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Second CGI Special Edition

GB Water Industry

for dummies®
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Understand what the water industry does and how it does it

Look at where the industry is today and where it's headed

Compliments of

CGI

Dr. Graham Hainsworth
Dr. Giordy Salvi

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In 2015, CGI was selected by Market Operator Services Ltd (MOSL) to design, build and operate the central market system to support the operation of the English water market when competition was introduced to non-household customers on 1st April 2017.

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GB Water Industry For Dummies®, Second CGI Special Edition

Published by: **John Wiley & Sons, Ltd.,** The Atrium, Southern Gate
Chichester, West Sussex, www.wiley.com

Registered Office

John Wiley & Sons, Ltd., The Atrium, Southern Gate, Chichester, West Sussex, PO19 8SQ, United Kingdom

ISBN 978-1-119-39323-8 (pbk); ISBN 978-1-119-39330-6 (ebk)

Printed in Great Britain by Page Bros, Norwich

10 9 8 7 6 5 4 3 2 1

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Authors' Acknowledgements

Many people have contributed to this book, and we'd like to take this opportunity of thanking them: Stefania Bortolotti, Stuart Brand, Jo Dow, Ben Jeffs, Martin Mavin, Peter Perry, *the Romans,* Chad R. Sievers and Steve Wilson. But we really must give particular thanks to our colleague Chris Beard, who wrote the original *Water Competition For Dummies,* which formed the basis for the water competition chapters in this book.

Contents at a Glance

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Introduction

Welcome to the second edition of the *GB Water Industry For Dummies*, Second CGI Special Edition, the essential pocket guide to the British water sector. Since the first edition, water competition in England has become a fact, so we felt it was time to update this book. We have also used the update to consolidate it with our other related book, *Water Competition For Dummies*, CGI Special Edition. We have included some of that information from that book and updated it.

About This Book

If ever there was an industry where being wet behind the ears might be justified, it has to be the water industry (as a pun only of course). If you do find your ears a little damp, then this book applies a metaphorical towel to them.

We explain how the water industry is structured and regulated, how it gets water to your taps and takes it away again, how it's ended up the way it is and some of the changes and challenges it faces.

As with any industry, the water industry has its share of jargon that we explain as we use it.

Foolish Assumptions

We made a few assumptions while writing this book. The first obvious one is that something as complex and diverse as the British water industry can be condensed into a conveniently pocket-sized book – clearly a ludicrous undertaking! We also assume that:

- You're relatively new to the water industry or just interested in a useful, fairly lighthearted overview of how the British water industry flows together (you may find some of this book *pun*-ishing!).

- You don't want our opinions as to the rights and wrongs of the various twists and turns that the industry has been through over the years.
- And if you've picked up this book several years after it was written, bear in mind that although things tend to move at the speed of a blocked sewer in the water industry, we are writing it as a snapshot of a point in time. For example, you may be reading it and domestic retail competition has happened. But don't expect too much change!

Icons Used in This Book

To make navigation to particular information even easier, we use icons to highlight key text:

REMEMBER

This icon addresses important points to keep in mind.

TIP

This icon highlights text to help you deepen your understanding of a topic.

WARNING

Pay attention. This icon draws your attention to the Dark Side!

TECHNICAL STUFF

These are fascinating (no, really) facts about the water industry. Amaze your friends.

Where to Go from Here

As with all *For Dummies* books, you can dip in and out or read from cover to cover – it won't take long!

Use the headings to guide you to the information you need. And if you require any more information, feel free to contact us at `enquiry.uk@cgi.com`.

IN THIS CHAPTER

- Examining the key bits of the industry
- Taking a historical tour
- Reviewing the key challenges

Chapter 1
Getting to Grips with the Basics

The British water industry is atypical when compared to the water industries of most other countries. In most countries the water utilities are owned and run by the municipality they serve, whereas ours are typically privately owned and cover a large geographic area serving several million people (but not all of them, as we shall see!).

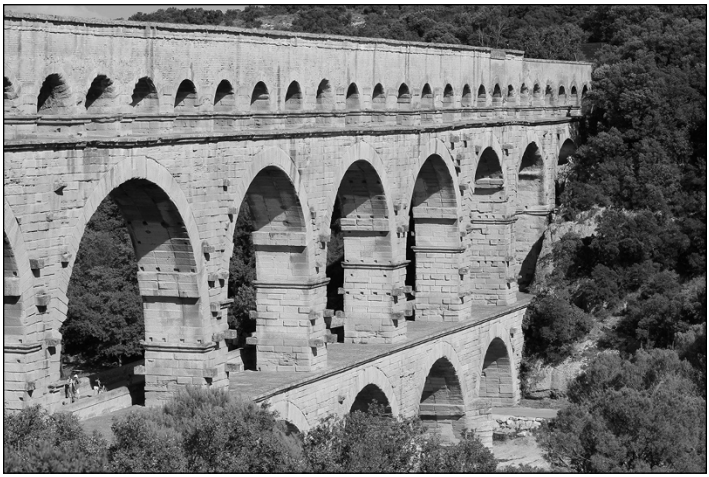
This chapter looks at how this industry came about and how it's changed, especially over the last 40 or so years.

Eyeing a Key Element for Health

The ancient Greeks thought there were four elements: earth, air, fire and water. It's not surprising they included water because it's essential to life.

Early settlements could only develop if there was a supply of water nearby. In times of war, besieging armies would often try to deny the inhabitants of a city under siege their access to water or poison it.

The only way to build cities away from sources of water was to transport the water from source to city (Romans spoiler alert!). The first people to do this on a colossal scale were the Romans. The Pont du Gard (see Figure 1-1) is probably the most famous aqueduct in the world, the most spectacular part of a 50km complex bringing water to Nemausus (now the city of Nîmes).



Source: Office du Tourisme du Pont du Gard, France

FIGURE 1-1: The Pont du Gard: water transported the Roman way.

Of course, large numbers of people produce large amounts of by-products (we're now entering an area where euphemisms abound!). Although there were sewers long before the Romans, it was probably the Romans (again!) who first produced what today would be recognised as public toilets. But even the effluent from these was simply washed away into the nearest river untreated. Figure 1-2 shows a Roman public toilet. When they said public, they meant it.

However, even well into the Middle Ages and beyond, the vast majority of human waste ended up on the streets. And people still wore sandals!

TECHNICAL STUFF

In medieval times, parents gave beer to children in preference to water because the brewing process killed off many bugs so it was safer to drink.

Diseases such as cholera, typhoid, dysentery and diarrhoea were common in cities at this time. This was hardly surprising because, if you were unfortunate enough to be towards the end of a river (as London is), any water you took from the river would include all the waste from those towns and cities upstream. In just one example, a polluted public well was found to be the source of a cholera outbreak in London in 1854.

FIGURE 1-2: Mind how you go: A Roman public toilet.

TECHNICAL STUFF

According to the World Health Organisation, one gram of human faeces may contain ten million viruses, one million bacteria, 1000 parasite cysts and 100 worm eggs.

With the eventual recognition that water was a major source of disease, authorities started to develop cleaner water supplies for their towns and cities. It's no exaggeration to say that the reliable supply of clean drinking water and the effective removal of sewage have given people fortunate to live in the developed world the biggest improvement in human health in history.

Today people take it for granted that clean water comes out of the taps and that when people flush the toilet, it empties. But how does the water get to the taps, where's it all flushed to and how is the industry that does it organised and regulated? You'll get the answers to these questions and more in this little book.

Understanding the Water Industry Structure

People in the UK are fortunate to live on islands that are generally well watered, where droughts are infrequent and, when they do occur, limited in extent and duration. The most severe UK drought in living memory was more than 40 years ago, between 1975 and 1976. Even then, it only really severely affected the more southern and eastern parts of England. Yet by Christmas of 1976, the reservoirs were full again. Compared to many other parts of the world, England has access to plentiful water, although it's not distributed evenly across the country.

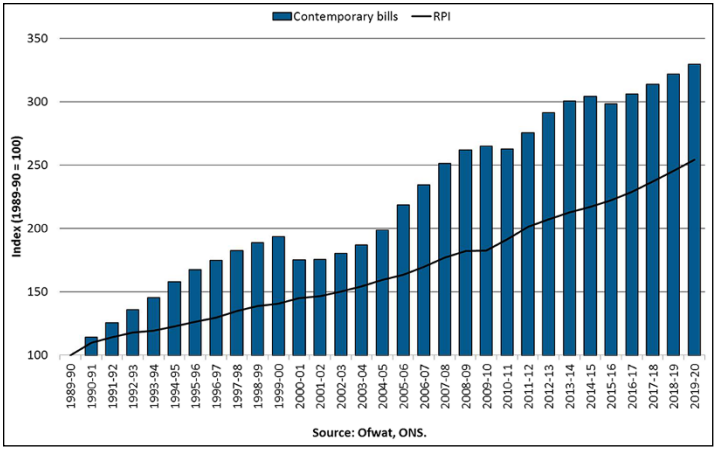
This relative plenty means people take it for granted that when they turn the tap on, water comes out of it. However, the price people pay for it is arguably amongst the highest in the world (fifth, in fact, in a table of average international tariffs, according to the Global Water Intelligence website). Since the UK water industry was privatised in 1989, water bills have more than trebled and, even allowing for inflation, they are 40 per cent higher than they were in 1989, according to a report by the New Policy Institute for UNISON (`www.npi.org.uk/files/9414/3014/8416/Water_industry_NPI_final_06_04_15.pdf`), the public service union. Figure 1-3 shows how water bills have increased compared with the RPI since 1989–90, where both are set to 100 in 1989–90 to enable comparison, with forecasts to 2019–2020.

The average annual UK water bill for 2016–2017 is £389.

Not surprisingly, the public has become more aware of the water industry and its ownership has come under question. So how is this industry structured? The following sections answer this question.

Water and sewage

It's probably worth mentioning that sewerage isn't an alternative spelling for sewage. Sewage is handled by the sewerage system, that includes the sewers in your street, and it delivers sewage to the sewage treatment works, which we describe in Chapter 2.



Source: New Policy Institute for UNISON, the public service union

FIGURE 1-3: The rising price of water, 1989 to 2020.

Although they are commonly just called *water companies*, there are actually two types:

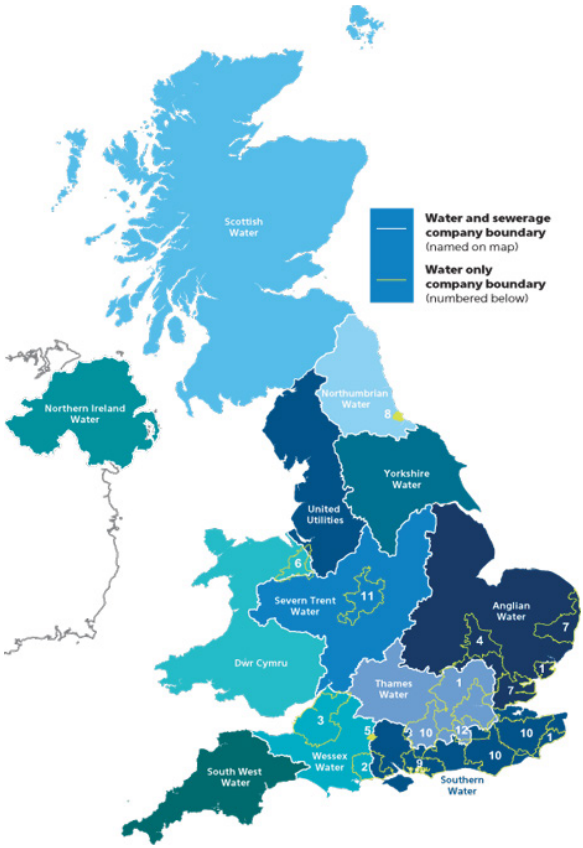
- **Genuine water only companies (WOCs):** These are relatively small when compared to the second kind.
- **Water and sewerage companies (WaSCs):** These are the larger companies that offer sewerage services as well as supplying water.

However, except where the distinction is important, we continue to use the term *water company* to refer to both WOCs and WaSCs.

Figure 1-4 shows where all of the water companies operate.

Table 1-1 shows all of the companies that operate in the United Kingdom with their turnover, the number of customers they serve and the size of their water and sewer networks. As you can see, their size varies enormously with Thames Water serving by far the largest number of customers.

Note that the introduction of retail competition for non-household customers from April 2017 will have an effect on the turnover figures in the future, especially for those companies who exit the market (we explain market exit in more detail in Chapter 6).



1. Affinity Water	*2. Bournemouth Water*
3. Bristol Water	*4. Cambridge Water (South Staffs)*
5. Cholderton and District Water	*6. Dee Valley Water*
7. Essex & Suffolk Water (Northumbrian)	*8. Hartlepool Water (Anglian)*
9. Portsmouth Water	*10. South East Water*
11. South Staffs Water	*12. Sutton and East Surrey Water*

Source: Water UK

FIGURE 1-4: The UK's water companies.

TABLE 1-1 Overview of UK Water Companies

	Revenue 2015-16 £m	Customers millions	Mains water (km)	Sewers (km)
Water and sewerage companies				
Anglian	1,185.4	6.7	38,095	76,335
Dŵr Cymru	743.2	4.1	27,554	35,989
Northern Ireland	413.5	1.8	26,712	15,582
Northumbrian (inc Essex & Suffolk)	831.8	3.6	25,678	29,923
Scottish	1,196.8	6.7	48,257	51,510
Severn Trent	1,506.1	10.4	46,727	92,416
South West	506.4	1.6	15,258	15,703
Southern	803.7	4.6	13,753	39,588
Thames	2,039.5	14.9	31,148	108,732
United Utilities	1,730.0	8.5	42,876	77,914
Wessex	520.8	3.1	11,688	34,627
Yorkshire	975.8	6.0	31,405	52,052
Water only companies				
Affinity	302.6	3.5	16,596	
Bristol	110.9	1.1	6,763	
Dee Valley	23.1	0.3	1,986	
Portsmouth	39.8	0.7	3,297	
Bournemouth	41.4	0.5	2,829	
South East	214.4	2.1	14,483	
South Staffordshire (including Cambridge)	234.9	1.6	8,358	
Sutton & East Surrey	63.0	0.7	3,466	

Source: Water UK and individual company websites.

Note the impact of the addition of private sewers to the English and Welsh WaSCs since the first edition. This table might suggest that there's an enormous difference between the bills customers get from different companies and that 'where there's muck, there's brass' (that is, there's more money in sewage treatment).

In fact, there isn't quite the difference in bills implied, as Table 1-2 shows. Other factors influence companies' turnover, especially the type and number of non-domestic customers and other services the companies provide. Furthermore, their costs vary owing to local circumstances. Anglian Water needs to use more energy to pump water around flat East Anglia, while South West Water is improving sewage treatment to protect bathing water in the south west. And, as Chapter 2 explains, the amount of treatment water needs – and thus the cost of treating it – is dependent on how clean it is to start with.

TABLE 1-2 Forecasts for Average Household Bills 2016–17

Company	Overall water	Overall sewerage	Overall combined
Water and sewerage companies			
Anglian	£182	£229	£411
Dŵr Cymru	£181	£257	£438
Northumbrian (excluding Essex & Suffolk)	£174	£203	£378
Severn Trent	£172	£157	£329
South West*	£219	£319	£488
Southern	£147	£264	£411
Thames	£198	£176	£374
United Utilities	£201	£214	£415
Wessex	£234	£226	£460
Yorkshire	£162	£204	£366

Company	Overall water	Overall sewerage	Overall combined
Water only companies			
Affinity Central	£174		
Affinity East	£174		
Affinity Southeast	£206		
Bournemouth	£136		
Bristol	£175		
Cambridge	£127		
Dee Valley	£145		
Essex & Suffolk	£236		
Portsmouth	£98		
South East	£198		
South Staffordshire	£142		
Industry average (weighted)	£183	£206	£389

Source: Ofwat

**From April 2013, South West Water customers benefit from a Government Contribution that reduces household bills by £50 per year.*

Finally, sewage treatment isn't quite the gold mine it seems. Clean water treatment tends to be concentrated in a relatively small number of treatment works, benefitting from economies of scale, whereas sewage is treated in a much larger number of often small treatment works.

Ownership

Since the privatisation of 1989, the water companies in England and Wales have been privately owned. The type of ownership varies, and includes publicly listed companies, companies, which are parts of a multinational, and companies owned by private equity. Welsh Water is unique because it's a not-for-profit company.

BREAKING THE MOULD IN THE WATER SECTOR

Peter Perry, Chief Operating Officer at Dŵr Cymru Welsh Water, said in 2014: 'Dŵr Cymru Welsh Water is unique in the water industry as it is the only company which is run as a non-shareholder company. This means that the company, which serves much of Wales, Herefordshire and parts of Deeside, is owned and managed on behalf of its customers with all gains going directly back to customers. As the sixth largest water and sewerage company in England and Wales, we provide water and sewerage services to over three million people who benefit from our efficient business model.

'So how do customers benefit? There are three main benefits to customers thanks to the business model. Firstly, we have been able to deliver an accelerated investment scheme which between 2010 and 2015 alone will see £1.5 billion invested in our assets. Secondly, we have been able to keep bills lower than they otherwise would be for customers. This has been achieved from returning £140 million directly back to customers in the form of lower bills since 2001, and also in us working hard to reduce our overall operating costs. These are 8 per cent lower today in real terms than in 2001. Thirdly, the fact that we've also secured the best credit rating in the industry means that we are able to borrow money to finance investment schemes at very low interest rates.

'Together, all of this means we have been able to keep customer bill increases below the rate of inflation over the past five years. We also intend to continue this trend into our next investment period (2015 – 2020) while at the same time maintaining our record level of investment of £1.5 billion – the equivalent of £1,000 per household.

'A further benefit to customers is reflected in the range of assistance tariffs we offer. We realise that a number of our customers genuinely struggle to pay their bills. We work hard to identify these customers and now have 56,000 customers benefiting from our range of assistance tariffs. We believe this is more than any other company.

'As well as direct benefits to customers, our business also benefits the wider Welsh economy. As one of the biggest companies operating in Wales, we contribute over £1 billion a year to the Welsh economy, directly employing around 2,500. In addition to this, we support a further 3,500 jobs through local companies and suppliers.

'Our environment has also benefited, particularly due to our billion pound investment in the wastewater network. Wales now has around a third of Blue Flag beaches, which is a significant achievement considering we have 15 per cent of the UK coastline and that only two beaches qualified for a Blue Flag in 1992. Clean bathing water plays an essential role in attracting tourists to Wales, which contributes nearly £7 billion to the Welsh economy and is set to be worth around 15 per cent of the country's GDP by 2025.

'With the business model now having been in place for more than a decade, our challenge will be to continue delivering the best possible service at the most affordable price whilst always striving to do the right thing for our customers'.

Scottish Water, which rather unsurprisingly supplies Scotland, and Northern Ireland Water, which just as unsurprisingly supplies Northern Ireland, are still publicly owned, although Northern Ireland Water is structured as a private company (it's actually a government-owned company, or GoCo to use the jargon).

Scottish Water and Northern Ireland Water don't issue domestic customer bills. In Scotland, water and sewerage charges are included in the Council Tax, while in Northern Ireland they're included in the domestic rates (yes, Northern Ireland still has rates)!

Regulation

In England and Wales, three organisations regulate the operation of the water companies. These are

- **The Water Services Regulation Authority, better known as Ofwat:** This is the economic regulator that ultimately decides the bills that people pay.
- **The Drinking Water Inspectorate:** This body regulates drinking water quality.
- **The Environment Agency:** This agency regulates how water is sourced and how it is ultimately discharged.

The EU sets the ultimate standards for the quality of drinking water, wastewater discharges and certain other areas that affect

the water companies, such as bathing water. We discuss regulation in much more excruciating detail in Chapter 5.

Reviewing How the UK Got Here

Piped water to most households only became common in the late 18th century, with sewers following some years later.

The early water industry in the UK developed along similar lines to that in the rest of Europe with, in most cases, local authorities responsible for supply and treatment. By the end of the Second World War, there were a very large number of private water companies and authorities – more than 2,000. Naturally these varied enormously in size.

Legislation up until the 1970s concentrated on consolidating these many authorities so that they would benefit from the efficiencies associated with being larger.

The Water Resources Act 1963 led to further changes. It introduced a system for the right to use water sources, with permits known as *abstraction permits.* These were intended to make sure that water resources were managed appropriately.

However, the water industry was still fragmented, with many authorities and companies responsible for water supply and sewage treatment.

How these developed depended on where you were. The following sections fill in the map.

England and Wales

In 1973 the industry in England and Wales was reorganised with the creation of ten Regional Water Authorities (RWAs), roughly by river basin area (Severn Trent Water being the outstanding example by name), although the private water companies that were already in existence at the time remained largely unchanged.

This created a structure with ten very large water and sewage authorities, all of which were disconnected from local government.

This is relatively unusual when you compare it with the structure in most other European countries.

In 1989 the ten RWAs were privatised. This took place before the privatisation of the electricity industry. Ofwat was created at the same time.

Since then, the ownership of most of these companies has changed, for some of them several times!

The Water Act 2014 introduced retail competition for all non-domestic customers in England and modified the water abstraction licensing system amongst other things. We discuss this in more detail in Chapters 6 and 7.

Scotland

In 1975 water administration in Scotland was reorganised with the creation of the nine Regional Councils and three Islands Councils. In 1996 water administration was combined into three water authorities: North, West and East of Scotland Water.

Finally, these were combined into the single Scottish Water in 2002.

Retail competition for all business customers was introduced on 1 April 2008. Scottish Water created a separate company to handle business customers, Business Stream.

Scottish Water is publicly owned.

Northern Ireland

In 1973 water administration in Northern Ireland came under the central control of the Water Executive within the Department of the Environment. In 1996 the Water Executive was renamed to the Northern Ireland Water Service, and it became an executive agency (a mechanism by which a government department behaves more like a private company). Finally, in 2007, it became a GoCo and is called Northern Ireland Water Limited.

Figure 1-5 details the key milestones in the development of the GB Water Industry.

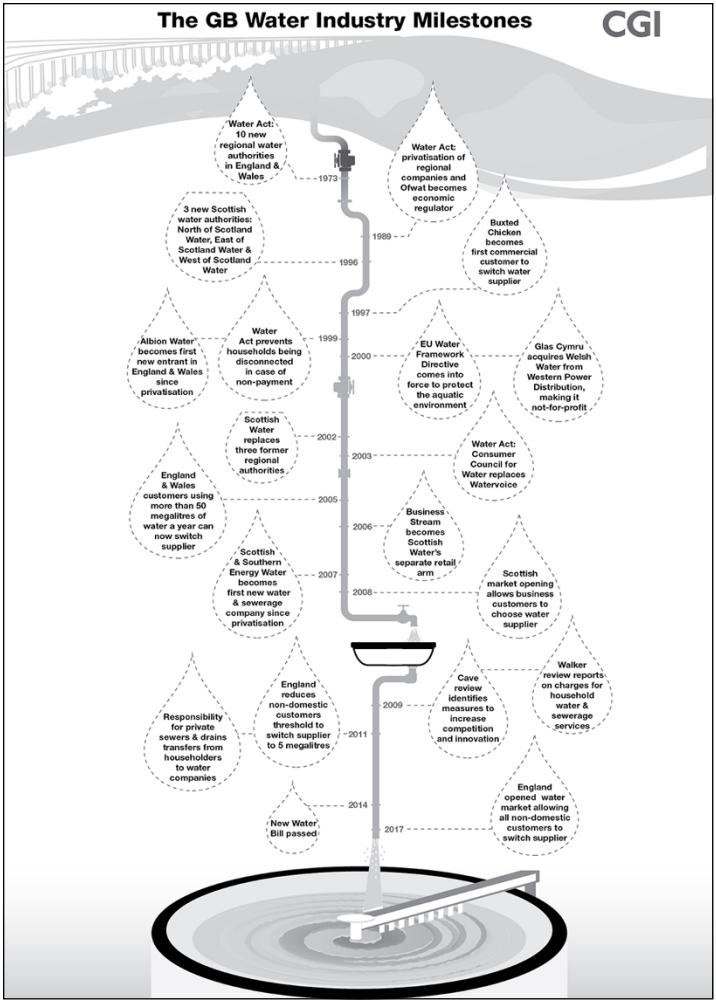


FIGURE 1-5: The GB Water Industry milestones.

Outlining the Key Industry-Wide Challenges

We look at the key issues affecting each area of the industry in the following chapters, but here's a heads-up on some of the big issues occupying the industry as a whole today:

- **Water scarcity:** As this author writes this on a grey damp day in rural Cambridgeshire, it can be hard to believe that, especially in the east and south east of England, water resources are under severe pressure. Only a few months of below-average rainfall can cause intense concern to water supply managers. Couple this with the increasing population in these areas, the likely impact of climate change and the unpopularity of ideas like building new reservoirs, and you have the potential for a crisis. Unless a *water national grid* is built, people need to be encouraged to use less water.
- **Leakage:** Of course, if a resource is scarce, it makes no sense to waste it. In many parts of the country the infrastructure is old, leading to high leakage levels (up to ~25 per cent of water produced). Fixing leaks is expensive and companies have to decide on the basis of cost between spending money on fixing leakage and allowing the water to leak. In practice, leakage targets are set and the water companies strive to meet these.
- **Bad debt:** Unlike with electricity or gas, domestic water customers can't be cut off, because no one wants to see the recurrence of diseases such as cholera and typhoid in this country. This has led to an ever increasing level of bad debt that the water companies find hard to recover. Ofwat estimated in December 2015 that bad debt adds £21 to each household's annual water bill (in the first edition of this book this amount was only £15).
- **Affordability:** Related to bad debt, and even a cause of it, is the affordability of water and sewerage services. Domestic prices have risen well above inflation in recent years, and there is now considerable political and consumer pressure to limit future price rises. This could limit the companies' future spending plans.
- **Metering:** Probably the best way of reducing a household's usage of water is to fit a water meter. After a meter is in place, Mum and Dad quickly turn the taps off! However, there is a reluctance to fit water meters, especially among households that would face higher bills (hardly a surprise!). Currently, water companies can only force a customer to have a water meter in areas classified as seriously water stressed.

- **Competition:** All non-domestic customers in England can now buy their water and sewerage services from any licensed retailer. Water companies have to acquire new skills, reorganise themselves and perhaps even break themselves up to cope with it. Some have already exited the market; it's unlikely they will be the last.
- **Corporate debt:** The huge investment water companies have made in their infrastructure since privatisation has led to these companies having large corporate debts, mainly in the form of bonds on which they have to pay interest. The extent to which more debt can be used as a means of funding future investment is questionable.
- **Changes to the regulatory environment:** The last regulatory review period for the industry was called AMP5. It's rather amusing that the privatised water industry uses a five-year planning cycle, just as the old communist bloc did (although there are no demands for 'more tractors'!) Until AMP5, the way that water companies were financially incentivised meant that they were more likely to build a new water treatment works than operate an existing one more efficiently to satisfy increasing demand (so not so much 'more tractors' as 'more treatment works'!). But in AMP6, something called *totex* (total expenditure) becomes the watchword, so water companies now have to look at the overall cost of providing water.

IN THIS CHAPTER

- Knowing where water comes from
- Recognising how water is treated to make it fit to drink
- Knowing where it ends up

Chapter 2
Understanding What a Water Company Does

Water companies provide high-quality water that is fit to drink and dispose of the produced sewage. This chapter describes how they do all this.

Seeing Where Water Comes From

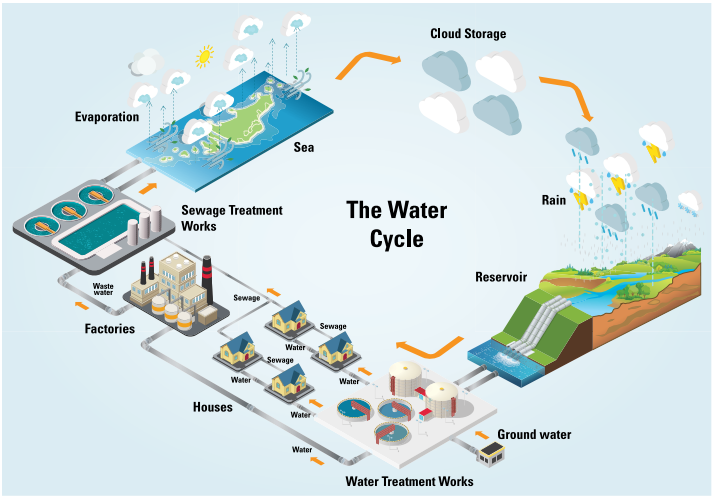
It might seem obvious to say it, but it's worth reiterating that in the UK all the water comes from the sky! Yes, it really does come from rain and snow. The UK has no untapped ancient aquifers, so all the water that's available comes out of the ground (via boreholes), from rivers and from natural lakes and man-made reservoirs. Water gets there via the hydrologic cycle. Because it's a cycle, it doesn't actually start or end so we begin with the sea:

1. **Water evaporates from the sea into the atmosphere as water vapour.**
2. **Water vapour in the atmosphere gets blown around and eventually cools and forms clouds, with a disproportionately large percentage that are over the British Isles.**

3. **Sooner or later, this water vapour precipitates as rain and snow and reaches the ground.**
4. **From the ground, some of it evaporates back into the atmosphere (it's gone straight back to the atmospheric jail without passing 'go').**
5. **The rest can either become groundwater seeping gently into the earth (which gives the UK its water table) or it can run off quickly, sometimes catastrophically, into rivers and lakes.**
6. **Eventually, this groundwater and runoff finds its way to the sea where the cycle starts all over.**

Of course, all of the earth's water today has been unchanged for billions of years (ignoring the tiny effects of losses to space and gains from meteors and comets). The water in your next cup of tea or coffee has been drunk many times, by anything from a dinosaur to an ant! Fortunately, the hydrologic cycle is nature's way of cleaning water (without it the thought of what you'd be drinking doesn't bear thinking about!).

Figure 2-1 shows the hydrologic cycle combined with the processing of the water industry.



Source: Foundation for Water Research

FIGURE 2-1: The water industry and the hydrologic cycle.

Producing Clean Water

The production of water fit to drink is complex and involves many steps (the motto seems to be 'if in doubt, filter it'!). We splash through these steps in the following sections.

Water abstraction

The process of taking water to be processed into drinking water is called *abstraction.* The abstraction of water has to strike a balance between where the water is and where it's to be used. Most people probably know that Birmingham's water comes from Wales (the area covered by Severn Trent Water attests to this).

Water is relatively heavy, so water companies pump it as little as they can to save energy. Water transport exploits gravity wherever possible to move water and so minimising energy costs.

Reservoirs that hold water to be treated are called *impounding reservoirs.* You can usually distinguish these from other types because you'll often see people fishing in them!


TECHNICAL STUFF

Although you probably think reservoirs are filled by rivers flowing into them, you may be surprised to discover that, for example, one of the UK's largest reservoirs, Rutland Water, is filled primarily by pumping water from the nearby rivers Welland and Nene! However, where possible reservoirs, such as Kielder Water, are put in places where they are fed by rivers and springs.

Treatment

In this section we concentrate on the process of producing drinking water; water for industrial use doesn't usually need to be so carefully treated. In Europe, drinking water must comply with the EU Drinking Water Directive (98/83/EC).

Although the hydrologic cycle cleans water so that it becomes fresh water, unfortunately, abstracted water is far from fit to drink. Even rain collected into a storage tank isn't clean enough. Here are just some of the things that may be in it and need to be removed:

- Larger solids such as silt, larvae and algae
- Bacteria, viruses and other microorganisms (such as *Cryptosporidium*)

» Dissolved substances such as iron minerals and chemical pollutants (the latter come especially from farming fertilisers)

Note that one reason for treatment is to enable water to be stored for extended periods (you may have noticed how standing rainwater can go green very quickly).

So how do the water companies do all this? Well, Figure 2-2 shows the overall process.

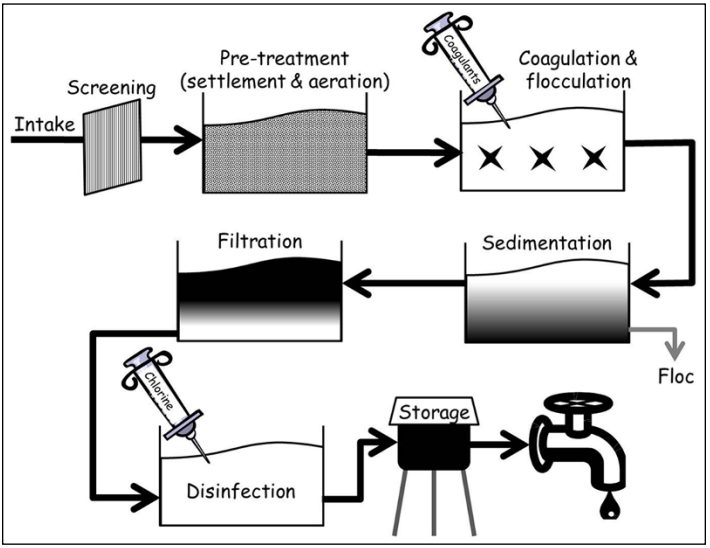


FIGURE 2-2: The water treatment process.

The actual stages involved may vary depending on the abstracted water.

Pre-treatment

Relatively large material such as vegetation is removed by screens. The water may then be left to settle in large tanks or reservoirs for a week or more and then further screened for smaller particles. One effect of leaving the water to settle is it reduces the number of pathogenic bacteria (which are eaten by protozoa!).

After this, the water may be aerated by, at its most basic, letting it run over a set of steps. This allows oxygen to dissolve into it and less desirable gases, such as hydrogen sulphide and carbon

dioxide, that might give the water an unpleasant taste or be too acidic to come out of it. Aeration can also cause excess iron and manganese to precipitate out.

Oh, and you guessed, it may then pass through yet another screen!

Coagulation and flocculation

The water so far has had lots removed from it and very little added, but there's still more to be removed. The very smallest particles either take too long to settle out or remain in suspension and give water its turbidity. *Turbidity* is the cloudiness of water and is caused by *colloids*, particles of ~1μm or less (including micro-organisms). Any real ale drinker will at some time have uttered the words 'I say landlord, the turbidity of my beer is a smidgeon too high. I fear you may have reached the end of the barrel'.

And now for the science bit!

These particles tend to be negatively charged (so helping to keep their distance from each other). If you want to get rid of them, you probably want them to stick together and form clumps you can then easily remove. Well that's exactly what coagulation and flocculation do (the precise mechanisms and chemical reactions are complex and far beyond the scope of this book and anyway, one of the writers (Giordy) being a physicist, prefers to hide behind Dirac's statement *'The fundamental laws necessary for the mathematical treatment of a large part of physics and the whole of chemistry are thus completely known'* and leave it at that!).

So in a nutshell

1. **Coagulants, usually aluminum and iron compounds and polymers, are added to the water.**

   This has to be done quickly, so the process is called *flash mixing.*

2. **This neutralises the negative charge on the particles, so the colloids begin sticking together, forming what is called a *floc*.**

3. **The water is then gently agitated for around half an hour causing the floc to further stick together.**

The water then goes on to another round of settling (or sedimentation).

Sedimentation

The purpose of *sedimentation* is to allow the floc resulting from coagulation and flocculation to settle out and to enable clean water to be drawn off. This process is performed in settlement tanks, with water passing continuously through them and the sediment, *sludge*, being taken off. There are many designs of settlement tank, with varying sizes, shapes, water inflow and sludge collection mechanisms. Typically, these tanks are large enough so that the speed of the water in them is slow enough to facilitate the sedimentation.

One particularly interesting design of settlement tank, shown in Figure 2-3, is a cone shape with an upward flow, the water entering at the bottom (Q). As the water rises and the cone widens out (A), its velocity tapers off and at some point the water's upward speed matches the floc's settling speed, producing a floc blanket in the water, which then also acts as a filter to the rising water. This floc blanket is bled off removing the need for any complex sludge scraping.

Filtration

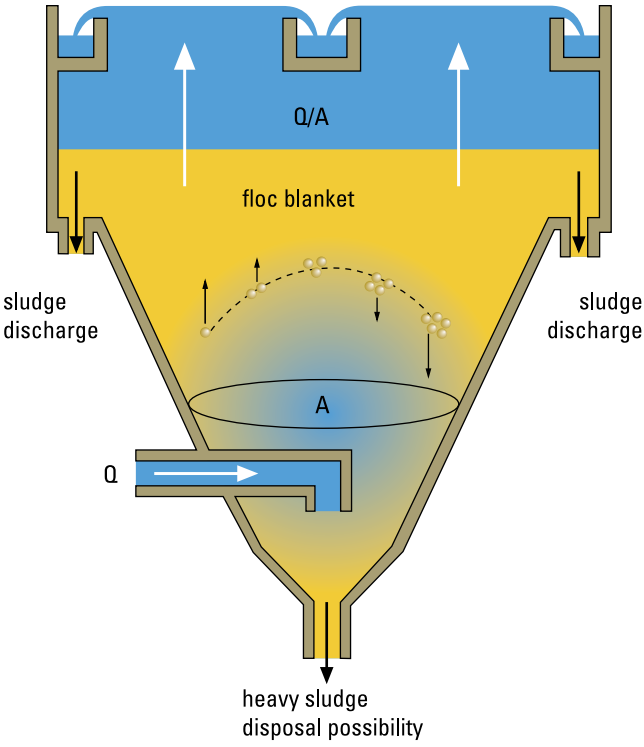
The water now passes through a filter. As ever, there are many designs and filter materials, but the most common use sand (and maybe charcoal). Note that these filters, perhaps counter-intuitively, remove particles that are smaller than the gaps between the filter material. This is because the main process by which the water is filtered is *adsorption* (in a nutshell, small particles stick to the sand and particles that got stuck earlier).

We're not finished yet!

Disinfection

Although you may think that by now the water is pure, some microbes will probably still be in it, some of which could be harmful. Thus the water is disinfected to kill any microbes (although some viruses may remain).

By far the most common disinfectant used is chlorine (ozone is an alternative). The way chlorine is added to the water varies, and there are complexities arising from the composition of the water that can affect the precise treatment (for example, some water can have an unpleasant odour when treated with chlorine).



Source: TU Delft – Delft University of Technology

FIGURE 2-3: A settlement tank.

Some chlorine is left in the water after treatment so that it can be stored and pumped around the distribution network without 'going off' again.

Further treatment

If the source of water is of sufficiently high quality, the steps described in the preceding sections should be sufficient to provide water fit to drink, complying with the required regulations. However, in some cases further treatment may be needed, for example:

- Irradiating the water with ultraviolet light to really zap any particularly resilient microbes (this is often used to remove *Cryptosporidium*)

- Filtering the water through very fine membranes (another way of removing *Cryptosporidium*)
- Removing nitrates (usually a consequence of intensive farming methods) through ion exchange or reverse osmosis
- Softening the water where it's particularly hard

Fluoridation

Although not part of the process to produce drinking water, fluoride is added in some parts of the country at the end of the treatment process because it prevents tooth decay. It's a rather controversial process because some people object to having fluoride 'forced' upon them.

Desalination

Desalination is an expensive process that is only used if there are no other cheaper sources of water. The potential scarcity of water in the southeast led Thames Water to build the only significant desalination plant in the UK, at Beckton, East London. It cost some £250m and can provide water for nearly one million people using a reverse osmosis process.

These processes have finally produced water fit to drink, so why not go and have a glass of it! Now it has to be delivered to your taps.

Looking At the Distribution Network

The distribution network gets the water from the treatment works to your taps. These sections delve deeper into the different parts of the distribution network.

Network components

The key components of the distribution network are as follows:

- **The service reservoirs:** Water treatment works supply a series of service reservoirs that hold water to meet the demand of the area each serves. Where possible, these are situated on high ground to make the best use of gravity.

However, in flatter areas such as Cambridgeshire where one of us (Giordy) lives, the water has to be pumped up into water towers so that a steady pressure can be provided to the surrounding area.

- **The pipes (commonly referred to as the *water mains)*:** These vary in size and in the material from which they're made. Modern pipes tend to be plastic (UPVC and MDPE). You'll be well aware, especially as the water companies never miss an opportunity to mention it, that there are some very old cast iron mains still in use. These don't take ground movement very well (whether from traffic, temperature changes, or extreme wet/dry changes) and so leaks from them are highly common.
- **Pumps and valves:** Unless the geography is particularly helpful, water has to be pumped around at least some of the network. The way water is routed around the network is managed through valves at strategic points.

Conduits buried underground in the UK are colour coded: water blue, electricity black, gas yellow and phone grey.

Network topology

You need to have some understanding of how distribution networks are structured, because you'll hear terms like DZ (Distribution Zone) and DMA (District Meter Area) all the time when talking to network engineers.

(Note that there are no hard and fast rules as to how to break up a water network or indeed for the terminology used to describe it, although the term DMA is nearly universally used.)

Figure 2-4 illustrates the key elements of water distribution, and the following sections expand on them.

In essence, the distribution network is broken down into Distribution Zones (DZs) that are further subdivided into District Meter Areas (DMAs). A large water company will have well in excess of 1,000 DMAs with the number of DMAs in a DZ varying hugely, from a handful to a hundred or so. As the name suggests, flows are measured at the DMA level.

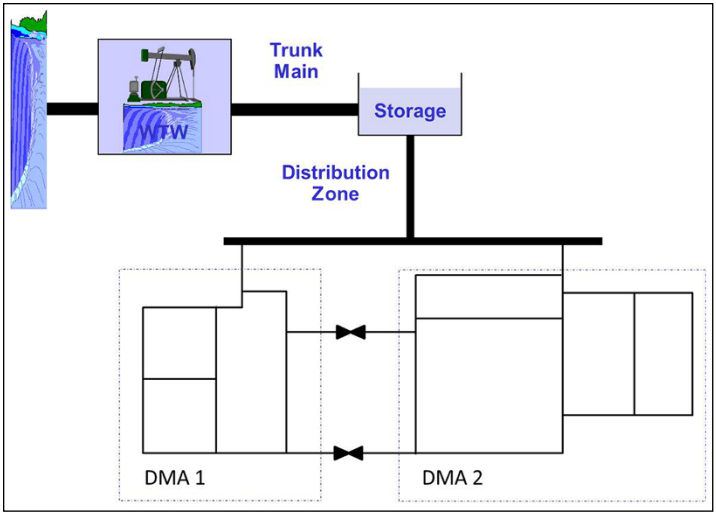


FIGURE 2-4: The water distribution network.

A DZ will tend to reflect the area supplied from a single source of water, such as a water treatment works or a storage reservoir. This allows any water quality issues to be immediately traced back to their source. (Things are actually more complicated because not all water companies use DZs in this way.)

Trunk mains interconnect the distribution network (between towns for example) to enable water to be moved around in bulk as conditions require.

A DMA is isolated from other DMAs by *boundary valves* (the 'bow-tie' symbols in Figure 2-4). The configuration of DMAs isn't static. For operational reasons they may be *rezoned* by closing and opening boundary valves to produce a new configuration of DMAs. Again, referring to Figure 2-4, if the boundary valves were opened, then you would have a single DMA covering both DMA 1 and DMA 2.

Wherever possible, the distribution network makes use of *ring mains*, so called because water moves round them. This has two advantages:

- Water is always moving through it preventing still water, which could 'go off!

» If work is needed that requires a break in the main, then water can be re-routed to minimise the houses affected.

One way in which DMAs are used is for leak detection. The water going through a DMA is measured (especially at night when it should be a minimum that is fairly stable, the *minimum night flow*). If this is found to increase over several days, then a leak can be suspected.

Breaking Down the Sewerage Network

Once you use water, it goes down the drain or toilet and few people ever want to see it again! The sewerage network takes all of this 'stuff' to the sewage works.

The nature of sewage means that, unlike clean water, it's harder to pump long distances. Therefore most towns and even small villages will have their own sewage treatment works.

The sewerage network consists of pipes and relatively open sewers, with manholes enabling access to them. Some of these sewers are very large (you've probably seen films where an actress in high heels has to descend into some seemingly stinking sewer infested with rats!).

The following sections examine the different parts of the sewerage network to help you understand how they all work together.

Blockages

One of the main issues those operating the sewerage network have to contend with is that sewers get blocked. Unfortunately, people tend to pour all sorts down their drains, not just dirty washing water.

Not only disposable nappies can clog drains and sewers. Householders, and especially food outlets, pour liquid fats down the sink. While hot, these are liquid and flow reasonably well. But of course they don't remain hot for long and quickly solidify in the sewerage network. These fats can build up and ultimately cause blockages. While we were writing the first edition of this book, Thames Water announced they had to remove a 15-ton 'fatberg' from one of their sewers, which was all but blocked by it!

The water companies would prefer you to throw your fat away in your rubbish, something much more easily done these days when many people can put their food rubbish into a dedicated recycling bin.

Rainfall

Many, particularly older, sewerage networks also handle rainfall and so are called *combined sewers.* When rainfall is relatively gentle, it helps keep the sewerage network flowing. However, when rainfall is particularly heavy, there is a risk of the sewage works being overwhelmed.

The flow into a sewage works in a combined sewer is controlled by *combined sewer overflows (CSO)*. A CSO does what it says on the tin: when the flow into a CSO is greater than that out, the level in the CSO rises and eventually it spills out, usually into a nearby river (be sure to be out of the way when this happens)! For this reason combined sewers are avoided wherever possible so that rainwater doesn't enter the sewerage system. A key term used in combined systems is the *dry weather flow*.

Although not ideal, CSOs overflow when rainfall is heavy so at least the discharged raw sewage is greatly diluted.

The pumping station

When sewage has to be pumped, it enters a *pumping station* and is collected in what must be one of the most inappropriately named elements in the water industry, the *wet well* (see Figure 2-5). This isn't the idyllic cottage well the name may conjure up: It contains raw sewage!

As the level rises, it eventually triggers a pump to start, and this pumps the sewage on to its next destination (perhaps the sewage treatment works or another pumping station). Often, there are two pumps, and this doubling serves two purposes:

- If one fails, there's a standby available.
- If the flow into the wet well is high, both pumps can run together, doubling the pumping capacity.

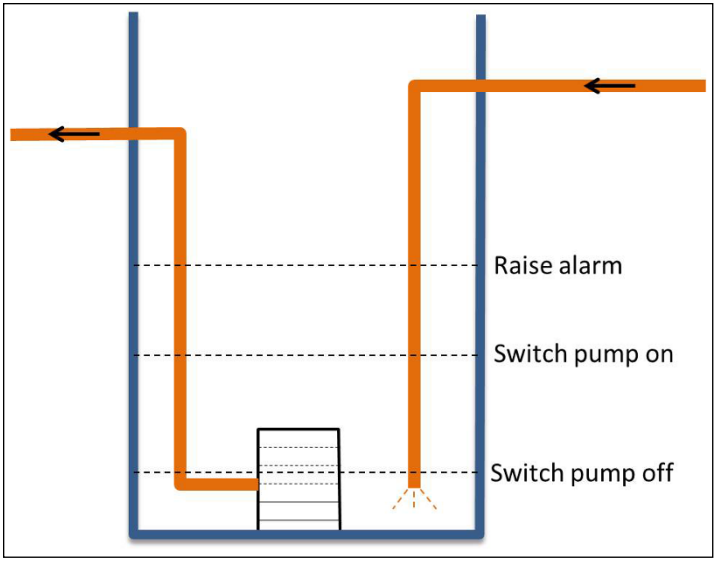


FIGURE 2-5: A wet well.

As with CSOs, a wet well can overflow and spill raw sewage, although this should only happen if all the pumps fail. Careful remote monitoring by telemetry and prompt responses to detected failures minimise the risk that this will happen. Water companies can be fined by the Environment Agency if it does happen.

A wet well isn't a safe place! As you can imagine, there can be noxious gases, so anyone working on the submerged pumps must take great care.

Examining Sewage Treatment

In this section we discuss how the majority of sewage is treated. There are of course various other treatment methods, such as septic tanks, but they're much less common and used mainly for isolated houses and small communities (about 96 per cent of the UK's population is connected to water company sewage treatment works).

Raw sewage has to be treated so that it can be safely disposed of in the environment. Treated sewage consists of two parts:

- A liquid part, which is discharged into streams
- A solid sludge, which is usually used in farming as a fertiliser (although its use in anaerobic digesters for energy production is becoming of increasing interest to the water companies)

Raw sewage contains a high proportion of organic matter (human faeces include a huge quantity of dead and alive bacteria). If this were discharged untreated into rivers, the risk of disease spreading would be very high, and the oxygen-carrying capacity of the river would be compromised, so threatening the life of the river. Untreated sewage has a high *biological oxygen demand* (*BOD*).

Untreated discharge into the sea can be less of an issue as long as the sewage is discharged far out to sea so that tides and currents can't bring it back to shore. Water companies must comply with EU bathing water directives.

Ironically, as the sewage discharged into the sea has become better treated over the years, the yield of shellfish and the like has reduced around some of our coasts. I hope you're not eating shellfish as you read this!

These sections give a whistle-stop tour of the sewage treatment process.

Pre-treatment

Before the sewage is treated, the relatively large solid parts are removed by screens. These include paper, wood, sanitary products, rubber and so on (just imagine what gets flushed down the toilet or gets washed into drains when it rains).

Primary and secondary treatment

Once filtered, the sewage enters large tanks where it flows slowly so that smaller solids can settle out as a sludge while fats and some solids can be skimmed off the surface.

Following primary treatment, the remaining sewage still contains fine particles as well as dissolved and solid biological matter, so it passes to secondary treatment. This consists of two main types:

- **Using filter beds:** This is probably the one you may have noticed. The sewage is sprayed from arms onto a bed of stones, gravel, coke or even plastic (and in its familiar form, the bed is circular with the arms slowly rotating round). Micro-organisms live in the bed, and they eat the biological matter in the sewage. The act of spraying the sewage onto the bed increases the oxygen level in the sewage. Their main disadvantage is that they require large areas.
- **Using activated sludge:** Sludge is added to the sewage, which is stirred and aerated. This increases the oxygen in the mixture and so speeds the decomposition process. After several hours the mixture goes into a sedimentation tank where the sludge settles out (and some of it is re-used in the next activated sludge cycle).

Tertiary treatment

Ideally, after secondary treatment the effluent is sufficiently clean that it can be safely discharged into a local water course. However, in some cases the level of some chemicals, such as phosphorous and nitrogen (which could encourage weed and algal growth), may be too high, and further treatment is necessary. Water companies avoid tertiary treatment where possible, because it's relatively expensive.

There are many further treatments that can be applied at this stage including: chemical or UV disinfecting, micro-filtration, nutrient removal, lagooning and activated carbon adsorption. We don't go into these topics in this book.

Sludge

As you may imagine, sewage treatment works produce a lot of sludge that is rich in organic matter and nutrients. To date, most of this has gone to farmers to spread on their fields (or leave in smelly piles this author frequently cycles past when out on his bike rides in the Cambridgeshire countryside).

However, the water companies are now beginning to look at more lucrative ways of dealing with this sludge. For example, it can be used in anaerobic digesters to produce biogas that can be used for heating and, at large sewage works, to generate electricity.

The remaining sludge will still be rich in nutrients and so still useful to farmers and gardeners.

A STUBBORN CHEMICAL TO REMOVE: OESTROGEN

From our description of sewage treatment, you'll have realised that not all chemicals are removed from the effluent discharged into rivers. One particular chemical that has had some publicity is the synthetic oestrogen common in contraceptive pills. The concern is that in some cases the concentration in rivers near sewage works may be such as to affect fish and other wildlife. Other pharmaceutical drugs probably aren't used extensively enough to have a significant environmental impact.

Coming Full Circle

So water has now come full circle; your sewage has been fully treated, has been put back into a river from which, further down, water might be abstracted. So it comes back into drinking water. Another opportunity to go and get a glass of water. Yummy!


TECHNICAL STUFF

Water drunk by Londoners has, on average, been through 2.5 bodies (that is, from people upstream in the Thames Valley).

IN THIS CHAPTER

- Understanding the challenges in managing networks
- Examining smart operation of networks
- Informing that smarter operation

Chapter 3
Managing the Networks

The networks (which we discuss in Chapter 2) that deliver clean water to customers are a critical part of the UK national infrastructure. Water companies must look after them well and operate them effectively to deliver the right service levels to customers. The networks are instrumental in ensuring that

- Water isn't contaminated in transit.
- There are few interruptions to supply.
- The pressure at the customer tap is at the right level.
- Sewers don't back up and flood properties.

This chapter explores the challenges and looks at some ways to address these.

Identifying the Big Issues

UK water networks are very large – 400,000 km of water mains delivering 19,000 megalitres of clean water each day and 375,000 km of sewers. For the most part these networks are buried underground. That fact makes the job of understanding what is going on inside them quite challenging.

Furthermore, the networks don't offer much by way of control options. Some valves and pressure-regulating devices give a limited capability to manage pressure. There is a limited storage capability in service reservoirs. And it's possible to pump more or pump less. Given the ever-changing nature of the demand, it's difficult to keep up by delivering the right amount of water to customers, at the right time and at the right pressure.

Water companies have been operating water and sewer networks for many decades, if not centuries. In doing so they have developed some quite advanced techniques for operation and control. But even today there are many operational challenges, which these sections discuss in greater detail.

Leakage

Water companies in England and Wales, collectively, lose more than 3 billion litres of water every day through leakage. Using the usual standard of measurement for these things, that's 1,238 Olympic-sized swimming pools every day. Using a more relevant comparison, that's 55 litres per person in the country per day and about 25 per cent of the total amount of clean water produced. That's an awful lot of clean, drinking quality water that is being wasted. Don't forget that this is water that has been treated and pumped around the network – both quite energy-intensive processes.

Pressure optimisation

To get to the customer's property water must flow through the distribution network. Water will happily flow downhill, but in most networks it needs a little help to overcome gravity. This help comes from pumping or from service reservoirs located at high points, which is why the pressure levels in a water network are an important factor.

There is a fine balance to be achieved here. On the one hand, pressures must be maintained above a certain level to ensure that the water can be moved through the network and to ensure that it's delivered to customers at the right pressure. In England and Wales the minimum pressure level is seven metres static head. That's the same as if the water were fed from a tank seven metres above the supply pipe. On the other hand, if pressure is too high, then this increases leakage and the number of burst pipes. Higher

pressure also means higher pumping costs, which are a major part of the total operating costs of any water company.

REMEMBER

The balancing act is made more difficult because of a number of complicating factors:

- The vast range of different elevations in the network
- A demand pattern that varies dramatically over any day
- The fact that pumping costs vary over the day
- The uncertain nature of pipe conditions, which makes it difficult to predict what pressure levels pipes can withstand

TECHNICAL STUFF

In some of the early distribution networks, hollowed out tree trunks were used to transport water. And sometimes as sewers, although hopefully not at the same time. Hence the term 'trunk main'.

The age and condition of pipes and sewers

There are a lot of shiny new pipes and sewers in the networks. After all the UK water industry spends millions of pounds every year in replacing them. But there are also a lot of very old ones.

BUS-SIZED FATBERG REMOVED FROM LONDON SEWER

In August 2013: Britain's biggest ever 'fatberg' was removed from a London sewer.

Thames Water say a 'bus-sized lump' of food fat mixed with wet wipes formed in drains under London Road in Kingston-upon-Thames. It took three weeks to clear the mass and work is now under way to repair damage it caused underground.

Gordon Hailwood, a sewer contract manager for Thames Water, said if it hadn't been discovered in time, raw sewage could have started to spurt out of manholes across the whole of Kingston.

Knowing the age and condition of pipes and sewers can be a challenge in itself. But predicting which of those will fail, where blockages will occur and where to spend the limited maintenance budgets is even more of a challenge.

If they do fail, then the impact can be pretty unpleasant at one end of the scale to catastrophic at the other end: from houses off supply to raw sewage flooding properties.

Considering the Smart Grid for Water

There is a lot of talk and a lot written about smart metering and smart electricity grids. In fact, CGI has produced two *For Dummies* books on these topics. You can obtain them via the website: `www.cgi-group.co.uk/the-dummies-series`. But does the concept apply to water networks – a smart grid for water?

A number of UK water companies are starting to implement smart metering schemes. Recently Ofwat commissioned UKWIR (UK Water Industry Research Limited), along with Frontier Economics and CGI to establish a methodology to be used by water companies when developing business cases for smart metering. There is a lot of noise from the supplier side of the industry too. Technology companies are promoting greater use of data and new control technologies in water networks, making for smarter, more efficient and more sustainable operation of the networks.

Much of the discussion on smart water networks looks at what is happening in the electricity sector. Here the concepts and capabilities are quite advanced. Electricity grids can do a certain amount of 'self-healing' by automatically reconfiguring themselves in response to certain problems. The programme for the deployment of smart metering for electricity is already established, as is demand side management. The concept of a smart grid for water isn't as well developed as in electricity, but it's helpful to look in that direction for pointers about the possibilities.

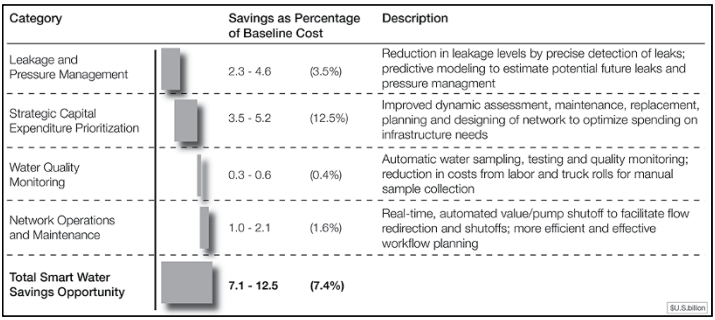
So maybe not a "smart water grid", but certainly the operation of water networks can be made smarter. There is now much more information available about how a network is operating. This data can be used to make more informed, proactive and customer-aware decisions. And new technology can be used to bring increased levels of automation and remote operation.

Thinking Smart

Water companies' main services are to deliver clean water that is safe to drink, and to take away wastewater. This is what customers pay their bills for, so they have a right to expect a high-quality service free from interruption. Water networks and sewer networks are essential in helping water companies deliver that service.

If things go wrong, it can cause significant disruption to a city's infrastructure. It's also expensive to fix the problem and to tidy up afterwards.

In their paper 'Water 20/20 – Bringing Smart Water Networks into Focus', Sensus claims that water companies globally could save between $7.1 and $12.5 billion. Figure 3-1 outlines these savings.



Category	Savings as Percentage of Baseline Cost		Description
Leakage and Pressure Management	2.3 - 4.6	(3.5%)	Reduction in leakage levels by precise detection of leaks; predictive modeling to estimate potential future leaks and pressure managment
Strategic Capital Expenditure Prioritization	3.5 - 5.2	(12.5%)	Improved dynamic assessment, maintenance, replacement, planning and designing of network to optimize spending on infrastructure needs
Water Quality Monitoring	0.3 - 0.6	(0.4%)	Automatic water sampling, testing and quality monitoring; reduction in costs from labor and truck rolls for manual sample collection
Network Operations and Maintenance	1.0 - 2.1	(1.6%)	Real-time, automated value/pump shutoff to facilitate flow redirection and shutoffs; more efficient and effective workflow planning
Total Smart Water Savings Opportunity	**7.1 - 12.5**	**(7.4%)**	

FIGURE 3-1: Globally water companies can save up to $12.5 billion a year.

Understanding How a Smarter Operation Can Help

What can be done now that is smarter and will make an impact? There are lots of areas, but an initial list might include

- Reducing leakage
- Optimising pressure
- Reducing pumping and water production costs

- Spotting the early signs of a problem and taking proactive steps to prevent it
- Making more informed maintenance and replacement decisions that optimise capital investment
- Understanding more about usage patterns

Figure 3-2 summarises the benefits of smarter operation.

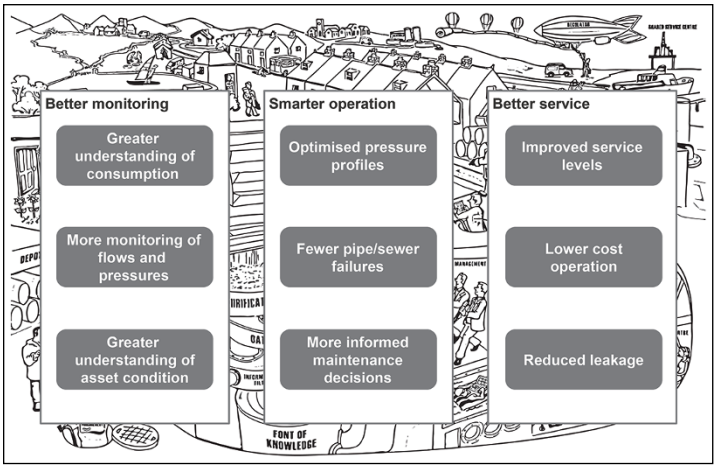


FIGURE 3-2: Smarter network operation.

Reducing leakage

Leakage is a major issue for water companies, and reducing it should be a target for smart network solutions. More loggers in the network can give a better picture of where the water is flowing and more metering can give a better view of what is being consumed. These pieces of information should then give a much better view of how much leakage there is and where it might be in the network.

Smarter pressure control can reduce the number of bursts and leakage generally. Perhaps the Holy Grail would be tools that could pinpoint exactly where a leak is. Water networks tend to be hidden underground, so it's difficult and costly to locate and then fix leaks if you have to dig lots of holes in the road.

Using smart technology in these ways to reduce leakage would bring significant benefits.

Optimising pressure

The pressure in a water network must be sufficient to move the water around but not so high that it bursts pipes. (Refer to the section, 'Pressure optimisation' earlier in this chapter.) Higher pressure also means higher pumping costs. Water companies need to strike a fine balance when managing pressure in a network.

What water companies want to be able to do is to control pressure in the network within a defined range. A smart solution to the problem would take advantage of increased numbers of loggers to monitor pressure levels and observe any abnormalities. Additionally, smart control technology can be deployed to respond to pressure variations dynamically and to adjust valve settings and pumps to ensure operations are within the defined profile. Companies such as Derceto and i²O Water have implemented a number of such solutions in the UK water industry.

Getting a better view of what is happening

All the opportunities for smarter operation of the networks rely on a better understanding of what is going on in that network. Doing so isn't so easy when the pipes and sewers are underground and in remote locations far away from a control room. A better view of consumption patterns, asset condition and a real-time view of pressures and flows all bring greater insight. That insight will allow the operators to

- Spot the early signs of a problem and take proactive steps to avoid it
- Make more informed maintenance and replacement decisions
- Make better control decisions

Considering Smart Metering for Water

Smart metering is now being rolled out across the country to measure electricity and gas consumption. Should the water industry follow the trend?

The first thing to note is that installing a smart meter to measure water consumption is fraught with some technical challenges. Communication devices that are buried in a hole in the ground, encased in iron, half covered by water and some distance from the nearest power supply don't tend to work very well!

If you can overcome those issues, then you would need to ask 'Why?' More metering is generally seen as a good thing for the industry. It's a fairer way to charge, yet only about half of customers have a meter. But that doesn't mean that smart meters should be installed. Smart meters will bring some savings in terms of reduced meter reading costs, but would this offset the additional cost of installing them? Perhaps the biggest benefit would come from an increased understanding of demand and usage patterns across the network. Ofwat, as the water sector regulator, is leaving it up to the water companies to make their own decisions based on a 'cost versus benefit to customers' type assessment.

Nevertheless, some water companies are planning to install smart meters. For example, Thames Water is beginning a programme to install water meters at all the properties it serves. The scheme will be the first in the UK to use smart water meters, connected to a wireless network, enabling residents to monitor their usage online. Thames Water believes that this will encourage customers to reduce consumption to save money and save energy. Thames Water also believes that the information provided by the smart meters will help them get a better understanding of their networks – where and when the water is used, and where the leaks are.

IN THIS CHAPTER

- Understanding why regulation is needed
- Looking at the regulatory structure
- Comprehending the mechanics of that regulation

Chapter 4
Regulating GB Water

The GB water industry is, in the main, a privatised industry owned largely by companies that, quite naturally, want to make a profit. Yet it delivers an essential service. No one can live without water.

In a regional sense, water is also largely a monopoly industry with the UK water companies each covering fixed geographical areas. The infrastructure has been set up over the years to serve the local populations in those areas and is owned by the regional companies. That ownership provides an effective barrier to new entrants who might want to set up in those regions. Hence, the regional water companies operate in an effective monopoly. That said, the introduction of competition in the non-household market should break down some of the monopolies. We cover competition in Chapters 6–8.

These two factors – private ownership and regional monopolies – mean that the industry must be regulated to ensure that customers get value for money.

The other main areas that require regulation are water quality and environmental impact. Drinking water must be clean and safe to drink – that probably goes without saying – but regulation is needed to monitor this. Regulation is also needed to keep the aquatic environment in a fit state. Although water is essential, the industry only really borrows it from the environment.

Everyone must make sure that people don't take too much out and that when it's returned that it doesn't spoil or pollute the environment. The expression 'What goes around comes around' is very apt when considering the water cycle that we explain in Chapter 2. Regulation must therefore build sustainability in.

Identifying the Regulators

In the UK water industry a number of bodies jointly regulate the industry. The regulatory situation is a little different in the different parts of the UK. The first part of this section deals with the regulators for England and Wales – but we don't forget Scotland and Northern Ireland.

Ofwat – the economic regulator

Ofwat's job, in its own words, is 'To make sure that your water company provides you with a good quality service at a fair price'.

It does this in a number of ways. It tries to ensure that water companies keep bills as low as is reasonably possible. However, in assessing bills it does recognise that water companies incur significant operational costs and must invest to maintain the infrastructure in a fit state for future generations. This is a tricky balancing act – low bills versus the ongoing need for investment.

REMEMBER

It isn't possible for water companies to disconnect customers. This applies to both water and wastewater services. The Water Industry Act 1999 prohibited disconnection. We can't think of many industries where the suppliers can't stop providing the service if the customers don't pay. Of course, this reflects the essential nature of water to everyone, but it does make it difficult sometimes in terms of debt collection.

Ofwat also monitors the quality of the services provided by the water companies in terms of outcomes and service levels. The introduction of the *Service Incentives Mechanism* (SIM) adds a dimension of customer satisfaction into the monitoring of services. Check out the section, 'The SIM' later in this chapter for more information.

Of course, in most other non-monopoly type industries, the customers are the ones who make the assessment of a fair price for services. If they don't feel they're getting value for money or the

right quality of service, they take their custom to another supplier. A regulator can't replace competition in that sense, which is why competition has been introduced into the non-household part of the industry. At the time of writing the government is deciding whether to roll out competition to domestic customers too.

When people talk about water regulation, they think first about Ofwat, which is natural because it has a major influence on the industry. However, other regulators also are involved.

The Drinking Water Inspectorate

The Drinking Water Inspectorate (DWI) is a section of the Department for Environment, Food and Rural Affairs (Defra). Its role is to ensure that water is fit to drink.

The DWI provides an independent scrutiny of water companies' activities. It publishes statistics on the quality of water provided and enforces the legislation on UK water quality.

The Environment Agency

The Environment Agency is an executive non-departmental public body responsible to the Secretary of State for the Environment, Food and Rural Affairs. A bit of a mouthful, but its main aim is to protect the environment. Water companies have a key part to play in achieving that goal. Not surprisingly, the interaction between the Environment Agency and water companies covers many areas, including:

- Water abstraction licensing
- Water resource management and drought planning
- Pollution control and discharge permitting
- Monitoring of bathing beaches and bathing water quality
- The disposal of sludge from the wastewater treatment processes

Natural Resources Wales carries out the same role in Wales.

Consumer Council for Water

The Consumer Council for Water (or CCWater) is another non-departmental public body. It isn't an official regulator but does have a role in representing customers' interests. It helps customers with complaints and offers impartial advice on water issues.

Importantly CCWater is independent from the water companies and not related to Ofwat or the other regulatory bodies.

Scotland and Northern Ireland

All of what is described in the preceding sections works for England and Wales. But other parts of the UK exist where things work slightly differently. The aims are similar, but different bodies are involved.

The market structure and company ownership in Scotland are somewhat different from those in England and Wales. The main water company – Scottish Water – is a public corporation accountable to the Scottish Parliament. It has a production, treatment and delivery responsibility for water across the whole country. But it doesn't have a retail function. Domestic customers are billed via the local authorities. Business customers have a competitive market, so they can choose their supplier. The main supplier is Business Stream, but other licensed suppliers take part in the Scottish market. Business Stream is actually part of the Scottish Water group but is a legally separate company. This means that strict rules need to be in place to ensure that fair competition exists.

The economic regulator for the Scottish water market is the Water Industry Commission for Scotland (WICS). The following bodies work alongside the WICS:

- The Drinking Water Quality Regulator (DWQR)
- The Scottish Environment Protection Agency (SEPA)
- Consumer Futures, which represents consumer interests
- The Scottish Public Services Ombudsman, who investigates complaints

In Northern Ireland there is just one water company – Northern Ireland Water – but several regulators:

- The Utility Regulator, which performs the role of the economic regulator
- The Northern Ireland Environment Agency (NIEA), which looks after environmental issues
- The Drinking Water Inspectorate responsible for regulating drinking water quality

Explaining How Regulation Works

In the following sections, we look at regulation in practice, describing some of the main features and the impact of those.

AMP periods and price setting

One of the main elements of water regulation, which affects all customers, is the price setting process.

In England and Wales, Ofwat coordinates it in five-yearly cycles. These cycles are variously referred to as AMP periods (for Asset Management Planning periods) or PR04, PR09, PR14 and so on where the 'PR' bit stands for 'Price Review' and the numeric bit is the year in which the prices are agreed, rather than the year in which the new prices take effect. At the time of writing the industry is in AMP6 (the sixth asset planning period since the industry was privatised). AMP 6 started in April 2015. This means that water companies and Ofwat are working to plans, costs and charges agreed as part of PR14 – you get the idea!

Scotland and Northern Ireland have similar processes but are on different time frames. In these cases, the Water Industry Commission for Scotland and the Utility Regulator for Northern Ireland govern the price setting processes.

Of course the various economic regulators don't just mandate what the price should be. In the first instance the water companies compile an Asset Management Plan (that is, as in 'AMP5' or 'AMP6' using the Ofwat parlance) or business plan. This is a highly detailed plan including all of the things that the company thinks that it needs to do to deliver the services and all of the investments it needs to make to keep the assets in a serviceable condition. Here *serviceability* doesn't just apply to the AMP period in question, but there is also an element of long-term serviceability required to ensure that the industry is investing for future generations too.

The economic regulators (Ofwat, WICS or the NI Utility Regulator) then assess these submissions and decide whether they represent good value to customers. This is a fine balancing act between price and costs, as Figure 4-1 shows.

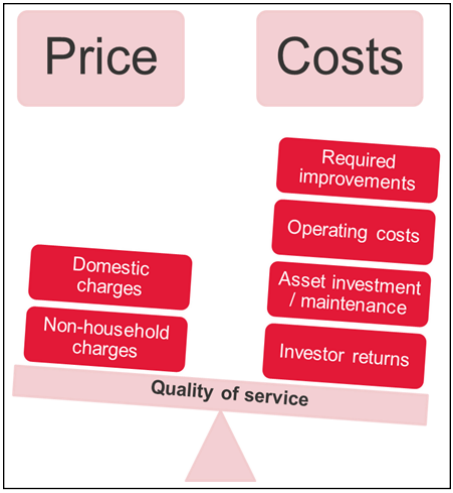


FIGURE 4-1: Balancing the pricing factors to deliver the right level of service.

In assessing the business plans the regulator considers a large number of factors. For example

- How detailed the plan is, because more detail suggests more accurate planning and less risk.
- Whether the company has sought customer opinion about the services and improvements that customers want in their regions.
- 'Cost to serve' type comparisons across the industry. Essentially a comparison of what it costs the different water companies to provide equivalent services, normalised by the number of customers they serve.

After weighing up all of these factors, the regulator makes a *determination*. There may be some toing and froing about whether this is a fair determination, but effectively this determination establishes what the prices should be and how much money the water company has to spend for the next five years (five years in England and Wales, but the period is different in Scotland and Northern Ireland).

Comparative performance

Many water companies exist in the UK, and it's tempting for the regulators to do a lot of comparative performance analysis. In previous regulatory periods they did indeed do a lot of this. For example, lots of efficiency and service performance information was gathered every year through the June Returns process. From that, Ofwat could compile tables of comparative performance – the *Overall Performance Assessment* (or OPA) – and the relative efficiency tables.

These tables were useful in that they allowed customers to see how well their water company was doing compared to others. The OPA was also used in the price setting process: A company with a high OPA might expect to be able to charge a bit more, and conversely, for lower OPA scores a bit less. However, the June Returns process did put a data collection burden on the industry.

Less information exists on comparative performance now, but the water industry is still an open and transparent industry. For example, you can easily find how your bills compare with other parts of the country or for how many pollution incidents each company was responsible.

Ofwat also felt that the effectiveness of the performance ranking approach to encourage companies to improve was diminishing. Nor did it reflect fully customer perceptions of the service they were getting. To address this the SIM (or Service Incentives Mechanism) was introduced.

The SIM

The Service Incentive Mechanism (SIM) is a new measure brought into regulation by Ofwat. The intention is to encourage water companies to provide better service to customers. Rather than measuring a basket of service outputs (such as the number of supply interruptions or how long it takes to answer the phone, for example), it attempts to assess how satisfied customers actually are with the service they receive. Ofwat believes that this approach better simulates the scenarios that, in a competitive market, might cause the customer to move to another supplier.

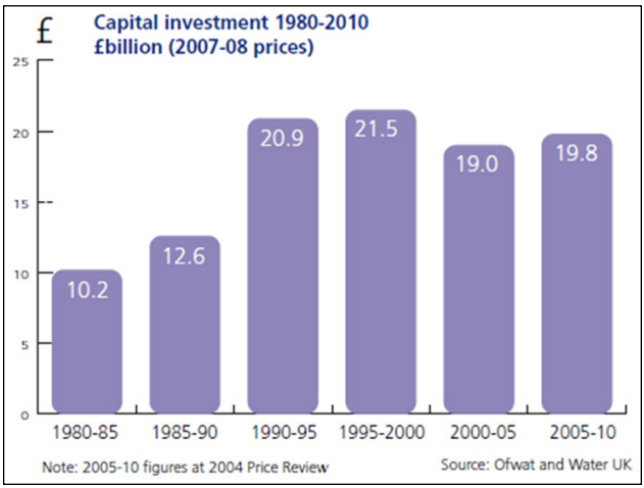
The SIM measures two aspects of customer service:

- The number of contacts that customers make reporting problems – the quantitative part of the assessment
- A customer satisfaction survey that assesses how well the company has handled a customer's contact – the qualitative part

A SIM score is produced for each water company and is used to produce a league table. There is no promotion or relegation in this league, but league position is very important to the water companies. League-leading companies, such as those that achieve better SIM scores, will be allowed to charge higher prices. Conversely, those that appear towards the bottom of the table will have a financial penalty imposed.

Totex versus Capex

In the last 30 years or so there has been a very large amount of capital investment in the water industry. More than £100 billion has been spent in England and Wales alone, or about £4,000 per household. This is a massive amount of money, but it was needed because, by all accounts, the infrastructure was in a poor state. Figure 4-2 shows the level of investment in graph form.



Source: Water UK, in the Water Industry Finance and Investment briefing paper – July 2009

FIGURE 4-2: Capital investment in the water industry.

A lot of industry stakeholders believe that there has been a bias in the UK water industry (in England and Wales at least) towards investing in new assets rather than spending more money on maintaining them or operating them more efficiently – a *capex bias* in other words (where *capex* is short for *capital expenditure*). Stakeholders also feel that the regulatory regime is partly the cause of this bias.

If you and I could travel back to 1989, when the industry was privatised, I'm sure that we would feel that the water infrastructure was in a pretty poor state. And maybe, at that time, we would have argued that more money should be pumped in to the industry – investment to improve the quality of our drinking water, improve services and reduce negative impacts on the environment. So perhaps a capex bias was necessary to provide the new assets and quality of service that we enjoy today. After all, if companies are to invest, then they need to make a return on that investment.

The jury is still out on the question of whether there has been a capex bias. However, looking at the industry today, you can see that many of the water companies are, in financial parlance, highly geared. In other words, they have a high ratio of debt to equity (equity being the value of their assets, primarily). A large part of each customer's bill goes to pay off that debt before it goes to providing the services. The industry believes that this very high level of indebtedness is no longer sustainable, in just the same way that it isn't sustainable for a homeowner to keep on re-mortgaging her home.

For AMP6, Ofwat changed the rules about capex and *opex* (operational expenditure) – introducing instead the concept of *totex* or total expenditure. The idea here is that water companies should think more about the total cost of ownership of assets and new developments. For a financially sustainable water sector this seems the right thing to do. Water companies should, when faced with a particular need or challenge, look at all possible solution options. Those solutions may include encouraging a change in customer behaviour, such as helping the customer to reduce water consumption and educating them against pouring fats and greases down the sink. Water companies should also look at ways to operate the assets and infrastructure more effectively to get more from the existing investments. Building new assets isn't always the right answer.

IN THIS CHAPTER

- Exploring why there is a focus on resilience in the industry
- Noting the impact of climate change on the industry
- Factoring in the demographic changes that aggravate those impacts
- Figuring out if the country has too much or too little water
- Looking at how the industry is responding

Chapter 5
Building Resilience for the Water Industry

Resilience is a word that is used a lot in the water industry at the moment. This chapter explores the concept of resilience and what it means for the water industry specifically, including what the key resilience challenges are, what factors impact these challenges and what the industry is doing about it.

Defining Resilience

The important question is what exactly resilience is. Ofwat defines the questions of what *resilience* is and what it actually means for the water industry.

Customers want confidence that clean, safe drinking water will be reliably available and that they can rely on their wastewater being taken away. Society needs confidence that these services will be provided today and in the long term, without compromising

the natural environment, and more widely that decisions taken today will not impoverish future generations.

The Water Act 2014 adds a new duty to our primary duties: to 'further' the resilience objective (in England and Wales). It highlights the need for long-term resilience of water and wastewater systems and service provision when faced with increasing external stresses, such as environmental pressures, population growth and changes in consumer behaviour. It also highlights the need to

- Promote long-term planning and investment, and the use of a range of measures to manage water resources in sustainable ways
- Increase efficiency in water use and reduce demand for water to minimise pressure on water resources

Answering the Question: Too Much Water or Too Little?

One of the things this country has plenty of is rain. Increasingly the rain seems to be falling in storm events and causing flooding. That's a problem for the industry because too much rain can overload sewer networks and result in foul flooding of properties. On the other hand, too little rain, combined with the increasing demand from demographic changes, is increasing water stress and has resulted in some water companies imposing temporary water restrictions.

The first issue to look at is when there is not enough water. Later in the section we look at the opposite problem caused by too much rain.

Increased dry weather

Were the droughts of 2012 just a flash in the pan or are they a sign of things to come?

Researchers have done a lot of work on this with varying results. Defra believes that the trend is for more dry weather events – perhaps up to ten times more drought-type events can be expected by 2100 than seen today.

The term *water stress* gets used a lot, but what does it mean? According to the European Environment Agency 'Water stress occurs when the demand for water exceeds the available amount during a certain period or when poor quality restricts its use.'

Even the UK – a pretty wet country – is already seeing some significant levels of water stress. In 2013 the Environment Agency conducted a survey on the water stress levels across the water companies of England and Wales. Figure 5-1 shows the results. This figure shows that most of the water companies in England and Wales contain areas with either mid or severe levels of water stress (such as "M" or "S" in the "Current Stress" column).

Water Company Area	Current Stress
Affinity Water (formerly Veolia Water Central)	S
Affinity Water (formerly Veolia Water East)	S
Affinity Water (formerly Veolia Water South East)	S
Anglian Water	S
Bristol Water	M
Cambridge Water	M
Cholderton & District Water	M
Dee Valley Water	M
Dwr Cymru Welsh Water	M
Essex & Suffolk Water	S
Northumbrian Water	M
Portsmouth Water	M
Sembcorp Bournemouth Water	L
Severn Trent Water	M
South East Water	S
South Staffordshire Water	M
South West Water	M
Southern Water	S
Sutton & East Surrey Water	S
Thames Water	S
United Utilities	M
Veolia Water Projects	M
Wessex Water	M
Yorkshire Water	M

Source: Water-stressed areas – final classification. Environment Agency

FIGURE 5-1: Levels of water stress for England and Wales water companies (L = Low stress, M = Moderate Stress, S = Serious Stress).

Demographic and consumption trends

The UK population is increasing quite rapidly and it's forecast to continue to grow. That increase tends to be concentrated in areas that are already some of the most water stressed.

Also, on a domestic level, consumers are using more water. In the last half a century the amount of water used in homes has been steadily increasing. It's now about 150 litres per person per day.

Another demographic trend that is having an impact is the reduction in the average household size. Smaller households tend to use more water when measured on a per person basis.

However, looking ahead, Defra believes that individual consumption will decrease a bit, but the increasing population will more than make up for that. The Defra prediction is that household demand will increase a little, 3 per cent by 2030.

For industry, though, the opposite trend applies. Industrial water use has reduced, especially as the heavy, large water-consuming industries have closed.

It is also expected that the focus on leakage by water companies will also drive overall demand down.

This is a bit of a mixed picture. Over the whole of the UK Defra expects that demand will drop. However, we can expect to see demand increase in some regions, particularly where the population is growing the fastest. Those regions where population is growing fastest already contain some of the most water-stressed areas.

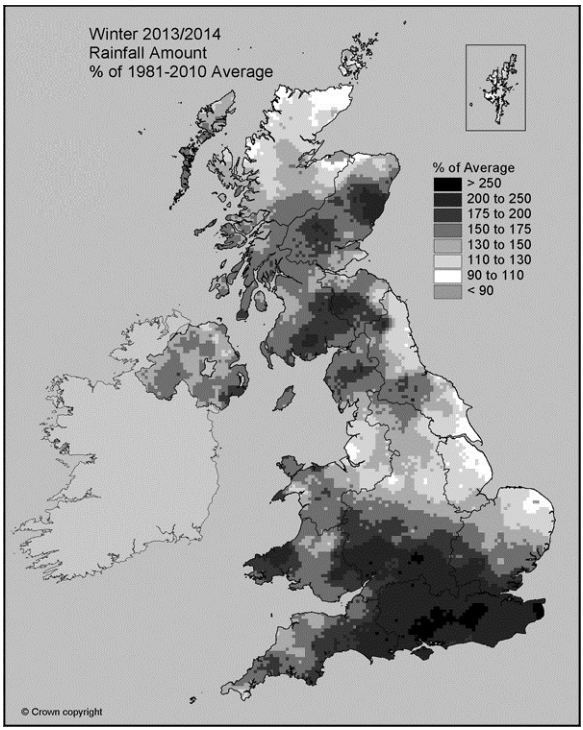
Increased heavy rain events

At the other end of the weather scale are many more heavy rain events. These are events that may cause surface flooding, or *hydraulic overload* in drains and sewers, and may lead to pollution events.

The winter of 2013–14 was the wettest on record, as is shown in Figure 5-2. The average rainfall for the UK was more than 500mm for the period between December 2013 and February 2014. This is 50 per cent more than the long-term average. This amount of excess water causes a number of problems for water companies, some of which can have particularly nasty consequences too because many of the sewer systems combine the excess rainwater with the wastewater from our homes. Some examples of the kind of problems are as follows:

- **Internal flooding:** Too much rainwater can overload the sewer network and cause sewer flooding. This is particularly nasty if it results in foul water flooding in people's houses.

- **Discharges into the environment:** Where there is just too much water to deal with, either in the sewer network or by the wastewater treatment works, it can result in the release of raw sewage into the environment. For example, 39 million tonnes of untreated sewage is released into the Thames in a typical year.
- **Resilience of treatment works:** River flooding, although not the responsibility of water companies, also can have serious consequences. For example, in the 2007 floods, Mythe Water Treatment Works near Tewkesbury had to be shut down as a response to river flooding. At the peak of this incident 140,000 properties were without a piped water supply.



Source: MET Office / BBC

FIGURE 5-2: The wettest winter on record.

That's the British weather for you. It's a case of too much or too little. The wastewater infrastructure just wasn't designed to deal with all of this rain.

Deciding What to Do about These Climate Changes

Everyone could buy a water butt and an umbrella! It's an intentionally flippant point but actually demonstrates a key response option – adaptation. If you take the view that droughts, storms and floods will happen increasingly often, and that the weather can't be changed, then the industry must plan, and is planning, to be ready.

These sections look at what to do with too little water and how to deal with too much.

Planning and managing better

All water companies have a statutory duty to produce water resource plans. They do so every five years and their work results in plans that look ahead 25 years. The aim is to find the right way of meeting the expected demand with available resources, taking account of factors such as those we mention in the preceding section.

In case those plans don't work, then the water companies must also produce and maintain drought plans!

The answers in these plans shouldn't just be about finding new sources and building more reservoirs. There needs to be a balanced set of measures that include, for example:

- **Use less water.** Encouraging people and industries to use less, perhaps by introducing more water efficient household devices.
- **Fix the leaks.** A startling 25 per cent of all the water produced is lost through leakage. Remember this is the treated water that is leaking, so in addition to the wasted water, the energy and chemicals that went into producing it are wasted.

» **Use the available resources better.** There is a view that the UK isn't short of water; it's just that it isn't necessarily in the right places. The south east of England has a high population density and is actually quite dry, whereas Scotland and Wales are a lot wetter.

Sharing more

Generally speaking, the local water company produces all of the water to meet demand in its own area from its own resources. There is very little trading of water from one company to another despite the fact that significant disparities exist between different regional water companies in terms of water availability and demand.

REMEMBER

Kielder Water in the North East of England is the largest reservoir in the UK by capacity. It's owned by Northumbrian Water and has a capacity of 200 billion litres. That is sufficient to supply Northumbrian Water's needs for 170 days – without the need for a refill. Not surprisingly some claim that it has never been less that 90 per cent full. Even though the population in the South East has had to endure hosepipe bans, Northumbrian Water customers enjoy a plentiful supply.

Sharing water about a bit could be an answer. It isn't a purely altruistic suggestion either. The Water Act 2014 aims to incentivise water companies to look for the most efficient ways to meet future demand. This includes trading between the regional water companies.

However, there are some significant practicalities to consider. Chapter 4 talks about the lack of a national grid for GB water. Water is relatively heavy, and its value is very low – $1m^3$ of water typically costs less than £2 at retail prices and weighs 1,000kg (a tonne). Consequently, moving water about can be relatively costly. Tankers aren't the answer, other than in some extreme circumstances. For a long time there has been talk in the industry about using the canals as a method of moving raw water between the wetter and dryer regions – but this hasn't taken off. Inevitably the trading of water between the different water companies will require investment in big pipes between the regions.

More metering

Historically only a fraction of households have had their water consumption metered. The number is now growing, but still only about half of households have a water meter. For those customers without a meter, bills are derived from the rateable value of their home. This is a historic measure, more to do with the value of their house than how much water they use. It means that two neighbours in the same street with similar size houses will be charged the same for their water even if one house has a family of ten living there and the other a single tenant.

Aside from the fact that this may not be a particularly fair way to charge for water, it doesn't necessarily encourage the right water saving behaviours. If you could see how much you were spending every time you watered the garden or washed the car, then you might reduce your discretional use.

Defra and Ofwat believe that more metering is good and will have a beneficial impact on water efficiency. Under the water regulations, water companies with serious water stress (see Figure 5-1) need to consider the use of compulsory metering when preparing their water resource plans. Such schemes would of course be expensive, so those companies must do a cost-benefit analysis when preparing the AMP plans for price setting review (Chapter 4 explains AMP planning and price reviews). A number of the English water companies, particularly in the parched South East of the country, have already gone for universal metering or are planning to do so.

Coping with too much water

Too much water can be a problem too, and it's likely that climate change will bring an increasing number of extreme rain events and floods. One approach might be to build an ark, but even Noah might find it difficult to get insurance, particularly if he lives on a flood plain.

Excessive rainfall is a more difficult issue to address because it will inevitably need a coordinated approach across many different areas, involving several stakeholders and organisations. These areas include

- **Planning new housing developments:** Planners need to look at where these developments are (on flood plains for

example) and what impact they will have on the natural run-off/water flows in these areas.

- **Building flood defences:** In particular, planners must decide where to spend the very limited budget that is available for this.
- **Designing new plants such as treatment works:** In particular, planners need to work out how to reduce risks and build resilience into these.

A large part of this planning is outside the responsibility of water companies to fix, but the companies certainly feel the impact of the consequences of increased rainfall and are playing their part in helping to address the problems.

The water companies own a lot of the sewers that take wastewater away. Much of this infrastructure is aging or is working at maximum capacity already. Blockages and overloads are common. Replacing this infrastructure would cost about £200 billion, not a practical option, but continued investment in this infrastructure is still required and is being made by many of the water companies.

For example, Thames Water is investing £4bn in the Thames Tideway super sewer project. This is a major project and aims to reduce the amount of raw sewage that flows into the Thames from the capital's sewers. Many other water companies are investing smaller amounts but with the same aims – to build in more capacity and more resilience in response to severe rain events and flooding.

Defra and Ofwat want to make drainage planning more joined up across different parties. They also want to see more use of sustainable drainage systems (SuDS). In building lots of roads and cities with tarmac and concrete everywhere, the natural drainage balance has been altered. Where excess rainwater once had a chance of draining away into the soil, it now tends to run straight off the roads and roofs into the drains and then into the sewers. SuDS use a range of measures to restore the natural balance.

The RainScape scheme from Welsh Water is a good example of putting these ideas into practice.

DŴR CYMRU WELSH WATER INVESTING IN CLEANER, GREENER COMMUNITIES

Steve Wilson, Dŵr Cymru Welsh Water's Director of Wastewater Services, said in 2014:

'Surface water is rainwater that runs off roofs, highways and paved areas. In many areas, this rainwater ultimately drains into our public sewerage system, which has to deal with increasing volumes of surface water. These flows are increasing for a number of reasons, including the growth of built-up areas and more frequent severe storms caused by climate change. When the capacity of the sewer network is exceeded, homes, gardens and roads can be flooded by sewage, and pollution incidents can occur affecting our rivers, streams and coastal areas. Our work is seeking to identify alternative means of managing surface water in ways that will mitigate its long-term impacts.

'Following extensive technical investigations, and research into best practice in Malmo, Sweden and Portland, USA, we have developed a number of surface water removal schemes called RainScape. These schemes involve installing a variety of 'RainScape solutions' including permeable paving, swales and planters. These solutions are designed to collect and store rainwater, providing as much rainwater as possible with an alternative route to local watercourses and to the ground, therefore slowing down the speed in which water enters the sewer network. This will in turn protect the combined sewer system, which can overflow during wet weather.

'We are currently investing £15 million in RainScape Llanelli (between now and 2015), which is a series of projects in Llanelli and Gowerton, designed to more effectively manage the discharges and rainwater runoff in the area. Further investment across Wales, in the region of £80 million is planned for RainScape schemes from 2015 to 2020'.

IN THIS CHAPTER

- Knowing what retail competition is and who can choose their retailer
- Defining key concepts and terms
- Understanding how the market rules are specified

Chapter 6
Setting the Scene – Retail Competition

In this chapter we explain the basics of the competitive retail market in England and Scotland. If you live in Wales or Northern Ireland, other than for the largest consumers, you can skip this chapter (and the next one) as you don't (yet!) have retail competition.

Focusing on Competition Today

Figure 6-1 shows the history of competition in the water industry. As you can see, all non-domestic water customers in England and Scotland can choose their water retailer. Unfortunately this choice doesn't extend to most of the consumer base (such as you and me!). The government is keen on extending competition to everyone so watch this space in 2020 (there may be another edition of this book!).

Retail competition actually started with the Water Supply Licensing (WSL) regime in 2003 that allowed the largest water customers to change retailer.

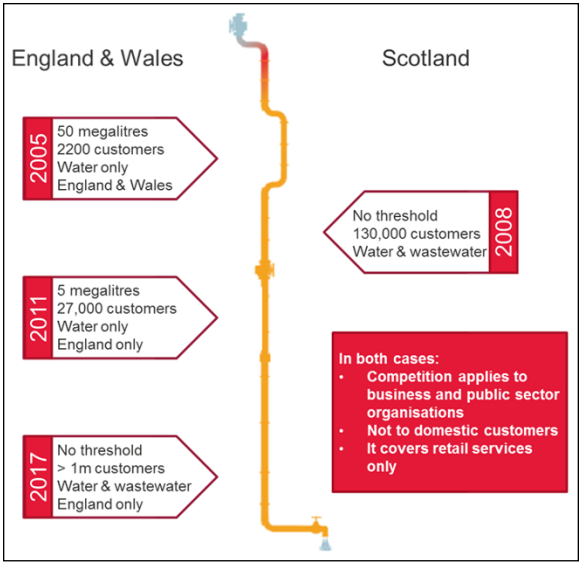


FIGURE 6-1: The current state of competition.

Although this chapter concentrates on retail competition, there are a few other areas where competition exists. Although a water company may own all the existing water and sewerage infrastructure in a given area, it doesn't mean that its monopoly should extend to new infrastructure. There's no reason why a third party shouldn't provide and, potentially, operate the infrastructure for a new development within an existing water company's area. Recognising this, the government

- Introduced the *insert regime* for third parties wishing to build, maintain and operate infrastructure for new developments
- Made provision for self-lay for those third parties wishing to build infrastructure but with no desire to maintain and operate it

The following sections look at each of these reforms in turn.

The inset regime

In 1990 the government introduced the *inset regime* (also sometimes referred to as *new appointments and variations* [NAVs]). This allowed a third party (an *inset appointee*) to set up as a new vertically

integrated service provider within an existing water company's region, typically servicing a new development. Often, water is just one of a bundle of services offered by the inset appointee. An example is Kennet Island near Reading. Although located within Thames Water's area, SSE Water is the inset appointee for Kennet Island for both water and sewerage services.

Self-lay

Self-lay concerns how new developments are connected to a water company's network. Prior to 1991, developers had to go to the incumbent water company to get new water mains and/or sewers for their developments. However, the Water Industry Act 1991 made provision for developers to appoint their own contractors to construct drains and sewers that, once laid, the incumbent water company is required to adopt.

To be eligible for adoption, the self-lay infrastructure needs to meet certain standards, such as having been installed by a self-lay organisation (SLO) accredited under the Water Industry Registration Scheme (WIRS). Despite the nine-step process that a developer has to go through in order to self-lay, it can still often be cheaper and/or more convenient than being dependent on the incumbent water company.

Experimenting on the Scots

In 2008, the Scots decided to give non-household retail competition a go and opened the water and sewerage retail market to all 130,000 Scottish non-household customers. The Water Industry Commission for Scotland (WICS) estimates that retail competition there will deliver £138 million in net savings to Scottish customers over 30 years (based on 2009–2010 prices). It also identified other benefits such as water efficiency improvements.

The overall positive outcome not only prompted the English to follow suit but also to pinch much of the structure, codes and processes of the Scottish market as a basis for their new market.


REMEMBER

The Welsh have yet to be convinced of the merits of a fully competitive non-household retail market and have decided not to join at this stage.

Further competition

The non-household retail market is just one of the aims of the Water Act 2014. It also contains provisions for the following:

- Extending competition into upstream services (although this isn't likely to happen before 2019)
- Making it easier for water companies to buy and sell water from each other
- Making it easier for developers and inset appointees to connect new developments to water companies' networks
- Improving the way in which Ofwat regulates the industry

The "easy" opportunity for competition in water exists at the retail end of the supply chain, covering customer-facing services such as billing, payment collection, meter reading and customer call handling. Ofwat estimates that this is only about 12 per cent of the overall cost base for delivering water services, as Figure 6-2 shows. So immediately the potential benefits of competition to customers are reduced. Although this chapter focuses on retail competition, upstream competition may ultimately bring the bigger benefits.

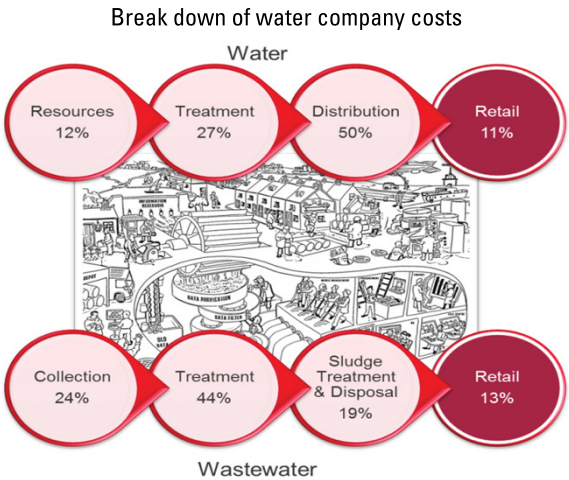


FIGURE 6-2: The breakdown of cost across a water company.

Upstream competition is intended to make it easier for new entrant companies to provide services further up the supply chain where, as Figure 6-2 shows, the costs are greater. Currently all upstream

services, raw water provision, water production, transmission and distribution, for example (and a similar set of services for wastewater) are under the sole supply of the incumbent water company. The intention of upstream competition is to open up this part of the supply chain to new entrants. New entrants might provide a source of water if they have one to spare, or provide sewage treatment services, for example.

This type of competition is similar to the wholesale competition in the electricity market, albeit more fragmented, and makes the total cost of services cheaper. Defra estimates that it would generate about £1.75bn of savings over 30 years.

Addressing the Non-Household Retail Market

These sections introduce competition in the non-household retail market, including what the retail market is about and the roles of the wholesaler and retailer.

These sections concentrate on the English market. Because the Scottish market is a little different to that in England, the following also provides background on the Scottish market so you can relate to the equivalent in Scotland.

Getting an overview of this market

In April 2017, all 1.2 million business, charity and public sector organisations in England were able to choose their water and sewerage provider for the first time.

When a customer transfers retailer, nothing much happens; the water coming out of the taps is still abstracted, stored, treated and distributed by the water wholesaler serving the customer's area, as before the transfer. Similarly, the sewerage wholesaler serving the area will still collect, treat and dispose of wastewater. The main differences the customer sees is that bills come from its new retailer (or retailers if the water and sewerage retailers are different), together with any other added value services that helped prompt it to transfer retailer in the first place, and perhaps a new meter reader (or the same one but now operating for the retailer). Any queries or complaints the customer has with its water and/or sewerage services must be directed to the new retailer(s).

Clearly, the wholesalers still expect to get paid for their wholesale services but, rather than charging the customer directly, they now get paid by the retailer who adds its own retail service costs (plus any margin) and bills the customer accordingly.

Someone needs to calculate what the retailers owe the wholesalers for their wholesale services, which is where the *market operator* comes in. The market operator is a new role within the non-household retail market. One of the market operator's responsibilities is to take wholesale tariff information provided by wholesalers, meter readings provided by retailers and a complex set of rules defined by the industry, to calculate what each wholesaler is owed by each retailer. The market operator calculates wholesale charges on a daily basis and aggregates these charges into monthly invoices that it sends to the wholesalers and retailers. The wholesalers then bill the retailers on the basis of these invoices.

REMEMBER

The role of market operator is the responsibility of Market Operator Services Limited (MOSL).

At least a portion of wholesale charges is volume based, and some charges rely on meter readings. Unfortunately, meters aren't read often so generating invoices based on actual meter readings can't happen until some time after the water has been used or the sewage has been treated. Given the large sums of money involved, it's not acceptable for wholesalers to wait for meters to be read, so the market operator re-calculates each monthly invoice several times over a 16-month period. Each calculation uses whatever meter readings are on hand at that time, and the market operator estimates anything that's missing.

As time goes by and more meters are read, each successive calculation uses a higher proportion of actual – compared to estimated – meter readings, and the resulting invoices become more and more accurate. Each invoice should, in theory, result in smaller and smaller sums of money exchanging hands as each successive payment relates to differences arising from replacing estimated with actual meter readings. Eventually, after 16 months, any remaining estimated meter readings are deemed to be as good as it's going to get and a line is drawn under settlement for that invoice period.

A key piece of information required by the market operator in order to generate invoices for wholesale services is knowing which customer belongs to which retailer. This is another of the market operator's key responsibilities, that of managing registration. When a retailer manages to convince a customer to transfer, it tells the market operator. There follows a classic change-of-supply process not dissimilar to those used in the energy markets and, if successful, the market operator records the change, tells all other parties that need to know (the wholesaler(s) and outgoing retailer(s)), and uses this information to ensure that wholesale services for that specific customer are invoiced to the new retailer from the start of their new supply contract.

This section just describes the basics. Other important titbits include updating market data (new buildings, new services, demolished sites and the like) and all the essential operational processes required to keep the water flowing (replacing faulty meters, managing planned and unplanned events affecting supply, handling water quality complaints and so on).

And remember, all of this started in Scotland well before the market opened in England.

But you're interested in Scotland!

If your interest is the Scottish market, don't despair because most of what follows (and in the next chapter) applies here too.

Since 2008, all non-household customers in Scotland have been able to choose their water and sewerage service provider. Because it forms the basis for the English market, the Scottish market is unsurprisingly similar. Table 6-1 provides a quick comparison of the Scottish and English markets.

With Table 6-1, you can read the rest of this chapter and the next in the context of the Scottish market. The most significant difference between the two markets is that there is only one wholesaler in Scotland.

TABLE 6-1 A Comparison of the Scottish and English Markets

Feature		Scotland	England
Legislator		Scottish Executive	Defra
Designer		WICS	Open Water
Implementer		WICS	MOSL
Market operator		CMA	MOSL
Incumbents		Scottish Water	Nine WASCs and eight WOCs
Cost (£m)		£45m over 15 years	£939m over 30 years
Benefits (£m)		£112m to £142m over 15 years	£1,150m over 30 years
Benefit to Cost Ratio		3:1	1.25:1
Codes	Wholesale contract	Wholesale services agreement	Wholesale contract
	Market Code	Market Code	WRC Part 3 Market Terms
	Market processes	18 CSDs	29 CSDs
	Operational Code	Operational Code	WRC Part 4 Operational Terms
	Operational processes	32 processes	71 processes
	Market data flows	33 data transactions	58 data transactions
	Market data items	119 data items	332 data items
	Corrective flows	None	40 data transactions

BUSINESS STREAM — AN ADVOCATE FOR COMPETITION

Jo Dow, Business Stream's CEO says:

'We have been vocal advocates for competition from the outset, and we're excited that customers in England can now access the benefits that water customers in Scotland have enjoyed over the last nine years.

'The industry as a whole has been working feverishly to prepare for the launch of the new market, and we're about to see just how ready market participants are. The resilience of systems and accuracy of data will undoubtedly be stress tested in the early days, as customers exercise choice and switch supplier. Retailers and wholesalers will have to work together to ensure the speedy and effective resolution of any issues arising, in order to maintain customer confidence.

'Customers will undoubtedly have high expectations, informed by their experiences in other markets, and retailers will need to "raise the bar" in order to meet those expectations. What was good enough yesterday won't necessarily be good enough tomorrow, and customers will have the opportunity to vote with their feet if they feel their existing supplier falls short.

'So what do customers really want? Our insight gained from serving water customers over the last nine years suggests that customers want a simple, effective market, which offers them choice of who they do business with. While the needs of customers will differ by segment, most customers want a trusted partner who will save them time, money and effort and who proactively helps them to reduce the amount of water they use.

'And finally, for the market to be a success, customers need to be aware of what's on offer. We all have a responsibility to spread the word and raise awareness, so that all businesses – big and small – are able to make informed decisions, to make the most of the opportunities available'.

Comprehending the Market Rules

The market rules are defined in the *Market Architecture Plan* (*MAP*), which comprises the entire set of codes, processes and agreements required to enable the competitive non-household retail market in England. The MAP comprises the following:

- The Wholesale Contract
- The Wholesale-Retail Code (WRC)
- The Market Arrangements Code (MAC)

The following sections take a closer look at these three.

Wholesale Contract

The Wholesale Contract is a standardised bilateral contract between a retailer wishing to procure wholesale water and/or sewerage services from a wholesaler. It's a replacement for the bespoke contracts that a retailer had to negotiate under the previous WSL regime.

The fact that the Wholesale Contract is standard is a key measure to ensuring a level playing field on which wholesalers offer the *same* level of service to *all* retailers.

Not only is the Wholesale Contract standard, it's also unbelievably short (just 15 pages). Its brevity is due to the fact that it makes extensive reference to sections and clauses within the WRC.

Wholesale-Retail Code

The Wholesale-Retail Code (WRC) is a statutory code that sets out how the retail market works. All the major players in the market (that is wholesalers, retailers and the market operator) must sign up to this code under their licence obligations.

The WRC is a single set of operational and market rules based on current Scottish rules (which, themselves, have evolved in the intervening years since the Scottish market opened).

If you're a retailer, you sign up to the WRC and then enter into Wholesale Contracts with all the wholesalers of the areas in which you intend acquiring customers. The wholesalers will have likewise signed up to the WRC.

Weighing in at a around 2,000 pages, comprising six parts and some 70 separate documents, the WRC is something of a beast. Here's a quick guide to each part and what it's for. In best reviewer style, we rate each in terms of its readability (impenetrable/intelligible/page turner) and usefulness (best avoided/occasional reference/essential reading).

Part 1: Objectives, Principles and Definitions

As its name suggests, Part A of this document sets out what the WRC is trying to achieve and the principles for achieving these objectives. However, most of its 60 pages are devoted to Part B, which defines 425 terms referenced extensively throughout the rest of the WRC and the Wholesale Contract [intelligible/occasional reference].

TIP

The term, *insolvency event*, with its 647-word definition including an impressive 13 clauses and sub-clauses, has the honour of the longest definition of all defined terms. One to avoid . . .

Part 2: Business Terms

Contained in these 107 pages are the rights and obligations on signatories to a Wholesale Contract. It has a useful section on wholesale charges that is well worth a read [intelligible (mostly)/occasional reference].

Part 3: Operational Terms

This 170-page section of the WRC (ignoring the nine annexes) sets out how wholesalers and retailers are expected to work together for a wholesaler to deliver water and/or sewerage services to a retailer. Unlike the market terms (see the next section), Operational Terms define processes that *don't* directly involve the market operator. Its 71 processes are split across nine process areas such as new connections and metering. The annexes contain process diagrams for each process area [page turner/essential reading].

Part 4: Market Terms

This document describes processes that involve the market operator, primarily registering and transferring non-household customers and calculating what retailers owe wholesalers for the water and/or sewerage services provided under the Wholesale Contract. The 89 pages of this document are largely a legal description of the processes described in the Code Subsidiary Documents (CSDs) [intelligible/occasional reference].

EXCHANGING DATA: THE DATA CATALOGUE

CSD 0301 is just an introduction to the world of data transactions. The guts of the Data Catalogue is contained in a separate Excel spreadsheet that defines the data items, valid sets, error codes and data transactions to be used when communicating with the market operator. At the time of writing, it contains 58 distinct data transactions, 40 of which are correction flows for sorting out the inevitable data problems that arise in such a market.

A given data transaction can be used for different purposes. For example, a retailer can send a T156 to notify the market operator of a billing address update; a market operator can also send it to provide the updated billing address to an incoming retailer. A suffix is added to denote the sender (for example, T156.R if sent by a retailer and T156.M if sent by the market operator).

The complete set of data transactions uses a total of 332 data items (there's actually 352 but 20 of them aren't used). The majority of data transaction instances contain 15 data items or fewer, but the T104 (Notify/Submit Meter Details) and T121 (Notify/Submit DPID) data transactions have more than 40 data items each.

Although not explicitly referenced, many of the Data Catalogue data items also appear in the operational terms processes.

Part 5: Code Subsidiary Documents (CSDs)

This is a collection of 29 documents, each describing a different process. It's by far the largest section of the WRC but, along with Part 3, it's probably the most useful. Included in this section is *CSD0301 Data Catalogue*, which, at 441 pages, is the largest CSD (see the nearby sidebar). It defines the structure and content of the data transactions that underpin the market processes defined in the CSDs [page turner/essential].

TIP

Most of these documents are publicly available on the MOSL website, `www.mosl.co.uk`.

Market Arrangements Code

The Market Arrangements Code (MAC) sets out how the market operates. Among other things, it sets out the following:

- How you go about joining the market
- The role of the market operator
- How you go about changing industry codes
- The role and workings of the *Panel* (the body that oversees the industry codes)
- A whole bunch of legal stuff such as intellectual property, liabilities, confidentiality, data protection, force majeure, disputes and the like

The MAC is your first port of call if something goes wrong and you want to find out how much it's going to cost you, but I can't see it forming anyone's book choice on Desert Island Discs [intelligible (mostly)/occasional reference].

Discerning the Lingo

In order to understand the way the market works, you need an explanation of some basic terminology. The following sections explain the key terms that are used in the structure of the competitive retail market.

Figure 6-3 attempts to illustrate how these terms – customers, premises, SPIDs, service components, tariff data, meters and DPIDs – fit together.

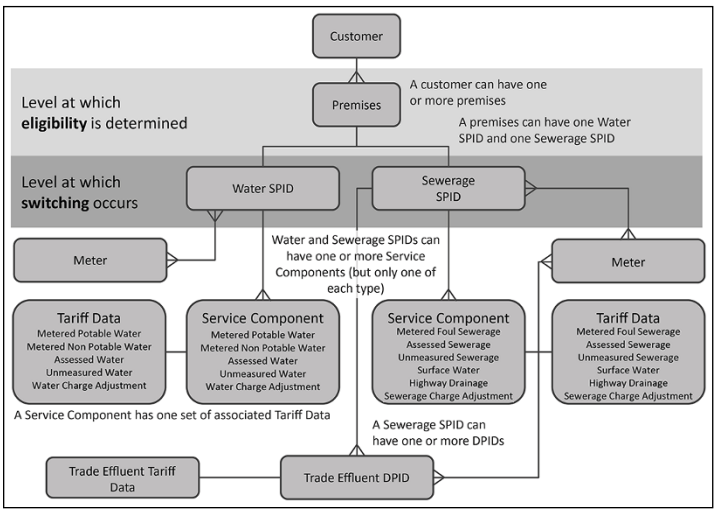


FIGURE 6-3: Basic terminology.

Eligible customers and premises

No, not a reference to the singles scene, in this context, *eligible* denotes the ability to participate in the market (that is, the ability to change retailers). And strange though it may seem for a reform that's supposed to be focused on benefiting customers, there's no such thing as an eligible customer.

Under the Water Industry Act 1991, premises are eligible (or not) to transfer retailers, not the occupants. Clearly, however, customers ultimately decide whether to transfer retailers or not (experience shows that buildings tend to be a bit conservative if left to their own devices).


TECHNICAL STUFF

Ofwat's guidance on eligibility uses the relatively simple test that the occupier should be paying business rates and, if the occupier is also paying council tax, the main use of the premises should be for business purposes. Ofwat's guidance regarding determining the eligibility of premises for which both council tax and business rates are paid is to use the definition of the property that's used by the Valuation Office for purposes of local taxation.

Supply points

Although premises are eligible (or not) to transfer retailers, the premises themselves don't switch; the supply points do. Premises can have up to two supply points, one for water services and one for sewerage services. A customer can elect to buy water and sewerage services from the same retailer or have a different retailer for each service. The two supply points can also have different wholesalers (a WOC for water and a WASC for sewerage).

For those familiar with the energy retail industry, this is analogous to gas and electricity. Most customers with both gas and electricity go for a dual fuel supply contract with a single energy supplier, but all have the option to buy each fuel from a different supplier.


TIP

You may sometimes come across the terms *other wholesaler* and *other retailer.* The former is used in the case where water and sewerage services are provided by different wholesalers, the latter to different retailers providing water and sewerage services at the same premises.

Supply point identifiers

When discussing supply points, you're more likely to hear the word *SPID* (pronounced 'spid'), short for *supply point identifier.* If you're familiar with the energy retail market, SPID is equivalent to an electricity meter point administration number (MPAN) or gas meter registration point number (MPRN).

REMEMBER

A SPID comprises a SPID *core* (a number unique to an eligible premises), a *category* ('W' for water, 'S' for sewerage), a *version* (allowing de-registered SPIDs to be re-registered) and a *check code* (calculated from the other elements of the SPID used to guard against corruption during data transfer).

Service components

A SPID can have several *service components*, each effectively representing an element of the service being provided by the wholesaler. A SPID can only have one service component of each type; there are different service component types for water SPIDs and sewerage SPIDs, reflecting the different water and sewerage services and the different charges associated with them.

You can consider service components as the component charges that make up a wholesale services invoice (akin to 'parts', 'labour', 'VAT' and so forth on your car service invoice). Not every SPID has the full set of service components, but the appropriate selection that reflects the services provided at that supply point.

The following sections examine the different possible SPID service components for water and sewerage services.

Water service components

Five possible service components are associated with any given water SPID, namely:

- **Metered Potable Water Service Component:** The provision of metered drinking water
- **Metered Non-Potable Water Service Component:** The provision of metered non-drinkable water
- **Assessed Water Service Component:** Any unmetered water service that's charged on a volume basis where the volume is estimated

- **Unmeasured Water Service Component:** Any water service, the charge for which isn't volume-based
- **Water Charge Adjustment Service Component:** A legislated financial adjustment to water service costs

REMEMBER

Water comes in two flavours, potable and non-potable. *Potable* water is defined as 'water that is wholesome under section 67 of the Water Industry Act 1991'. *Non-potable* water is defined in Part 1 of the WRC as 'water that is not potable water'. Genius!

Sewerage service components

Seven possible service components are associated with any given sewerage SPID, namely:

- **Metered Foul Sewerage Service Component:** The disposal of metered sewerage
- **Assessed Sewerage Service Component:** Any unmetered sewerage service that's charged on a volume basis where the volume is estimated
- **Unmeasured Sewerage Service Component:** Any sewerage service, the charge for which isn't volume-based
- **Surface Water Service Component:** Services for coping with drainage from the surface of buildings or land
- **Highway Drainage Service Component:** Services for coping with drainage from roads and highways
- **Sewerage Charge Adjustment Service Component:** A legislated financial adjustment to sewerage service costs
- **Trade Effluent Service Component:** Services relating to trade effluent, a special kind of sewerage

Trade effluent data

Trade effluent is defined as any liquid produced in the course of trade or industry. Trade effluent services are the services provided by a sewerage wholesaler for disposing of them. A sewerage wholesaler can provide multiple trade effluent services at the same premises. A single SPID can, therefore, have one or more discharge points, one for each trade effluent service provided. Trade effluent services are so complicated that they warrant a weighty CSD of their own (CSD 0206).

Discharge point IDs

Each trade effluent service provided is delivered at a unique discharge point that has an associated Discharge Point ID (DPID – pronounced 'dee-pid'). Therefore, a sewerage SPID can have one or more associated DPIDs, but each DPID can only belong to one sewerage SPID at any given point in time. Still awake? Good coffee!

Tariff data

With the exception of the trade effluent variant, each service component has a corresponding *tariff* (method for calculating the charge). Wholesalers set tariffs, and these may vary from wholesaler to wholesaler. However, any given wholesaler will use the same tariffs when calculating charges for all retailers operating in their area (the so-called 'level playing field').

In the case of a trade effluent service component, each discharge point associated with the trade effluent service component has its own tariff, each tariff comprising one or more charge components.


TECHNICAL STUFF

Calculating the charges for trade effluent services really is fiendishly complicated, including such jaw-dropping terms as the Mogden formula!

Meters

Some service components require *meters* to measure the volumes used in their volume-based charges (namely, those that start "Metered"!). DPIDs can also have associated meters.

As with most industries, a complex, many-to-many relationship exists between meters and the supply points that they serve. In the simplest case, a single meter records the volumes required for a metered service component of a SPID. There are also arrangements of meters (called *meter networks*) in which readings from several meters are required to calculate a SPID's metered service component.


REMEMBER

Water meters are often used to measure metered foul sewerage service components. The metered volume of water supplied to a water supply point is reduced by a percentage (typically five) to allow for water taken from the tap but not flushed down the sewer.

NON-HOUSEHOLD WATER COMPETITION: NWG'S PERSPECTIVE

Martin Mavin, Northumbrian Water's Head of Wholesale Services, says:

'Northumbrian Water Group (NWG) supplies water and sewerage services to just under 4.4 million customers. We supply water to 794,000 properties in Essex & Suffolk and water and sewerage services to 1.3 million properties in the North East of England.

'We have worked with Open Water from the start of the market reform programme. This has enabled us to understand and plan for the required changes to our business activities. We were an active participant in the data pilot and have undertaken a robust programme of work to cleanse our data to ensure that it is ready for market opening. In addition, we have opted to align our market readiness preparations with our existing planned billing system replacement. This enabled us to leverage the rigorous programme management structures and technical skillsets required for a major billing system replacement and it ensures that NWG will have modern systems that have been designed and built for the new market.

'As an incumbent water and sewerage operator, market opening has presented us with a range of organisational, technical and cultural challenges, which require careful and detailed planning to align with the commencement of shadow operations in October 2016 and full live market opening in April 2017. NWL are intending to exit the Retail market on April 1 and will transfer all non-household customers that have not pre-switched Retail provider, to a new Associate Retail Licensee called NWG Business. NWL has created a dedicated wholesale services function within the existing organisation.

'The fast-paced and evolving nature of the market has required an agile and flexible approach. NWG has joined fellow industry-wide stakeholders and participants in working together to deliver an effective water retail market for non-household customers.

'The pre-market opening "Shadow Operations" period has enabled extensive system testing and trial running to take place between all market participants' systems and processes and the Industry is now preparing itself for the final push in advance of market opening on April 1'.

IN THIS CHAPTER

- Understanding how retailers and wholesalers interact
- Grasping how financial settlements are calculated

Chapter 7
Retail Competition – the Market in Action

This chapter explains how the competitive retail market operates in England and Scotland.

Explaining Day-to-Day Activities

So how do the market terms processes, defined in the Code Subsidiary Documents (CSD), and operational terms processes, defined in the Operational Terms, map onto the day-to-day activities of wholesalers and retailers in the non-household retail market? They are as follows:

- **Market terms processes:** They primarily have to do with customer registration, transfers and settlement and involve the market operator. They're precisely defined as who does what, when and how information is exchanged between market participants.
- **Operational terms processes:** They are everyday activities (such as replacing a faulty meter and notifying customers of planned outages) that are solely between wholesalers and

retailers. There is no precise specification of how these processes should happen. No central body such as MOSL manages this. There are only the forms in Part 6 of the WRC.

The following is a high level description of how it all hangs together. We divide the business-as-usual activities of the market into the following categories:

- **Transfer:** Switching a customer from one retailer to another
- **Metering and settlement:** Invoicing retailers for wholesaler charges
- **New connections:** Establishing a new supply point
- **Disconnecting and reconnecting:** Temporary or permanent disconnections of water and sewerage supplies at customers' premises
- **Keeping things up-to-date:** Ensuring changes to market data make it into CMOS
- **Network maintenance and incidents:** Notifying retailers of planned and unplanned incidents on a wholesaler's network(s)
- **Customer queries and complaints:** Sorting out customer gripes
- **Market entry:** Enabling latecomers to join the market
- **Mergers, acquisitions, sales and insolvencies:** Coping with changes to market participants
- **Communicating:** Managing the transfer of information between market participants
- **Fixing problems:** Knowing what to do when things go wrong
- **Other stuff:** The inevitable bucket for everything else

The following sections spell out in plain English what you need to know about these different categories of process.

Transferring Retailers

Transferring retailers is one of the few examples of a new process that arrived courtesy of retail competition. Indeed, it could be argued that transferring retailers is the whole point of the market.

REMEMBER

Switching and *transferring* retailers are two different terms for the same thing.

Management of the transfer process is one of the key responsibilities of the market operator and, as such, it's a market terms process, *CSD 0102 Registration: Transfers*, that defines how it's done. As with most competitive markets, the gaining retailer kicks off the process by notifying the market operator. If everything's above board, the market operator notifies the losing retailer of its loss. The gaining retailer is responsible for obtaining the transfer reading(s) (if the gained SPID has one or more associated metered service components) and uses the approach defined in *CSD 0202 Meter Read Submission* to submit the meter readings. If the transfer involves trade effluent service components, the gaining retailer is also responsible for submitting calculated discharge volumes in accordance with *CSD 0206 Trade Effluent Processes.*

If the customer changes its mind or the gaining retailer finds it has made a mistake, the gaining retailer can reverse the transfer using *CSD 0103: Cancellations and Erroneous Transfers*. The losing retailer can use the same process for objecting to a transfer (if, for example, the customer has an outstanding debt).

Metering and Settlement

The responsibilities for metering and settlement are divided up between retailers, wholesalers and the market operator as follows:

- Retailers are responsible for providing customer meter readings to the market operator.
- The market operator is responsible for calculating wholesale charges and publishing a series of settlement reports containing these charges.
- Wholesalers are responsible for invoicing retailers based on the contents of these settlement reports.
- Retailers are responsible for paying these invoices (and billing the customer).

The following sections provide a bit more detail.

Metering

The WRC recognises eight types of meter reading and four different methods for acquiring them. The most common is the cyclic read (type 'C'), periodic readings submitted for settlement purposes. Other types are associated with events such as:

- A change of retailer (type 'T' for transfer reading)
- A change of meter (type 'F' for final readings from the old meter and type 'I' the initial readings from the new)
- A change of supply status (type 'X' for disconnection and type 'Y' for reconnection)
- An estimated reading produced by CMOS (type 'G')

In most cases, the retailer is responsible for acquiring and submitting readings from customers' meters (with some notable exceptions that are too involved for this book).

REMEMBER

Non-market meters are water meters not registered to a SPID but whose consumption must be subtracted from that of registered meters in order to calculate the SPID's metered service component. Wholesalers are responsible for non-market meters.

The processes for retailers and wholesalers to submit meter readings are described in *CSD 0202 Meter Read Submission: Process*, and the validation applied by the market operator is documented in *CSD 0203 Meter Read Submission: Validation.*

Settlement

The market operator is responsible for accepting data (including meter readings) from retailers and wholesalers and applying a complex set of charging rules (documented in the beast that is *CSD 0207, Charge Calculation, Allocation and Aggregation*) to calculate the wholesale charges associated with each service component of each SPID on a daily basis. The market operator aggregates these daily charges for an invoice period (a calendar month) and publishes *settlement reports* that wholesalers use as the basis of the invoices they send to retailers.

This process is repeated several times over a 16-month period for each invoice period in a series of *settlement runs*. The reason for the repetition is that some service components are based on metered

volumes, but meters are read relatively infrequently, and so many readings aren't available for the first settlement runs. Without meter readings, the market operator calculates estimates based on algorithms defined in CSD 0207 and uses them instead. As time goes by, actual meter readings replace these estimates, meaning that the results of each successive settlement run becomes increasingly more accurate.

REMEMBER

Settlement reports come in two bits: a high-level aggregated settlement report that summarises the charges owed by each retailer to each wholesaler and a detailed disaggregated settlement report that shows the workings of the charge calculations.

CSD 0201, Settlement Timetable and Reporting, specifies the number and timings of the settlement runs that the market operator performs. The market operator performs at least five settlement runs for each invoice period:

- The first (*P1*) produces the provisional settlement report 16 business days prior to the start of the invoice period.
- The second (*R1*) produces the first settlement report four business days after the end of the invoice period.
- The third (*R2*) produces the second settlement report four business days after the end of the second month after the invoice period.
- The fourth (*R3*) produces the third settlement report four business days after the end of the eighth month after the invoice period.
- The fifth (*RF*) produces the final Settlement Report sixteen months after the invoice period.

The market operator may also run unplanned settlement runs if a market participant has corrected some data and its impact is so significant that it can't wait for the next planned settlement run.

Invoice payment

Wholesaler charges come in two flavours:

- **Primary charges:** For wholesaler water and sewerage services as calculated by the market operator in settlement reports

- **Non-primary charges:** Essentially anything that isn't a primary charge – mostly payments to wholesalers relating to services provided under the operational terms

Retailers have two options when paying their wholesaler invoices, namely:

- **Pre-payment:** The retailer pays up-front on the basis of the P1 settlement run performed in advance of the invoice period.
- **Post-payment:** The retailer pays in arrears on the basis of the R1 settlement run performed within four business days of the end of the invoice period.

Whenever a new settlement report is generated for an invoice period, the wholesaler invoices the retailer for any differences between the charges calculated with the latest settlement report and those calculated using the previous settlement report.

Getting New Connections

This is the process of getting a new connection to a water and/or sewerage system (when building a new property or extending an existing one, for example). Not surprisingly, it starts with a customer requesting a new connection, although this request may have been preceded by a pre-application enquiry (in the form of an *A/01 form*) where wholesalers are asked to confirm there is sufficient network capacity and to give indicative costs and timescales.

The customer can approach the wholesaler or a retailer, but because the connection doesn't exist yet, there's no registered retailer at this point because there's no SPID to be registered against. If the wholesaler is approached, it directs the customer to the registered retailer for the premises if one exists. If not, the wholesaler will ask the customer to pick a retailer.

Having found one, the customer gets its chosen retailer to make a formal application for the new connection to the wholesaler by submitting the appropriate form (*A/02*, *A/03* or *A/04*, depending on whether the application is for a water supply, building water supply or sewerage connection). If the wholesaler agrees,

the wholesaler requests a new SPID from the market operator by following *CSD 0101: Registration: New Supply Points.* As part of the request, the wholesaler provides the market operator with the service components, the associated wholesale tariffs and details of any associated meters. If the request is for a trade effluent connection, the wholesaler needs to provide the relevant trade effluent data.

After the SPID exists, the retailer can submit an *A/05* form to the wholesaler requesting to be registered as the retailer and, the wholesaler passes it on to the market operator in accordance with *CSD 0101*.

Disconnecting and Reconnecting

Sometimes, disconnecting non-household customers, either permanently or temporarily, is necessary. If the disconnection is temporary, it's also good to be able to reconnect them.

REMEMBER

Unlike household customers, non-household customers can be disconnected for non-payment (with some notable exceptions such as hospitals, care homes and prisons).

Section 1 of the operational terms defines the processes for disconnections and reconnections. Most of these processes update CMOS through *CSD 0104 Maintain SPID Data*.

Keeping Things Updated

Things inevitably change over time. Premises are vacated, customers move, supply points are connected and disconnected, and meters are replaced. For the market to continue to operate successfully, these updates must be reflected in the market data held within CMOS by following the processes defined in *CSD 0104 Maintain SPID Data.* The owner for the data that has changed is responsible for notifying the change to the market operator.

Handling Planned and Unplanned Activities

Within the market, retailers get the lion's share of customer engagement. This presents some challenges when wholesalers need to communicate with customers to notify them of planned activities or unplanned incidents on the network that will affect them.

Two sets of operational terms processes exist to communicate planned and unplanned activities to customers.

Part D: Planned Activities and Affected Services

This sets out how a wholesaler should notify retailers with customers affected by planned work and comprises three processes:

- Publicising details of planned activities at least every three months (*D1*)
- Giving 22 business days' notice of specific planned activities (*D2*)
- Providing 48 hours' notice of reactive activities, such as averting loss of services, fixing leaks or rectifying damage to the network (*D3*)

Part E: Unplanned Events and Incidents

These processes set out how to prepare for, and deal with, unforeseen events. In emergencies, it's particularly important to look after the needs of vulnerable customers and premises that may require special arrangements in an emergency (hospitals, for example).

There are processes for wholesalers and retailers to share information concerning vulnerable customers/premises as it becomes available, something that's particularly important as retailers can gain customers that they know very little about. These processes may call *CSD 0104 Maintain SPID Data* to update

central market data with newly discovered details of vulnerable customers/premises and their needs. Similarly, emergencies often require people to be contactable 24 hours a day so processes exist for nominating contacts and passing their details between wholesalers and retailers.

And there's also a bunch of processes for handling different incidents and emergencies, such as unplanned changes to water and/or sewerage services, drinking water quality incidents, sewer flooding, droughts and non-water-related events such as civil emergencies or security incidents.

Dealing With Customer Queries and Complaints

Part F of the operational terms specifies the processes for conducting investigations and handling enquiries and complaints. The retailer holds the primary relationship with a customer and is generally the first port of call when a customer has issues with its water and/or sewerage service. That said, the wholesaler still has a requirement to visit non-household customers' sites, either announced or unannounced, in order to meet its statutory duties. In the case of such visits, the wholesaler needs to keep the retailer in the loop either prior to or following the visit, depending on its purpose. In some cases, the wholesaler may arrange the visit through the retailer.

Other processes cope with customer enquiries and complaints. They can come to either the wholesaler or retailer and may, depending on their nature, need redirecting to the other party. In order to respond to some enquiries, the retailer may need to request information from the wholesaler, which it does through a predefined form (*F/01*). It's a similar story for handling complaints, but with tighter service level requirements and a different form (probably a red one). Any payments due from the wholesaler as a result of the complaint are paid to the customer via the retailer.

Entering the Market

The WRC defines a process (*CSD 0001, Market Entry Assurance and Market Reassurance*) for anyone wishing to become a trading party. As part of the process, would-be trading parties need to demonstrate that they have processes and systems in place to comply with the market's rules. CSD 0001 describes the level of assurance required, the processes for assurance/re-assurance and the roles and responsibilities of the parties involved.

Responding to Participants' Mergers, Acquisitions, Sales and Insolvencies

Any competitive market has winners and losers. Although large numbers of new entrants may be viewed as an indicator of a successful market, market exits could also be viewed as an indicator of a healthy, competitive market. Suffice it to say the WRC includes detailed processes for handling such cases, especially when a retailer fails (in this case, the market operator allocates the failed retailer's customers randomly amongst a group of retailers who have previously declared themselves happy to take on customers in such circumstances, so called *opted-in retailers*).

REMEMBER

When allocating SPIDs, the market operator tries to ensure that all opted-in retailers get roughly the same number, water and sewerage SPIDs at the same premises go to the same retailer, an opted-in retailer already registered for one of the SPIDs at a premises gets the other SPID, and SPIDs belonging to the same customer go to the same retailer.

Having completed the allocation, the market operator notifies the lucky recipients by issuing market data reports as per *CSD 0302 Standing Reports and Data Extracts*.

Communicating with Retailers, Wholesalers and the Market Operator

Between market terms and operational terms processes, the WRC defines more than 500 interfaces between wholesalers, retailers and the market operator.

CSD 0301, Data Catalogue defines the data items and data transactions used by wholesalers and retailers interacting with the market operator's CMOS. Trading parties have two options for communicating with the market operator, namely:

- **The high volume transactional interface (HVI):** An automated, machine-to-machine interface for sending and receiving files containing one or more data transactions (described in *CSD 0401*)
- **The low volume transactional interface (LVI):** A screen-based interface for manually entering single data transactions (described in *CSD 0402*)

CSD 0400, Common Interface Technical Specifications describes technical requirements, terminology and standards common to both the HVI and LVI.

The market operator also makes a large amount of information available to trading parties in the form of reports and data extracts. Which reports you receive and what they contain depend on who you are. In general, wholesalers get reports pertaining to the SPIDs on their network and retailers get reports pertaining to SPIDs for which they're registered. *CSD 0302, Standing Reports and Data Extracts* describes the content and format of the reports produced by the market operator, including who can access them and when they're made available. *CSD 0403, Interface for the Provision of Reports from the Market Operator to Trading Parties* describes the interface over which trading parties can access these reports.

CSD 0405, Data Query Interface describes a screen-based interface through which trading parties can write their own market data queries and download the results as CSV files. Queries are run

against a copy of live market data (up to an hour old) so as not to impact the running of the live CMOS.

Finally, the market operator also provides trading parties with a screen-based interface for manually entering non-transactional data required to operate the market such as tariff data from wholesalers and trading party administration data. *CSD 0404, Interface for the Provision of Tariff Data and Other Data Sets from Trading Parties* describes this interface.

Fixing Problems

Despite the best efforts of data owners, it's just conceivable that a rogue piece of invalid data somehow makes its way into CMOS. Unlikely, but stranger things have happened! The following sections describe the processes and mechanisms for addressing data quality issues as and when they arise.

Correcting data

Fortunately, correcting data has been considered, and a whole CSD has been devoted to addressing this highly improbable eventuality. *CSD 0105, Error Rectification and Retrospective Amendments* sets out how to go about correcting data held in CMOS. As suggested by CSD 0105's title, the two types of correction are as follows:

- **Error rectifications:** Corrections that have *no impact* on the calculation of wholesale charges
- **Retrospective amendments:** Corrections that *do impact* previously calculated wholesale charges

Different processes are to be followed, depending on the type of correction and the amount of time that's passed before the problem was identified. To aid these processes, 40 of the data transactions defined in the Data Catalogue are devoted to correcting data items (something notably absent from the Data Catalogue used in the Scottish market).


TIP

Data transactions devoted to correcting data items have the prefix *TCORR* to distinguish them from the standard data transactions (which have the prefix 'T').

Gap sites

It's possible that hitherto unidentified eligible premises and/or supply points are identified. In this eventuality, the wholesaler registers the so-called *gap site* using the process in *CSD 0101, Registration: New Supply Points.* The market operator follows the process described in *CSD 0005, Gap Site Allocation Process* to allocate the gap site to a retailer who has previously put itself forward to acquire such sites (an opted-in retailer with a desire to take on gap sites).

Operational Terms processes

A set of processes are defined in Part C of the Operational Terms that wholesalers and retailers can use to request a data owner to verify data it owns or fix it if the requestor suspects that it's wrong.

Handling Other Stuff

Not surprisingly, a bunch of processes don't neatly fit into any of the preceding categories:

- **CSD 0002, Market Performance Framework** sets out the standards that trading parties and the market operator must meet and, more importantly, the charges they will incur if they fail to meet them. It also describes the market operator's quarterly publication of 'name-and-shame' peer performance comparisons.

  The penalties described in CSD 0002 only kick in 12 months after market go-live.

REMEMBER

- **CSD 0007, Business Continuity Management** sets out requirements for the market operator and trading parties to establish and maintain adequate business continuity arrangements and the processes for invoking these.
- **CSD 0501, Change Management (New Releases)** describes the process for market operator changes to systems, which are separate from any approved changes. The system changes described here are those that may have an impact on the market operator systems and therefore trading parties.

- Not only does **trade effluent** have its own dedicated CSD (*CSD 0206, Trade Effluent Process*), it also warrants its very own set of six operational terms processes (defined in *Part G*).
- Finally, there's a set of operational processes for wholesalers and retailers to sort out a bunch of disparate special cases, from applying for allowances for water used in firefighting to claiming incentive payments for finding gap sites. These are defined in *Part H* of the operational terms.

TECHNICAL STUFF

VIEW FROM THE MARKET OPERATOR

Ben Jeffs, MOSL's Chief Executive, says:

'The competitive market for non-household customers opened on 1 April 2017, just 436 working days after MOSL assumed responsibility for implementing the market.

'The opening of the non-household market was orchestrated by MOSL on behalf of the industry, in partnership with Defra and Ofwat, supported by CGI, which delivered the Central Market Operating System (CMOS).

'The programme had a significant IT system development component at its core – not only the CMOS, but market participants' own systems – which needed to be delivered against strict timescales, within a very tight budget.

'Few programmes with such a heavy and complicated IT component, involving re-engineering almost every legacy system and process across an entire market, have achieved that level of success.

'It was made possible by a herculean effort from all involved, especially the water companies – three of which (United Utilities, Northumbrian Water and Anglian) rose to the challenge and set up MOSL in early 2015 to procure, build and implement the central market and CMOS capability.

'MOSL is a membership-based organisation, limited by guarantee, in which all market participants are members. In late 2016 members approved changes to our articles of association, business plan and budget, confirming MOSL as the enduring market operator once the market opened.

'The opening of the market is just the beginning of course, and there are plenty of challenges ahead. The next phase involves commissioning the market, systems, processes, dataset and the know-how on which the market is founded. We anticipate that this commissioning period will extend through the first couple of years of the new market as lessons are learned.

'Now that the market is live, our members rely on the CMOS to accurately calculate customers' bills and determine who-owes-who-what in a sector that is expected to generate £2.4 billion in turnover each year. It affects companies' bottom lines, so all eyes will be on us to get it right.

'MOSL's responsibilities extend beyond this transactional role, however, to a wider responsibility to deliver an efficient and stable market in which our members can pursue their strategies. Part of our role is therefore working to help identify and reduce risks on behalf of our members, including the need for regulatory intervention.

'Ultimately we want to enable "self-regulation of the market by the market" by making market data (and therefore behaviours) as transparent as possible, including the use of the latest mapping tools. We will also be part of the integrated governance process through which market participants can influence the way in which the market changes and evolves (for instance, the code panel).

'Our mantra to the market since day one has been "data quality, data quality, data quality". To a large extent a customer's switching experience will depend on the accuracy of the data held in the central system; data that was collected years, possibly decades, ago and never before subjected to the merciless scrutiny of a competitive market.

'All that has now changed and we expect the market to identify its fair share of data anomalies and gremlins. The message to our members is to be ready and to act quickly. From now on, the winners and losers in the market will be determined by how such things are handled. It's no longer just about the technology; it's about the customer.

'The industry has worked extraordinarily hard to get to this point. As the market operator, we look forward to playing our part in helping make the new competitive water market not only the world's largest but the world's best'.

IN THIS CHAPTER

- Speculating on household retail competition
- Understanding upstream competition

Chapter 8
Competition in the Future

The opening of the non-household retail market is just one of a number of reforms being considered by the government for introducing competition into the water industry. This chapter considers some future reforms that may follow in the wake of non-household retail competition.

Contemplating Household Retail Competition

Following the opening of non-household retail market in England, 1.2 million businesses, charities and public sector organisations are able to choose their water and sewerage service provider. But what about the 22 million household customers?

In November 2015 HM Treasury published 'Better Deal: Boosting Competition to Bring Down Bills for Families and Firms', a paper extolling the virtues of competition across a number of sectors including energy, telecoms and banking. With respect to the water sector, HM Treasury stated, 'Building on opening up

the non-household retail market to competition, the government wants to extend choice to households.'

Ofwat was asked to assess the costs and benefits of such a move, and in September 2016 published its findings. In the report, Ofwat considered four different scenarios, three of which indicated that the introduction of competition to the household market would provide benefits to end customers. Table 8-1 shows the outcomes for each scenario.

TABLE 8-1 A Comparison of Possible Scenarios for Domestic Competition in England

Scenario	Net present value	Annual benefit/ cost per customer
1. Low cost, widespread innovation, strong competition among retailers	£2,917m	£8
2. Low cost, less innovation, competition among retailers	£1,214m	£4
3. High cost, less innovation, competition among retailers	£185m	£1
4. High cost, little innovation, weaker competition among retailers	£-1,445m	£-3

Source: Ofwat

WARNING

Of course if three out of four scenarios indicate benefits, then one must indicate a cost!

REMEMBER

This may be when England finally overtakes Scotland in the water reform stakes. In Scotland, local authorities currently recover household water and sewerage service charges through the council tax, something that could make the introduction of household retail competition problematic.

Pondering Upstream Competition

Upstream services are those that the customer doesn't see and that typically require lots of assets to provide (pipes, sewers, water

treatment plants and the like). The fact that these services are dependent on expensive assets means that they're naturally monopolistic in that it's prohibitively expensive for a new entrant to compete with the incumbent.

However, given the huge costs associated with upstream services (a capital value of around £50 billion and an annual capital and operating expenditure of around £7.5 billion), even small efficiency gains could result in significant cost reductions. The 2009 Cave Report recognised this, concluding that 20 per cent of upstream services, representing more than £11 billion of costs, could benefit from competition.

The following sections examine the upstream services that the government is considering opening to competition, the barriers that need to be overcome, the benefits to be realised and the likely timescales for introducing competition.

Identifying upstream services

Currently, an appointed monopoly incumbent (also known as the *undertaker*) provides most upstream water and sewerage services within a region. Exceptions to this include the following:

- **Bulk supply agreements:** An incumbent can put in place an agreement with a neighbouring incumbent for the provision of raw or treated water.
- **WSL supply licences:** A new entrant can apply for a licence to input water into an incumbent's network and sell it to an end customer.
- **New appointments and variations (NAV):** Also known as the *inset regime*, a new appointee replaces the local incumbent for the provision of water and sewerage services in a given geographical area within the incumbent's region.
- **Self-supply:** A company can develop its own private supply, treatment and disposal facilities.
- **Pre-treatment:** A non-household customer can undertake all or some treatment of its wastewater before discharging it into the incumbent's wastewater network.

Barriers to competition

The Cave Report identified a number of barriers to introducing competition into upstream services, including the following:

- Under the existing WSL licensing regime, a new entrant wishing to provide upstream services to a wholesaler must also provide retail services to the end customer. This is because the ability to introduce water to a wholesaler's network has been bolted onto a supply licence in the form of a combined water supply licence.
- A new entrant wishing to provide upstream services to a wholesaler needs access to some of the wholesaler's assets and services. This access is currently priced according to the *costs principle* which leaves little or no margin.
- Under the costs principle, the cost of access to network assets and services isn't known in advance, making it difficult for new entrants to put together business cases for market entry.
- A would-be inset appointee must negotiate each appointment individually with the relevant incumbent, which is both expensive and time consuming.

Reforming upstream services

The Cave Report recommended a set of reforms to address these barriers including:

- Splitting the combined water supply licence into supply and upstream licences to allow the entry of pure-play upstream service providers
- Replacing the costs principle with an Ofwat-owned common methodology for determining access prices to an incumbent's network assets
- Mandating the publication of access prices by water resource zone along with transport costs across the region
- Replacing negotiated access with a set of national market and operational codes
- Replacing individual inset appointment applications with a single new network licence, allowing the holder to provide network services nationally

The Water Act 2014 facilitates many of these changes when the relevant provisions of the act are brought into force.

Reforming abstraction

In parallel with the upstream reforms mentioned in the previous section, the government is also looking to reform the management of water abstraction. *Abstraction* is taking water from the environment for immediate use or treatment into drinking water. WASCs and WOCs abstract most water, but others, such as farmers and brewers, can also abstract.

REMEMBER

Currently, if you abstract more than 20m^3 of water a day, you need an abstraction licence of which there are currently around 20,000.

As water becomes increasingly scarce, the need to maximise its availability while still protecting the environment becomes increasingly important. This means

- Maximising the amount of water abstracted
- Enabling it to be traded to determine its real value
- Ensuring its management doesn't damage the environment

Defra identified two main options for reform, which it christened *current system plus* and *water shares*. Both are designed to address the preceding objectives, but they differ in the way that volumes available for abstraction are determined.

- Under the Current System Plus option, the amount of water that can be abstracted is determined by annual or daily volumetric constraints.
- Under the Water Shares option, abstractors are given a share of available water in the catchment, encouraging them to take shared responsibility for its management.

Defra consulted on these options in December 2013, publishing responses in July 2014. It published a government response on 15 January 2016, which proposes a new abstraction management system that will include replacement abstraction permits from the early 2020s. The intention is to allow greater flexibility and achieve a system with resilience. (Chapter 5 discusses resilience in greater detail.) An example of greater flexibility is that abstractors will be able to take water at any time when flows are high,

allowing them to store it for when flows are low and so make better use of reservoirs.

Trading bulk water

Several bulk supply arrangements are in place between incumbent water company areas, enabling incumbent water companies to supply water to each other. The majority of these bulk supply arrangements have been in place for a long time.

The Water Act 2014 also enables reform of the existing bulk supply regime to make it easier for water companies to buy and sell water and wastewater services from each other while ensuring that arrangements don't end up damaging the environment.

Benefiting from reform

A government impact assessment on upstream competition, first published in November 2011 and subsequently updated in May 2013, looked at the costs and benefits of introducing the upstream reforms recommended in the Cave Report. It concluded that costs of £622 million were outweighed by benefits of £2,371 million over a 30-year period, giving a healthy NPV of £1,750 million and a benefits-to-cost ratio of 3.8 to 1.

In the same government response to abstraction reform, the economic benefits in England and Wales of water abstraction reform are stated as ranging from about £100m up to about £650m net present value (NPV) over 25 years.

Upstream reform isn't likely to happen before the next price review scheduled for 2019.

IN THIS CHAPTER

- Seeing some of the reasons the water industry behaves the way it does
- Understanding some of the impending changes
- Noting some of the challenges it faces

Chapter 9
Ten Take-Away Points to Remember

This chapter summarises ten key points you should remember from reading this book that will help you understand the GB Water Industry better.

Understanding That Water Is Vital to Life

Water is essential to life. Furthermore, it's essential that it's always wholesome, which means the quality of drinking water can never slip. The industry is therefore naturally, and rightly, cautious.

Using the Information Effectively

Water companies typically collect vast amounts of data about all sorts of things – customers, assets, jobs, service levels and costs, for example. This data is a very valuable asset for a water company but isn't always used to its full potential. We believe there are opportunities to use this data to make informed asset

investment decisions, to ensure that the work water companies do is effective as well as efficient and to ensure that the industry serves customers well.

Thinking Smart

As we explain in Chapter 3, there is both a need and an opportunity to introduce smarter operation across networks and assets. On the opportunity side there is more information available from loggers and telemetry, giving a good view on what is going on in the field. There are needs too: to reduce leakage, for example, and to move more towards a proactive mode of operation.

Embracing the Change

The water sector is facing its biggest changes since privatisation, particularly with the expansion of competition in 2017 and the potential introduction of domestic competition. The regulatory changes around totex and the SIM will also drive change. For one thing, these changes make it difficult to write a book like this because the future is somewhat uncertain – but that's not the point. Embrace the change because it will bring opportunities for water companies and improved services for customers.

Having a Clear Strategy: Sink or Swim?

Retailers must have a clear strategy in the new market. For example, strategies include cherry-picking the biggest, sticking to your own region (if you're an incumbent's retailer) or offering other services alongside water such as gas and electricity, a unique irresistible offering. Whatever retailers choose, they can't survive with declining revenues because, with some operational costs fixed, it can only end in tears.

Managing a Wholesale Water Company as an Asset Management Business

A wholesale water company must deliver a service to its customers, but it's the management of its assets that makes the difference in terms of how well that service is delivered and how profitable the company is. Asset management is now a well-established discipline with cross-sector approaches being adopted and a new ISO standard. In the UK, water companies have been at the forefront of that development. CGI has produced another *For Dummies* book – *Implementing Enterprise Asset Management For Dummies*. You can download this from the website: `www.cgi-group.co.uk/implementing-enterprise-asset-management-for-dummies`.

Managing Precious Water Resources

In many parts of the country, significant water stress exists with the potential for shortages at certain times of the year. Climate change is likely to exacerbate this. Water companies will try to reduce consumption, especially through the wider adoption of water meters. More radical measures may be needed, though, perhaps creeping towards a national water grid through the greater trading of water between companies.

Ensuring a Resilient and Sustainable Industry

This is an industry that will be around for a long time, so long-term thinking is needed: sustainable use of resources; asset lifecycle planning that builds in resilience; long-term planning to meet current demands but also those of future generations.

Appreciating Pressures on Costs and Affordability

Affordability and the level of customer debt is a major issue for the industry. Ofwat continues to put pressure on the water companies to reduce their costs and pass savings on to customers. The industry hopes that the introduction of the total expenditure (*totex*) concept for AMP6 will reduce the bias for new capital projects and encourage water companies to look for solutions that have minimal lifetime costs. But, as never before, greater efficiency will be a theme.

Focusing on the War on Leakage

The 'war on leakage' will continue, and the press will continue to focus on this wastage. The fact that much of the industry's infrastructure dates from Victorian times, contributing significantly to leakage levels, means that expenditure on its replacement will continue to be needed for many more years. Smarter methods for finding leaks more accurately and earlier will be increasingly adopted.

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- What it does and how it is structured and regulated
- How the industry got to where it is now
- How competition is changing the industry
- Some major points to bear in mind about the GB Water Industry

CGI

Dr. Graham Hainsworth is one of CGI's leading Water Sector subject matter experts. He has more than 20 years' experience developing solutions for utility businesses and has worked with many of the UK's water companies.

Dr. Giordy Salvi has worked in IT for more than 30 years, specialising in solving problems in the utilities and water industry. He has helped – amongst other things – implement some of the largest telemetry systems in the world.

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ISBN: 978-1-119-39323-8

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