

International comparison of water and sewerage service 2007 report

Ofwat – Protecting consumers, promoting value and safeguarding the future



Covering the period 2004-05

International comparison of water and sewerage service

2007 report

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Foreword

We have regulated the water and sewerage industry in England and Wales since its privatisation in 1989. We have used a comparative approach to overcome the lack of natural competitive competition opportunities in this regional monopoly industry. This approach has allowed a huge programme of capital investment (around £70 billion by 2010), a step change in the level of service provided to customers and at the same time incentivised efficiencies worth £100 per year in bill reductions for each customer.

While we can measure comparative performance between companies and improvements in performance over time in England and Wales we can not simply make the assumption that our industry performs well on the world stage. This report sets out the relative position of the England and Wales industry in world terms by making international comparisons in a number of key performance areas, from unit costs to leakage rates.

The annual company data returns provided to us are now the most comprehensive and consistent sets of information about any water industry. However, while we know a great deal about the England and Wales industry we need to look outwards to put its performance in context with the rest of the world. This is not as easy as it sounds – the scale and structure of the water industry here is not seen elsewhere, making benchmarking difficult. That is why we are very grateful to our benchmarking partners who we have developed relationships with over a number of years.

We are particularly pleased to include for the first time data from the Instituto Regulador de Águas e Resíduos (IRAR), the Portuguese regulator and from the National Water and Wastewater Benchmarking Initiative of Canada. And again we express our thanks to the 6-cities benchmarking group of Scandinavia who have provided data for another year. Working directly with partners allows us to understand differences in data, ownership and operating environments and we look to expand these partnerships and others in the coming year.

Where we can make comparisons of customer service the England and Wales companies perform well at a cost to customers and a level of efficiency that appears comparable to elsewhere. The statistics on water use and leakage in the recent drought in the south-east of England are also interesting. Our consumption figures lie in the middle of the range of European comparators (where, unlike in England and Wales, universal metering is typical) and our

average leakage rates are also among the typical range of performance seen in Northern Europe. We find that very low leakage is generally explained by external factors and where England and Wales companies operate in comparable conditions they have similar low levels of leakage.

It is also clear that other regulators, and providers of water and wastewater services want to learn from our experiences. We have welcomed many visitors and have developed productive working relationships with colleagues around the world. We have also continued to make comparative information available on our website.

We look forward to continuing to gather comparable data to put the performance of the England and Wales companies into an international context.



Dr Melinda Acutt
Director of Network Regulation

Summary

In this report, we compare data from a range of water enterprises with the regulated companies in England and Wales for 1 April 2004 to 31 March 2005.

We concentrate on enterprises from:

- Scotland;
- Scandinavia;
- the USA; and
- Northern Ireland;
- the Netherlands;
- Portugal.
- Canada;
- Australia;

We also include information from other countries where it is available. We focus on enterprises that have, to some extent, a distinct corporate identity and independence, rather than being a consolidated function of local government. We feel that enterprises of this nature offer the best comparators for the companies in England and Wales.

We assess relative performance in the following areas.

- Bills to customers.
- Customer service levels.
- Water quality and environmental performance.
- Water delivered, leakage and water efficiency.
- Unit costs and relative efficiency.
- Network activity.
- Financial performance.

Data comparability

Benchmarking is a key business technique for assessing relative performance in the areas of:

- price;
- unit costs;
- efficiency.
- customer service;
- processes;
- quality;
- procedures; and

Although the data may have limitations, benchmarking findings can, and should, help management to improve performance and efficiency.

The data used in this report for the non-UK water enterprises comes mainly from trade association publications and annual reports and accounts. Different

definitions and assumptions in these sources means that information is not completely comparable to that which the companies in England and Wales submit to us.

The major exceptions are the information for the Scandinavian 6-cities benchmarking group, and the Portuguese and Canadian companies included in this report, where we have obtained the data direct from the enterprises or regulators, who have worked to match their input to our reporting requirements for England and Wales.

However, we consider the data used in this report is sufficiently comparable to allow us to draw generalised conclusions. We recommend that the reader is cautious about basing specific regulatory or business decisions on the comparisons in this report (see appendix 1).

1. Introduction

1.1 Purpose of this report

We make our annual comparisons between the companies in England and Wales in the areas of:

- bills;
- leakage;
- relative efficiency;
- service levels;
- operational costs;
- network activity; and
- quality compliance;
- capital expenditure;
- financial performance.

We call this process comparative competition. We believe it has served customers and the environment well, leading to improved services at lower costs. For instance, average bills will be £100 lower due to efficiency savings by 2010 than they would have been without our regulatory regime. Comparative competition also enables us to quickly identify poorly performing companies.

We see this report as an extension of comparative competition. We develop this work both by taking advantage of opportunities, such as those described in section 1.2, to make comparisons with other water enterprises and by actively promoting further water enterprise comparisons. The extent to which we can use this work varies with the quality of the comparative data that we obtain.

We find the results useful in four ways.

- **Context setting.** Data is not very robust and can only be used to put the regulated companies' performance into an appropriate wider context.
- **Challenging.** Data is not fully comparable, but exposes differences that challenge the current performance levels of the regulated companies for England and Wales.
- **Reinforcing.** Data is robust enough to be used as additional support to regulatory decisions.
- **Benchmarking.** Data is robust enough to provide a new benchmark to be used in regulatory decisions.

1.2 Overseas contact

As well as compiling this annual report, we actively pursue a wide range of international contacts throughout the year, with the aim of both consolidating

existing relationships and seeking out new opportunities for international comparisons.

In 2006 we received delegations from a number of countries, including Bulgaria, Germany, Italy, Japan, Korea, Malaysia, Mexico, South Africa and most recently, Portugal. These meetings have allowed us to exchange ideas and best practice with colleagues working in a number of different regulatory environments, and have the potential to develop into the exchange of benchmarking information at a greater level of detail than is usually available in the public domain. The Portuguese visit yielded a large amount of good quality, comparable data, and will hopefully develop into another useful, ongoing, benchmarking partnership.

As well as welcoming visitors to our offices in Birmingham, our staff attend and speak at conferences abroad. Noteworthy events we attended in 2006 included an international workshop on hydro-economic modelling in Valencia, Spain, and the 2nd Ofwat/IRAR dinner debate in Lisbon, Portugal.

One of our most productive benchmarking relationships is with the Scandinavian 6-cities group, an arrangement that is now in its third year. A meeting with the group's facilitators in Gothenburg at the beginning of 2007 has bolstered this relationship.

In general, these kinds of contacts ensure that we have a wide range of experiences to draw on when making decisions that affect the industry in England and Wales. We also develop a greater understanding of the policies and factors that are driving the performance and costs of the companies included in this report. This allows us to be more confident about the implications of any variance in performance of the industry in England and Wales from the comparative enterprises used in this report.

We will continue to extend our involvement with established partners around the world so that more accurate and valuable comparisons can be made. In addition, we will endeavour to forge new opportunities to compare international water enterprises with those in England and Wales.

We actively seek new partners with which to work. If you wish to contact us with regard to benchmarking an overseas enterprise with the water companies of England and Wales then please send an e-mail in the first instance to **enquiries@ofwat.gsi.gov.uk**.

1.3 Areas of comparison

Wherever possible, we compare companies' data across the seven areas that form the basis of our comparative work in England and Wales.

Bills

A simple comparison of the bill levels across various countries cannot take into account the level of service to customers, investment to maintain and enhance assets or the presence of subsidies. However, comparison of bill levels in England and Wales with other countries can provide a useful high-level appraisal, particularly following the large levels of investment seen since privatisation. Other European Union (EU) member states perhaps provide the best comparison because they also must comply with the same EU legislation.

Customer service levels

In England and Wales we assess levels of customer service against a range of indicators. We publish the results each year in our 'Levels of service for the water industry in England and Wales' report so that customers can see how well their company is performing. Details of our criteria can be found in our 'Levels of service for the water industry in England and Wales' report, which is available on our website at www.ofwat.gov.uk.

Water quality and environmental performance

We monitor these areas in liaison with the Drinking Water Inspectorate (DWI) and the Environment Agency, and publish figures provided by these regulators in our 'Levels of service' reports.

Water delivered, leakage and the efficient use of water

We collect information on water delivered to customers, leakage and the efficient use of water to help us assess whether or not a company is using its water resources effectively and to assess companies' relative efficiency. Each year, we publish details of England and Wales companies' security of supply, water balance, levels of leakage and the measures they are taking to encourage customers to use water efficiently. The assumptions we make when estimating components of the water balance can significantly influence comparisons such as unit costs.

Unit cost comparisons and relative efficiency

Unit cost comparisons provide a simple indicator of relative cost performance. We express costs on the basis of cost per property billed and cost per cubic metre of water delivered and sewage collected. Overall unit costs are divided into:

- the costs of operations;
- maintenance; and
- servicing capital.

Where possible, we separate the cost of operations into functional areas of expenditure.

High and low costs do not always directly reflect relative efficiency because factors relating to the operating environment may increase or reduce unit costs relative to other businesses. To take account of this, we use statistical techniques, combined with assessments of company-specific factors, to identify the relative efficiencies of companies in England and Wales. We publish the overall efficiency of companies against these models each year alongside the unit costs in our 'Water and sewerage service unit costs and relative efficiency' report. See appendix 2 for details of our models.

Capital expenditure and network performance

The data we collect on capital expenditure and network performance provides an indication of the expenditure on maintaining and enhancing service delivery, and the effect this has on service to customers.

Financial performance

Comparison of companies' financial positions and performance is an important component of regulation in England and Wales. It opens companies' policies to public scrutiny and allows us to ensure that companies are able to fund necessary investment.

Further information

Further information on the main reporting areas in this report with regard to the companies of England and Wales only can be found in the following five annual Ofwat publications.

- 'Water and sewerage charges' report.
- 'Financial performance and expenditure of the water companies in England and Wales' report.
- 'Levels of service for the water industry in England and Wales' report.
- 'Security of supply, leakage and water efficiency' report.
- 'Water and sewerage service unit costs and relative efficiency' report.

These reports are available free of charge on our website at www.ofwat.gov.uk.

1.4 Countries compared and sources of data

The data in this report is based on a number of sources, which we summarise in table 1. We also include ad hoc data from other countries not included in this table.

For England and Wales, Scotland and Australia, this report uses data for the financial year 2004-05. This runs from April to March in England and Wales and Scotland, and from July to June in Australia. The Netherlands, the USA, Canada, Portugal and the countries in the 6-cities group all report against the calendar year. We have used data for the 2005 calendar year for the Netherlands, Canada, Portugal and the 6-cities group and the 2004 calendar year for the USA.

Unless otherwise stated, all financial data in the tables is in 2004-05 prices. We use exchange rates from the Bank of England for the appropriate year.

Companies in England and Wales submit annual June returns, giving details of all their regulated activities. Data is collected according to specific reporting requirements, leading to a high level of data comparability.

Table 1 Summary of information sources and other assumptions

Country/Group	Companies	Source of data	Financial year	Exchange rate per £
England and Wales		June returns 2005	April 04 – March 05	–
Scotland	Scottish Water	Scottish Water annual return	April 04 – March 05	–
6-cities group ¹	Gothenburg Water Helsinki Water Malmö Water and Wastewater Stockholm Water	Collaboration with 6-cities group	2005 (calendar year)	€1.46 and SEK13.58
Netherlands	Duinwaterbedrijf Zuid-Holland Gemeentewaterleidingen Amsterdam ² PWN Waterleidingbedrijf Vitens Waterleiding Maatschappij Limburg Hydron Midden-Nederland Brabant Water	Annual reports and VEWIN Water Supply Statistics	2005 (calendar year)	€1.46
Australia	Brisbane Water City West Water Limited Gold Coast Water South East Water Limited Sydney Water Corporation Water Corporation Yarra Valley Water Limited	WSAAfacts 2005	July 04 – June 05	AU\$2.47
USA	California Water Service Company Elizabethtown Water Company Illinois American Water Indiana American Water Company Missouri-American Water Company New Jersey-American Water Company Penn American Water San Jose Water Company Southern California Water Company	NAWC Financial and Operating Data report	2004 (calendar year)	US\$1.83
Canada	Regional Municipality of Durham Regional Municipality of Peel Greater Vancouver Regional District City of Waterloo	National Water and Wastewater benchmarking initiative	2005 (calendar year)	CAN\$2.21
Portugal	20 water and 11 wastewater companies regulated by IRAR	Collaboration with IRAR	2005 (calendar year)	€1.46

Notes:

1. As well as the four cities listed here, the 6-cities benchmarking group also includes Oslo and Copenhagen, which did not submit data for this year's report.
2. With effect from 1 January 2006 Gemeentewaterleidingen Amsterdam (the municipal water company of Amsterdam) has merged with the local wastewater utility to form the new company, Waternet.

1.5 Exchange rates and purchasing power parity

The effect of fluctuations in exchange rates can significantly impact on unit costs and perceived efficiency, masking changes in costs. Even our use of average exchange rates may not provide a true reflection of costs. Fluctuations will affect per property unit costs more than water delivered unit costs because of the (relatively) smaller denominator. Similarly, the impact of currency movement will be greater for smaller companies (in terms of there being a lower number of properties and the amount of water delivered).

Purchasing power parity (PPP) theory is one method of correcting for this. It states that exchange rates between currencies are in equilibrium when the purchasing power is the same in each of the two countries. This means that the exchange rate between two countries should equal the ratio of the countries' price levels of a fixed basket of goods and services. When a country's domestic price level is increasing through inflation, we must apply a depreciating factor to that country's exchange rate in order to return to PPP.

The Organisation for Economic Co-operation and Development (OECD) publishes yearly and monthly PPP figures for all member countries. PPPs are based on a sample basket of goods and services selected to be representative of the Gross Domestic Product (GDP) for each country. If PPPs specific to water industry expenditure were available they might differ from these, although probably not substantially. Other caveats include:

- for the theory to hold, there should be competitive markets for goods and services in each of the countries;
- people in different countries consume different sets of goods and services, so the comparison is not strictly like-for-like; and
- non-traded goods are not subject to PPP.

For the countries we consider the first two points are unlikely to lead to large discrepancies. This is because they all operate in competitive market environments and consumption patterns in these developed countries are probably sufficiently similar. The third point could lead to errors. Trade between countries in construction and maintenance projects tends to be low. For example, energy and labour costs may need specific corrections. On the other hand, trading in mechanical and electrical equipment and components is likely to occur.

Bearing these limitations in mind, the PPP US\$ exchange rates can be converted to base sterling (table 2) and applied to the relevant expenditure figures.

Table 2 PPP exchange rates against sterling

Country	Period	Currency	PPP exchange rate (currency/£)
Finland	Calendar year 2005	€	1.57
Sweden	Calendar year 2005	SEK	14.88
Netherlands	Calendar year 2005	€	1.43
Australia	July 2004 – June 2005	AU\$	2.23
USA	Calendar year 2004	US\$	1.62
Canada	Calendar year 2005	CAN\$	2.02
Portugal	Calendar year 2005	€	1.14

2. Regulatory structures, data sources and company characteristics

2.1 Regulatory structures

While approaches to water service provision and regulation differ across the world, all customers want an efficiently run company that seeks to minimise price increases and provide good levels of customer service.

The water industry in England and Wales consists of 23¹ fully privatised companies, with 10 providing both water and sewerage services and 13 providing water only. Three main agencies regulate these companies. We are the economic regulator and we use comparative competition to set companies' price limits and make sure that they run their businesses efficiently. The DWI monitors the quality of drinking water supplied to customers and the Environment Agency scrutinises the companies' environmental performance.

The regulatory framework in Scotland is now very similar to that in England and Wales. The Water Industry Commission for Scotland (WICS), which took over the role of the Water Industry Commissioner for Scotland on 1 July 2005, oversees economic and customer service regulation. Separate public bodies regulate drinking water standards and environmental performance. Water and sewerage services are provided by Scottish Water, a publicly owned company formed in April 2002 from the three vertically integrated water authorities.

Northern Ireland is moving to a system of economic regulation based on that in England and Wales and Scotland. The water industry in Northern Ireland is not privatised.

The regulatory regimes vary across the 6-cities group, but there are some common characteristics. Ownership and operation is normally organised in the form of a public utility, either as part of a municipal organisation or a publicly owned company. The local municipalities are often responsible for monitoring drinking water standards whilst regional bodies consider environmental and resource issues. Prices are not controlled through an economic regulator but by frameworks or the law. In Sweden, for example, it is illegal to make a profit from a water supply enterprise. Although the national laws lay down minimum standards, benchmarking is largely done on a voluntary basis through national associations such as the Danish Water Association (DANVA), the Norwegian

¹ Data for Cholderton Water is not included in this report.

Water and Wastewater Works Association (NORVAR) and the Swedish Water and Wastewater Works Association (Swedish Water).

Water resources management in the Netherlands involves national, provincial and local government. As of 1 January 2005 there were 14 water utilities in the Netherlands. Of these, one was a municipal (AMS) and one a small private company (Bronwaterleiding Doorn). The remaining companies are regional PLCs owned by municipalities and/or provinces. A trade association called the Association of Dutch water companies (VEWIN) represents their interests. Price setting is a regional responsibility whereby companies propose annual price changes which are approved by supervisory boards. In 1997 a number of the Dutch water companies began participating in a voluntary benchmarking system, with the aim of improving efficiency in the sector by encouraging comparisons between suppliers.

Australia, like Scotland, has a generally similar regulatory framework to England and Wales. Public bodies exist to regulate drinking water standards and environmental concerns, whilst economic regulators monitor prices and efficiency. Due to the federal nature of government in Australia, each state is responsible for regulating its water sector. Consequently, the exact nature of the sector varies from vertically integrated organisations to separate entities undertaking the wholesale and the distribution/retail functions.

The large number of water systems in the USA varies widely in size and form of ownership, and the type of regulation depends on the ownership and location of the system. Federal policy drives drinking water quality. The privately owned concerns are members of a trade association, the National Association of Water Companies (NAWC). Many serve cities or suburban areas. Each of these companies is relatively small in terms of properties connected.

Tribunals generally regulate prices in the USA by fixing the rate of return that a company can earn on its assets. There is less emphasis on the medium-term incentive-based regulation used in England and Wales.

The majority of the public water supply in Canada is provided by municipally owned infrastructure, and is subject to levels of finance and quality standards set at a provincial level in accordance with government guidelines. The municipalities are generally responsible for setting water prices. Depending on the financial restrictions and subsidies handed down by the provincial government bills can vary from very low cost to higher full cost pricing. Instances of private operation and ownership as well as public/private partnerships are increasing.

The water industry in Portugal is split into bulk and retail suppliers, and has been subject to regulation by IRAR since 2000. Table 3 sets out the abbreviations used for companies in this report.

Table 3 Company abbreviations

Abbreviations used in this report	Company name	Area served
SCO	Scottish Water	Scotland
GTB	Gothenburg Water	City of Gothenburg
HEL	Helsinki Water	City of Helsinki
MAL	Malmö Water and Wastewater	City of Malmö
STH	Stockholm Water	City of Stockholm
SCG	6-cities group	Scandinavian cities listed above plus City of Copenhagen and City of Oslo
DZH	Duinwaterbedrijf Zuid-Holland	South Holland
AMS	Gemeentewaterleidingen Amsterdam	Amsterdam
NHO	PWN Waterleidingbedrijf	North Holland
VIT	Vitens	Gelderland, Overijssel and Friesland
WML	Waterleiding Maatschappij Limburg	Limburg (Maastricht)
WMN	Hydron Midden-Nederland	Mid-Netherlands (Utrecht)
BRA	Brabant Water	North Brabant
BRB	Brisbane Water	Brisbane, Queensland
CW	City West Water Limited	Melbourne, Victoria
GC	Gold Coast Water	Gold Coast, Queensland
SAW	South Australian Water Corporation	Adelaide, South Australia
SEW	South East Water Limited	Melbourne, Victoria
SYW	Sydney Water Corporation	Sydney, Illawarra and Blue Mountains
WC	Water Corporation	Perth
YVW	Yarra Valley Water	Melbourne, Victoria
CAL	California Water Service Company	Various communities including East LA and South San Francisco
ET	Elizabethtown Water Company	Parts of Northern New Jersey
ILL	Illinois American Water	Various communities including Chicago, Peoria and Alton
IND	Indiana American Water Company	Indiana
MA	Missouri-American Water Company	Missouri
NJ	New Jersey-American Water Company	Monmouth, Camden, Cape May, Hunterdon
PEN	Penn American Water	Various communities including Pittsburgh and Hershey
SJ	San Jose Water Company	San Jose Metropolitan Area
SC	Southern California Water Company	Sacramento, Santa Barbara, LA
DRM	Regional Municipality of Durham	Region immediately east of Toronto, Ontario, (including Pickering, Oshawa)
PEEL	Regional Municipality of Peel	Brampton, Mississauga, Caledon, Ontario
GVRD	Greater Vancouver Regional District	Lower mainland of British Columbia
WAT	City of Waterloo	Waterloo, Ontario
POR	Companies regulated by IRAR	A range of municipalities representing 15% of Portugal's population

2.2 Data sources and company characteristics

The Scottish regulator (WICS) requires that Scottish Water fill out an annual return very similar to the June return used in England and Wales. We have used the data from the 2004-05 annual return in this report.

Our partnership with the Scandinavian 6-cities group has now entered its third year. Data collection was once again facilitated by Peter Stahre, chairman of the group, who has submitted individual city data, matched as closely as possible to our June return reporting requirements. Our ongoing contact with the group, which included a recent fact-finding trip to Gothenburg, ensures that confidence in the comparators is growing, and we look forward to developing this relationship still further in the future.

In conjunction with the members, we have had to adjust the properties connected data supplied by the 6-cities group. Because of the way they define connections and properties, each of the suppliers has a comparatively high number of properties served per connection. We have therefore used actual property numbers for the group because this is a better approximation of properties connected as used in England and Wales.

We hope a relationship similar to that with the 6-cities group can be forged with the Portuguese regulator IRAR. Following our meeting with IRAR representatives in January 2007, they sent us information on the Portuguese water industry matched closely to our June return reporting requirements, which has been included in this report. We look forward to developing this partnership further in the future.

In addition to Portugal, we have also begun a partnership with the Canadian National Water and Wastewater Benchmarking Initiative (represented at this time by four Canadian municipalities), which has been facilitated through our contact David Main. Again, we hope to develop this partnership in the future.

Data for the Netherlands is from 2005 company annual reports and the VEWIN publication, 'Water Supply Statistics 2005'. Australian information comes from the Water Services Association of Australia's annual overview of company performance, 'WSAAfacts2005'. In the USA, the NAWC publishes a set of annual operating and financial data for its members. Information is based on the figures published for 2004.

Tables 4 and 5 compare a set of basic indicators for each country against the England and Wales average.

Table 4 Comparison of base data with the England and Wales companies

	Properties connected (000s)		Population served (000s)		Volume (MI/d)		Network length (000 km)		Turnover (£)
	Water	Sewerage	Water	Sewerage	Water delivered	Sewage collected	Water	Sewerage	Total
E&W average	1,097	2,319	2,415	5,335	577	1,034	15	31	333
E&W range	71–3,684	667–5,586	150–8,184	1,534–13,115	26–2,140	265–2,989	1–46	9–68	14–1,142
SCO ¹	2,474	2,372	4,913	4,913	1,362	918	47	48	–
GTB	254	254	482	484	121	112	1.7	1.4	42
HEL	310	310	558	558	120	113	1.2	1.9	64
MAL	142	142	271	271	68	67	0.9	0.9	31
STH	420	420	856	856	223	216	2.2	1.9	85
DZH	582	–	1,185	–	193	–	4.4	–	76
AMS	477	–	891	–	189	–	2.7	–	53
NHO	717	–	1,623	–	285	–	10.0	–	106
VIT	1,644	–	3,820	–	654	–	38.0	–	202
WML	517	–	1,132	–	199	–	8.5	–	71
WMN	557	–	1,231	–	212	–	6.4	–	56
BRA	948	–	2,212	–	429	–	16.9	–	116
BRB	420	421	975	951	416	311	6.3	6.8	154
CW	307	303	704	704	271	262	4.0	3.5	85
GC	205	190	495	456	172	152	3.0	3.0	80
SAW	492	465	1,095	1,062	395	266	8.8	7.0	181
SEW	594	559	1,350	1,317	382	317	8.3	7.7	133
SYW	1,685	1,635	4,228	4,101	1,186	1,245	20.7	23.2	517
WC	649	567	1,484	1,342	566	304	12.0	10.0	258
YVW	632	585	1,529	1,441	397	369	8.8	8.3	141
CAL	452	–	1,884	–	1,353	–	8.7	–	185
ET	207	–	567	–	444	–	4.7	–	97
ILL	287	–	881	–	391	–	7.3	–	104
IND	273	–	736	–	380	–	6.5	–	83
MA	451	–	1,065	–	650	–	9.0	–	95
NJ	361	–	957	–	476	–	7.8	–	163
PEN	614	–	2,000	–	532	–	14.7	–	235
SJ	220	–	995	–	500	–	3.9	–	99
SC	252	–	1,055	–	647	–	4.3	–	119
DRM	145	140	522	520	178	–	2.2	2.9	–
PEEL	281	281	1,287	1,287	478	–	3.6	2.8	–
GVRD	–	–	2,031	2,071	1,121	–	0.5	0.5	56
WAT	29	29	113	–	33	–	0.3	0.3	–
POR ² average	39	28	79	58	22	12	0.6	0.3	–
POR ² range	5–289	4–96	7–558	7–182	1–242	1–50	0.1–1.4	0.1–0.7	–

Notes:

1. Data for Scottish Water includes 13,200 km of lateral sewers.
2. The data supplied by the Portuguese regulator, IRAR, is for two types of enterprise, Alta and Baixa: literally, high and low. The Alta enterprises are bulk suppliers of water and sewerage services, whereas Baixa enterprises are responsible for the local distribution systems and the retail function. The figures included in this table are for Baixa enterprises, which are most comparable to the other enterprises listed.

Table 5 Comparison of operating environment with the England and Wales companies

	Population per water connection ¹	Household meter penetration (%)	Ground or surface water	Length of main (m/prop)	
				Water	Sewerage ²
E&W average	2.2	26	Mixed	13.9	13.3
E&W range	2.1–2.4	4.7–61.2	–	8.6–20.5	11.7–14.7
SCO	2.0	<0.1	Mixed	18.9	20.4
GTB	1.9	100	Surface	6.7	5.4
HEL	1.8	100	Surface	3.7	6.0
MAL	1.9	100	Surface	6.2	6.1
STH	2.0	100	Surface	5.2	4.5
DZH	2.0	100	Surface	7.6	–
AMS	1.9	47.4	Surface	5.7	–
NHO	2.3	100	Surface	14.0	–
VIT	2.3	100	Ground	23.1	–
WML	2.2	100	Ground	16.4	–
WMN	2.2	99	Ground	11.5	–
BRA	2.3	99	Ground	17.8	–
BRB	2.3	100	Surface	14.9	16.2
CW	2.3	100	Surface	13.0	11.6
GC	2.4	100	Surface	14.6	15.6
SAW	2.2	100	Surface	17.8	15.0
SEW	2.3	100	Surface	14.0	13.8
SYW	2.5	100	Surface	12.3	14.2
WC	2.3	100	Mixed	18.6	17.7
YVW	2.4	100	Surface	13.9	14.2
CAL	4.2	100	–	19.2	–
ET	2.7	100	–	22.8	–
ILL	3.1	100	–	25.6	–
IND	2.7	100	–	23.6	–
MA	2.4	100	–	20.0	–
NJ	2.7	100	–	21.7	–
PEN	3.3	100	–	23.9	–
SJ	4.5	100	–	17.8	–
SC	4.2	100	–	17.1	–
DRM	3.6	100	–	15.3	21.1
PEEL	4.6	99.9	–	12.8	10.1
GVRD	–	–	Surface	–	–
WAT	3.8	–	–	8.8	11.5
POR average	3.2	100	Mixed	15.4	10.7 ³
POR range	1.4–6.2	–	–	4.9–94.7	7.2–32.9 ³

Notes:

1. Figures for the 6-cities group are per property figures.
2. Data for Scottish Water includes 13,200 km of lateral sewers.
3. Data for Portugal includes lateral sewers.

The most obvious difference between the United Kingdom and other countries studied is the near universality of metering across Europe, the USA and Australia. There are exceptions to this such as Gemeentewaterleidingen Amsterdam (AMS), although even its reported level of meter penetration has been increasing in recent years, and currently stands at 47.4% (up from 30% in 2003-04).

High meter penetration influences the approach that companies may take to certain activities. For example, it may allow more accurate measurement of leakage and the water balance, as well as opening up demand management options like tariff structuring. However, higher meter penetration will incur associated operating costs.

The water industry in Scotland operates in similar conditions to the more sparsely populated companies in England and Wales. The climate, for example, is similar to Wales and the north of England; and population served, water delivered and lengths of main per connection are within the range of companies in England and Wales. In terms of properties connected, Scottish Water with 2.5 million properties is similar in size to a large water and sewerage company.

On average, the organisations in the 6-cities group (142,000–420,000 properties) are about the same scale as a medium-sized water only company in England and Wales. The low lengths of main per property values suggest that the areas served are quite densely populated. This is to be expected given that the enterprises in the group serve only urban areas.

Companies in the Netherlands (around 500,000 properties) are generally comparable in size to the larger water only companies in England and Wales. The exception is the much larger Vitens, which with 1.65 million properties, is closer in size to a medium sized WaSC. Operating conditions in the Netherlands are broadly similar to those in England and Wales, but we might expect the generally flatter nature of the terrain to have some cost implications. Population per connection is also similar, as is the range of values for network length per connection. Urban areas such as AMS and South Holland (DZH) have a very low connection to network length ratio. Others, such as North Brabant (BRA) are more sparsely populated. Overall, the suppliers in the Netherlands draw a larger proportion of their supply from groundwater than the companies in England and Wales.

Most of the Australian companies reviewed here range in size from around 200,000 connected properties, similar to a medium-sized water only company in England and Wales, to just under 650,000, similar to a small water and

sewerage company. Sydney Water is the exception as its 1.7 million property connections make it more comparable to a medium-sized water and sewerage company in England and Wales. The industries share a number of characteristics including similar mains lengths per property and population per connection, perhaps because 'WSAAfacts' covers only urban areas. Other aspects are noticeably different, particularly those affected by climate.

The American companies reviewed are the largest of the private water companies in the USA and are comparable to medium to large water only companies or small water and sewerage companies in England and Wales. The American companies differ from the other countries studied because they have higher occupation rates and sparser population distributions. The higher occupation rate per property suggests that each connection serves a number of dwellings.

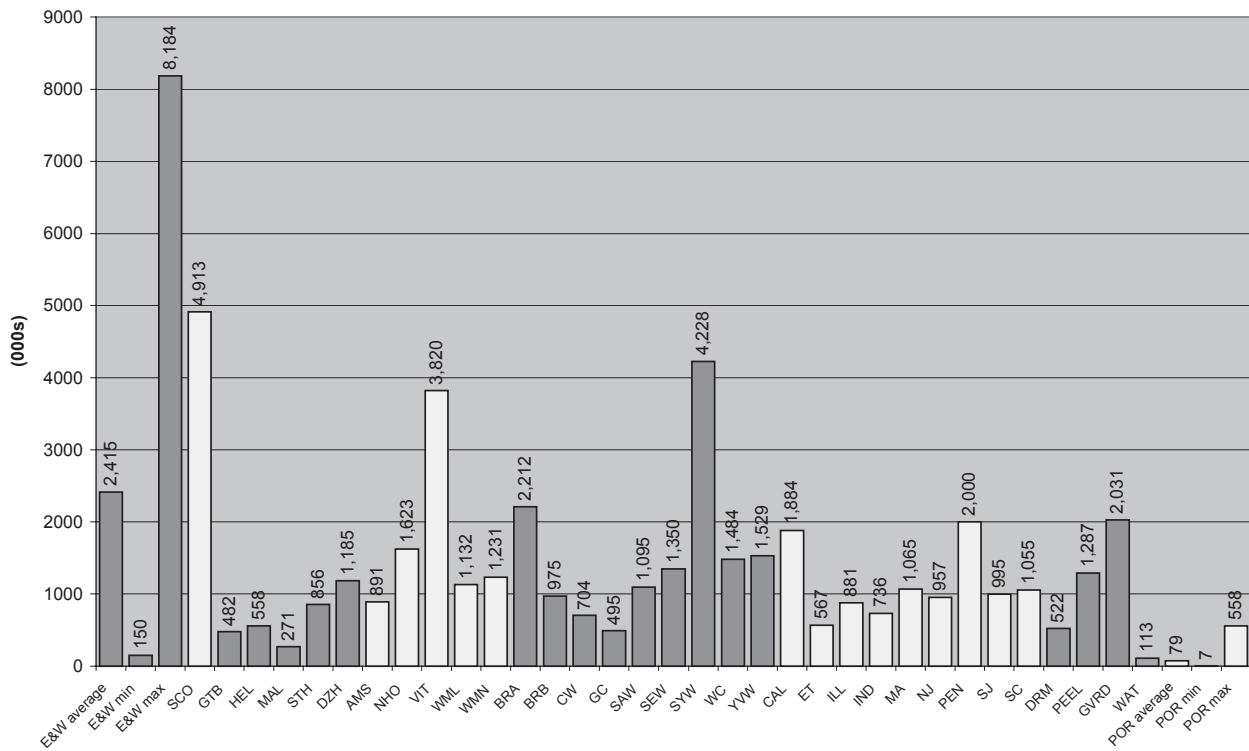
Of the Canadian utilities included in this report, Greater Vancouver and Peel are similar in size to those in the USA and Holland, and equivalent to the size of a larger water only company in England and Wales. Waterloo is a relatively small municipal utility with a smaller population than all of the English and Welsh companies. Occupancy rates are similar to those in the USA, but the mains length per property are lower and more typical of those found in England and Wales.

The average size of companies in Portugal, for which IRAR has provided information, is small compared to those in England and Wales. Average population is 79,000, but actual company population sizes range from 7,000 to 558,000.

There is some evidence to suggest that the water industry in England and Wales displays diseconomies of scale². This could mean that the large companies in England and Wales are disadvantaged in these comparisons against often much smaller organisations. Figure 1 compares the difference in size between often much bigger England and Wales companies with the other enterprises included in this report.

² See the report, 'Investigation into evidence for economies of scale in the water and sewerage industry in England and Wales' by Scott Reid of ICF, published by Ofwat in January 2004.

Figure 1 Population served – water



3. Bills

3.1 Household bills

Table 6 sets out a selection of average household bills for customers in a number of countries.

The figures in table 6 suggest that customers' bills in England and Wales are not out of step with those in other countries.

European comparators are perhaps the most relevant because of the need to comply with EU legislation. However, bills in England and Wales will increase markedly between 2005-06 and 2009-10 in order to meet new EU standards and other rising costs.

From the limited data we have available the trend for rising prices appears to be being repeated across Europe although prices are generally rising at slightly lower rates than in England and Wales. The two main exceptions to this are, in Germany where prices are rising more slowly, partly because large-scale investment has already taken place, and in Spain where prices are rising much more steeply.

Scottish Water has also recently announced that its bills between 2007-08 and 2009-10 will rise each year by 0.5% less than the Retail Prices Index. This means Scottish Water's charges will rise more slowly than in England and Wales, and will be cheaper than the average for England and Wales.

It is difficult to draw detailed conclusions from such comparisons. Simple, average figures do not provide an indication of the level of service to customers, investment to maintain and enhance assets, and take no account of the presence of subsidies. A report published in 2006 by German water industry association VEWA attempted to address these inherent difficulties in an examination of the water prices in Germany, England and Wales, France and Italy. VEWA concluded that if the countries in question were operating on a level playing field in terms of levels of investment, subsidies and quality standards, then their water and wastewater charges would be broadly similar.

Table 6 Water and sewerage household bills (£)

	2003	2004	2005
E&W water and sewerage	228	236	249
E&W water only	107	111	117
SCO	248	267	278
Stockholm	128	125	130
Gothenburg	132	147	158
Malmö	135	147	154
DZH	(119)	(119)	(123)
AMS	(118)	(117)	(121)
NHO	(116)	(115)	(119)
WML	(107)	(108)	(98)
WMN	(84)	(85)	(114)
BRA	(86)	(87)	(88)
Germany	–	(157)	
Sweden	195	206	
BRB	287	298	304
CW	206	195	200
GC	317	323	348
SAW	317	312	314
SEW	205	195	199
SYW	292	287	287
WC	321	337	333
YVW	217	209	206
Helsinki	225	–	–
Paris	–	–	–
Marseilles	–	(123)	–
Berlin	356	(166)	–
Munich	–	(110)	–
Frankfurt	–	(160)	–
Brussels	–	(145)	–
Portugal water and sewerage	–	–	132
Portugal water only	–	–	93

Notes:

Figures in brackets are for water only.

Where bills are based on consumption, figures are based on average household water demand for the country or company involved.

Other currencies are converted into sterling using PPP rates for the relevant year.

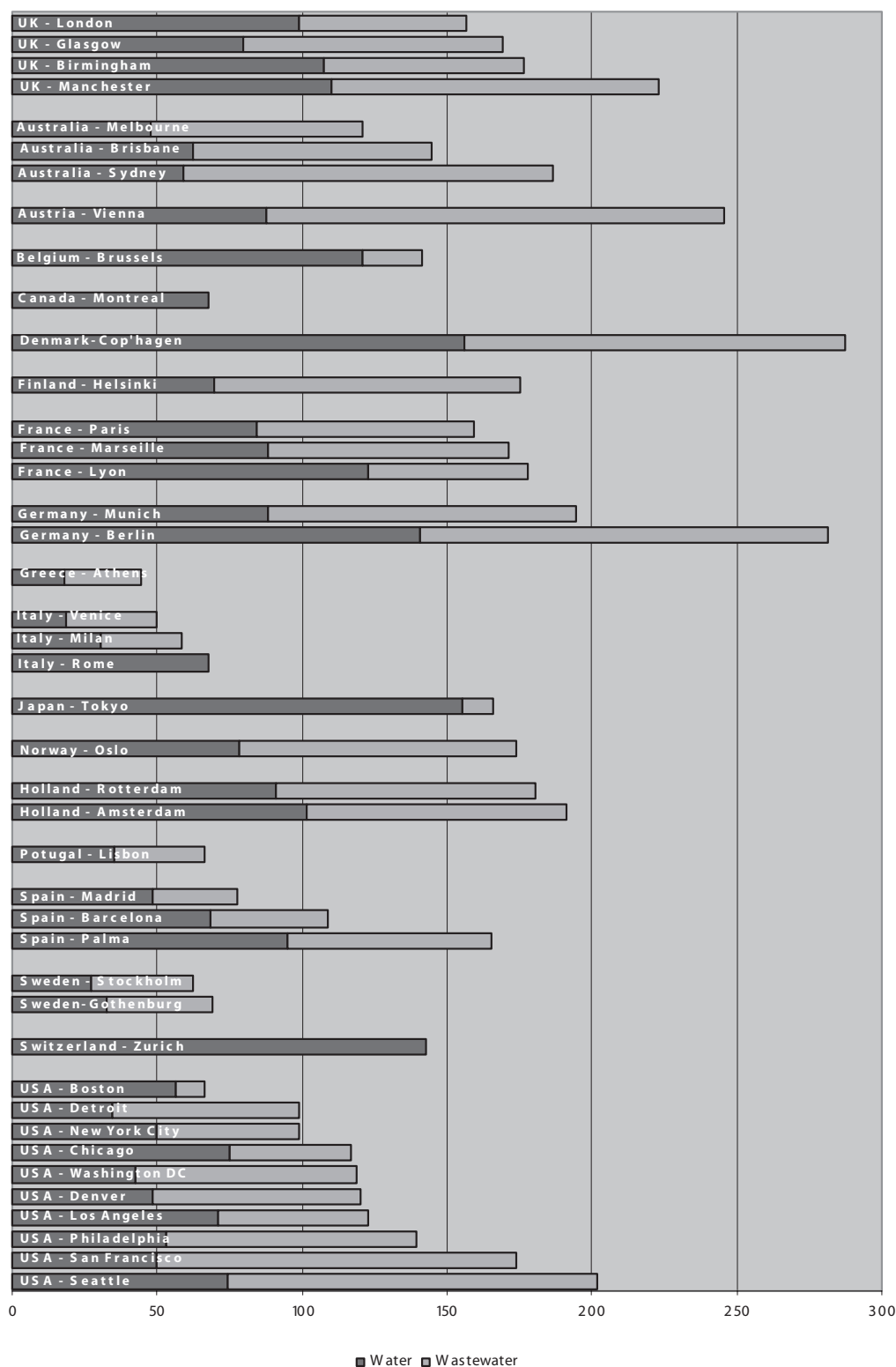
All data are in outturn prices.

Data comes from both national association publications and company websites.

Portuguese data comes from 'Água e Saneamento em Portugal – O Mercado dos Preços' published by IRAR and the Associação Portuguesa de Distribuicao e Drenagem de Águas.

The industry journal 'Global Water Intelligence' (GWI) produces a detailed annual survey of the water and wastewater tariffs that domestic consumers pay in a cross-section of the world's major cities. Figure 2 compares a selection of these findings. The GWI bases its results on a model consumer with a $\frac{5}{8}$ inch meter who uses 15 m³ of water a month. It concedes that some anomalies arising from differing charging structures may remain hidden within the figures.

Figure 2 International water and wastewater tariffs 2005 (p/m³)



Source: 'The 2005 GWI Water Tariff Survey', GWI – September 2005.

It shows that the cost of water in Europe falls within a reasonably narrow band. The most notable exceptions are the cost of water for the Swedish, Spanish and Italian cities we feature.

Lower costs in Sweden reflect that companies are not allowed to make a profit from water; consumption is also lower than in England and Wales.

The main reasons for relatively cheap water in Italy appears to be the low levels of investment in infrastructure compared with other countries in Western Europe, and the continued policy of subsidising water bills.

In Berlin, the cost of water is slightly higher. It is likely that this would be the case for most German customers as in recent years there has been a high level of investment in infrastructure to improve the network and to meet more demanding water quality standards.

One of the key findings highlighted by the GWI survey – and something that is mirrored in the business charges in figure 3 – is the comparatively low cost of water in the USA compared to many European countries. GWI's own analysis of this trend, based on 2006 data, claims that tariffs in the USA are on average 31% lower than Europe. Possible explanatory factors include the fact that municipalities have access to tax exempt forms of finance, giving a lower cost of capital. Also, American networks are generally much younger than European ones, and are subject to weaker environmental regulation that does not provide the same levels of incentives to invest as the EU's directives do.

It is also the case that, historically, tax payers have subsidised water and wastewater infrastructure in the USA, and that pricing structures often differ from most European systems, by, for example, charging connection fees up to \$2,500 (£1,360).

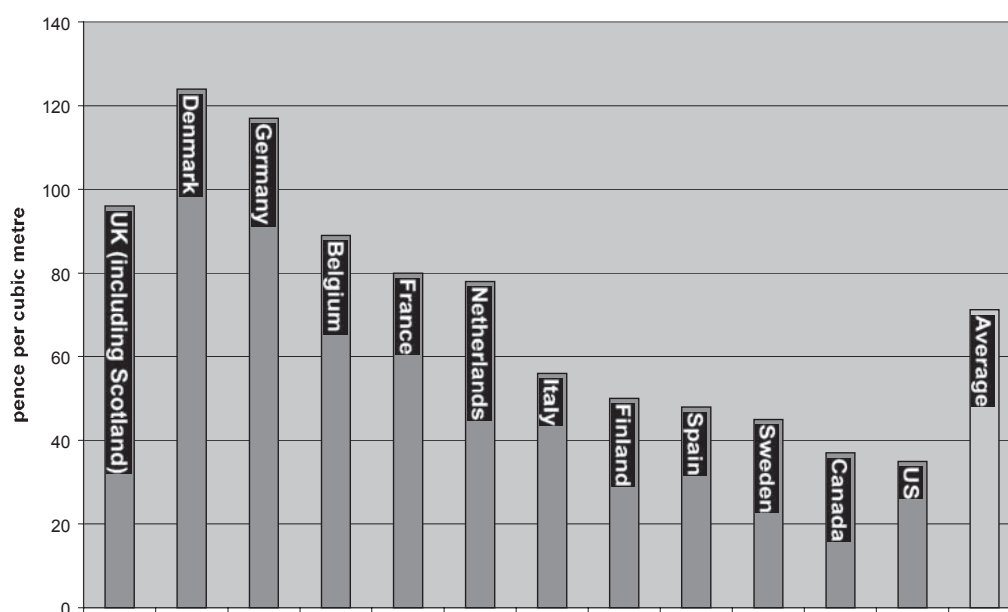
3.2 Business charges

Figure 3 and table 7 show estimates of charges to business customers in a range of European countries, taken from a 2005 National Utility Services (NUS Consulting) survey. Figures are calculated on the basis of a model supply for a business occupying 45,000 square feet of city centre office space and consuming 10,000 m³ of water a year.

For the second consecutive year, the UK (defined, by NUS consulting, as England, Wales and Scotland) is reported as having the third most expensive business charges of all the countries surveyed, although this may reflect

varying levels of subsidy, service and investment to maintain and enhance assets. Some of the cheapest countries, such as Italy and Spain, appear to be holding tariffs below the levels required to fund necessary improvements in infrastructure. However, prices have increased since 2001 as companies move to ensure security of supply and improve water quality in order to meet EU directives such as the Urban Waste Water Treatment Directive.

Figure 3 Charges to business customers 2005



Source: NUS Consulting '2004/5 International Water Report and Cost Survey' (2005).

Table 7 Charges to business customers in a range of European countries (p/m³)

	1999	2001	2003	2004	2005
UK	75	78	80	83	96
Germany	118	107	127	122	117
Denmark	106	103	124	120	124
Belgium	79	53	72	68	89
Netherlands	77	69	82	78	78
France	77	66	77	76	80
Italy	48	43	51	52	56
Finland	41	37	45	43	50
Sweden	36	36	43	41	45
Spain	35	41	52	47	48

Source: NUS Consulting '2004/5 International Water Report and Cost Survey' (2005).

Notes:

Data are in outturn prices.

Currency conversions use the daily exchange rate at a given point during the year.

Key conclusions

- Bills for domestic and business customers in England and Wales are generally in line with those of customers in most other countries.
- The main exceptions are the bills in Sweden, Italy, the USA and Germany.
- Swedish bills are lower partly because water companies there are not allowed to profit from water, consumption is lower and water sources are cheaper.
- Scottish Water's bills are also rising more slowly than those in England and Wales. Increases 0.5% below the retail prices index have been agreed between 2007-08 and 2009-10.
- Scottish Water's bills for business customers will rise by 1.5% less than the rate of inflation over the next three years.
- In Italy there is evidence of low investment in the water infrastructure. There also remains an element of subsidy in customers' bills.
- The USA's comparatively young infrastructure, different financial climate and charging schemes, and less forceful environmental regulations all play a part in keeping tariffs down.
- In Germany, the higher prices reflect a high level of investment in infrastructure.
- While we are confident bills in England and Wales allow for full cost recovery, we cannot be certain this is the case elsewhere.

4. Customer service levels

Information comparing levels of customer service is generally difficult to find. Where it is available, it can give comfort to both the regulator and the customer that companies, in the absence of full competition, provide an appropriate service. It allows us to ensure that drives for efficiency are not made at the expense of the service consumers receive.

Water and sewerage companies in Great Britain provide an outstanding range of levels of service information to their consumers. In Scotland, WICS collects data on the industry's performance against our customer service indicators, as well as a number of its own. This data is included in Scottish Water's annual return and is used in the yearly customer service reports.

Australian regulators require companies in major cities such as Melbourne, Perth and Sydney to provide customer service information. These tend to be more focused on customer satisfaction, water quality and wastewater odour complaints rather than the levels of service measures we use.

We have also included data from Portugal for the first time in this year's report.

Tables 8 and 9 compare service performance against some of our network and customer contact DG indicators (see our 'Levels of service for the water industry in England and Wales' report on our website at www.ofwat.gov.uk for details).

Most comparisons are made with Scotland because of the data available. Placing the performance of England, Wales and Scotland in the context of the rest of the world is not possible with these indicators.

Scottish Water has a higher proportion of properties at risk of low pressure than the poorest performing company in England and Wales. And despite having improved its year-on-year performance against unplanned interruptions to the water supply, the number of properties affected still exceeds the England and Wales average for every time period.

The number of incidents of sewer flooding per 100,000 properties in Scotland is similar to that in England and Wales. Scottish Water is below the England and Wales average for overloaded sewers, but above the average for other causes.

Table 8 Customer service indicators – network indicators

	DG2: Properties at risk of low pressure (%) ¹	DG3: Properties subject to unplanned interruptions >6hrs (%) ²	DG3: Properties subject to unplanned interruptions >12hrs (%)	DG3: Properties subject to unplanned interruptions >24 hrs (%)	DG5: Properties subject to sewer flooding incidents per 100,000 properties	
					Overloaded sewers	Other causes
E&W average	0.03	0.31	0.06	0.03	9.95	11.29
E&W range	0.00–0.10	0.04–0.9	0.00–0.35	0.00–0.34	0.82–30.5	4.16–15.23
SCO	0.48	1.35	0.37	0.04	7.63	13.95
GTN	–	0.07	–	–	0.06	0.09
MAL	–	0.02	–	–	–	0.02
STH	–	0.10	–	–	0.07	0.10
DRM ³	–	0.13	–	–	–	2.8
POR average	–	–	–	–	3.3	–
POR range	–	–	–	–	0–21.4	–

Notes:

1. Companies in both England and Wales and Scotland report against a standard of 15 metres head of pressure in the adjacent water main serving the property.
2. Australian companies report against a five-hour standard.
3. DG3 data for Durham and Waterloo is >3 hours.

Table 9 Customer service indicators – customer contact indicators

	DG6: Billing contacts not responded to in ten working days (%)	DG7: Written complaints not responded to in ten working days (%)	DG9: Received telephone calls not answered within 30 seconds (%) ¹	Average connect time to operator (seconds)
E&W average	0.13	0.31	4.87	16
E&W range	0.00–0.42	0.00–1.11	2.11–9.95	3–84
SCO	3.74	0.43	6.36	13
BRB	–	–	–	16
CW	–	0.0	–	15
GC	–	–	–	123
SAW	–	–	–	20
SEW	–	0.0	–	25
SYW	–	1.6	–	26
WC	–	9.9	–	21
YVW	–	2.3	–	30
POR average	–	34.0	–	–
POR range	–	0–82	–	–

Note:

1. Figures for England and Wales represent only the companies that can measure this indicator accurately.

Although it remains well outside the range that companies in England and Wales have achieved, Scottish Water's performance against DG6 has shown considerable improvement in 2005 (down to 3.74% from 6.49% in 2004). The percentage of written complaints not responded to in ten working days (DG7) worsened for England and Wales, Scotland and Australian companies, although England and Wales remained the better performer in relative terms. Of the Australian companies that reported against DG7, City West Water and South East Water achieved better performance than the England and Wales average, whilst Sydney Water, Yarra Valley Water and Water Corporation were relatively worse.

The 6-cities group has provided us with some DG3 and DG5 data. For interruption greater than 6 hours the 6-cities companies fall within the range of the England and Wales companies, with overall performance being slightly better than the England and Wales average.

For both DG5 measures Gothenburg and Stockholm report better performance than the England and Wales companies. However, as each connection serves several properties the measure is not directly comparable to the indicators we use in England and Wales.

Little information is available on the level of customer service Dutch companies provide. In its report, 'Reflections on performance 2003: Benchmarking the Dutch Drinking Water Industry', VEWIN found that customers gave their water companies an average rating of 7.6 out of 10 for customer service, with little variation around the figure. Dutch law defines certain standards, for example the quality and pressure of water that the companies must supply, and the translation of customer standards into service guarantees has increased significantly since 1997.

In a similar survey carried out in 2005, Helsinki Water received a rating of 8.32 out of 10.

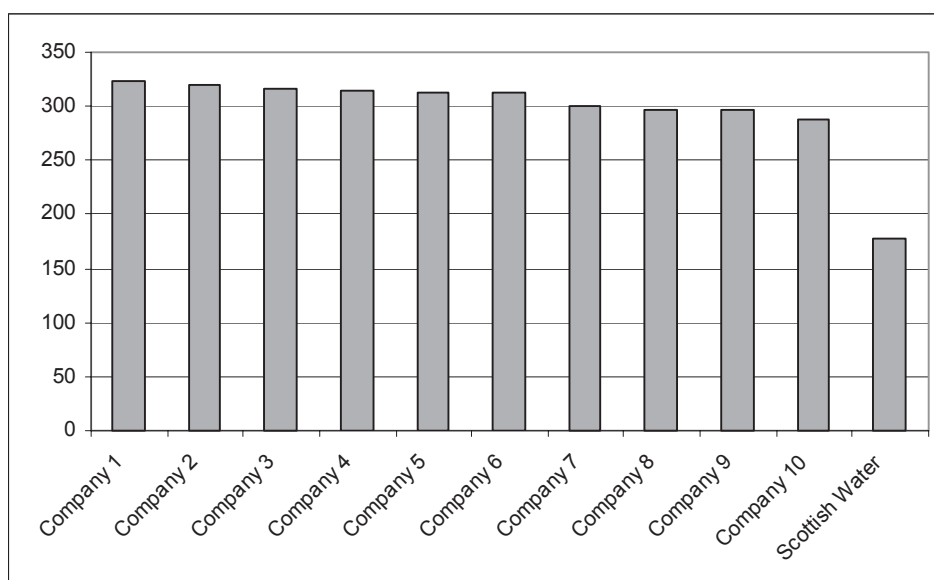
There is no data on the levels of customer service for the USA. Some standards of service, for example on pressure, are set out in 'general orders'.

In its 'Strategic Review of Charges 2006-10' WICS compared Scottish Water's service performance against its England and Wales counterparts. It did this using a modified version of our overall performance assessment (OPA). The assessment took account of such factors as performance against DG indicators, water quality and environmental impact.

According to its performance assessment, Scottish Water is ranked below all the water and sewerage companies in England and Wales, scoring only 61% of the score of the lowest ranked water and sewerage company in England and Wales in 2004-05. Since taking over in 2002, though, Scottish Water has improved its performance and has extra money in the price review to continue this trend. The target is for the company to achieve a score of 250 by 2009-10.

However, levels of customer satisfaction with Scottish Water have shown significant improvement in recent years. In 2002, its satisfaction rating was 75%. In the most recent survey, the customer satisfaction levels had risen to more than 90%.

Figure 4 OPA score for England and Wales and Scottish Water 2004-05



Source: 'The Strategic Review of Charges 2006-10: The Final Determination'.

Key conclusions

- The level of customer service that companies in England and Wales offer appears to be high.
- WICS' assessment of overall service performance shows that, despite improving, Scotland continues to be significantly outperformed by England and Wales. However, Scottish Water's price limits for 2006 to 2010 include assumptions that it will improve further to bring it closer to the levels seen in England and Wales.
- Few countries collect customer service data which is as detailed as that collected in England and Wales. We will continue to work with our contacts in other countries to improve the comparability of customer service data.

5. Water quality and environmental performance

Comparing drinking water quality and environmental performance between countries is difficult. The EU acknowledges that the implementation of directives and reporting procedures varies between member states. An Australian Productivity Commission report³ noted that while it was possible to observe regulatory processes, data for identifying gaps between standard requirements and actual water quality or public health outcomes was generally not obtainable. 'WSAAfacts' notes that, as in England and Wales, Australian companies achieve high levels of compliance with state and national standards.

5.1 Water quality

Comparable water quality information is difficult to find for many countries. Consequently, we only consider variations in quality for the water industries in England and Wales, Scotland and Northern Ireland, and, in this year's report for the first time, Portugal. Again, this limitation means we can not put the UK's performance into a world-wide perspective.

Table 10 shows how water quality has varied between the water industries in the UK between 2000-2004. The prescribed concentration value (PCV) defines the minimum or maximum legal concentration levels needed to meet water quality standards.

Although England and Wales continue to maintain substantially lower percentage failures than the other UK water suppliers, 2004 was notable for being the first year since 1998 that Northern Ireland reported a superior performance to Scotland.

An important caveat to these figures is that 2004 saw the implementation of the Water Supply (Water Quality) Regulations 2000, which changed the way in which water companies in England and Wales, Scotland and Northern Ireland monitor water quality. For this reason, data from 2004 and beyond is not directly comparable with previous years.

³ 'Arrangements for setting drinking water standards – International benchmarking' (2000).

Table 10 Water quality

	Percentage of determinations exceeding PCV				
	2000	2001	2002	2003	2004 ¹
England and Wales					
Water treatment works	0.08	0.06	0.04	0.05	0.04
Service reservoirs	0.12	0.10	0.09	0.06	0.06
Supply zones	0.20	0.17	0.15	0.15	0.06
Scotland					
Water treatment works	0.40	0.22	0.26	0.24	0.39
Service reservoirs	0.50	0.34	0.42	0.26	0.35
Supply zones	1.00	0.81	0.72	0.86	0.58
Northern Ireland					
Water treatment works	0.17	0.13	0.12	0.13	0.17
Service reservoirs	0.52	0.34	0.46	0.26	0.19
Supply zones	1.80	1.62	1.45	1.25	0.37
Portugal²					
Supply zones	2.52	2.47	2.37	2.10	2.71 ³

Source: Annual drinking water quality reports of Drinking Water Inspectorate, Drinking Water Quality Regulator and Environmental and Heritage Service Northern Ireland. IRAR.

Notes:

1. From December 2003 the lead standard changed from 50µg/l to 25µg/l, meaning 2004 data was assessed against a more stringent measure. This is an interim standard; by December 2013 the final lead standard will be 10µg/l.
2. Portugal's figures include almost 300 water supply utilities subject to water quality control by IRAR.
3. Portugal's 2004 figures are measured against a new, and more stringent, set of standards than previously.

Table 11 Results for a variety of water quality measures in the United Kingdom

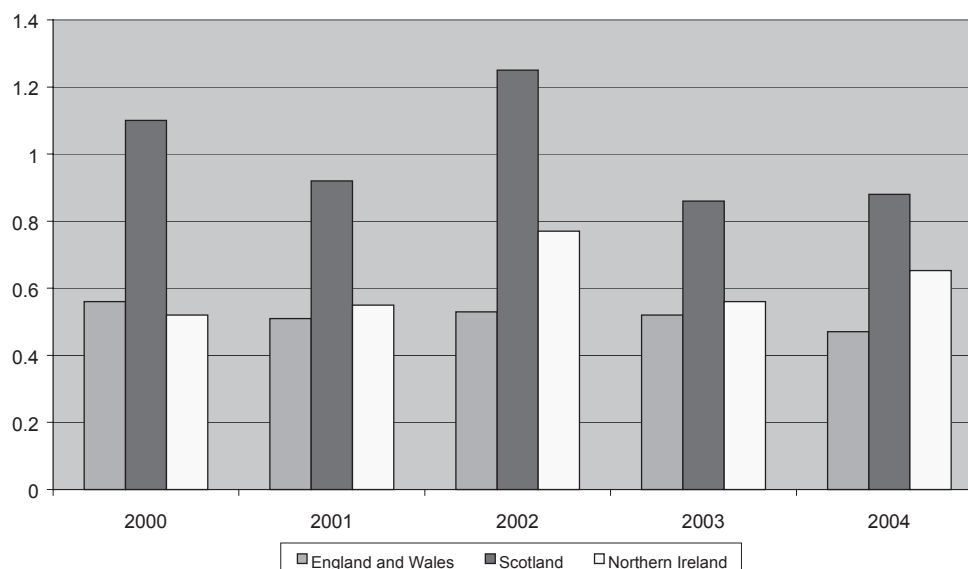
	Percentage of determinations exceeding PCV				
	2000	2001	2002	2003	2004
Coliforms					
E&W	0.56	0.51	0.53	0.52	0.47
Scotland	1.10	0.92	1.25	0.86	0.88
Northern Ireland	0.52	0.55	0.77	0.56	0.65
Colour					
E&W	0.02	<0.01	<0.01	0.00	0.01
Scotland	0.70	1.19	0.17	3.80	3.26
Northern Ireland	0.12	0.00	0.00	0.00	1.02
Turbidity					
E&W	0.06	0.07	0.04	0.06	0.04
Scotland	0.10	0.19	0.12	0.13	0.20
Northern Ireland	0.29	0.27	0.29	0.21	0.25
Lead¹					
E&W	0.93	0.63	0.42	0.24	0.49
Scotland	1.10	0.68	0.29	0.40	1.10
Northern Ireland	3.14	2.65	5.41	6.43	5.08

Source: Annual drinking water quality reports of Drinking Water Inspectorate, Drinking Water Quality Regulator and Environmental and Heritage Service Northern Ireland.

Notes:

1. From December 2003 the lead standard changed from 50µg/l to 25µg/l, meaning 2004 data was assessed against a more stringent measure. This is an interim standard; by December 2013 the final lead standard will be 10µg/l.

Figure 5 Percentage of determinations exceeding coliform PCV



5.2 Environmental performance

Table 12 compares the levels of sewage treatment in England and Wales, the 6-cities group, Australia and Greater Vancouver in Canada for 2005. As in England and Wales, Australian companies generally treat their sewage to at least secondary biological level. A number of companies in Australia, though, are treating the majority of their sewage to the tertiary level. A large proportion of Sydney Water's sewage only receives primary treatment because of the geographical constraints of building coastal tertiary treatment plants. The company relies on further treatment to sewage from coastal plants in the marine environment by discharging effluent through deep ocean outfalls.

The four members of the 6-cities group that submitted data on sewage treatment levels all treat 100% of their sewage reaching the treatment plant to the tertiary level.

Table 12 Sewage treatment levels

	Primary ¹ (%)	Secondary ² (%)	Tertiary ³ (%)
E&W average	1	56	43
E&W range	0–8	22–72	20–77
GTB	0	0	100
HEL	0	0	100
MAL	0	0	100
STH	0	0	100
BRB	0	34	66
CW	0	100	0
GC	0	0	100
SAW	0	3	97
SEW	0	44	56
SYW	79	6	18
WC	4	57	39
YVW	0	0	100
GVRD	53	47	0

Notes:

Numbers may not add due to rounding.

1. Sewage treated to a primary level has only undergone primary levels of treatment.
2. Sewage treated to a secondary level has also undergone primary levels of treatment.
3. Sewage treated to a tertiary level has also undergone secondary and primary levels of treatment.

The percentage of sewage receiving tertiary treatment in England and Wales has increased to 43%, reflecting a significant improvement in the performance of the companies in England and Wales. Table 13 shows that the Australian companies now treat a higher proportion of their sewage load to this level. The volume of sewage receiving primary treatment is now very similar, if Sydney Water is excluded.

Table 13 Sewage treatment levels 2000-01 to 2004-05

England and Wales	2000-01		2001-02		2002-03		2003-04		2004-05	
Primary (%)	6		2		1		1		1	
Secondary (%)	66		66		60		60		56	
Tertiary (%)	28		32		39		39		43	
Australia	2000-01		2001-02		2002-03		2003-04		2004-05	
Primary (%)	38	(6)	35	(4)	32	(1)	31	(1)	30	(1)
Secondary (%)	37	(61)	30	(49)	26	(43)	28	(43)	24	(35)
Tertiary (%)	24	(33)	34	(47)	42	(56)	41	(56)	47	(65)

Notes:

Figures in brackets exclude Sydney Water. We do this because the high loads that Sydney Water deals with, coupled with the high level of primary treatment, significantly distorts the other companies' performance. Numbers may not add due to rounding.

Table 14 puts the UK Bathing Water Directive performance in a European context. Some countries have been excluded from the comparison because they are only assessed on a small number of bathing areas. Scotland and Northern Ireland also fall into this category, but have been left in to allow comparison with England and Wales. Of course, factors outside of individual countries' control can influence compliance rates, as can the way the numbers are reported.

Between 2001 and 2005 companies in England and Wales have maintained one of the highest compliance rates in the EU (see figure 6). Northern Ireland performs well most of the time, but the small number of bathing areas in the survey means that one or two failures can skew the results. Scotland, like most countries, has improved its performance since 2001, but still lags behind the rest of the UK.

Table 14 Compliance with the EU Bathing Water Directive 2001-05

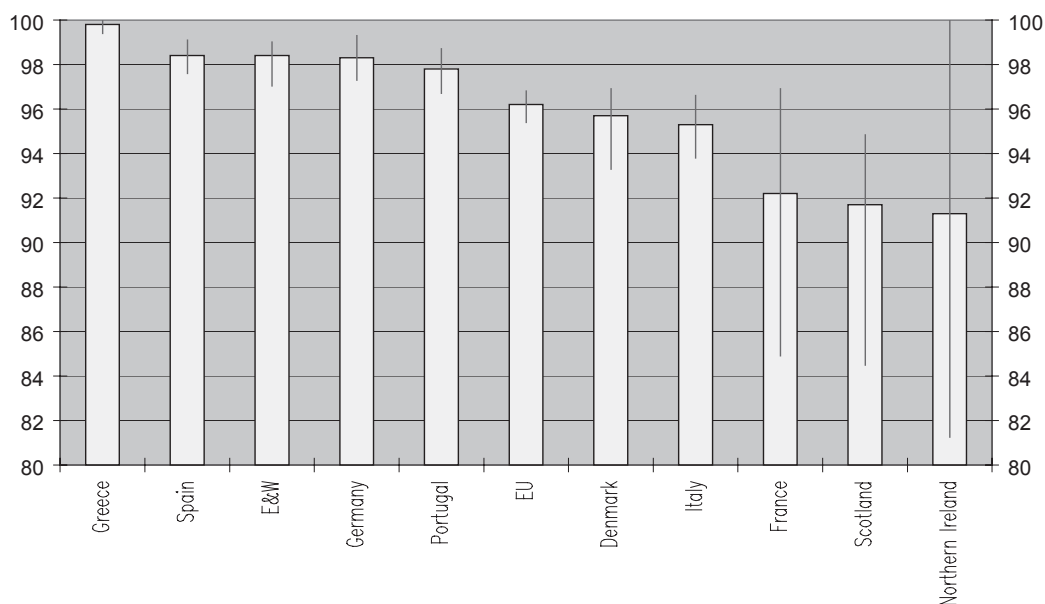
	% compliance with EU Bathing Water Directive mandatory microbiological standards					
	2001	2002	2003	2004	2005	Average
Greece	99	100	100	100	100	100
Spain	98	98	98	99	99	98
E&W	97	99	99	99	99	98
Germany	99	97	98	99	99	98
Portugal	97	99	98	98	98	98
EU	95	96	97	97	96	96
Denmark	95	93	96	97	97	96
Italy	97	96	95	95	94	95
France	85	88	96	96	97	92
Scotland	84	91	98	98	95	93
Northern Ireland	81	94	100	88	94	91

Source: EEA and e-Digest of Environmental Statistics.

Note:

Figures are for coastal bathing water areas only.

Figure 6 Compliance rates for the EU Bathing Water Directive



Note:

The vertical lines indicate the range of percentage compliance over the five-year period 2001-05.

Key conclusions

- In 2004, companies in England and Wales generally achieved better drinking water quality compliance than their counterparts in Scotland and Northern Ireland.
- Lack of comparable data makes it difficult to put UK performance in a global context.
- Whereas companies in England and Wales generally treat sewage to the secondary level, the majority of Australian sewage now receives tertiary treatment. All members of the 6-cities group who submitted data treat all sewage to tertiary level.
- Companies in England and Wales have maintained high levels of compliance with the Bathing Water Directive.

6. Water delivered, leakage and water efficiency

6.1 The water balance

Comparison of volumetric data that accounts for all types of water use should always be treated with some caution. Although the measurement of the volume of water put into distribution systems is relatively straightforward, different definitions for water balance components such as distribution losses, supply pipe leakage and customer use can make direct comparison difficult. Large numbers of customers without meters can also cause problems.

In our published work, we avoid using the percentage of distribution input as a comparative measure (particularly for leakage) as it is often misleading. For example, distribution input in the USA can be twice as high per property than it is in England and Wales. Therefore, the same level of leakage expressed as percentages would be reported differently for the two countries. Similarly, we avoid percentages as they can distort trend data over a number of years as distribution input is influenced by, for example, prolonged wet or dry periods impacting on customer demand. In these years, the same level of actual leakage would be reported differently as percentages.

The International Water Association (IWA) has sought for a number of years to overcome the problem of different measures and definitions through the development and promotion of a standard water balance similar to that used in England and Wales. A number of countries continue to adopt this work. We hope this will lead to more robust data being available and allow more meaningful comparisons in the future.

With the difficulties of water balance comparisons as a caveat, table 15 sets out the key parameters for water use.

Table 15 Water delivered, leakage and water use 2004-05

	Distribution input	Total leakage		Proportion of water delivered to non- households	Metered household water use	Household water delivered
	(l/prop/d) ¹	(l/prop/d) ¹	(m ³ /km/d)	(%)	(l/head/d) ²	(l/head/d)
E&W average	637	150	11	30	151	169
E&W range	423–850	70–248	6–29	19–50	116–185	129–195
SCO	961	460	24	37	208	177
GTB	602	114	17	31	176	–
HEL	460	67	18	24	159	–
MAL	517	33	5	25	185	–
STH	846	106	21	–	187	–
DZH	339	8	1.0	–	–	–
AMS	397	–	–	–	–	–
NHO	397	–	–	–	–	–
VIT	422	24	1.1	–	–	–
WML	420	35	2.1	–	–	–
WMN	385	4	0.4	–	–	–
BRA	468	16	0.9	–	–	–
BRB	1,153	–	–	33	286	286
CW	971	–	–	48	201	201
GC	960	–	–	25	262	262
SAW	926	–	–	24	273	273
SEW	710	–	–	28	203	203
SYW	854	–	–	24	214	214
WC	965	–	–	23	294	294
YVW	729	–	–	22	202	202
CAL	3,118	122	6	39	–	437
ET	2,563	412	18	44	–	441
ILL	2,020	657	26	58	–	188
IND	1,742	350	15	60	–	209
MA	1,751	309	15	41	–	357
NJ	1,513	193	9	43	–	284
PEN	1,327	461	19	41	–	156
SJ	2,382	114	6	40	–	300
SC	2,777	205	12	10	–	550
POR average	749	126	8	–	–	–
POR range	308–1085	62–268	1–31	–	–	–

Notes:

1. The denominator used in the calculations for the England and Wales data is year end properties connected.
2. The numerator used in the calculations for the England and Wales data is total water delivered and will include an element of underground supply pipe leakage that may be excluded from other countries data.

6.2 Water delivered

Although slightly lower, perhaps as a result of near universal metering, distribution input (treated water put into supply) in the Netherlands is broadly comparable to England and Wales. However, the range of values for the Dutch countries for this statistic is much tighter than the England and Wales range, possibly because of the smaller geographic size of the Netherlands and the implication that climate variation will be a lot less.

The Scandinavian and Dutch companies' range for distribution input generally falls within the same range as in England and Wales. Stockholm is near the upper end of the range whilst the other companies are closer to the average for England and Wales. The Dutch companies all fall within the lower end of the range.

Scottish Water reports a figure above the highest reported in England and Wales. This is probably due to higher leakage. The company is addressing this issue and aims to meet its economic level of leakage by 2014.

Distribution input in Australia and the USA is significantly higher than the England and Wales average, although there is a marked variation among the American companies. This might be due to inconsistent data collection standards, such as how companies treat internal and external water use. However, the American companies all report data above the highest point of the England and Wales range and this is indicative of a generally higher demand for water. Figure 7 compares the distribution input of the England and Wales companies with the other organisations included in this report.

Climatic, social and economic trends are clearly important determinants of higher water use. In the USA, hotter and drier climates in some areas, combined with higher living standards, appear to lead to higher levels of water use. Swimming pools and air conditioning, for example, are much more widespread. Garden watering will contribute to high water use in arid areas such as California, particularly if, in the face of low rainfall, inhabitants wish to maintain 'temperate zone' gardens with lawns.

This is supported by work carried out on behalf of the American Water Works Association (AWWA), which linked water use in the USA to both climate and garden size. The AWWA's work also suggested that outdoor water use in the USA accounted for 58% of household use. This is much higher than in Europe, including England and Wales, but similar to the pattern in Australia. It is likely that this will at least partly explain the higher distribution input and water use in Australia.

Figure 7 Distribution input

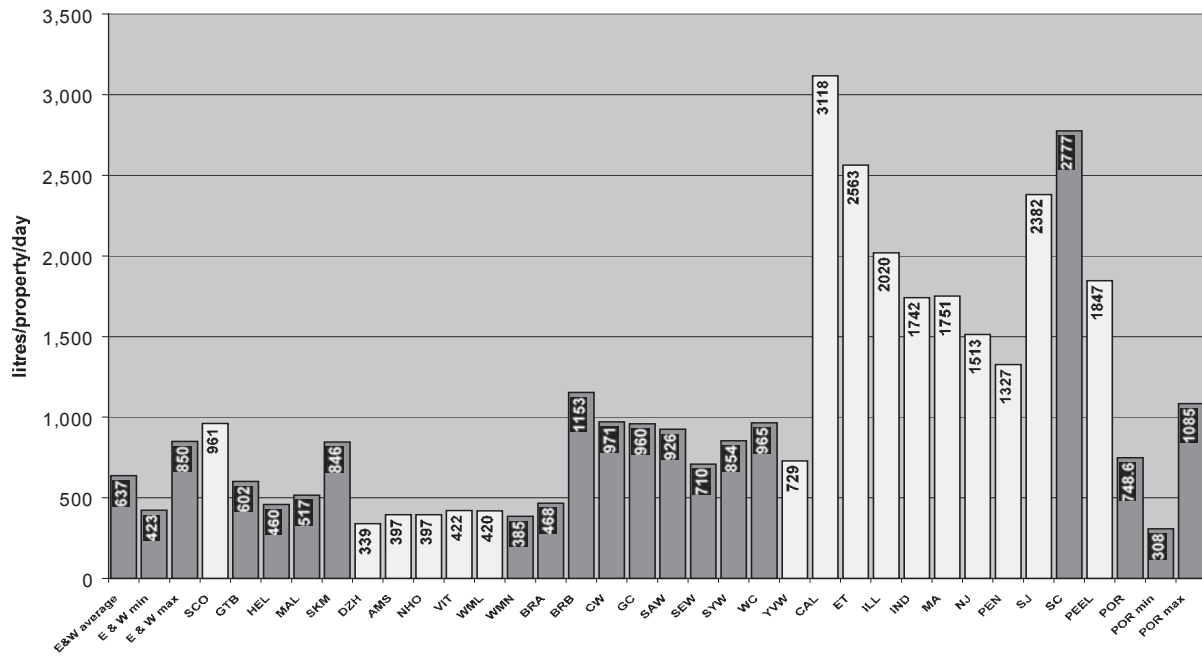
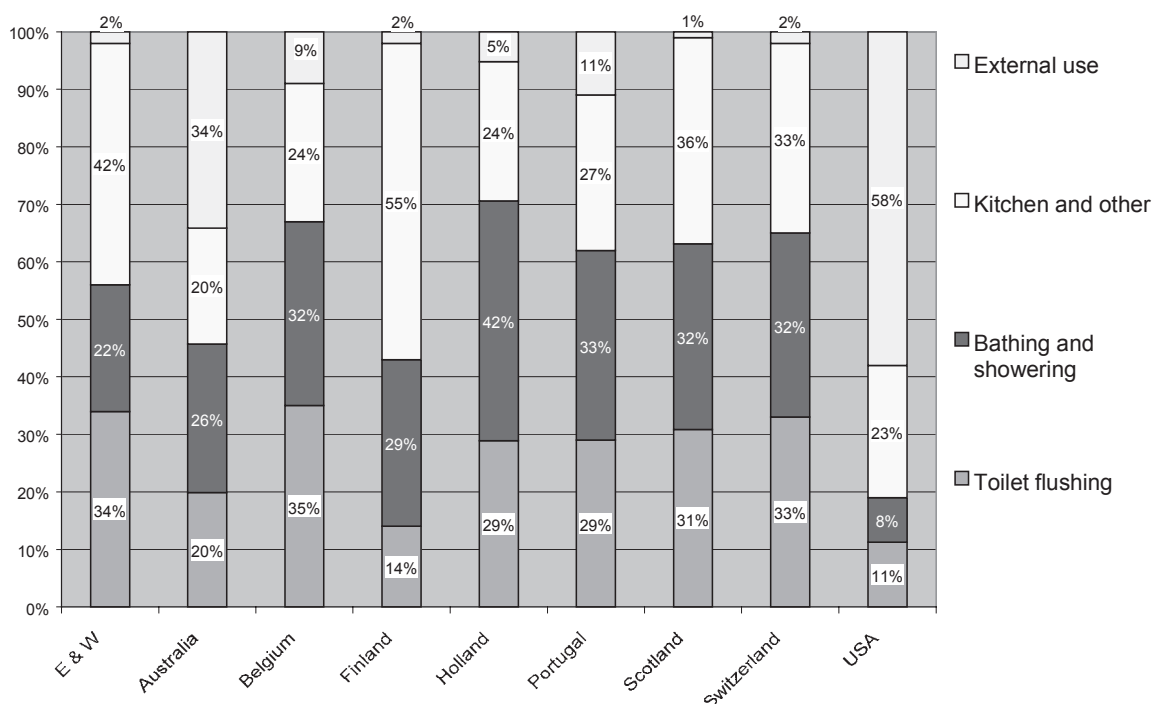


Figure 8 sets out estimates of elements of household water use taken from a number of sources. These percentages should be considered in conjunction with the water delivered figures in table 15.

Figure 8 Estimates of elements of household water use (%)



6.3 Water efficiency

There is evidence that water use education, the promotion of water-saving devices and water pricing is effective in reducing consumption. Taking a shower instead of a bath, for example, reduces water use. The large proportion of water used for toilet flushing (see figure 8) shows the importance of encouraging the use of water-saving cistern devices and the installation of low flush toilets.

Reports from Denmark, Australia and Germany claim that water consumption per head has fallen by 20% since the early 1990s. In Helsinki, it is reported that water consumption has fallen by 40% in the past 20 years.

In each of these cases, water-saving campaigns and water saving initiatives have been promoted, leading to greater public awareness of both the need to save water and how this can be done.

Consumption has fallen steadily in recent years in Australia. However, this is not entirely due to the concerted water efficiency and water saving messages but also due to the severe drought conditions which have led to water use restrictions.

The scope and size of our 'Water efficiency initiatives – good practice register' (www.ofwat.gov.uk) is testament to the extensive and innovative water efficiency activity carried out by the water companies in England and Wales over the last few years. A good deal of this innovation has been driven by the recent drought, and at least one company has quoted that peak summer demand had been reduced by 6% as a result of customers' water efficient behaviour.

Waterwise has been particularly active in seeking out information and experience on water efficiency from other countries, in particular Australia, the USA and Spain. They are gathering international information via a detailed template questionnaire and are identifying five transferable examples for discussion at the water saving group.

According to Waterwise (figure 9), consumption in England and Wales is within the middle range, and lower than countries such as France, Sweden and Norway. The highest use countries include the USA, Canada and Japan. Although not shown in the Waterwise survey, Australia also belongs in the high use band (for example per capita consumption in Sydney Water is around 275 l/h/d). Per capita consumption in Australia has fallen in recent years, partly because of increased awareness of water efficiency and supply restrictions arising from the drought.

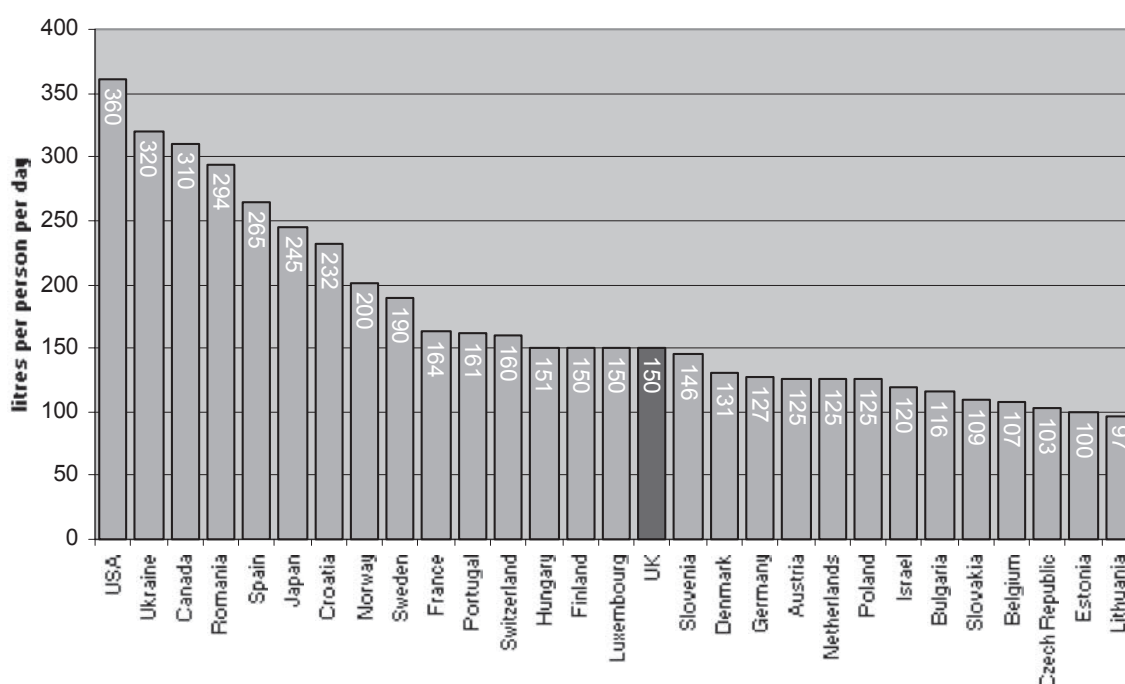
Tariffs are not used to influence customer demand in England and Wales. The lack of customer meters is the obvious reason for this at present, although this may change as meter penetration increases. However, there are examples around the world where tariffs have helped to reduce demand. In Finland and Denmark water efficiency has been promoted while at the same time prices have increased. The Danish Ministry of the Environment believes the clear correlation between increasing prices and decreasing consumption supports and confirms the effect of 'green taxes' (14% of the total bill) as an incentive to save water.

There are also examples from the 1990s where the removal of subsidies in the Czech Republic and Hungary saw domestic consumption fall by one-third. In the case of the Czech Republic, average domestic use is reported to have fallen from 171 l/head/d to 103 l/head/d. More sophisticated examples of seasonal and rising tariffs are used in Australia where water supply is more

constrained and metering is near universal. For example, Water Corporation has a five-part rising block tariff, which it combines with water efficiency measures such as alternate day rosters for customers', sprinkler usage and an ongoing efficiency programme. This has recently had the effect of reducing peak demand by up to one-third during the ongoing drought around Perth.

Also, in response to the ongoing drought in Australia, Sydney Water is stepping up its 'Waterfix'⁴ initiative and has spent more than AU\$107 million (£43m) on demand management programs since 1999.

Figure 9 Per capita consumption in a range of countries



Source: Waterwise.

6.4 Leakage

Robust information on leakage can be difficult to find outside England and Wales. Leakage is often measured as a percentage of distribution input. The European Environment Agency fact sheet, 'Water use efficiency: leakage'⁵ sets out, as a percentage, levels of leakage for Europe spanning a number of years. However, we show figures in terms of megalitres per day (Ml/d), litres

⁴ The WaterFix initiative gives consumers the opportunity to have a qualified plumber inspect their home, install water saving devices and fix minor leaks, at a discounted price.

⁵ European Environment Agency. 2003. Indicator fact sheet WQ06, 'Water use efficiency (in cities): leakage' (www.eea.europa.eu).

per property per day (l/prop/day) and cubic metres per kilometre of main per day (m³/km/d).

We do not express leakage figures in terms of a percentage of distribution input, as this can be misleading. An increase in water use, for example because of a sustained hot, dry period, will appear to lead to an improvement in leakage levels when, in reality, the volume of water lost has not reduced. Likewise, a successful water efficiency campaign will reduce the amount of water put into supply and leakage will appear to increase.

The IWA performance indicators also support the view that leakage should not be presented in percentage form. Further to its work on a standardised water balance, the IWA has also worked on standard performance indicators for water losses, with the most detailed being the infrastructure leakage index (ILI). This is the ratio of current annual real losses to the calculated unavoidable annual real losses based on a number of factors such as the number of connections, average pressure and length of mains. Companies in England and Wales have previously been shown to perform well on the ILI. A number of regulators and companies are continuing to adopt this work, including those in Australia. More recently, the IWA has been working to develop the ILI for setting more economically-based leakage targets.

The measures we use for leakage (l/prop/d and m³/km/d) are not perfect for direct comparisons between companies. However, we do believe they provide some of the explanatory factors, such as rurality or urbanisation, for differences in performance. Allowing for variables such as average system pressure can explain even more of the variance between companies' performance, but our focus is not to normalise performance. Our main aim is that companies in England and Wales meet their economic targets. We accept that the economics for each company will be different and this will lead to legitimate and deliberate variations in attained performance.

Figure 10 shows how leakage compares internationally on the two measures, l/prop/d and m³/km/d. It should be noted that this does not deal with the economic level of leakage (ELL), which is considered key in our regulation of leakage in England and Wales. The ELL can be defined as the level at which it would cost more to make further reductions in leakage than to produce the water from another source. We expect that companies will have different ELLs depending on their individual circumstances. For example, different costs of repairs, necessary pressure variations, availability of resources and the level of urbanisation may all impact on the balance between the costs of leakage control and the cost of other ways of augmenting demand. We expect

companies in England and Wales to achieve their ELL as this produces the best results for customers and the environment.

Scottish Water's leakage rate is considerably higher than the range found in England and Wales. However, the WICS' recent review of charges for 2006-10 allowed for significant reductions to achieve the economic level of leakage.

Compared with England and Wales, Dutch companies tend to report very low levels of leakage (in some cases, zero). DZH, for example, reports leakage of 2.2 m³/km/day. The England and Wales average is 11 m³/km/day.

Recent collaborative work suggests that while no active leakage reduction work in the Netherlands takes place, a number of factors might contribute to the low level of leakage. UK Water Industry Research Limited (UKWIR) has completed research to better understand the differences in leakage between England and Wales and the Netherlands⁶. UKWIR also considered the effect of applying Dutch leakage techniques to England and Wales and vice versa.

The main conclusions are that the Dutch companies have low leakage because:

- they have low operating pressures due to the flat terrain, while tall buildings also have their own pumps;
- they have a newer post-war infrastructure system compared with England and Wales, made of non-corrosive pvc;
- mains tend to be located under footpath paving blocks in sandy soils which means that leaks cause the pavement to subside, allowing easy leak location and easy repair access;
- they have fewer joints as a single connection generally supplies a number of buildings; and
- they respond rapidly to reported leaks.

The UKWIR project also looked for similar conditions of sandy soils, low pressures and a newer system in England Wales. Where these conditions were found, then leakage was recorded at comparable levels.

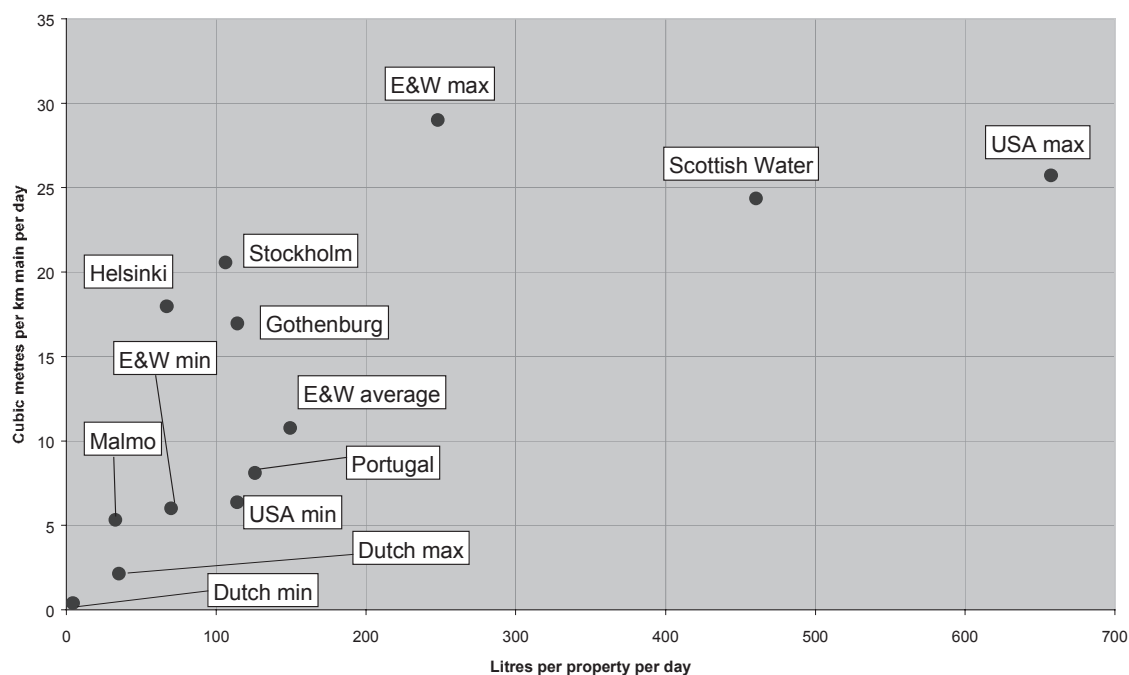
This year we have again included individual company data from the 6-cities group in this report, and it reveals that most leakage values are similar to the England and Wales range.

⁶ See UKWIR's 2006 report, 'A comparison of leakage practice and leakage levels in UK and Netherlands' (UKWIR Report ref. No. 06/WM/08/34).

While Australian distribution inputs are higher, distribution losses are more in line with the levels experienced in England and Wales. 'WSAAfacts' notes that system losses were 38% lower in 2001 than five years previously. This mirrors similar reductions in England and Wales, where reductions in distribution losses of around 30% were achieved over a similar period. The American companies still appear to have higher leakage levels per property than England and Wales, although the figures are lower than in previous reports. Data from the 2000 water and wastewater survey suggests that leakage in large systems is apparently higher than in smaller systems.

The American Water Works Association Research Foundation (AwwaRF) has commissioned a study into whether the proactive leakage management techniques used in England and Wales can be usefully applied by the American water companies. The techniques used in England and Wales are also beginning to be applied in France, with the installation of district meter areas (DMAs). These are used to identify current and new leakage in discrete areas of the distribution system.

Figure 10 Estimates of leakage



Key conclusions

- Water use in England and Wales lies in the middle of the range found in Europe.
- Water use in the USA and Australia is higher than. High outdoor use is particularly significant.
- Reported leakage levels in the Netherlands and Copenhagen are extremely low. There is evidence to suggest that differences in the operating environment can explain some of the disparity between the countries considered.
- Leakage in the USA is higher than the other countries in this report, but has fallen since last year.
- Water efficiency measures and tariffs have a greater effect on customer demand where metering exists.

7. Unit costs and relative efficiency

7.1 Water service unit costs

Tables 16 and 17 set out the main components of water service unit costs per property and per unit of water delivered. The former may be the more useful measure, as levels of water use vary widely between countries and volume may be a poor determinant of costs for some areas of operations.

The comparisons do not take account of the operating environment, level of treatment required, or scale economies. Whilst our econometric models consider these factors for companies in England and Wales, the available data from other countries is not detailed or robust enough for us to run them. The water models we use are detailed in appendix 2.

Thanks to the WICS publishing Scottish Water's annual return we have been able to calculate the unit cost figures for the industry in Scotland.

Table 16 Water delivered unit costs (£/property)

	Cost of operations	Resources and treatment ¹	Distribution ¹	Business activity ¹	Cost of capital maintenance	Return on capital	Total cost ²
E&W average	65	21	22	23	47	40	152
E&W range	52–98	15–42	14–31	17–42	21–62	8–78	102–200
SCO	62	17	21	24	69	38	170
GTB	50	15	17	17	22	-4	67
HEL	–	21	14	–	17	–	–
MAL	42	20	12	9	25	34	101
STH	38	11	16	11	15	24	77
DZH	83	–	–	–	41	8	132
AMS	96	–	–	–	34	-17	112
NHO	100	–	–	–	37	12	149
VIT	63	–	–	–	23	38	124
WML	73	–	–	–	32	33	138
WMN	50	–	–	–	20	32	101
BRA	60	–	–	–	25	37	123
BRB	85	–	–	–	29	63	177
CW	118	–	–	–	44	-12	150
GC	63	–	–	–	96	24	183
SAW	70	–	–	–	25	77	172
SEW	71	–	–	–	15	17	102
SYW	93	–	–	–	27	21	141
WC	70	–	–	–	80	16	166
YVW	72	–	–	–	42	-7	107
CAL	254	150	33	71	30	81	366
ET	171	68	30	73	46	201	418
ILL	167	66	15	86	60	96	322
IND	95	23	17	55	45	131	271
MA	94	26	15	53	18	75	188
NJ	186	79	20	86	48	170	404
PEN	143	36	21	87	49	149	342
SJ	259	182	26	51	44	98	401
SC	250	144	21	85	38	133	421
POR	48	–	–	–	–	–	–

Notes:

Numbers may not add due to rounding.

1. Where possible, we have broken operating costs down into resources and treatment, distribution and business activity costs.
2. Figures for the Dutch companies include abstraction tax.

Table 17 Water delivered unit costs (p/m³)

	Cost of operations	Resources and treatment ¹	Distribution ¹	Business activity ¹	Cost of capital maintenance	Return on capital	Total cost ²
E&W average	33	10	11	11	23	20	77
E&W range	25–58	7–21	7–16	8–22	11–33	4–58	51–147
SCO	29	8	10	11	33	18	80
GTB	28	9	10	10	12	-2	38
HEL	–	16	10	–	12	–	–
MAL	25	12	7	5	15	20	60
STH	20	6	8	6	8	13	41
DZH	68	–	–	–	34	6	109
AMS	66	–	–	–	23	-12	78
NHO	69	–	–	–	26	8	103
VIT	43	–	–	–	16	26	85
WML	52	–	–	–	23	23	98
WMN	36	–	–	–	14	23	73
BRA	37	–	–	–	15	23	75
BRB	24	–	–	–	8	17	49
CW	37	–	–	–	14	-4	47
GC	21	–	–	–	31	8	60
SAW	24	–	–	–	9	26	59
SEW	30	–	–	–	6	7	44
SYW	36	–	–	–	11	8	55
WC	22	–	–	–	25	5	52
YVW	31	–	–	–	19	-3	47
CAL	23	14	3	6	3	7	33
ET	22	9	4	9	6	26	53
ILL	34	13	3	17	12	19	65
IND	19	5	3	11	9	26	53
MA	18	5	3	10	3	14	36
NJ	39	17	4	18	10	35	84
PEN	45	11	7	27	16	47	108
SJ	31	22	3	6	5	12	48
SC	27	15	2	9	4	14	45
POR	44	–	–	–	–	–	–

Notes:

Numbers may not add due to rounding.

1. Where possible, we have broken operating costs down into resources and treatment, distribution and business activity costs.
2. Figures for the Dutch companies include abstraction tax.

These results show the influence that high levels of water use can have on unit costs. On a per property basis, the performance of the American companies is relatively poor, while those in Australia generally have similar costs to companies in England and Wales. But the performance of both the American and Australian companies is better than England and Wales using costs in pence per cubic metre. For the Dutch companies, costs are similar to those in England and Wales.

The return on capital in England and Wales is below American levels on a per property basis and similar to the returns in Australia and Scotland. The Dutch companies reported returns on capital employed are generally lower. The figure for England and Wales has decreased in recent years, reflecting the impact of the lower price limits that we set in 1999.

Both measures of Scottish Water's total unit costs are higher than the England and Wales average, but all of its costs are within the England and Wales range. Its capital maintenance costs, though, are higher above average than the rest of its costs, particularly on a per property basis. This is partly because Scottish Water is carrying out a large amount of capital work under the Quality and Standards II programme; inefficiency is also pushing up the cost.

For the second year running, we have been able to include individual unit cost data for members of the 6-cities group on both a per property and pence per cubic metre basis. We have also agreed to work with the group on a per person basis in the coming year.

The four cities that submitted unit cost data have lower total unit costs compared with companies in other countries, and lower than the lowest company in England and Wales on a per property basis. However, Malmö is within the England and Wales range on a pence per cubic metre basis.

Costs are generally lower for the 6-cities than in England and Wales, with total costs around half the cost to customers in England and Wales. There is a similar gap on the pence per cubic metre measure.

We recently met with the 6-cities group to discuss their operating environments, and identified the following cost drivers which we consider contribute to lower unit costs.

- The water entering the treatment works is generally of higher quality than in England and Wales.
- A large proportion of flats means one billing point for many properties. The landlord has responsibility for collecting from tenants.

- The 6-cities group does not have as stringent regulatory customer service standards. The existence of dedicated call centres is only just beginning to be considered. Complaints from tenants living in flats will be directed through a landlord, reducing the amount of customer contact.
- The companies have very low levels of bad debt. The right to disconnect customers is allowed and actively used with non-payers charged for each disconnection. Pressure on a landlord from tenants means water bills are generally high priority.
- Members of the group do not face abstraction charges for drawing raw water from surface or groundwater sources.

We also investigated differences in the cost of power, but found that they were not contributing to the low unit costs of the 6-cities group.

We look forward to continuing our work with the group to increase our understanding of comparative costs. This year, we have agreed to run our relative efficiency econometric models that will take key operating conditions into account. We hope this will highlight areas of genuine efficiency for further investigation.

Generally, the costs of operations component of bills in the Netherlands is higher than in England and Wales on both a per property and pence per cubic metre basis, while capital maintenance costs are lower per property but similar to England and Wales in pence per cubic metre.

Consequently, total costs are broadly in line with the England and Wales average. Per property unit cost comparison (table 19) suggests that overall the Dutch companies are slightly better performers, though all are within the England and Wales range.

The companies in the Netherlands with the lowest operating and capital expenditure tend to be those that rely almost exclusively on groundwater. Untreated groundwater is of a higher quality than untreated surface water and so costs less to treat.

On a per property basis the Australian companies' operating costs are again higher and are slightly above the England and Wales average. Their capital maintenance costs are still lower than the companies in England and Wales. As was the case last year, most of the companies have also seen falls in their return on capital leaving overall costs broadly in line with the England and Wales average. The Australian companies are generally cheaper than England and Wales for all measures on a 'water delivered' basis.

High per capita water use in the USA pushes per property costs up to very high levels compared with all the other countries surveyed. Other factors such as the relatively sparse population distribution may also have an impact. Distribution and capital maintenance costs per property are more in line with those in England and Wales. Total costs per unit of water delivered vary, but in general are below those in England and Wales. The return on capital component is within the range of companies in England and Wales.

When costs are analysed using the PPP exchange rates, the general conclusions above are still valid. Companies in England and Wales perform better in relation to Australia and the USA on both a unit of water delivered and per property basis. Overall costs per property of water delivered, as shown in table 18, are also higher for Scotland.

Table 18 Costs per property of water delivered based on purchasing power parity (£/property)

	E&W	Scotland	SCG	Netherlands	Australia	USA
Cost of operations	65	62	28	74	91	197
Cost of capital maintenance	47	69	17	30	43	46
Return on capital	40	38	11	26	26	139
Total cost¹	152	170	56	129	159	383

Notes:

Numbers may not add due to rounding.

1. Figures for the Dutch companies include abstraction tax.

When based on PPP, table 19 shows that the cost per unit of water delivered for the 6-cities group, the USA and Australia remain lower than those for England and Wales. Costs in Scotland are now closer to those in England and Wales whilst in the Netherlands they remain relatively high.

Table 19 Costs per unit of water delivered based on purchasing power parity (p/m³)

	E&W	Scotland	SCG	Netherlands	Australia	USA
Cost of operations	33	29	16	51	33	31
Cost of capital maintenance	23	33	10	20	15	7
Return on capital	20	18	7	18	9	22
Total cost¹	77	80	33	89	58	61

Notes:

Numbers may not add due to rounding.

1. Figures for the Dutch companies include abstraction tax.

Tables 20 and 21 provide information on total unit costs for the period 2000-01 to 2004-05.

Costs per property and per unit of water delivered have risen in England and Wales. Following a period of falling costs, both Australia and the Netherlands saw costs per property rise in 2004-05. Costs on a per property basis in the USA also rose sharply during 2004-05, but were stable on a cost per unit of water delivered basis.

Table 20 Costs per property of water delivered 2000-01 to 2004-05 (£/prop)

	2000-01	2001-02	2002-03	2003-04	2004-05
E&W	137	140	140	145	152
Netherlands	134	133	127	124	129
Australia	176	178	166	157	159
USA	354	346	363	352	383

Notes:

Data are in outturn prices and have been adjusted for PPP.
Numbers may not add due to rounding.

Table 21 Costs per unit of water delivered 2000-01 to 2004-05 (p/m³)

	2000-01	2001-02	2002-03	2003-04	2004-05
E&W	68	68	69	70	77
Netherlands	88	85	83	84	89
Australia	51	52	54	55	58
USA	59	57	62	62	61

Notes:

Data are in outturn prices and have been adjusted for PPP.
Numbers may not add due to rounding.

7.2 Sewerage service unit costs

Tables 22 and 23 show the unit costs of the sewerage service in England and Wales, Scotland, the 6-cities group and Australia.

Table 22 Sewage collected unit costs (£/property)

	Cost of operations	Sewerage ¹	Sewage treatment ¹	Sludge treatment and disposal ¹	Business activity ¹	Cost of capital maintenance	Return on capital	Total cost
E&W average	60	10	19	13	18	52	56	167
E&W range	47–88	7–16	13–40	10–19	13–28	35–87	38–95	120–270
SCO	53	15	14	4	20	42	129	224
GTB	55	12	31	–	12	25	20	101
HEL	–	6	15	–	–	37	–	–
MAL	61	18	31	–	13	17	36	114
STH	49	18	16	–	15	26	52	126
BRB	65	–	–	–	–	145	-26	185
CW	93	–	–	–	–	45	-13	125
GC	79	–	–	–	–	209	-67	222
SAW	58	–	–	–	–	23	123	204
SEW	81	–	–	–	–	52	-7	127
SYW	81	–	–	–	–	90	-4	167
WC	70	–	–	–	–	72	119	261
YVW	95	–	–	–	–	46	-19	122

Notes:

Numbers may not add due to rounding.

1. Where possible, we have broken operating costs down into sewerage, sewage treatment, sludge treatment and disposal, and business activity.

Table 23 Sewage collected unit costs (p/m³)

	Cost of operations	Sewerage ¹	Sewage treatment ¹	Sludge treatment and disposal ¹	Business activity ¹	Cost of capital maintenance	Return on capital	Total cost
E&W average	35	6	11	8	11	30	33	98
E&W range	23–58	4–10	6–27	5–12	7–16	17–57	18–63	58–179
SCO	36	10	10	3	14	29	88	153
GTB	34	7	19	–	8	15	12	61
HEL	–	5	11	–	–	28	–	–
MAL	36	11	18	–	7	10	21	68
STH	26	10	9	–	8	14	27	67
BRB	24	–	–	–	–	54	-10	69
CW	30	–	–	–	–	14	-4	40
GC	27	–	–	–	–	71	-23	76
SAW	28	–	–	–	–	11	59	98
SEW	39	–	–	–	–	25	-3	61
SYW	29	–	–	–	–	33	-1	60
WC	36	–	–	–	–	37	61	133
YVW	41	–	–	–	–	20	-8	53

Notes:

Numbers may not add due to rounding.

1. Where possible, we have broken operating costs down into sewerage, sewage treatment, sludge treatment and disposal, and business activity.

Scottish Water's sewerage total costs fall within the range recorded by companies in England and Wales for most measures but are slightly higher compared to the England and Wales average. For other cost measures Scotland is similar to England and Wales.

As with the water service, the 6-cities submission shows the companies in England and Wales to have higher average total unit costs than the four members of the group who submitted data. Whilst these cities' average return on capital is much lower than the England and Wales average, the difference in unit costs is lessened by their higher sewerage, sewage treatment and capital maintenance costs. Our recent meeting with the group revealed that local discharge consents can be tighter than EU based ones.

On a per property basis, average total costs in Australia fall within the range of the England and Wales companies. Costs of operations in Australia are higher than in England and Wales and capital maintenance costs have increased dramatically for some companies since 2002-03. This could explain the negative returns on capital reported in 2004-05. On a volumetric basis, the

Australian companies again come out with much lower costs than their counterparts in England and Wales.

As with the water unit costs, table 24 shows that England and Wales and Scotland perform better relative to Australia and worse relative to the 6-cities group when costs are compared using PPP. Although England and Wales do well on a per property basis, Australian companies are cheaper on a volumetric basis (table 25).

Table 24 Sewage collected unit costs based on purchasing power parity (£/property)

	E&W	Scotland	SCG	Australia
Cost of operations	60	53	35	87
Cost of capital maintenance	52	42	25	87
Return on capital	56	129	27	18
Total cost	167	224	86	191

Note:

Numbers may not add due to rounding.

Table 25 Sewage collected unit costs based on purchasing power parity (p/m³)

	E&W	Scotland	SCG	Australia
Cost of operations	35	36	21	35
Cost of capital maintenance	30	29	15	35
Return on capital	33	88	16	7
Total cost	98	153	52	77

Note:

Numbers may not add due to rounding.

A 2002 study for us by WS Atkins found broadly similar levels of capital maintenance across countries. The disparity in levels of capital maintenance expenditure between England and Wales and many of the other companies in this report, particularly evident in volumetric unit cost comparisons, appears to be due to a number of differences in the way in which costs are allocated. As the concept of capital maintenance as applied in England and Wales is not widely applied across the world, our international work uses depreciation as a proxy. This may not fully reflect the actual levels of capital maintenance. In Australia, WS Atkins found clear differences in asset valuations, asset lives and accountancy rules, all of which had significant effects on the non-infrastructure charges.

7.3 Relative efficiency

During 'The Strategic Review of Charges 2006-10' process, WICS compared Scottish Water's efficiency with that of the companies in England and Wales. We have presented the results of the operating expenditure analysis in table 26.

Table 26 Relative operating efficiency

	GB average ¹	Scottish Water ²
Water	100	115
Sewerage	100	116

Notes:

1. Average score for all water companies in England, Wales and Scotland.
2. Results are based on extended Ofwat models after special factor and residual adjustments.

These results placed Scottish Water in band D of our efficiency banding system, meaning that for 2003-04, they were within 35% of the benchmark company in England and Wales.

WICS also assessed Scottish Water's capital maintenance efficiency using the cost base system that we developed. It did not use any version of our capital maintenance econometric models.

As a result of its cost base analysis, WICS determined that Scottish Water would need to improve its capital maintenance procurement efficiency by 24% for the water service and 23% for the sewerage service in order to achieve benchmark performance in England and Wales.

Key conclusions

- Comparisons based on the number of properties suggest that total costs are broadly similar in Australia, the Netherlands and England and Wales. Four members of the 6-cities group, and one or two other companies, report total cost levels notably below the England and Wales average. American companies report very high costs per property.
- Comparisons of volumetric unit costs suggest that the 6-cities group, Australian companies and many American companies provide water and sewerage services at a lower cost than companies in England and Wales, while costs in the Netherlands are higher. However, levels of water use distort comparisons.

- Adjusting unit costs for PPP removes the effect of currency fluctuations. When comparing PPP-adjusted unit costs, the general conclusions above are still valid but the performance of companies in England and Wales appears better relative to Australia on both a per property and water delivered basis.
- The water and sewerage companies in England and Wales appear more cost efficient than Scottish Water.

8. Network activity

The England and Wales companies are required to maintain their non-infrastructure asset and networks of water mains and sewers so that they can provide services to customers over the long term, whilst protecting our environment.

In the regulatory context, 'serviceability' is the capability of a system of assets to deliver a reference level of service to customers and to the environment now and into the future. The trend help us to make judgements as to whether the capital maintenance activity carried out by the companies over the period resulted in changes in the serviceability and service to customers. Companies are required, as a minimum, to maintain (or achieve and maintain) stable serviceability.

Serviceability is deemed to be stable when the assessment of trends in a defined set of service and asset performance indicators demonstrates that service is in line with the reference level of service and, by inference, is likely to remain so into the future. Unless demonstrably sub-optimal or atypical, the reference levels of service and asset performance are taken as the best historic levels achieved by the company.

8.1 Network activity

Table 27 compares network activity rates between England and Wales, the 6-cities group and, for the first time, single year data provided to us from Canada and Portugal.

Table 27 Levels of network activity

	E&W 2000-05		SCG 2000-05		Canada 2005		Portugal 2005	
	Average	Range	Average	Range	Peel	Waterloo	Average	Range
% of water mains renewed	0.8	0.1–2.2	0.6	0.4–0.9	0.58	0.78	1.6	0–6.0
% of sewers renovated or replaced	0.05	0.01–0.14	0.5	0.2–0.8	0.12	0.59	0.2	0–1.4

Notes:

1. England and Wales is a five-year average.
2. 6-cities group is a five-year average.

Water mains renewal rates are very similar for England and Wales, the 6-cities group and Canada. However, both the 6-cities group and Portugal are more active in renovating or replacing their sewerage network. The least active organisation in the 6-cities group is as active as the most active company in England and Wales.

The Water Industry Commission for Scotland's 'Investment and asset management report 2003-06' observes that Scottish Water invested £1.8 billion throughout the four years of the Quality and Standards II programme (2002 to 2006). Key amongst Scottish Water's outputs from this period of investment was the repair of 2990km of water pipes. This has enabled Scottish Water to meet the majority of its mains and sewer replacement targets, and to report gradual improvements in the percentage of its water mains and sewers reported as being in an adequate or better condition.

Evidence from the USA and Germany suggests that ageing or substandard infrastructure is a relatively common problem for the water industry. The American Society of Civil Engineers reported in March 2005 that drinking water infrastructure spending in the USA was currently running at less than 10% of the national requirement. And in Germany, the German Association for Water, Wastewater and Waste Management (DWA) estimates that €50-€55 billion (£35-38 million) needs to be spent on the public sewage networks to bring their performance up to the necessary standards.

8.2 Burst rates

Table 28 shows mains burst rates in England and Wales, Scotland, the 6-cities group, Australia, Canada and Portugal. Table 29 shows sewer collapse rates for all of these with the exception of Canada.

Table 28 Water main bursts (per 1,000 km)

E&W 2000-05		SCO 2002-05		SCG 2000-05			Australia 2000-05		Can 2005	Portugal 2005	
Ave	Range	Ave	GTB	HEL	MAL	STH	Ave	Range	Peel	Ave	Range
200	89-404	197	177	140	80	134	419	164- 929	100	807	175- 1,851

Notes:

England and Wales is a five-year average.

6-cities group is a five-year average.

Australia is a five-year average.

Portugal and Canada are single year averages.

Table 29 Sewer collapse (per 1,000 km)

E&W 2000-05		SCO 2002-05		SCG 2005		Portugal 2005	
Ave	Range		GTB	HEL	MAL	Ave	Range
14	5–30	55	27	47	9	21	0–59

Note:

Data for Scottish Water includes collapses in 13,200km of lateral sewers.

Scottish Water’s 2002-05 mains burst figure is similar to the England and Wales five-year average. Its sewer collapse rate compares less favourably and falls outside the range of the England and Wales companies.

The members of the 6-cities group have all reported lower mains burst rates than the England and Wales average. Three of the companies are within the range of the England and Wales companies, Malmö is below the range.

The number of main bursts is higher in Australia, Canada and Portugal, which might suggest that the underground network is in a worse condition than that in England and Wales. Differences in both soil type and the age of a network might contribute to relative performance. The Australian companies also have particular problems with root intrusion.

The sewer collapse rates reported by Gothenburg and Helsinki are much higher than the England and Wales average. We believe this is due to a difference in definitions rather than significantly poorer performance as shown. We will discuss this with the 6-cities group in the coming year so we are able to present more comparable data in next year’s report.

Key conclusions

- England and Wales have higher water main activity rates than Australia and similar rates to the 6-cities group.
- Following a programme of investment, the condition of Scottish Water’s water mains and sewer pipes are seen to be improving.
- Companies in England and Wales have a lower long-term burst rate than Australian companies but a higher rate than the 6-cities group.

9. Financial performance

The financial performance of an organisation is important whatever its regulatory framework. In most cases, companies need to borrow money from the relevant debt markets to finance capital investment. Therefore, they need to convince lenders that they can meet payments. Table 30 sets out some key financial ratios that provide an indication of a company's ability to finance its functions.

Australian companies' figures are reported on a current cost basis. The accounts of the 6-cities group, Scottish Water and the Dutch and American companies are prepared on an historic cost basis, with assets valued with reference to the purchase price, regardless of the passing of time and the level of associated inflation. This differing approach is reflected in depreciation.

Approaches to valuing capital bases vary. In England and Wales, values for capital employed are based on an initial value at privatisation, adjusted for subsequent depreciation and new investment. Companies also report net modern equivalent asset (MEA) values: the estimated cost of assets of equivalent productive capability to satisfy the remaining service potential of the asset, less accumulated current cost depreciation. Australian companies report the current replacement cost of the asset in a similar way to the companies in England and Wales, but often value them differently. Companies in the USA, the 6-cities group and the Netherlands report overall capital employed.

Estimates of the capital base vary between countries. American companies quote values per property for the water service only that are around the level of the combined water and sewerage service for England and Wales. Australian estimates of current replacement costs per property served are much lower than in England and Wales. The differences may reflect different accounting approaches and assumptions, as well as the lower value of assets per property required to serve the urban areas that 'WSAAfacts' covers. Estimates of capital employed are also lower for the organisations in the Netherlands.

Table 30 Financial indicators

	Net water and sewerage replacement cost MEA (£/prop)	Capital employed water service (£/prop)	Return on capital MEA (%)	Return on capital, estimated capital employed (%)	Operating margin (%)	Dividend + interest /capital employed (%)	Current cost dividend cover	Current cost interest cover	Historic cost dividend cover	Historic cost interest cover
E&W average	9,632	1,584	0.97	5.9	29	6.5	1.2	1.9	1.1	2.4
E&W range	7,473–12,728	1,101–2,584	0.70– 2.72	3.6–10.1	16–41	5.3–53.1	0.1–3.3	0.9–9.8	0.1–2	1.1– 10.7
SCO	–	1,210	–	7.4	–	–	–	1.6	–	2.1
SCG average	–	–	–	–	–	–	–	1.1	–	–
DZH	–	541 (555)	–	3.8	15	–	–	–	–	1.5
AMS	–	427 (438)	–	4.3	15	–	–	–	–	1.3
NHO	–	635 (651)	–	4.4	18	–	–	–	–	1.2
VIT	–	490 (502)	–	6.6	26	–	–	–	–	2.6
WML	–	698 (716)	–	4.7	23	–	–	–	–	1.4
WMN	–	390 (400)	–	5.8	21	–	–	–	–	2.2
BRA	–	370 (380)	–	7.6	22	–	–	–	–	3.9
BRB	2,848 (3,156)	–	6.1	–	48	1.8	5.9	7.9	–	–
CW	1,716 (1,901)	–	11.8	–	74	4.2	3.7	11.5	–	–
GC	3,274 (3,627)	–	9.9	–	80	3.4	3.6	15.6	–	–
SAW	3,655 (4,049)	–	6.1	–	59	5.7	1.6	3.3	–	–
SEW	1,322 (1,464)	–	5.3	–	31	3.1	2.9	4.2	–	–
SYW	2,749 (3,046)	–	3.8	–	34	2.4	3.7	2.8	–	–
WC	4,520 (5,008)	–	5.9	–	63	5.3	1.3	7.5	–	–
YVW	1,551 (1,719)	–	4.3	–	29	3.5	2.3	2.6	–	–
CAL	–	936 (1,061)	–	8.1	21	4.9	–	–	1.0	3.3
ET	–	2,043 (2,316)	–	9.7	48	3.3	–	–	3.8	5.7
ILL	–	1,137 (1,289)	–	7.9	28	4.6	–	–	1.6	3.5
IND	–	1,195 (1,354)	–	9.3	41	5.6	–	–	1.5	3.2
MA	–	906 (1,027)	–	7.0	34	4.4	–	–	1.5	3.0
NJ	–	1,585 (1,797)	–	10.5	41	5.1	–	–	2.4	4.0
PEN	–	1,590 (1,803)	–	9.2	43	5.5	–	–	1.5	3.4
SJ	–	1,066 (1,208)	–	8.4	22	5.1	–	–	1.3	3.9
SC	–	1,383 (1,568)	–	9.0	29	5.1	–	–	1.7	3.4

Notes:

England and Wales based on water and sewerage companies only.

The use of historic and current cost accounting can vary between companies. For simplicity we have assumed a consistent approach within a country.

Figures in brackets are based on purchasing power parity.

Public sector companies can often support much lower levels of interest cover than private concerns because of the lower risks associated with lending to the public sector. Evidence from the publicly-owned companies in the Netherlands appears to verify this.

However, the interest cover for Scottish Water is similar to the England and Wales average and the Australian companies report higher levels of cover. It should be noted that the levels of interest cover in England and Wales have decreased in recent years as companies have increased borrowing to fund their capital expenditure programmes.

We would also expect publicly-owned companies to have lower returns on capital than the companies in England and Wales. But the data we have does not bear this assumption out.

Australian companies' returns on capital, based on the MEA, are higher than the returns of companies in England and Wales, although the difference could be partly the result of differences in the basis on which revenues are set. Companies in England and Wales, for example, earn a return based on the capital value rather than the MEA.

The operating margins of the publicly-owned organisations vary. The Dutch companies operate with margins at the lower end of the England and Wales spectrum. The Australian companies have comparatively high margins when considered against their counterparts in England and Wales.

The private companies listed from the USA have returns on capital, operating margins and interest covers that are, on average, slightly higher than the corresponding figures for England and Wales.

Dividend cover provides a measure of the long-term sustainability of dividend payments and the ability of the companies to raise additional equity capital. The level of dividends paid by companies in the USA and Australia, relative to profit levels, are roughly the same as in England and Wales. Scottish Water, the 6-cities group and most of the Dutch companies do not pay dividends.

Key conclusions

- Financial indicators across countries appear to be broadly similar to England and Wales, though there is significant variation between individual companies within each country.
- Methodologies used to estimate the capital base vary between countries, but the levels of return on each of these are broadly similar.
- Accounting practices and assumptions between countries are likely to distort the ability to make direct comparisons.

Appendix 1: Data comparability

The data in this report is based on trade association publications, annual reports and accounts. Consequently, information might not be on a comparable basis to that set out in the June returns that the reporters audit.

Operating expenditure data

Operating expenditure may include work on capital equipment that a company's employees may undertake. We exclude such expenditure from our definitions and have, therefore, adjusted the Netherlands' figures.

Costs associated with providing services other than the provision of water and sewerage supply to third parties may be included. These are separately identified in June return tables. Costs associated with bulk supply arrangements may also be included, which can impact on unit cost calculations if costs are associated with supplying properties outside the company's area. Although included in England and Wales data, bulk supplies are more common in other countries.

Contracting out increases operating costs at the expense of capital maintenance and the return on capital component. This is particularly the case for Build, Own and Operate (BOO) and Private Finance Initiative (PFI) arrangements for treatment works. This applies equally to comparisons between companies in England and Wales.

Capital maintenance charges data

Differing accounting standards affect the level of the depreciation charge. Current cost accounts tend to increase the capital maintenance charge, but may be a more accurate way of recording the depreciation requirement because historic cost depreciation fails to take account of inflation.

Return on capital data

Because the return on capital in this report represents a residual it is important that turnover is collected on a comparable basis. Turnover figures sometimes include income from the treatment of capital expenditure items, new connections and possibly unread meters. The Netherlands' accounts include

some capital items that companies' employees produce. These appear as both a turnover item (for which the company charges itself) and an operating cost item. Adjustments have been made to remove this where possible.

In Australia, revenue for new connections is a turnover item. Other countries treat this item as negative capital expenditure. Some adjustments have been made, but in others turnover and, as a result, the return on capital item may be overstated.

Water delivered data

The water balance is important both in itself and for comparing costs. In England and Wales each component, including leakage, is estimated separately and then checked against top down estimates. Other countries, with extensive metering, take a different approach with one component (usually leakage) estimated as a residual. This has the risk that inaccuracies in other areas (for example, meter under-registration or supply pipe leakage) may accumulate in the leakage estimate.

Other, more pressing circumstances may influence leakage levels. For example, there may be a need to maintain a certain pressure level or resource position.

Properties served data

Differences in interpretation affects unit cost comparisons. How a company treats blocks of flats and other, multi-household, buildings is particularly important, especially for the Netherlands and the 6-cities group where there is a greater number of such properties. Our June return guidance states that companies treat such properties as non-households. Other countries may regard such properties as a single connection (resulting in very high per property usage) or as multiple households.

Financial indicators data

The extent to which companies finance their assets, rather than just operate them, will affect the operating margin that a company requires. A low capital value allows a lower operating margin to be sufficient.

The other main difficulty is exceptional and atypical earnings, such as profits made on the disposal of land or other assets. These have been removed from the analysis wherever possible.

Appendix 2: Water econometric models

Operating costs models

Table 31 summarises the four water models for operating costs. The overall water service operating efficiency assessment combines the results of the water service models including any adjustment for special factors, exceptional and atypical costs and pensions.

Table 31 Operating expenditure models

Model	Explanatory factors
Distribution	Population, proportion of total mains length with diameter >300 mm
Resources and treatment	Population, number of sources, distribution input, proportion of supplies from rivers
Power	Distribution input, average pumping head
Business activities	Number of billed properties

Distribution

This is a log model expressed in unit cost form with resident population as the scale variable. The proportion of large mains to small mains is the most important cost driver in this model. We use this as a proxy for urbanisation. Repairs, maintenance and inspection of large mains incur much greater costs than the same work on small mains.

Resources and treatment

This is a linear model expressed in unit cost form with resident population as the scale variable. We take into account the explanatory variables of population, number of sources, distribution input and the proportion of supplies from rivers. These ensure that we take into account economies of scale at source level (costs will be lower if fewer sources are used) and the difficulty of treatment (river supplies will generally be more expensive to treat).

Power

This is a log linear model. For most companies, power expenditure is almost entirely for pumping, although there are some water treatment processes that are energy intensive. The model considers the effects of terrain (companies in hilly areas will require more power to move water around) and the significant economies of scale associated with high power consumption.

Business activities

This is a log linear model. Business activities include customer services and scientific services, and the charge for doubtful debts. The model takes into account the economies of scale associated with high volume billing and customer service activities.

We combine the results of the water service models together with any adjustment for special factors and pension costs and compare these to give an overall water service operating efficiency assessment. We have re-estimated the operating efficiency models using 2004-05 data.

Capital maintenance costs models

Table 32 summarises the four water models for capital maintenance.

Table 32 Capital maintenance expenditure models

Model	Explanatory factors
Water resources and treatment	Connected properties
Distribution infrastructure	Length of main, connected properties
Distribution non-infrastructure	Pumping station capacity, water service reservoir and water tower capacity
Management and general	Billed properties, proportion of non-household billed properties

Resources and treatment

Water resources and treatment comparison is unit cost based, using connected properties.

Distribution infrastructure

This is a log unit cost model expressed in unit cost form with length of main as the scale variable. The key cost driver in this model is the log of connected properties per length of main.

Distribution non-infrastructure

This is a log unit cost model expressed in unit cost form with total booster pumping station capacity as the scale variable. We take into account water tower and service reservoir capacities in this model. The ratio of storage capacity to pumping station capacity helps to explain the higher costs of companies with relatively greater storage capacity.

Management and general

This is a log model expressed in unit cost form with the total number of billed properties as the scale variable. The key cost driver in this model is the proportion of billed properties that are non-household. The model explains the higher unit costs incurred by companies with more business customers due to metering and billing requirements.

We combine the results from the econometric models and the unit cost comparison and make adjustments for further expenditure, leakage allocation and special factors. This is our water service econometric assessment of capital maintenance efficiency. We average this with the results from the cost base to give an overview of each company's capital maintenance efficiency for the water service.

Special factors

The econometric models take into account factors that describe the size or operating environment of different companies. These factors are common to all companies. There are other factors that are specific to each company or a group of companies that we cannot incorporate into our econometric models. Such company specific special factors typically lead to higher operating or capital maintenance costs, which in the short to medium term are outside management control. We need to take account of these when we interpret the results of our econometric models. Examples of special factors are legal requirements or circumstances peculiar to an individual company's area of operation.

Some of the most common special factors allowed in the assessments of relative efficiency in 2004-05 were:

- unusual water resources and treatment costs;
- unusual sludge and sewage treatment costs;
- legal requirements;
- high level of meter penetration;
- costs of operating in London and the surrounding area;
- unusual costs relating to debt and debt collection; and
- regional power costs.



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