is managed for maximum decision-making benefit is becoming evident as utilities seek to implement and integrate their risk management processes.

Having both sectoral and 'home grown' organisational capacity for all this activity is important, because risk and opportunity management – a core business function – cannot be outsourced. The water and wastewater utility sector is therefore progressing a number of initiatives on risk management that include the overhaul of international guidance, undertaking practical management research and the delivery of risk tools and techniques for utility professionals.

Likely to be the most influential of these initiatives is implementation of the World Health Organisation's revision (2004) of its drinking water guidelines. Building on rolling revisions (1996 onwards) to the Australian Drinking Water guidelines and other contributions, the WHO guidelines place an explicit emphasis on catchment to tap risk management and promote 'water safety plans' as a basis for preventative risk management in water supply systems – in both affluent and less developed countries.

Coincident with revision of the guidelines, the International Water Association published the Bonn Charter (2004), a universal framework that assists water suppliers in their delivery of good safe drinking water that has the trust of customers. Adoption of the Bonn Charter represents a visible commitment to risk management of water supplies and IWA, partnering with a number of first adopters, has formed a best practice network (Bonn Network, 2007) aimed at coordinating the rapidly growing portfolio of risk management tools for practitioners.

With respect to managing water and wastewater assets, UKWIR's Common Framework for capital maintenance

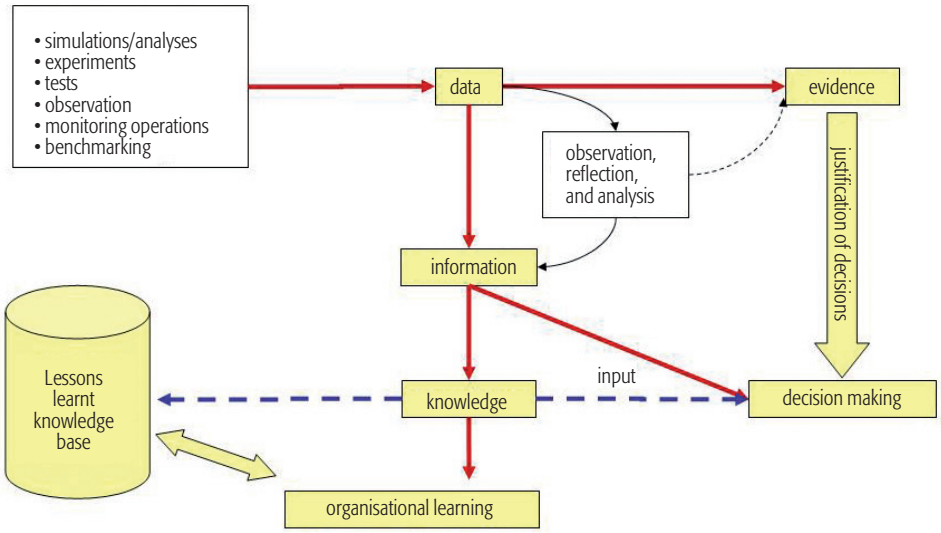

Figure 1 Making better decisions – the relationship between risk analysis, risk knowledge and evidence-based decision-making.

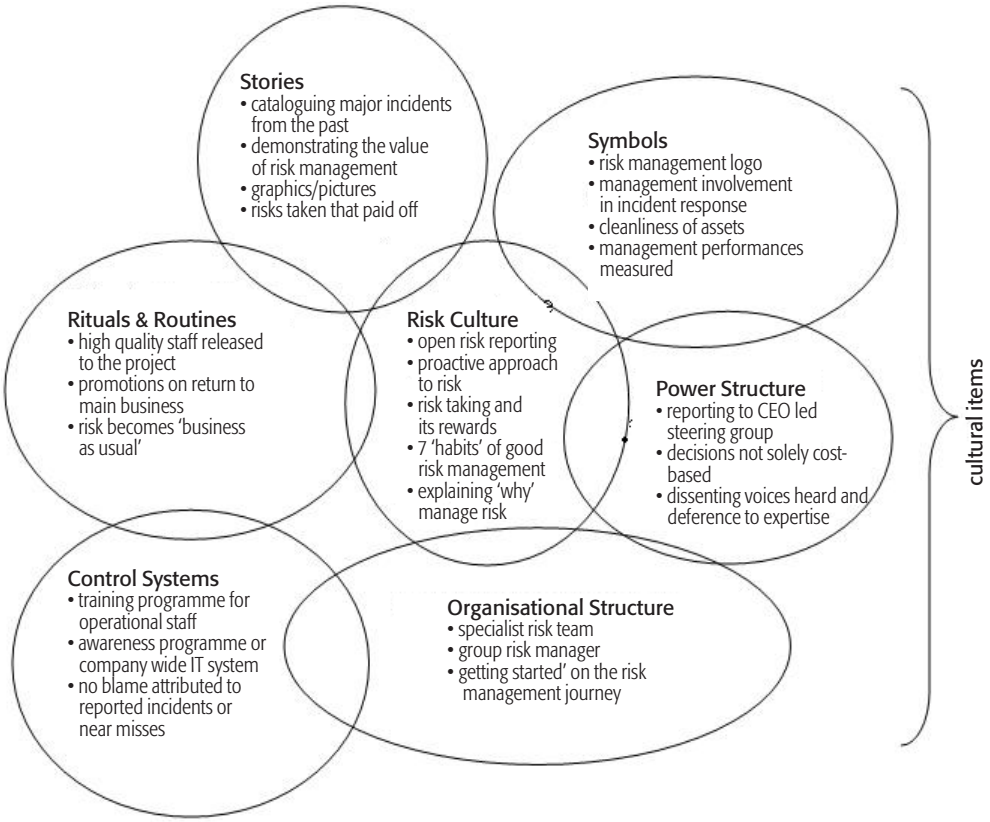

Figure 2
A cultural web for risk management with selected features (adapted from Johnson, 1992).

planning (2002) is seeing wide application, alongside a growing adoption of the publicly available standard (PAS 55) on optimising the management of infrastructure assets (British Standards Institution, 2004), which is proving a valuable tool for integrating asset performance, process reliability and investment planning.

The American Water Works Association Research Foundation (AwwaRF), the Australian Cooperative Research Centre for Water Quality and Treatment and UKWIR have each published influential practical research on water quality risk management.

Cranfield University's Centre for Water Science (UK; see bibliography for our recent work) has contributed to this agenda by reviewing, and making recommendations on the risk analysis strategies adopted by the international water sector, in benchmarking utility risk management capabilities and advising on how water suppliers can better implement risk management.

We are international consortium leaders for two AwwaRF projects on risk management, and are researching the influence of organisational culture on risk management implementation within water utilities, through collaborative research in Canada, Australia, the US and UK. Our future research will focus on the improved management of risk knowledge within organisations, and the adaptation of risk management lessons to less developed countries, with a view to sustainable implementation of water safety plans.

In these settings, the challenges of water safety must also address the risks associated with water access, sanitation, hygiene promotion and the cultural perception of supply priority. This particular stream of our work is now funded through a Research Council UK Fellowship in water safety and international development.

In support of our postgraduate programme in water sciences and commitment to practitioners, we have also edited the distance learning text 'Risk management for water and wastewater utilities', published by IWA Publishing.

The text is a postgraduate primer for water professionals seeking an introduction to risk management. It includes chapters on corporate risk management, process risk analysis, risk and regulation and organisational risk management and is aimed at risk managers, process engineers, contractors and regulatory scientists.

Concluding then, the practice of risk management needs to move beyond the conceptualisation of business processes to targeted, preventative activity on the ground. Delivery will be enhanced if we avoid the failure tolerance inherent to overly 'lean' asset management, if we challenge the dismissal of risk management as a 'cottage industry' and train operational staff in risk principles and practice. In our view, it is entirely possible to balance opportunity and risk – to secure good returns on investment without compromising the central mandate of the sector, which is to proactively manage risks to public health and the environment. ●

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Benchmarking best practice in the water sector

Benchmarking is an important tool of self improvement, and benchmarking programmes of one sort or another are being used increasingly across the international water sector. **LIS STEDMAN** reviews developments, including a focus on the role being played by the International Water Association.

Benchmarking is becoming an important tool globally to encourage best practice and promote efficiency within the water sector. For example, the International Water Association has been a lead organisation in establishing techniques, parameters, performance indicators (PIs) and best practice and, increasingly, other organisations are expressing interest in becoming involved in what is now seen as the best way forward for the industry.

Dr Enrique Cabrera is one of the authors of the forthcoming IWA manual of best practice and one of the world's leading experts in water utility benchmarking. He explains the initial premise: 'Basically there are two types of benchmarking, especially in the water industry – process and metric benchmarking. Metric is the comparison of values of PIs, and takes two or more utilities, selecting a number of PIs and comparing to see who is doing better or at least find out areas of possible improvement.'

Most of the benchmarking being undertaken across the world is of this type, he adds. 'It is valuable because it allows artificial comparisons of businesses that don't have direct comparisons, because the water industry is naturally monopolistic.'

Unfortunately, he explains, metric benchmarking has problems in that all utilities are different. 'There are political, geographical and topographical differences, as well as differences in assets, whether they are private or public, regulated or non-regulated, so just comparing numbers or metrics may not be enough.'

In the group producing the IWA manual, there is a conviction that unless there is some interpretation of results, it is not possible to speak of true benchmarking, he adds. 'You have to find out what is behind the figures.'

Dr Cabrera points out: 'Metric benchmarking is useful – it is being used a lot, especially by regulators of companies, because it is a good way of creating artificial competition and comparing how utilities are doing.'

But there are huge disadvantages, he explains. 'It is difficult to get proper results because of the context, and also it only provides information. After selecting a good number of indices, all parties agree on the data, it is checked, etcetera, but all you are getting is information: who is doing better, who is best, who has best practice in one area, but no direction on how to improve. You know where the problem lies, not how to solve it.'

This is where process benchmarking comes into play. 'Process benchmarking provides solutions. It is searching for who is doing certain practices in the best way, who is excelling at certain processes, and utilities try to learn from it and adopt best practice.'

Finding out who is best requires some metrics, so process benchmarking contains an element of this as well, he says. 'But it is just a tool, not a means to an end: it is not there to compare figures but specific processes or practices. Once best in class is identified, the processes are broken down into very small parts, which sometimes have to be evolved and adapted to what is needed, and in the end you need to implement changes. Unless there is some improvement, process benchmarking is not completed, the same as metric benchmarking needs a final analysis of results.'

It is important to understand these distinctions, he stresses, because there are 'huge misconceptions' within the

industry about what metric and process benchmarking are, he warns. 'Sometimes metric benchmarking is called process benchmarking – sometimes metrics are measured by breaking tasks down into very small processes, which are measured, but to that point it is still only metric benchmarking because you are only comparing figures. Even at conference level, people keep mixing both types of benchmarking up.'

Most benchmarking efforts start with metrics, and regulators are keen on them as they are a good tool for their purposes. Even individual utilities, associations and NGOs have developed metric benchmarking and there are many examples such as IBNET (see box). 'There are not many people doing process benchmarking, or they don't publicise it – they may do it on their own, and sometimes we don't find out.'

Metric benchmarking is a good way to interest utilities in benchmarking, he explains, in order to find their weaknesses, but after a while, particularly if the partners in the exercise remain the same, the exercise loses meaning. 'Often utilities think they know a lot about their processes and data, but once they try to get it out they realise they don't have it so handy,' Dr Cabrera notes. 'It becomes a learning experience.'

Progress on processes

Usually, at this stage utilities begin to investigate process benchmarking, he adds, in order to get results. One of the most significant process benchmarking efforts is being undertaken by WSAA/IWA (see box). Many utilities around the world are involved, using the IWA system, in an ongoing project. Every year, a different topic is chosen and benchmarking is undertaken against this. 'The point is that these utilities get together each year and focus very specifically on these issues, try to find the best in class and break things down to find out if they are being efficient.'

The IWA Task Group has recently been set up and it is trying to explain this type of best practice, but in 'quite a lot more detail,' Dr Cabrera adds, the intended result being the manual of best practice which will explain clearly what both types of benchmarking are and how to be successful in undertaking them.

'Fortunately we have some very experienced people and we are trying to write the manual now. It won't have any data from the WSAA/IWA project, but it will reflect the experience of people and we hope it will be very useful.'

On the ground, one of the groups at the forefront of European benchmarking is the Dutch water companies under the aegis of VEWIN, the umbrella association for the country's water utilities. Peter Dane is the project manager involved in establishing an international benchmarking programme with the Scandinavian countries to take their efforts further. He explains that the Dutch water companies began benchmarking in 1997, when there was an ongoing discussion about the future of the sector and whether it should remain public or be privatised. 'The water companies said at the time they wanted to remain public because the water supply was fully public in Holland, and they didn't see the advantages of privatisation. But they said if we wanted to avoid this, then we needed to put more effort into being more efficient. The Dutch utilities said we needed to be more active and show that we were more efficient and show the government there was no need for privatisation, so benchmarking started.'

The companies have now been benchmarking for a decade, and three years ago the University of Rotterdam calculated that their efficiency had improved by an extremely creditable 20% over that time. However, the companies were not content to rest on their laurels and, realising that to continue to improve they needed a fresh impetus, decided to branch out.

If you are benchmarking with the same group over ten years, you know each other and you don't get new ideas for improvement. Benchmarking is a matter of calculating performance, looking at figures, and the most important part is the exchange of best practices. But after so many years, they knew all about each other and have had to look for something new.'

The companies are now looking in two new directions – towards cross-sector benchmarking, looking at completely different industrial sectors to see if it is possible to find comparable business processes such as customer services and find out how these are organised, and towards enlarging the group by bringing in international comparators.

Hence the approach three years ago to the Scandinavian countries to establish benchmarking cooperation. VEWIN is now preparing for a second pilot project this autumn, and has sent out letters of invitation to utilities in western and northern Europe to join the enlarged group. 'Because it's still a pilot, a developing project, we can't do everything – we can't invite the world, it's too much for the present organisation. But we are not directly limited – if there are other utilities in the southern part of Europe or even further afield it is not a problem, but our main target is west and north.'

It is a project that must be handled carefully, Mr Dane notes, because the idea is not to have the largest benchmarking project in the world, rather to have new partners to compare with. 'It is our aim to let it grow one step at a time,' he observes.

Holland also has contacts with other international projects such as the landmark Australian benchmarking initiative, and has another project with an international consultant as well as contacts with the World Bank's IBNET project.

The need for common definitions

'We have initiatives in IWA itself, because when you are talking globally, the idea with the IWA is to connect these sorts of initiatives. That is one of the reasons why we have set out the next project – we want to use the IWA PI system as much as possible. The IWA has made two extensive manuals of benchmarking PIs for water supply and wastewater, with a lot of definitions, and we have said in our project with the Scandinavians that what we see even in this little part of the world is that we use a lot of different definitions, for instance between Holland, Denmark and Sweden. It's no good if you want to compare internationally, you need a common definition.'

He adds: 'You could invent the wheel again, but it is better to use an

IBNET: The International Benchmarking Network for Water and Sanitation Utilities

The International Benchmarking Network for Water and Sanitation Utilities, or IBNET, began in 1996, a World Bank initiative to enable water and sanitation professionals with an interest in utility performance to compare data by working on reducing the key barriers to benchmarking by agreeing a standard set of indicators, a standard set of definitions and a route to sharing results. The first product was the preparation of an IBNET benchmarking start-up kit that can be used to start the benchmarking process.

In the next phase of IBNET's development, the focus is on developing a global database, with comparable data, for use by stakeholders such as utilities, regulators, policymakers, funding agencies, academia and consultants, which is free to access and use. The website will not only contain a large database that attempts to represent the different regions of the world, but also resources such as tools, publications, useful links and a glossary to help utility managers starting the benchmarking process, and other stakeholders needing more background.

The idea behind IBNET is that benchmarking must start as a local initiative. 'Only when there is local demand for benchmarking, local ownership will ensure the sustainability over time. To generate the benefits of improved performance, benchmarking will have to become institutionalised in the organisation as one-off benchmarking efforts tend to have little long-term impact,' IBNET says.

existing system like the IWA as an opportunity in future to connect with different international initiatives.' Holland is also involved in a collaborative project with southern Germany and Austria, which also uses the IWA system, he notes.

Roelof Kruize, CEO of Waternet, Amsterdam's water company, explains that at a national scale, when you drill down to that level of detail, the existing Dutch benchmarking system has a solid foundation for reaching out in this way. 'Our water companies are involved in three different types of benchmarking – for sewerage, water treatment and drinking water. These are national benchmarks. By law, all of the drinking water companies in the Netherlands must benchmark because they are publicly owned, so there is no regulation apart from benchmarking.'

He adds: 'I think one of the main issues in benchmarking is that you show the public what you are doing and compare the results with other countries. The second main issue is to learn from each other and improve processes and results. Sometimes these get mixed together, which makes things complicated. When you learn, you want extra details and information, but when it is for the public you are not so interested in detail, it is more the headlines that you want to report.'

He notes that companies' stakeholders hold them responsible if they are not at the top of the list, so there are companies that 'show their figures as more positive than they are. When you want to learn from each other, you should be honest.'

Mr Kruize explains that there are discussions in the Netherlands about separating these two goals, and having a public awareness benchmark and another, more detailed one on improvement. This was one of the main issues at a benchmarking conference in Amsterdam last year, he adds. 'How you deal with this is always difficult, to find the right parameters – things are not always comparable. You can have discussions for years before starting. Even if you have international benchmarking, which we like to do, it is more difficult because you have different situations, so it is important to choose the right parameters.'

First step in establishing these, he adds, is to have discussions, asking the key question – whether the process will be looking for process parameters or results. 'Process is easier, there is more space for interpretation. With results there is one figure or value, it is important to define what is in the value or definition – you have to have a very good definition discussion and even if you do, at the end you find it has been interpreted differently and sometimes you have to do it two or three times. It is a long process, but worthwhile because you can learn from each other. It is good for companies and their employees to see how good they are – it can be a motivating factor.'

Bank interest

It is not, of course, just utilities and their regulators that benchmark. Christoph Gleitsmann of the European Investment Bank, says that when he attends conferences some people find it surprising that the banks are interested in benchmarking. 'We thought it was a natural thing, depending on accurate data from potential clients.'

At the first appraisal stage, he explains, when the bank is looking at investing in a project, they need reliable data 'and if it comes in the form of PIs all the better'. But he adds: 'We are not just looking at data, but how prepared and how reliable a client is. From experience we can tell if certain parameters are okay or not, so accurate data gives an indication of the quality of those presenting the data.'

At appraisal stage, the bank discusses the data with the project promoters and owners, which gives good feed-back about how the data is being calculated. 'I would stress the point that the quality of the data is very much dependent on the quality of the input – rubbish in, rubbish out. You could present the best PIs and benchmarking parameters but if the data assessment is not accurate and reliable it is useless.'

This is why during the preliminary discussions, the bank's primary aim is to discover if the data it is being presented with is reliable. 'Then we use certain PIs as a tool for monitoring the project, and put in the contract a reporting sheet request as an annex, which requests the utilities we are working with to report and we refer explicitly to the IWA indicators for water and wastewater utilities.'

'This is not always met with enthusiasm,' he notes. 'Certain countries have their own indices, for instance Germany has not used the IWA indices. This is not a big problem – we allow them to use their own as long as they get similar results. For others it might be a challenge, it would be the first time they had encountered such indices. We feel it's quite useful for them. If we get data from them it should be comparable. We stress data comparability.'

He explains that first steps in benchmarking do not have to be overly ambitious in scope: 'A utility could monitor vertically within the same utility or project, or across several utilities. Even national benchmarking can be difficult because of the generation of data, there might be different qualities or standards, not to mention international comparisons.'

For the bank, quality is more important than quantity, Mr Gleitsmann adds. 'If we restrict to a few key parameters that we like to get from a project, we can judge how reliable they are and compare, but we are aware there are limitations.'

He notes: 'It's useful, it's a good tool, but it's not everything you need to see. It doesn't replace detailed discussion and on-site visits. Its usefulness shouldn't be over-estimated. There are countries and utilities that are very decent in data assessment and

'You could invent the wheel again, but it is better to use an existing system like the IWA toolkit, and have the opportunity to connect with different international initiatives'

The WSAA benchmarking programme

The Water Services Association of Australia (WSAA) is very active in benchmarking. WSAA deputy executive director Claude Piccinin says: 'We are involved in both metric and process benchmarking. WSAA published an annual metric benchmarking document called WSAAfacts between 1996 and 2005. In 2006 we joined all the state, territory and federal governments in publishing a two volume metric benchmarking document called the National Performance Report (released in 2007). Both volumes and the detailed definitions can be downloaded free of charge from our website (www.wsaa.asn.au). The 2007 edition will be released in 2008.'

'Since 2000 we have also run a voluntary and rolling programme of process benchmarking projects. The current project – which is a joint IWA/WSAA project – is on customer services. There are 15 participants: 10 Australian water utilities, two US water utilities, two European water utilities and one New Zealand water utility.

The project concluded with a best practice workshop held in Sydney in mid-September. Each participating utility receives an industry-wide report and a utility-specific report. These reports are available only to participants. A more general article is usually published after each project.

'In 2008 we will run the asset management process benchmarking project. This is an easy entry project for benchmarking because there is no data requirement – this project is really a companion project to the civil and mechanical and electrical projects.

'WSAA and IWA will call for utilities to indicate their interest in participating in the 2008 project soon, with a view to finalising participating utilities by 5 December. The project would run from March and end in September 2008.'

reporting, but they are still in the minority.

'It is still very much a case of promoting and disseminating the IWA benchmarking and PI exercise. It is important that people are reporting on the same set of data and indices. Then benchmarking will become more useful.'

Judging accuracy as an outsider is not easy, he remarks. 'What we are trying is testing certain parameters, to get a feeling for how reliable they are. It would be welcome if it was used on a bigger scale and more accurately, in the new EU member states for example.'

The message is that in some form or other, however rudimentary, benchmarking is now being undertaken virtually everywhere.

Benchmarking has recently been introduced in the Czech Republic, he notes, but it is still very new though 'they are open to see it is an important tool for them.'

'From our perspective, it is less important to have a very sophisticated system with dozens or hundreds of indicators, but rather 20 or 30 indicators that give us the information we need,' he concludes. But benchmarking is inevitably becoming more sophisticated. 'Other banks are doing the same. The EBRD and World Bank are still on percentages for leakage, but we are trying the more sophisticated IWA parameters for leakage, and are trying to convince the World Bank to follow suit.'

The World Bank benchmark

The World Bank, meanwhile, has been a leader in establishing basic benchmarking among developing countries via its IBNET project (see box). Caroline Vandenberg is project manager for this, and has wide experience of how benchmarking is being implemented around the world.

She instances Brazil's water company association SNIS as an interesting example, where benchmarking is used as an instrument for public finance. 'If the water companies want government investment, they have to submit data or they can't access funding.' Benchmarking has moved from a Bank project with the 26 state water companies to involve around 400 municipalities, which are beginning to look further afield at how other countries such as the UK deal with customer issues.

As another example, the Bank has worked on a preliminary benchmarking exercise with Shandong province in China, and is now undertaking a second, and work is also being undertaken in areas as disparate as Vietnam and Africa, where South Africa is interesting in that it distinguishes between water supply and bulk water companies, and Zambia has a system that it uses as a proxy for regulation.

Eastern Europe has had to catch up on the data front to meet the demands of EU entry, and some interesting work has been undertaken there, she comments. Further east, there is work even in some of the poorest countries such as Moldova, Georgia and Armenia, and Russia, with its many Vodokanals and aspirations to private involvement.

On IBNET, she says: 'When I took over the project two and a half years ago the major goal was to get more data in the system, because if you talk to people they do not think you are serious unless you have that. The second goal was to make the website easier to manage and more attractive.'

The focus has been on developing countries, because IBNET is donor funded and that is their focus, but the next phase will expand the project further to other regions. Some are better than others at benchmarking, she notes, with Asia particularly weak. 'There is a distinction in how it is managed and it is hard to get data.

The Bank is also trying to work more with developed countries despite the spending ties, and is looking at how to move from donor funding to a more sustainable system, possibly using the revamped website to generate funds. IBNET would evolve to become an inexpensive hub, with the bulk of the work being undertaken by regional hubs. 'We also have to think about who would take it over, though there is not anything specific yet. I think there will be people who would want to take it up, particularly if it did not cost a lot.'

Ms Vandenberg says: 'I would like to work with the IWA on IBNET. It is a minimum step, the IWA toolkit is at the other end of the spectrum, it requires extremely complex, detailed information, which is not necessarily available in the developing countries. But we can do things on the quality of data, and how you can slowly move from the basics such as IBNET and build up modules so that in the end you get something like the IWA toolkit.'

The question being discussed with an IWA task force is whether to take the approach of benchmarking the financial and operational aspects or to focus on quality issues and customer satisfaction, or to go for higher reliability of data. The idea, whichever approach or combination of approaches is taken, is to move gradually to a gold standard.

Although the picture around the world is clearly extremely mixed, the message is that in some form or other, however rudimentary, benchmarking is now being undertaken virtually everywhere. And inevitably, as interest grows a thirst for more sophisticated comparison emerges and benchmarking develops, as it already has in the countries that embraced it first, into a powerful tool for self-improvement. ●

North European Benchmarking Co-operation (VEWIN)

The North European Benchmarking Co-operation (NEBC) is an initiative of the national water associations and several utilities of Denmark, Finland, the Netherlands, Norway and Sweden. The objective is to improve efficiency and transparency of water services by:

- exchanging knowledge on benchmarking
- developing a common benchmarking programme
- exchanging best practices of management and operations

After a first pilot the NEBC-partners decided to work towards an international benchmarking programme for water as well as for wastewater activities, for smaller as well as for larger utilities and to focus not only on costs, but on all relevant performance areas. A second, larger pilot project was due to start on 1 October, with data of 2006 and using a newly developed model based on the IWA PI-system.

Water utilities from (in principle, but not limited to) North- and West Europe are invited to join this leading edge project which is supported by IWA. If you are interested, please visit www.waterbenchmark.org or contact us at info@waterbenchmark.org.

Customers and complaints: lessons to improve water utility communications

Failure by water utilities to understand customers and how to communicate with them can increase the level of complaints. **ANNE OWEN** describes work carried out in the UK to create a framework for understanding customer behaviour and improve the approach to interacting with them.

Since privatisation in 1989, the UK water industry has conducted a number of customer surveys. Some of the findings have highlighted for the industry that attitudes, opinions and beliefs held by customers may be contrary to those expected or assumed by water industry professionals such as managers, engineers, scientists, regulators and public relations groups (Owen, 2000). Customer complaints about the quality of tap water increased in the years after privatisation. This is despite parallel improvements in compliance with regulatory drinking water quality standards (see Figure 1).

Drinking water monitoring programmes have been used to demonstrate compliance in relation to customers' perceptions of drinking water quality, an approach which has attracted criticism (Ward, 1996; Schofield & Shaoul, 1997). It is apparent that established methods of monitoring and testing for water quality using samples taken from customer premises for regulatory compliance cannot be relied upon as providing an indication of customer satisfaction (Owen, 2000).

Customers have been expressing their dissatisfaction of drinking water by complaining in significant numbers to their local water company (Hurd, 1996; Owen, 2000). Customer complaints are useful to water companies (Mallevialle & Suffet, 1987) if they are recorded and investigated properly. However data of this type cannot be used as an absolute 'measure' of drinking water quality in itself. If customer complaints are to be used alongside regulatory scientific measurements, then more accurate systems for diagnosis and recording of complaints need to be developed.

Much of the UK water industry literature about customer complaints and service (Bailey & Tuckwell, 1992; Jones & Tuckwell, 1993; Jones, 1996; Farrimond *et al.* 1997) has failed to identify the key influencing factors which are critical to communicating with customers about financial issues and the complex processes behind the delivery of drinking water to their homes. Customer acceptance of communications from the professional community about drinking water supplies is dependent upon how an individual receives, interprets and understands the information provided to them in the context of their local community (Fessenden-Raden, *et al.* 1987; Fitchen, 1987).

This article describes a framework developed to better describe the water utility customer base and the lessons this framework provides to help utilities adjust their approaches to customer communications.

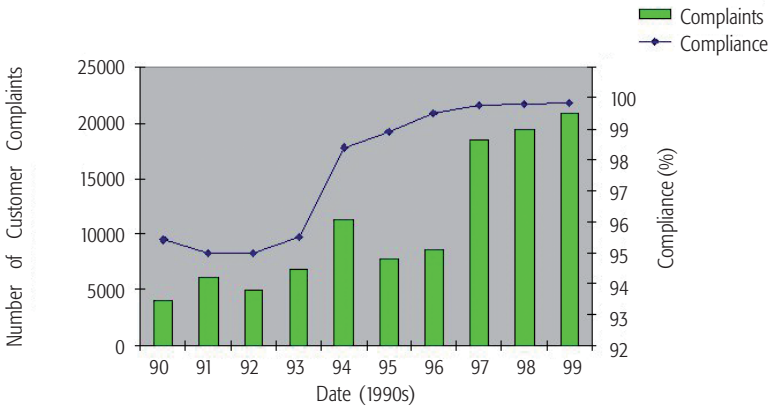

Figure 1 Customer complaints compared to compliance data, 1990-1999 (source: Owen, 2000)

Methodology

Design of the Perceptions of Drinking Water Survey (PDWS)

To explore the factors influencing customer complaints about drinking water supplies, a questionnaire was used, The Perceptions of Drinking Water Survey (PDWS) (Owen, 2000). The survey had been developed following qualitative studies with focus groups of customers (complainers and non-complainers) immediately after the introduction of a new source of water in an area of Oxfordshire (Owen, *et al.* 1999a). The PDWS comprised thirteen pages divided into discrete sections and was used to explore customer and professional perceptions about drinking water supplies, namely: consumption of tap water; knowledge about tap water; attitudes, beliefs and opinions about the water industry; views about the water industry; anything not covered by the questionnaire (left blank for comments); and demographics.

Recruitment of customers

The PDWS, a postal survey, was sent to customers who had been recruited based on complaining behaviour. Customers who had contacted Thames Water about the quality of their drinking water during an eighteen month period were defined for the purposes of this study as 'complainers'. Customers who had had no contact with the company, except through receipt of their water bill, during the same study period were defined as 'non-complainers'. Each questionnaire was posted with a covering letter, prepaid return envelope and pen. Reminder calls were made to participants two weeks after the postal date to prompt a response. Questionnaires not returned after four weeks were counted as non-responses. A total of 2494 questionnaires were distributed to the customer groups who all lived within Thames Water's operational area; 1319 (53%) were returned, of which 1213 (49% of the total distributed) were usable, i.e. complete.

Results

Qualitative and quantitative data collected using the PDWS were considered in the context of published knowledge about complaining behaviour (MacGregor & Fleming, 1996), organisational communications

(Grunig & Hunt, 1984) and complaint handling (Tax *et al.* 1998) leading to the development of a framework describing the factors influencing customer complaints about the quality of drinking water supplies.

The organisational communication theory of Grunig & Hunt (1984) proposed that a population could be segmented into groups of 'publics': 'non-publics', who are non-complaining customers who would not complain under any circumstances; 'passive publics', who are satisfied but might complain under certain circumstances; 'latent publics', who have concerns and have the potential to complain; and 'active publics', who are complainants. They identified three factors which determine what makes a public become an active public – perceived involvement, recognition of a problem, and constraint from doing something about the problem.

The published sources and the results from the PDWS were combined to create a framework of factors influencing customer perceptions and complaining behaviour in relation to the water supply process (see Figure 2). It can be seen that public perceptions about drinking water supplies are affected by changes that occur in an individual's emotional response (somatic cue). Three distinct types of somatic cue were confirmed as influencing decision-making about the quality of drinking water supplies: aesthetic; health concerns; and service failure. Media reporting of drinking water issues was found to be influential in how groups of 'publics' responded to communications produced by Thames Water.

The quantitative data collected using the PDWS revealed characteristics of the different customer groups (complainers and non-complainers). The qualitative data collected proved useful in exploring how each factor impacted on perceptions of drinking water supplies, highlighting for water companies and regulators how their own communication processes and also customer perceptions could be measured and improved.

The model of Grunig & Hunt (1984) provided a justification for organisations to develop and implement communication strategies as 'a way to prevent publics from becoming active'. To explore the data in greater depth a decision was made to divide the complaining customers into two discrete groups – complainers (bulletin board) and complainers (transitory). Complaints made by the first group were those which could be linked to an operational incident that had occurred and where the problem had been electronically recorded. The

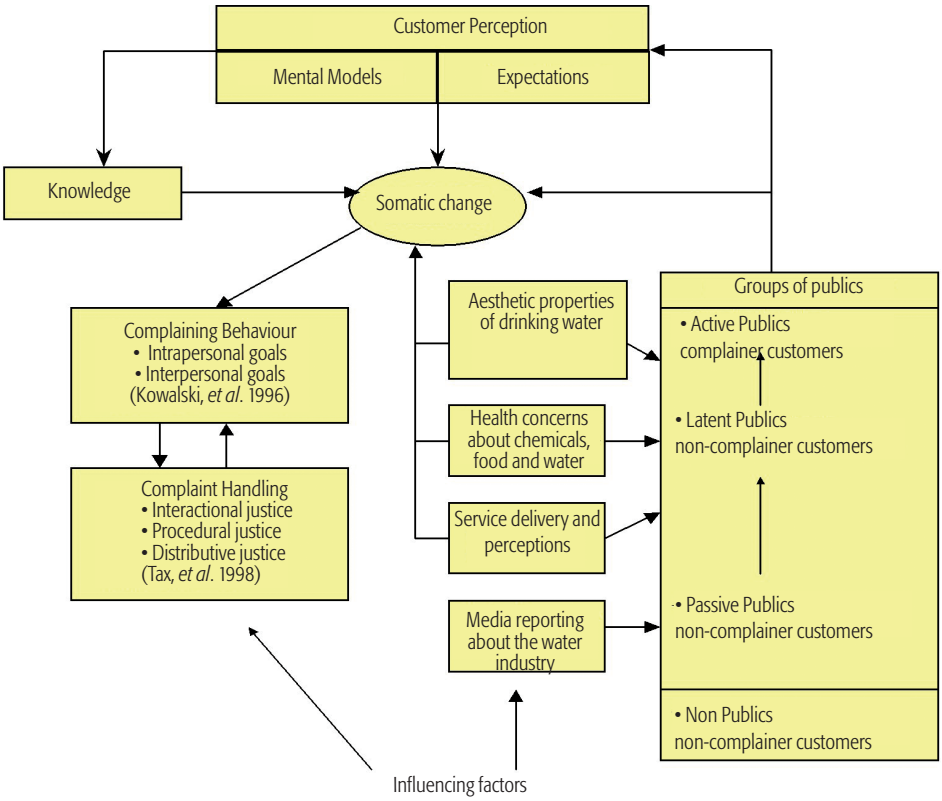

Figure 2 Framework of factors influencing customer perceptions and complaining behaviour about the water supply process (source: Owen, 2000)

second group could not be identified in this way and were considered to have experienced a 'transitory' aesthetic problem such as taste, smell or discoloration. Analysis of the quantitative and qualitative data collected using the PDWS considered in terms of Grunig & Hunt's (1984) work revealed five discrete publics (Figure 3) in the context of the quality of drinking water supplies (this excludes 'non-publics', which were not distinguished, but includes an additional category of 'water professionals').

Non-complainers were categorised either as 'passive publics' or 'latent publics'. They were categorised as 'passive publics' where responses indicated no concerns (i.e. 'water safe', 'no treatment concerns', 'trust water company'. They were were categorised as 'latent publics' where responses indicated there were concerns (i.e. 'water unsafe', 'treatment concerns', 'distrust of water company').

As can be seen in Figure 3, passive publics is the largest group of non-complainers. This group was seen to hold strong views about water safety, fewer treatment concerns and greater trust in water companies when responding to quantitative questions. However, this group did not express any views in qualitative questions indicating they had no need to complain to their water company. Passive non-complainers are individuals who feel able to personally control events in their life; they also have an inherent distrust of authority and made judgements about risk for themselves rather than relying on (or accepting) the decisions of 'professionals'.

The other group of non-complainers expressed views in qualitative questions and therefore fit the latent public group definition of the Grunig & Hunt (1984) model. These non-complainers exhibited the potential to become active complainers primarily through their receptivity to the way industry, government and the scientific community engage the media in reporting about the water industry, water quality and health concerns and regulation. This group display a willingness and desire to be involved in decisions about or changes to their water supply. This sense of involvement enables them to judge risks and retain a sense of control over the situation.

Discussion

Acceptance of communications by groups of publics (customers) about drinking water supplies depends upon how the individual receives, interprets and understands the information provided to them in the context of their local community (Fessenden-Raden, *et al.* 1987). Fessenden-Raden also argued that when incorrect subjective judgements are made, no amount of subsequent effort will be effective in correcting an individual's initial perceptions. Public models of the drinking water supply process do not need to be complete or consistent for them to be effective; a reasonably large

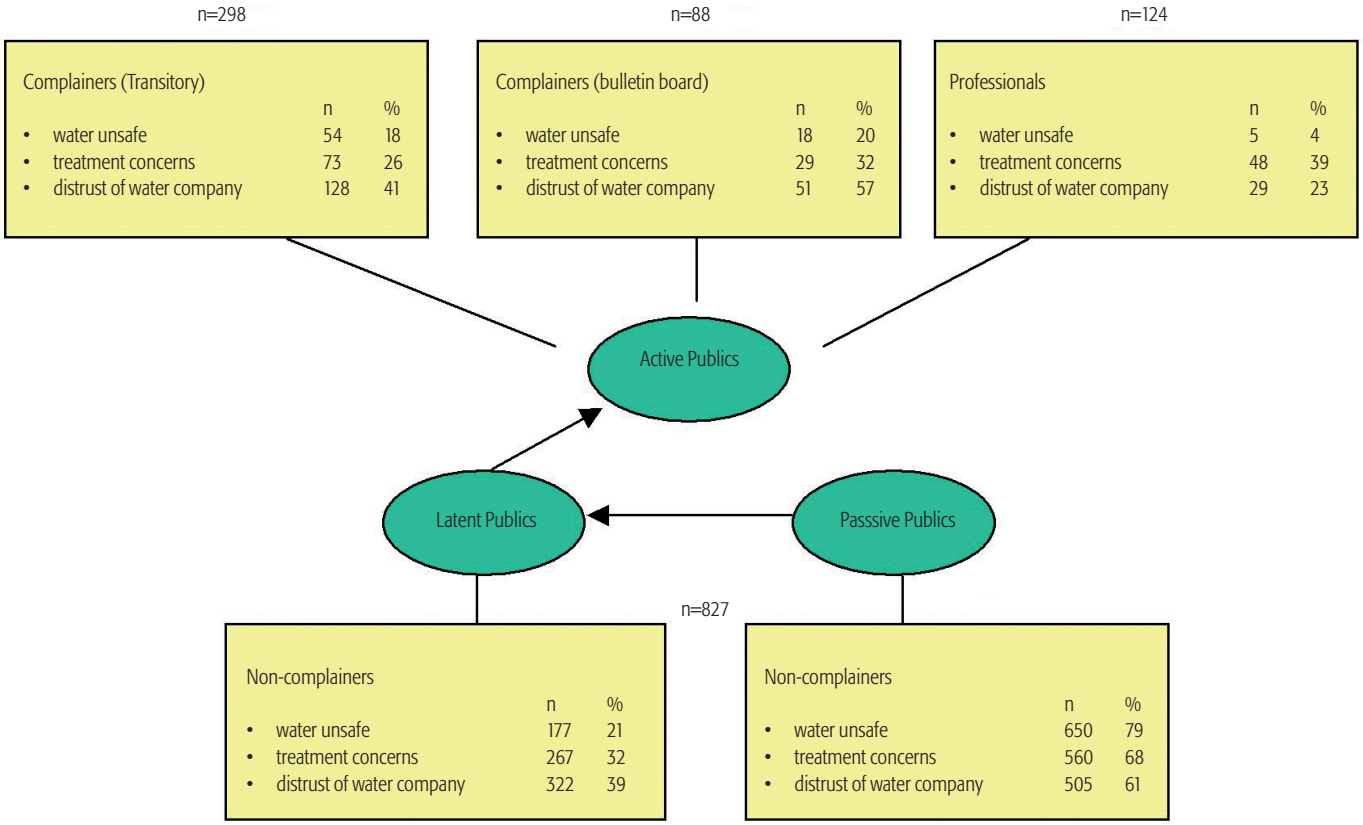

Figure 3 Water company customers classified according to Grunig & Hunt's (1984) model of organisational communications (source: Owen, 2000).

and coherent interconnected set of facts and hypotheses can be made workable and robust (Owen, 2000). This is one of the reasons why communication of information about perceived or real risks associated with drinking water supplies is difficult between professionals and publics (audiences). Professionals tend to disseminate information as a one-way process using technical jargon. Professionals also hold detailed mental representations (linear cognitive maps) of how drinking water supply processes work making it difficult for them to understand or predict how the public will receive, interpret and act upon communications they produce.

Conclusions

In the 1990s, the UK government and the water industry went to considerable efforts to provide the public with information about drinking water supplies. This process began in the 1980s in the context of a political debate about new European legislation and standards. By 1990 there was the added dimension of privatisation of the water industry. The findings presented in this article suggest that such communications have been ineffective, if not counterproductive, causing customer complaints and dissatisfaction about drinking water quality to increase, even though water companies in the same time period have invested heavily in programmes of work to measure and improve drinking water quality.

It is suggested that new methods of customer communication, based on the framework developed, are essential if the publics (audiences) are now to accept that their water supplies are safe to drink. Established methods of scientific testing of water samples should not be relied upon as the best or the most relevant means of identifying or resolving customer complaints about drinking water quality. Similarly, water quality compliance reports showing that 99.5% of tests have passed government standards may be a further cause of erosion of the publics (audiences) trust in the industry, as there may be adverse judgements made about the nature and magnitude of health risks surrounding the 0.5% of samples which failed the regulatory standards.

In 2004, following recommendations from a PhD research project by the author (Owen, 2000), a new system of reporting customer complaints was adopted. The Drinking Water Inspectorate for England and Wales asked water companies to report customer calls as either (a) enquiries (seeking more information) or (b) operational service failures (complaints). Without doubt this new approach assists both the regulators and the water industry in minimising the actual reporting of customer dissatisfaction and maximises regulatory compliance.

However, there is still a need to address the real crux of the problem, which is proactively communicating with customers. For this type of reporting to truly reflect customer satisfaction and compliance with regulations it is necessary for the water industry to develop a generic complaint handling and classification system. This would involve training of the much undervalued customer agents who are the mainstay of customer call centres and who are often the people least likely to be provided with the appropriate training and information to deal with calls from customers effectively and efficiently.

As a first step towards developing a generic complaint handling system, the technique of mental modelling should be used to gain an understanding of what customer agents already know about the drinking water supply process and what gaps exist in their knowledge. Only then can realistic training programmes be developed to meet the ever increasing needs of customers, water utilities, regulators. The new classification system would also provide positive feedback to water companies on the gaps in their communication and complaint handling strategies. ●

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The views expressed in this paper are solely those of the author.

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Legislation drives Brazilian investment

Brazil is expecting to see substantial increases in investment in the water sector thanks to new legislation. By **JOSÉ AURÉLIO** and **ANNA VIRGINIA MACHADO**.

Water consumption in Brazil has increased at a rate exceeding population growth and this, allied with exclusion from access to drinking water and basic sanitation, has accentuated deep-seated inequalities regarding living opportunities.

With a view to making advances in terms of human development, there is a need for political disposition and vision in applying resources (those of the financial, technological and human capacity kind) in order to overcome the global crisis that affects the water supply and basic sanitation sector. This is a task that should unite the efforts of all concerned, both government and society.

As far as water supply is concerned, significant advances have been made in Brazil over the last few decades, attaining notable results, particularly in urban areas. Ministry of Cities data indicate that, in 2005, 82.3 % of households in the country were provided with water via the public supply network.

Despite the efforts that have been made, especially with regard to investment, capacity building and institutional improvement programmes, there are still overall deficiencies in coverage, especially when one considers services provided for the poorest layers of society, in other words, those who live on the margins of large cities and in rural areas.

The greatest challenge remaining is that concerning basic sanitation services. Only 47% of the Brazilian urban population has access to a sewage

Brazil:

Forecast of basic sanitation investment and services (2007 – 2010)

Region	Total Investment (R$ billion)	Households Served (million)
North	3.9	2.2
Northeast	9.6	5.4
Southeast	15.5	8.7
South	7.4	4.2
Central-West	3.6	2.0
Total	**40.0**	**22.5**

Source: 'Programa de Aceleração do Crescimento – PAC' (Growth Acceleration Programme), January 2007 - R$ 1.00 = US$0.49

collection network, and only half of this percentage enjoys sewage treatment services. As a result, major rivers are chronically polluted by untreated sewage, adversely affecting the environment and reducing the flow of available water for human use.

Important advances have been made with respect to water resources management, with the preparation of a National Water Resources Plan in 2006. At the present time, implementation strategies are being developed, focusing on management instruments, on technological development, capacity building and the dissemination of information, and on multiple use and integrated management, among others.

There is also growth in the technical capacity of the country, where public service companies have improved their operational and institutional capacity. There is also a growing number of graduates and post-graduates in the basic sanitation and environmental areas. In addition, there are currently two research programmes focusing specifically on this area, involving around 60 institutions, including universities, research centres and utility companies, backed by government financing.

The most significant advance found at the beginning of 2007 was the coming into effect of the Lei do Saneamento Básico (Basic Sanitation Law – Law No 11.445/2007), which establishes the universal provision of water supply services, sewage collection networks, urban drainage and refuse collection, with a view to guaranteeing the public health of the Brazilian population. This legislation was the result of widespread discussion in the different sectors concerned, and it creates mechanisms and procedures ensuring that the public is provided with information and the right to participate in policy formulation and planning processes.

The legislation establishes creation of the Sistema Nacional de Informações em Saneamento Básico (National Basic Sanitation Information System), with the objective of systematising data relative to the condition of services provided, thus facilitating the monitoring and assessment of the effectiveness and efficiency of such services. Also defined are the ways in which these services may be contracted, together with the preparation of Basic Sanitation Plans.

The principal stakeholders agree that Law 11445/2005 will facilitate the advance of basic sanitation services in Brazil in a significant manner.

The debate that is mobilising the various actors of this sector in Brazil is discussion regarding the way in which the law will be effected by individual states, in accordance with the specific situation found in each one.

Besides this, the National Basic Sanitation Plan is currently in its initial phase of preparation. This plan is to be developed by the National Cities Council and articulated with Municipal Basic Sanitation Plans, thus being an important tool for the strategic planning of environmental remediation measures.

With a view to attaining its goal of universal provision of basic sanitation services, Brazil has determined that investments to the sum of US$ 19 billion will be made by the year 2010. The established target is that of providing 86% of households on the country with a water supply and 55% with sewage collection services. This investment is one of the principal elements of the 'Programa de Aceleração do Crescimento - PAC' (Growth Acceleration Programme), developed by the Federal Government.

The programme establishes that 24.5 million people will be provided with a water supply and 25.4 million with basic sanitation services. It is foreseen that there will be a financial outlay of US$ 4.38 billion for the year of 2007.

As far as sanitation is concerned, the basic premises of the programme includes the universal provision of services, implementation of the Basic Sanitation Law, guaranteeing of a sustainable financing policy, promotion of integrated and sustainable intervention measures in 'favelas' (shanty towns), and support for the preparation of projects, civil works and institutional development actions on the part of basic sanitation service providers. ●

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