Cutting the cost of water

The case for improving water efficiency in the UK

green alliance...

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By William Andrews Tipper

The views expressed in this report are Green Alliance's own.

Green Alliance
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Contents

Executive summary 2

1 Why water scarcity will increase bills 4

2 How water efficiency can reduce the cost of living 8

3 Getting more from water efficiency 12

4 How to accelerate reduction in water use 18

5 Recommendations 25

Executive summary

The demands of maintaining a clean, safe water supply and sewerage system have led to household bills rising at above inflation levels for a number of years. Affordability is now a growing concern for many people. Efficiency savings and the low cost of borrowing for water companies mean that bills are set to come down slightly in the short term. However, the scale of investment planned for the water and sewerage network, amounting to £44 billion over the next five years alone, will continue to put strong upwards pressure on bills.

Meeting environmental quality standards will remain a primary cause of rising costs. And finding ways to satisfy the rising demand for water will require new investments by water companies, particularly in the south east. Water scarcity is already a problem: all but one water company region in England and Wales is currently classified by the Environment Agency as either seriously or moderately water stressed.

Three factors in particular are likely to increase water scarcity in the coming years: population increase, a reduction in available water due to climate change and regulatory restrictions on abstracting water from over-stretched sources.

Water efficiency will help to bring down costs and bills

To address the growing scarcity challenge, the next five years will see greater ambition than ever before on reducing water use. There is huge untapped potential in simple interventions in the home. Installing a dual flush toilet could save 7,000 litres of water per person per year. Water companies will use retrofit and behaviour change programmes alongside accelerating the introduction of water meters. These programmes could have a significant impact on bills. Our analysis suggests that ambitious water efficiency could save the average metered household as much as £78 across their water and energy bills.

Existing plans aren't ambitious enough

Planned water efficiency programmes will at best slow the rate at which total demand for water increases. Beyond 2020, water efficiency is projected to play a relatively minor role in ensuring demand can be met. Across the south east, supply deficits foreseen for the next 25 years will be addressed overwhelmingly by developing new sources of water supply. This implies significant investment in new supply infrastructure. These costs will be passed onto consumers, raising water bills.

More ambitious water efficiency will minimise costs

Our analysis suggests that, under the right conditions, large scale water efficiency would offer a more flexible and cost effective way to manage scarcity than increasing supply. We have identified four ways to maximise the benefits of water efficiency:

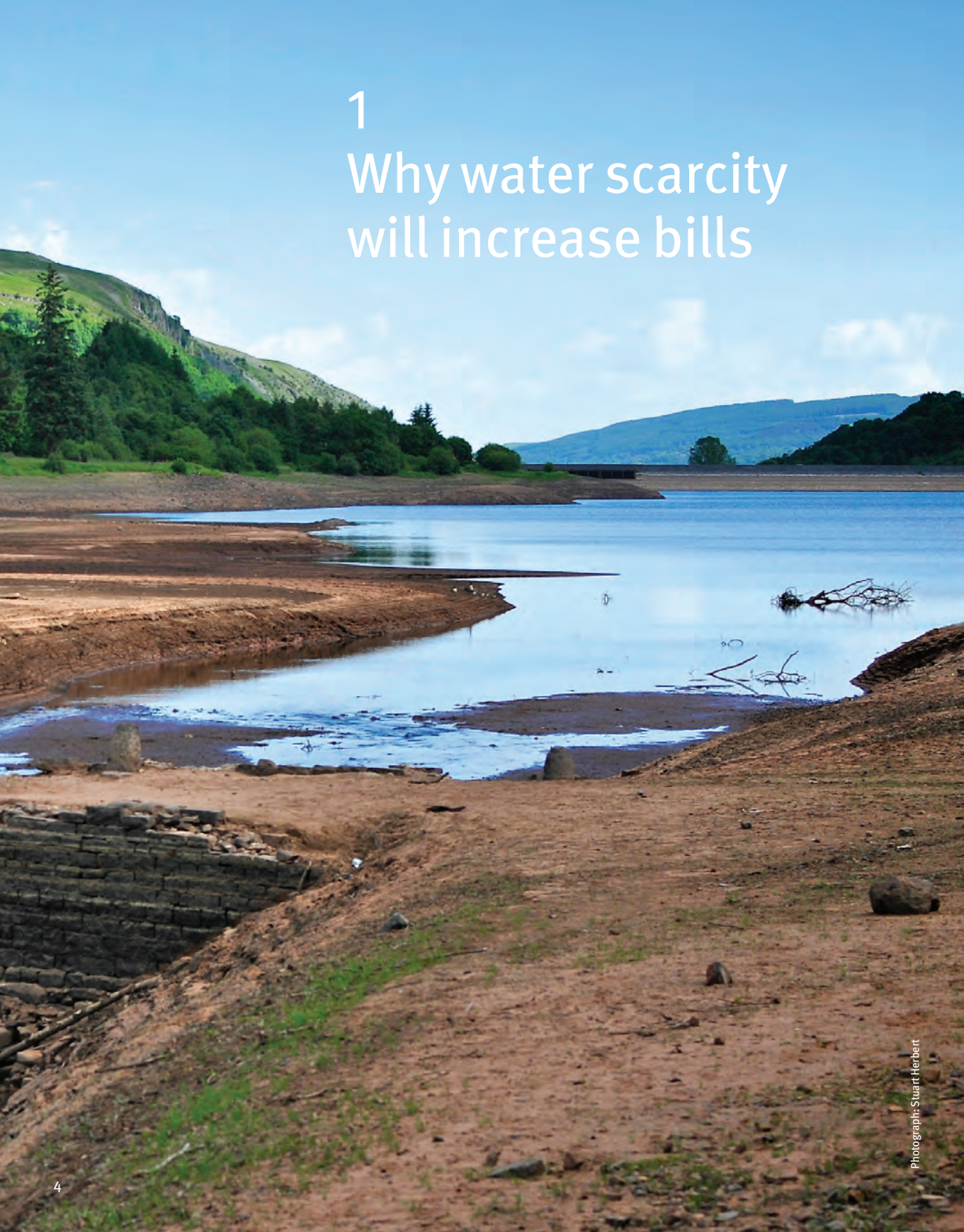
- Reduce peaks in demand.
- Tackle water deficits where they arise rather than a blanket approach.
- Reduce non-essential water use by large users.
- Integrate water and energy efficiency programmes.

"Large scale water efficiency would offer a more flexible and cost effective way to manage scarcity than increasing supply."

Recent regulatory reforms will help water companies take bold steps to bring down water use. However, further reforms are needed to ensure that the full potential of demand reduction is reflected in long term water resource planning. We recommend a series of additional steps to accelerate this process, improve the management of water resources and minimise future costs to consumers:

- Accelerate action to tackle unsustainable abstraction through the abstraction reform process and the 2019 Price Review.
- Provide regulatory incentives for water companies to reduce water demand, learning from demand reduction mechanisms in the UK and US electricity sectors.
- Charge households for water on the basis of use. Variable tariffs should be introduced alongside the water meter roll-out to provide clear price signals to householders.
- Maximise water savings through energy efficiency retrofit programmes, particularly the Green Deal and ECO, building regulations and product standards via the Water Label.

1
Why water scarcity will increase bills



Photograph: Stuart Herbert

UK households enjoy access to some of the cleanest and safest water to be found anywhere in the world. The public water supply is the largest single user of water, most of which is abstracted from rivers or underground aquifers.[1] The demands being placed on water resources have increased substantially over the past 25 years. The amount of water provided to households in England rose from just over 5,000 million litres (megalitres) a day in 1990 to around 8,500 megalitres a day in 2010-11.[2] There have been concerted efforts from regulators and water companies in recent years to tackle this rise in demand. They have been particularly focused on south east England, a dry and densely populated part of the country, with some success.

Water bills have also risen significantly during this period. In the decade 2003-13, average inflation in water bills, at 5.4 per cent, and sewerage bills, at 5.2 per cent, was twice as high as the general rate of inflation (at 2.6 per cent). The impacts of these rises have hit low income households hardest. The poorest ten per cent of the population spends four times as much on water, as a proportion of their spending, as the richest ten per cent.[3]

"In the decade 2003-13, average inflation in water bills was twice as high as the general rate of inflation."

This rise in bills is the result of substantial investment by water companies into the water and sewerage network. From 2015 to 2020, these investments will total £44 billion.[4] The majority of this spending is to minimise the environmental impacts of sewage. The UK produces more than 16 billion litres of wastewater and sewage each day, which requires extensive treatment prior to being returned to the environment to meet regulatory standards for inland waterways and bathing waters.[5]

The average combined water and sewerage bill is currently £385. The water sector in England and Wales is organised on the basis of regional monopolies. The very different challenges that different parts of the country face in sourcing water and managing sewage mean there is a large regional variation in bills, from £329 at the lowest to £482 at the highest.[6]

In the context of the economic crisis and the resulting squeeze on living standards, the affordability of water is a growing concern for many households. To help address this, water companies have been allowed by the government to introduce a social tariff; this is where most customers' bills are increased to help reduce the bills of those customers who have difficulty paying.[7] The number of people benefiting from social tariffs is expected to rise from 60,000 in 2014 to more than 850,000 in 2020.[8]

In the short term, bills will come down. They will decline by an average of five per cent, before inflation is applied, between 2015 and 2020. This is partly due to improvements in the efficiency with which companies run the water network, which will deliver savings of £417 million for water and £258 million for wastewater.[9] It is also the result of water companies' historically low borrowing costs, which have enabled Ofwat, the water sector's economic regulator in England and Wales, to reduce the return on capital from water company investment programmes from 5.1 per cent to 3.74 per cent.[10]

But the long term picture is more complex. Whilst meeting environmental quality standards will remain costly, the challenge of meeting the rising demand for water will put strong upwards pressure on bills in many parts of the country. This will be driven by three factors, described below: an increasing population, a reduction in the amount of available water due to climate change, and the introduction of regulatory restrictions on how much water can be abstracted from sensitive sources.

Increasing demand

By the 2030s, the population of England and Wales is expected to grow by an extra 9.6 million people.[11] This will create the paradoxical situation whereby even though average individual water consumption is coming down, total demand for water is highly likely to increase. The extent and pace of this rise in demand will vary from region to region. Regulators have estimated that if demand for water is left unchecked it could increase by as much as 49 per cent by 2050 across England as a whole.[12]

Decreasing availability

Climate change is predicted to create major changes to the UK's water systems. By 2050, the total annual river flow in England and Wales could drop by as much as 10–15 per cent, with mean monthly river flows during summer and autumn decreasing by around 50 per cent and up to 80 per cent in some areas.[13]

"If demand for water is left unchecked it could increase by as much as 49 per cent by 2050 across England as a whole."

Regulatory restrictions

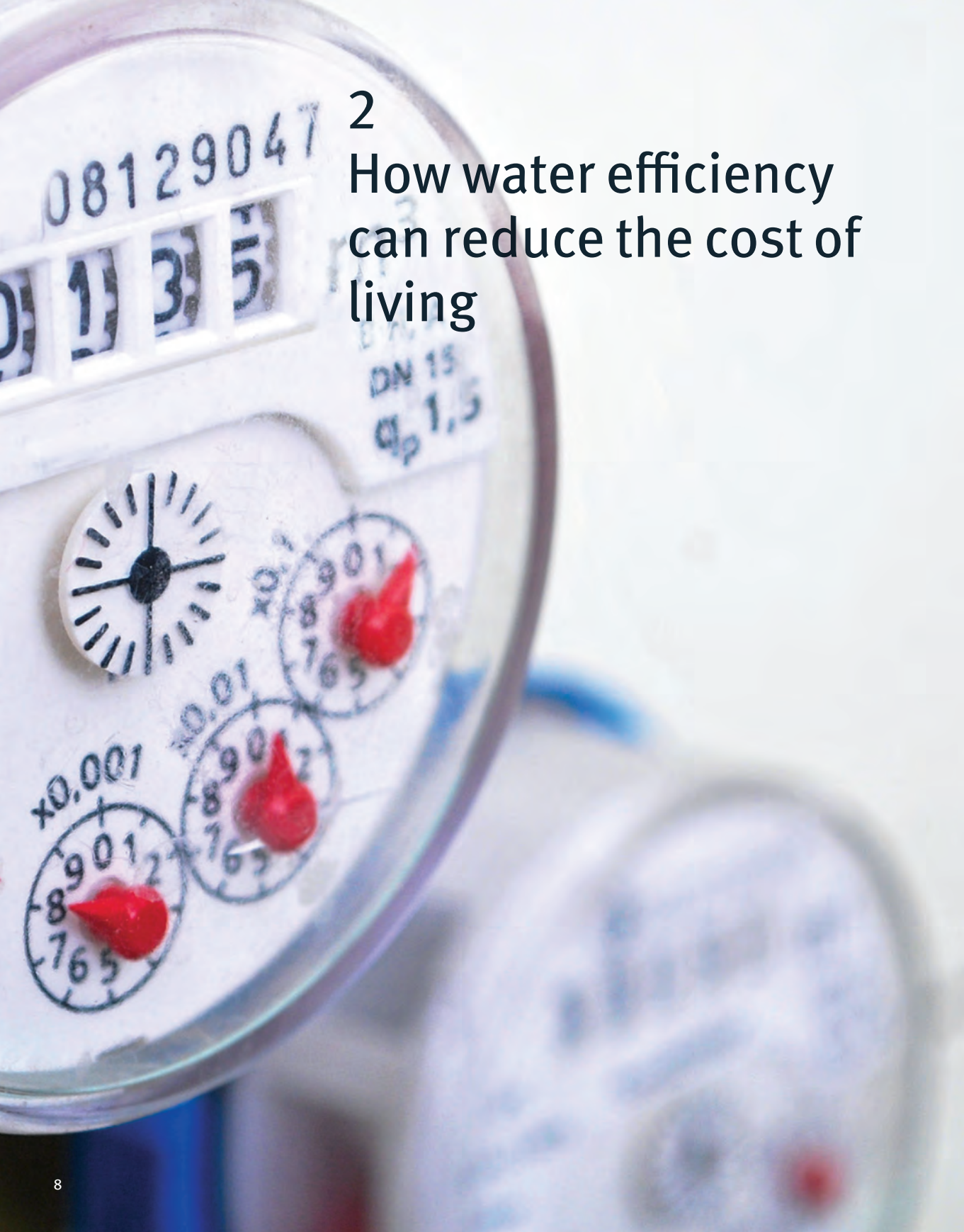
Many water resources are highly stressed due to excessive abstraction. It has been estimated that in England and Wales, on average, between 1,100 and 3,300 million litres more per day is abstracted than can be naturally replenished.[14] The amount of water that can be taken from sensitive water sources will be restricted during times of scarcity (so-called sustainability reductions). As an example, this could amount to nearly 100 megalitres per day being withdrawn from the public water supply from a single river, the River Itchen in Hampshire.[15] This is equivalent to nearly two per cent of total water demand across the south east in a dry year.[16]

Water scarcity is already a significant problem. The Environment Agency has classified nine out of 24 water company areas in England and Wales as seriously water stressed, with all but one of the remaining 15 areas classified as experiencing moderate stress.[17] South east England is the most severely affected region. Prior to the latest round of water company investment programmes, which will take effect from April 2015, the south east was projected to be facing a water supply deficit by 2020. In the case of extreme drought this deficit could have exceeded 200 megalitres per day.[18]

Dealing with these challenges will be costly. One 2013 estimate projected that up to £96 billion would need to be invested in water infrastructure up to 2030, implying an increase on current levels of an additional £1.5 billion per year (although the actual number may well prove to be lower in the light of the 2014 publication of new water company investment plans).[19] There is an opportunity to reduce this cost through more

ambitious approaches to reducing water consumption. But, under current plans, this opportunity will be missed.

In this report, we identify practical interventions to reduce water consumption and address the growing problem of water scarcity. We explore how greater ambition on water efficiency could defer or eliminate the need for some additional investments in water supply infrastructure, and the role of reforms to water resource management in helping to minimise costs for bill payers.



2
How water efficiency can reduce the cost of living

Concern over future supply deficits has led to the gradual introduction of water efficiency programmes. From 2015, these efforts will intensify. Previously, water companies were permitted to deliver one litre per property per day in water efficiency savings. From 2015-20 (the water sector is regulated on the basis of five year business plans), water companies will have the freedom to go much further. This has been enabled by Ofwat's new 'totex' approach (see below); this removes the implicit financial incentive for water companies to prioritise additional sources of supply over demand reduction in their water resource planning.

"Home retrofit and behaviour change programmes have been shown to result in savings of up to 41 litres per property a day."

The economics of water: a new calculation levels the playing field for efficiency

The UK water sector is regulated according to a Regulated Asset Base model. This allows water companies to benefit from a financial return from capital expenditure (capex) on infrastructure. This return is set by the regulator based on their determination of the cost of capital, ie the interest rate that water companies must pay to borrow money and deliver an appropriate return to shareholders.

New sources of water supply are considered to be capital assets. Water companies can pass on the cost of capital to bill payers as well as the investment cost. In contrast, spending on water efficiency counts as operational expenditure (opex), which is funded directly from bills rather than borrowing.

For the 2015-20 period, a new 'totex' (total expenditure) calculation has been introduced to ensure opex can be considered equally with capex in water company spending plans, removing the implicit financial incentive to favour new supply over demand management.

To date, water companies' water efficiency programmes have mostly been characterised by making cheap or free measures available on request, such as toilet cistern inserts. Under the new rules, the coming years will see increasing use of more ambitious approaches incorporating home visits and retrofit programmes. The water savings can be considerable. Multi-measure home retrofit and behaviour change programmes have been shown to result in savings of up to 41 litres per property a day, with average savings of between 20-25 litres a day.[20] With the average household using 349 litres of water every day, water efficiency measures can reduce average daily household water use by between seven and 12 per cent.[21]

The impact of water meters

Increasingly, water meters will be used to reduce household water use. By creating a financial incentive, meters have been estimated to reduce water use by around ten to fifteen per cent. In turn, many households with a water meter benefit from lower bills; the average metered property pays £355 for its combined water and sewerage bill compared to £417 for an unmetered property.

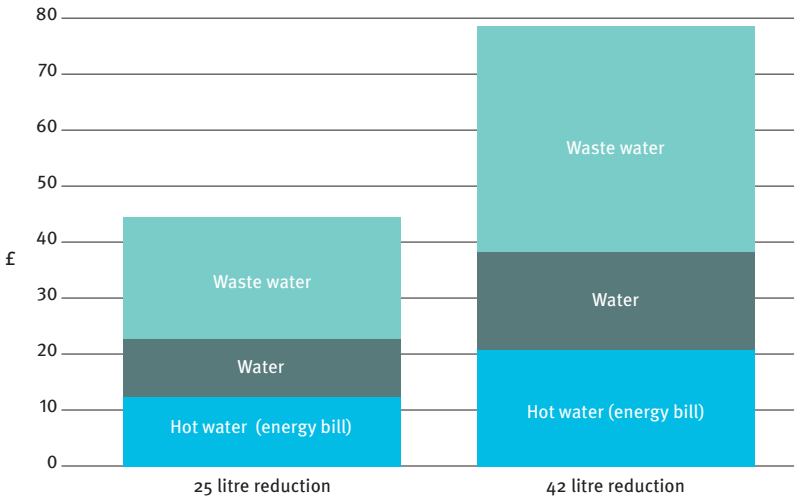
Around 48 per cent of households have water meters and their use varies hugely across the country.[22] Most are in southern England, where Southern Water introduced a universal metering programme in 2010 as part of its efforts to encourage customers to reduce their water use. Households without water meters have their bills estimated based on an assessment of the property's historic rental value or have been moved to an assessed charge.[23]

Savings for householders

The financial savings from reducing water use can be considerable. The results of large scale water efficiency programmes conducted to date indicate that a metered property could save up to £78 per year from ambitious water efficiency and £45 from more conservative levels of water conservation (see below).[24] Of these savings, the average household would save between £12 and £20 per year on energy bills from reduced heating of water. In this way reduced water use will save all households money regardless of whether they have a water meter.

"A metered property could save up to £78 per year from ambitious water efficiency."

Potential annual household bill savings from reduced water use[25]



As a result, average individual water use is projected to decline from its current level of 150 litres per person per day. This decline will be particularly pronounced in areas of water stress, due to more extensive use of demand management programmes; Southern Water is predicting per capita consumption of just under 130 litres in 2030.

There is huge untapped potential to cut water use further. A major Energy Saving Trust study found that more than two billion litres of water are "showered away" across Britain each day. Simple reduced flow showerheads use 25 per cent less water, yet they have been fitted in only a quarter of suitable homes. Dual flush toilets could save 7,000 litres of water per person per year, but nearly 60 per cent of homes still have standard single flush toilets.[26]

In the short term, water efficiency can be an effective way of helping to manage household bills. However, its longer term role in improving the affordability of water is less certain, for two reasons.

"Even though average individual water consumption is falling, overall demand for water will rise."

First, because expected reductions in water use are largely planned to be achieved through more widespread use of water meters. The lower average bills currently enjoyed by metered properties are the result, in part, of voluntary take up. Many households who have chosen to install a meter have done so because they know that their bill will fall, for example if they live in a property with high rateable value yet use little water. Average monetary savings may well fall as more households install water meters. Research has also shown that water meters can actually increase affordability problems for poor or vulnerable households. Where 90 per cent of households are metered, affordability will worsen for low income single parents and low income households with three or more children.[27]

Second, the current scale of planned water efficiency programmes will, at best, slow increases in water demand. As has been seen, even though average individual water consumption is falling, overall demand for water will rise. Meeting this increased demand, in an environment where less water is available from rivers and aquifers, will require substantial additional investments into new sources of supply. These investments will need to be funded from customer bills.

Conclusion

The increased level of ambition on water efficiency from government, regulators and water companies will deliver some degree of short term financial savings for many households. The potential for additional water savings is considerable. However, the aggregate impact of planned water efficiency programmes will not be sufficient to close long term water supply deficits. For this reason, existing initiatives will delay, but not reverse, the upward pressure on bills from water scarcity.

3 Getting more from water efficiency

The costs of addressing water scarcity will become increasingly important as a driver of higher bills over the course of the next decade. Water companies are planning a range of far reaching actions to meet future demand. Reducing leaks continues to be a priority, with considerable progress already made. Leaks have been reduced by one third from their mid-90s high.[28] And changes introduced under the 2014 Water Act will also enable companies to make much greater use of water trading across geographical boundaries.

As outlined in the previous chapter, over the next five years water efficiency programmes will play a major role in meeting supply deficits. In the south east, Thames Water predicts that household water efficiency in London will actually contribute more (12 megalitres per day) than new supply (8.9 megalitres per day).[29] Affinity Water envisages demand reduction of 3.16 megalitres per day from water efficiency against 5.26 megalitres per day from new supply.[30] South East Water is planning one megalitre per day in water efficiency savings compared to 1.7 megalitres per day from new supply.[31] Even greater water savings will be achieved through leakage reduction programmes and the roll-out of water meters.

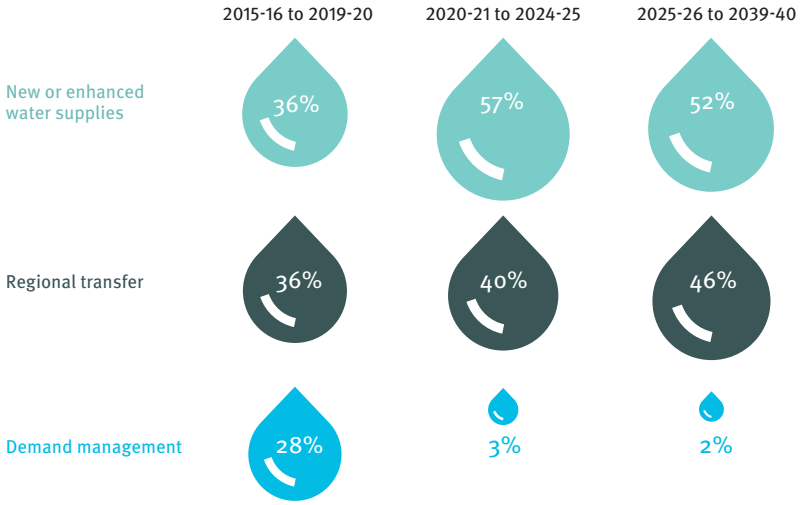
Post-2020 decline in water efficiency

In the longer term, the contribution from water efficiency will be much smaller. In 2013, the Water Resources South East group (a collaboration between the six water companies covering the south east) produced modelling of the resource options available across the region. Between 2025 and 2040 demand management was estimated to provide only 1.38 per cent of the additional capacity needed, compared to 52 per cent from new supply.[32] In absolute terms, the volume of water planned from new supply will massively increase, from 191 megalitres per day from 2015-16 to 2019-20, to 341 megalitres per day from 2025-26 to 2039-40. In contrast, across this period, the savings envisaged from demand reduction will plummet from 142 megalitres per day to just nine megalitres per day.

Water company resource management plans published in 2014 reinforce this disparity between supply and demand. In part, this disparity reflects the importance of short term water meter programmes to reduce demand (Southern Water's universal metering programme will be largely complete by 2017, while Thames Water will have metered the majority of London's houses by 2020). It also suggests that the water resource management planning process is not giving sufficient weight to the potential for water efficiency to manage long term supply deficits. By using demand management as a short term option, and relying primarily on new sources of supply to avoid future shortages, water companies risk locking in capital intensive infrastructure programmes that leave little scope to explore more flexible and potentially cheaper alternatives.

Examples of planned large scale supply infrastructure include an extension to the Arlington Reservoir in East Sussex, which willl deliver 22.1 megalitres per day at a capital cost of £127.2 million, and a new reservoir at Broad Oak near Canterbury, providing 13.5 megalitres per day at a capital cost of £77.3 million.[33]

How water companies in south east England plan to avoid shortages during extreme drought



"Retrofitting thousands of homes could bridge supply deficits at a comparable cost per unit of water to new supply but at substantially lower overall cost."

There is a strong case that large scale water efficiency could represent a cost effective alternative to some large new supply schemes. We have undertaken an illustrative analysis of the implications of addressing a supply deficit using large scale water efficiency retrofit. We used the UK's first large scale desalination plant at Beckton in the Thames Estuary as a theoretical point of comparison. Opened in 2010, it cost £250 million to build and has a maximum supply capacity of 140 megalitres per day. It is intended to avoid the need for supply disruptions and standpipes in a very dry year in a supply area covering 3.4 million homes. The risk of such a dry year was estimated at five per cent, ie likely to occur once every 20 years. In other words, the plant was built as a buffer against extreme events, in the expectation it would sit idle for the vast majority of its lifetime.

We calculated two things. First, the reduction in water consumption that each retrofit would have to achieve to save 140 megalitres per day, matching the maximum that could be supplied by the desalination plant. And, second, what each retrofit would have to cost for the retrofit programme to be no more expensive than the desalination plant.

We found that, for retrofit to deliver the same capacity as the Beckton desalination plant at the same cost, it would need to save an average of 41.2 litres per property per day at an average cost of £88.70 per property.[34]

This comparison is hypothetical; we are not suggesting that Thames Water should have pursued a retrofit strategy rather than build the desalination plant. It is, nevertheless, striking that existing retrofit programmes have delivered water savings on this scale within this range of costs. Anglian Water's Ipswich Area WEM trial achieved savings of 41.5 litres per property per day at a cost of £40.80 per property.[35]

Under the right conditions, retrofitting thousands of homes could bridge supply deficits at a comparable cost per unit of water to new supply but at substantially lower overall cost. Permanently reducing demand on this scale would increase the resilience of the existing system to rare events such as drought, reducing the need for additional back up supply sources.

How water efficiency can delay investment in new infrastructure [36]

During the 1990s Barrie, Ontario, was faced with a bill of $68 million to meet new demands for water and sewage treatment from a population expected to double over 15 years.

Planners instead implemented an alternative, cheaper approach built around reducing demand, offering householders a rebate to fit ultra-low flush toilets and water efficient showerheads.

From early 1995 to February 1999, average daily water consumption was reduced by 62 litres per person, saving 1,782,500 litres per day. Waste water entering sewage works was reduced by 55 litres per day per household.

At a cost of $4.7 million, the programme allowed Barrie to delay investment of $21.8 million, resulting in a net saving of $17.1 million.

"Substantial investments are made in providing supply infrastructure that may only be used during very occasional periods of severe water shortage."

We have identified four ways to maximise cost effective water savings from water efficiency programmes.

1 Reduce peaks in demand.

2 Tackle water deficits where they arise rather than a blanket approach.

3 Reduce non-essential water use by large users.

4 Integrate water and energy efficiency programmes.

1/ Reduce peaks in demand

The costs of the water system are largely set by the need to meet peak demand. Water companies have strict standards of service that place a major emphasis on avoiding supply disruptions. Companies must pay £10 compensation to households and £50 per day or part day to business customers when essential water supplies are interrupted as a result of emergency drought orders.[37] As a consequence, substantial investments are made in providing supply infrastructure that may only be used during very occasional periods of severe water shortage. It has been estimated that the costs of enabling sprinklers to run for an hour under dry conditions could add as much as £50 onto a household's annual bill, given the need it creates for expensive but rarely used supply sources, such as reservoirs, to manage extremely rare spikes in demand.[38]

As water meters become widespread, water companies will have access to the data they need to understand where and how peak demand occurs in different conditions at different times of year. This will enable more targeted interventions to reduce demand spikes and the need for expensive but rarely used supply buffers.

2/
Tackle water deficits rather than a blanket approach

Water stresses are highly dependent on local conditions. There can be huge variability between water resource zones in terms of the supply-demand balance. In the south east, under normal conditions 13 of the 34 water resource zones are projected to have supply deficits in 2020. In extreme drought conditions half of these zones would face supply deficits, with the combined water shortage exceeding 500 megalitres per day.[39]

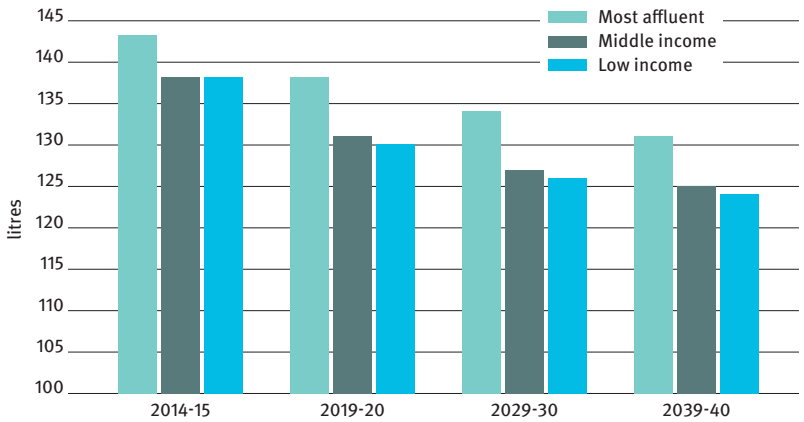
Targeting water efficiency programmes at zones with the risk of supply deficits is likely to be more effective at managing the costs of the water system than a strategy aimed at reducing per capita consumption across a whole supply region.

"Targeting water efficiency programmes at zones with the risk of supply deficits is likely to be more effective."

3/
Reduce non-essential water use by large users

Water use varies considerably across different demographics. Analysis for southern England (see below) highlights that affluent households use considerably more water than less well-off households. This pattern is predicted to continue over the next 25 years, with less well-off users reducing their consumption by more than the most affluent. Many affluent households will be large discretionary users of water for purposes such as gardening, offering potential for considerable reductions in water use.

Per capita water consumption in southern England by demographic (all users, litres per head per day)[40]



Among lower income households, social housing tenants also use considerable volumes of water. Even the best performing social housing achieves no better than national average use. Average water use among members of SHIFT (Sustainable Homes Index For Tomorrow), a recognised best practice group for the social housing sector, is 150 litres per person per day. This is largely down to the prevalence of older than average bathrooms and fittings. Uptake of water efficiency technologies is low. Only 33 per cent of SHIFT members have installed dual flush toilets, and only 12 per cent have

low flow showers.[41] A recent London social housing retrofit programme found 80 per cent of properties had a bath but no shower.[42] So the potential to reduce water use through social housing retrofit is considerable.

4/
Integrate water and energy efficiency programmes

Water efficiency programmes are overseen by water companies and funded from water bills. Most programmes, so far, have been of limited scale. Some have reached a few thousand properties but many have benefited only a few hundred.

The cost of retrofit varies considerably, from £41 per property to as much as £220 per property. The cheapest programmes have been achieved when retrofit accompanies water meter roll-out or when they are delivered across housing stock in partnership with a social housing provider.[43]

Lowering the opportunity cost of retrofit, ie the cost of identifying eligible or willing participants, will hugely increase the cost effectiveness of water efficiency. This could be achieved by systematically linking water efficiency to energy efficiency programmes, as recommended by, among others, the independent Walker Review commissioned by the government.[44]

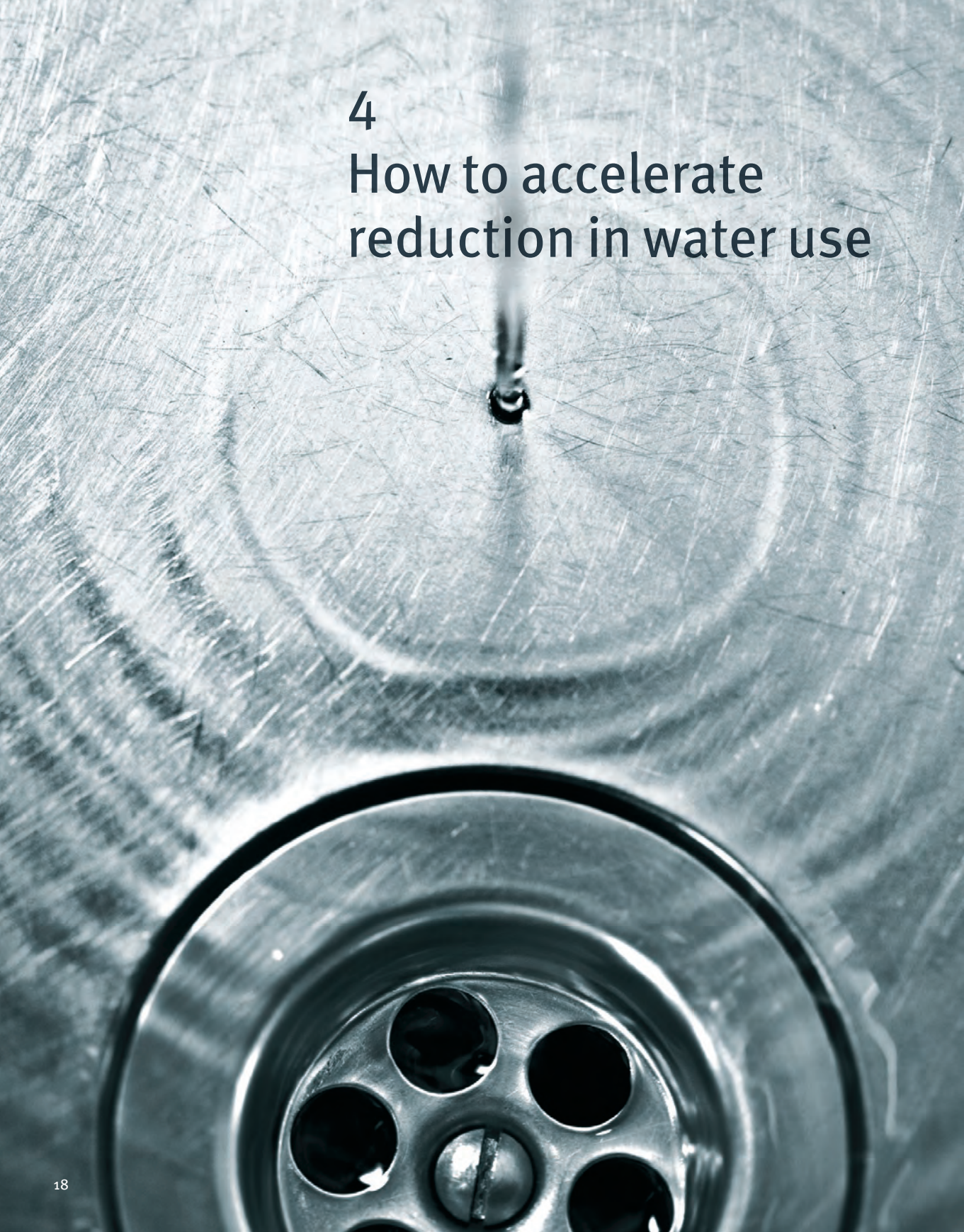
Significant sums of public money are being made available for energy efficiency upgrades to homes. The Energy Company Obligation (ECO), a levy on household energy bills to subsidise household energy efficiency measures, ensures that the best part of a billion pounds will be spent each year on energy efficiency.

Under ECO, over a quarter of a million households have benefited from a free new boiler since April 2013. The government has made hundreds of millions of pounds available to householders through the Green Deal Home Improvement Fund. A further 12,000 households have used Green Deal cashback vouchers to part finance a new boiler.[45] £88 million was granted to 24 local authorities in 2014-15 to support local, area based delivery of energy efficiency retrofit via the Green Deal Communities scheme. Linking bathroom retrofit to the installation of a new boiler would, as has been seen, reduce energy use and bills over and above that due to a more efficient boiler alone.

"The potential to reduce water use through social housing retrofit is considerable."

Conclusion

While water companies will be making far greater use of water efficiency and other demand reduction tools over the next five years, from 2020 new supply will dominate water resource planning. Well executed water efficiency programmes could cost effectively manage supply deficits on a far greater scale than is currently foreseen.



4
How to accelerate reduction in water use

The potential to reduce UK water consumption further should be considerable. A number of European countries have achieved per capita consumption levels at or below 100 litres, compared to the UK's average of 150 litres.[46] Ambitious reforms are likely to be needed to stimulate uptake of demand reduction programmes on a large scale beyond 2020, matched with efforts to engage water users about water conservation.

We propose four approaches:

1 Use pricing to encourage water conservation and sustainable abstraction.

2 Create stronger price signals for householders.

3 Ensure new housing developments are water efficient.

4 Encourage greater innovation from water companies in ways to meet demand.

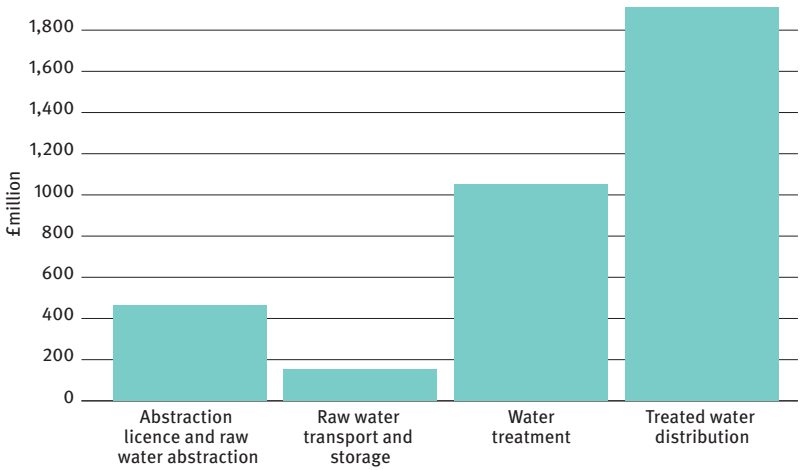
1/ Use pricing to encourage water conservation and sustainable abstraction

Water company decisions over how to meet demand reflect two things: how water is priced, and their regulatory obligation to balance supply with demand as cheaply as possible.

"There is no difference in the abstraction cost of water during times when it is plentiful compared to when supplies are scarce."

Water companies, like all other water abstractors, need a licence to remove water from the environment. Charges for licences are set to cover the cost of administering the licensing system. Water has no cost within this system. Its wider social, environmental and economic benefits are not reflected in the price paid for it by abstractors. There is no difference in the abstraction cost of water during times when it is plentiful compared to when supplies are scarce. For these reasons the cost of taking water from the environment is a relatively small component of water company costs. Abstraction represents about 12.8 per cent of upstream operating costs across all water companies.

Water company upstream operating costs 2013-14[47]



Reforming how water is priced to better reflect its true value would deliver two beneficial outcomes:

First, it would improve the cost effectiveness of demand reduction programmes relative to new supply, particularly at times when water is scarce.

"Water is being abstracted beyond the level at which many resources can be naturally replenished."

Second, by encouraging better stewardship of water resources it would protect bill payers from the financial consequences of over abstraction.

Water is being abstracted beyond the level at which many resources can be naturally replenished. These unsustainable demands contribute to the declining condition of many water bodies, which creates significant costs for the water network.

A major 2004 study found that 50 per cent of the groundwater used in the public water supply had quality problems.[48] In the past two years 13 per cent of rivers and 42 per cent of groundwater bodies have failed environmental health assessments.[49] Energy, chemicals and mixing with clean water are all necessary to make water from degraded water bodies clean enough to meet regulatory standards for drinking water. These costs are considerable and water companies spend over a billion pounds per year on water treatment.

Unsustainable abstraction not only drives up treatment costs. If not checked, it can also lead to water resources being withdrawn from the public supply. Over 140 groundwater sources were closed from 1975-2009 due to quality problems, removing over 400 megalitres from the public water supply.[50] Across the south east, it is projected this will lead to 200 megalitres per day becoming unavailable in the next few years.[51]

Substantial capital investments are usually needed to develop replacement supply sources. The 2004 study calculated that billions of pounds would need to be spent over two decades to replace groundwater resources that could no longer be used.[52] In this light, avoiding over abstraction from sensitive water bodies to preserve their long term value to the water supply is a cost effective way to minimise expenditure on new supply. Modelling of this approach for the River Dart (see over) has demonstrated its value compared to business as usual.

Reducing long term financial risks[53]

South West Water calculated the financial impact of increasing the cost of abstraction from the River Dart during the 1995-96 drought.

During times of scarcity this would have led to water being drawn instead from the Roadford and Burrator reservoirs which, under normal circumstances, would have been more expensive. The total additional costs were estimated at £75,000 above the level of the annual charge paid by South West Water to the Environment Agency for abstracting from the River Dart (£119,531 in 2010-11).

The relatively small additional cost (£75,000) of preserving the environmental health of the Dart represents a fraction of the cost of developing an entirely new resource capable of replacing it, estimated at £100 million.

"Of the options available, setting minimum flow levels for rivers and groundwater below which water cannot be abstracted offers the best environmental protection."

There are also significant untapped opportunities to reduce the cost to bill payers of waterway pollution. Agriculture is responsible for over half of nitrate pollution and three quarters of sediment in the UK's waterways, as well as faecal bacteria and other pollution from animal slurry.[54] Some water companies are exploring opportunities for changing how agricultural land is managed to improve water quality and reduce costs. A stronger focus on this could help to reduce the one billion pound annual cost of water treatment.

Options for change

To address some of these issues the government has proposed a series of reforms to the abstraction licensing system. Two options have been put out to public consultation, as a result the government is now developing a hybrid third approach. Under all three options, the abstraction charge per unit of water would be higher in regions where water is scarce. Charges would be applied to individual abstractors according to how many units they have used, and the proportion of the total allowance this represents. This approach would imply households in areas of scarcity being charged more for water than households in areas where water is plentiful.

Whichever approach is ultimately chosen, it will need to ensure that the environmental health of water bodies is protected, if the treatment costs caused by over abstraction are to be minimised. Of the options available, setting minimum flow levels for rivers and groundwater below which water cannot be abstracted offers the best environmental protection. This approach would also guard against the risk that the proposed changes could actually lead to additional water abstraction, for example if unused abstraction permits were to be released to other users. It does not, however, explicitly consider broader measures of water body health, eg levels of biodiversity. Given the slow timescale of these reforms (they are not due to be introduced until the 2020s), it would be appropriate to consider whether a broader set of indicators beyond flow levels could deliver better outcomes for the water system.

In the short term, additional measures will be necessary to address the issue of unsustainable abstraction. The next major opportunity for reform

will be the Price Review process, through which Ofwat and water companies agree business plans covering the upcoming five year period. The next Price Review will fall in 2019 (PR19) to cover 2020-25. The next couple of years offer a window of opportunity to identify and test new mechanisms that will shape water company investment plans for PR19.

For the 2014 Price Review (PR14), two options were put forward that offer considerable potential to address unsustainable abstraction. The Abstraction Incentive Mechanism (AIM) uses a notional scoring system giving incentives to water companies not to abstract from environmentally sensitive water sources. Points are allocated to sensitive water abstraction sources, with the points for each source increasing as water availability decreases. Water companies are incentivised to minimise the points they accrue from their abstraction activities. A prototype project with five water companies indicates that this approach could work effectively.[55]

"Abstraction reform alone could deliver net savings of between £100-500 million over 25 years."

The second approach proposed by water companies is scarcity charging. Scarcity charges can take many forms, ranging from a shadow price, a nominal price based on environmental impacts that water companies factor into their water resource planning, to an actual financial charge levied on water abstraction. This charge can be applied uniformly across all abstraction within a region, or in a way that differentiates based on the relative scarcity of water within the region. One estimate has concluded that a relatively low differential charge of up to ten pence per cubic metre would facilitate water transfer from less scarce to more scarce regions, whilst being less likely to lead to expensive new supply options such as desalination.[56] Nevertheless, during PR14 Ofwat turned down a number of requests from water companies to introduce scarcity charging.

Implementing a combination of these reforms would enable water companies to set investment plans that minimise the environmental impacts of abstraction. This would, in turn, reduce the cost of water treatment and avoid the need for capital investments to develop replacement supply sources. The government has estimated that abstraction reform alone could deliver net savings of between £100-500 million over 25 years, largely as the result of avoided water company investments through more efficient use of water resources.[57]

2/
Set stronger price signals for householders

Variable pricing also offers a means of influencing water users as well as abstractors. Research has demonstrated that introducing variable tariffs alongside metering could reduce demand by up to five per cent on average across the year, and potentially by as much as ten per cent at peak times, over and above the effect of metering alone.[58] While variable tariffs have been found to be unpopular with householders, their potential to further drive down water consumption makes them a tool that will ultimately need to be used.

Price signals alone will, however, not be sufficient to dramatically change patterns of water use. There is a strong expectation among UK householders that they should be able to use water freely without restrictions at any time. Many are willing to pay to ensure this. Customers have been shown to be willing to tolerate higher bills to reduce the likelihood of supply disruptions, such as hosepipe bans and standpipes.[59] Developing additional ways of engaging householders on water use will be necessary to shift these attitudes. For example, a water label has now been developed for bathroom products.[60] It is too soon to know what the impact of the label will be on consumer purchasing habits. But it could be a valuable means of building awareness among householders of the water consumption of products. If successful, the label could be extended to the full range of water using products.

"There are particular opportunities to learn from approaches used in the energy sector."

3/
Ensure new housing developments are water efficient

Opportunities should also be taken to limit the impact of population increase on water demand. Considerable numbers of new properties will be built in the south east in the coming years, all of which will have the right to connect to the public water supply. The government has recently published a new building standard that proposes to maintain the water efficiency standard for new buildings at 125 litres per person per day. Housing developments in the south east are permitted to set a more stringent water efficiency standard. Some are doing so; Eastleigh Borough Council in Hampshire, alongside the Environment Agency and Southern Water, is proposing an incentive for an even more stringent standard of 95 litres per day. More widespread use of this approach will be necessary to manage growing water deficits.

4/
Encourage greater innovation from water companies in ways to meet demand

Recent reforms such as the introduction of totex (see page nine) have created new financial levers to influence water company resource planning. The 2014 Water Act has introduced further measures to challenge established patterns of behaviour in the water sector, principally by extending the role of competition. The retail market will be opened up to new entrants and, from 2017, businesses, public sector entities and charities will be able to choose their water and sewerage supplier. This raises the possibility of suppliers choosing to compete on the basis of price by engaging with customers on reducing their water use and managing their bills.

No comparable incentives exist for water companies to innovate in how they engage with household customers. Parallels exist within other sectors that could help to identify alternative options for encouraging companies to place a greater priority on demand reduction. There are particular opportunities to learn from approaches used in the energy sector, both in the UK and abroad, where demand reduction mechanisms have been used for a number of years.

For example, the UK government is piloting the introduction of negawatts (energy saving measures), offering support for schemes that remove electricity demand from the grid. Similarly, the US has made widespread use of reforms aimed at decoupling utility revenues from sales. Decoupling is a rate adjustment mechanism that separates an electricity or gas utility's fixed cost recovery from the amount of electricity or gas it sells. Twenty five US states had adopted decoupling for at least one electric or natural gas utility by the end of 2012. Applying lessons from these regulatory mechanisms to the UK water sector could identify new ways to challenge supply dominated resource management programmes.

"Local authorities should make better use of existing powers to limit the impact of population growth on water demand."

Under PR14 Ofwat introduced a financial incentive for water companies which substantially exceeds their agreed per capita consumption reduction targets. This incentive has not been widely granted; however, if it proves to be successful, then rolling it out more broadly should be considered during PR19.

Conclusion

The potential scale of looming supply deficits will mean that additional water supply sources will be needed in the coming years. However, the way in which charges for water abstraction are set creates risks that some unnecessary new supply options will be pursued.

Using pricing mechanisms to encourage better stewardship of water resources will reduce treatment costs and create new incentives to explore large scale demand management options.

Setting a price for water that varies during times of scarcity will also help to influence the behaviour of water users. Local authorities should make better use of existing powers to limit the impact of population growth on water demand. Regulators should examine demand reduction mechanisms being used in other sectors to identify ways to enable more ambitious long term approaches to water demand reduction.

5 Recommendations

Addressing the growing problem of water scarcity will be complex and expensive. New sources of supply will be needed to relieve the stress on existing resources. However, our analysis suggests that water efficiency could play a more significant role than is currently foreseen in managing demands on the water system, thereby reducing the need for additional capital investment and relieving upward pressure on bills. Addressing over abstraction to ensure more efficient use of existing resources could also offer a better deal for bill payers, whilst protecting the environmental health of rivers and aquifers.

Existing reforms will go some way towards delivering these outcomes. But it is likely that, without further effort, these interventions will not be sufficient, given the potential scale of water deficits in some parts of the country. We recommend a series of steps to accelerate the move to a more resilient water system for the UK that will minimise costs for bill payers.

"The next two years offer a window of opportunity to further assess the merits and impacts of the Abstraction Incentive Mechanism and scarcity pricing."

1/
Accelerate action on unsustainable abstraction

The government's proposed reforms of the abstraction licensing regime could have significant positive impacts, creating a stronger link between the cost of water and its availability.

Whichever option is chosen will need to include measures that effectively protect the environmental health of water bodies. From the current proposals, this could be achieved by setting minimum flow levels that ensure sufficient water is left in the environment to protect the long term sustainability of water resources, with the share of water retained in the environment at a fixed rather than variable volume. Given the slow timescale of these reforms (they are not due to be introduced until the 2020s), it would be appropriate to consider whether a broader set of indicators beyond flow levels could deliver better outcomes for the water system.

New mechanisms are needed as part of the 2019 Price Review (PR19) to address unsustainable abstraction. The next two years offer a window of opportunity to further assess the merits and impacts of the Abstraction Incentive Mechanism and scarcity pricing. The government, regulators and water companies will need to work together during this period to ensure that PR19 delivers a higher level of ambition on demand management post-2020.

2/
Provide incentives for companies to reduce water demand

Regulatory changes, such as the introduction of the new totex calculation described on page nine, have enabled greater ambition on demand reduction. However, current water company plans indicate low levels of additional savings from water efficiency projected beyond 2020. Further regulatory intervention is necessary to ensure the full potential from demand reduction is reached across the 25 year water resource management period.

"Variable tariffs should be introduced in water-stressed regions."

Ofwat should assess the mechanisms being used by other regulators to break the link between utility revenues and sales. In particular, lessons should be learned from regulatory interventions into UK and US electricity markets aimed at delivering electricity demand reduction.

3/
Charge households for water on the basis of use

Variable tariffs should be introduced in water-stressed regions that make water more expensive during times when water resources are under most stress. This could, for example, be structured as a rising block tariff to be implemented during peak demand months. For the areas where it applies, there would need to be near universal roll-out of water meters to ensure that all customers have the ability to influence their water bills.

Social tariffs should be introduced in all regions where variable tariffs apply, to ensure that this does not disproportionately impact low income or vulnerable households who have limited scope to reduce their water use. In fairness to those bill payers subsidising the social tariff, those wishing to access it should be required to make water efficiency improvements to their homes, provided they are in a position to access water efficiency programmes.

4/
Maximise savings from retrofit and building standards

The government should introduce a mechanism to inform water companies when boiler replacements are planned under the Green Deal or ECO schemes. Hundreds of millions of pounds of public money is spent on home energy efficiency upgrades every year. This would increase financial savings for households whilst cutting the cost of identifying suitable properties, improving the cost effectiveness of water efficiency. The government should also extend eligibility criteria for the Green Deal and ECO to include water efficient bathroom appliances, possibly including cold water appliances, given their potential to increase financial savings for householders from energy efficiency retrofit.

Local authorities in water stressed areas should be encouraged to set water efficiency standards for new housing, beyond those set by building regulations. Housing developments in the south east are already permitted to set a more stringent water efficiency standard and this approach should be enforced by councils more widely.

The government should encourage manufacturers and retailers to speed up adoption of the Water Label to enable consumers to differentiate between products, based on their water consumption. If it is proven to be effective, the scope of the label should be expanded to include all water using products.

Endnotes

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[3] Green Alliance analysis using data from ONS, 2013, *Average weekly household expenditure*

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[20] Waterwise, 2011, *Evidence base for large-scale water efficiency, phase II final report*

[21] Energy Saving Trust, 2013, *At home with water*

[22] Ofwat, December 2014, op cit

[23] 'Rateable value': a local authority's assessment of the annual rental value of an individual property, based on surveys carried out between 1973-90. Source: Ofwat, 'Paying by rateable value', www.ofwat.gov.uk/consumerissues/chargesbills/unmetered/rv (accessed 05 December 2014)

[24] Assumptions: household consumption 349 litres per day; occupancy level of 2.5 people; 68 per cent of water is used in the bathroom; 50 per cent of total water saving is achieved from hot water in the bathroom.

[25] Standard scenario: this assumes reduction in water use of 25 litres per property per day (approximately a seven per cent reduction), in line with the approximate average achieved by programmes to date. Ambitious scenario: this assumes reduction in water use of 42 litres per property per day (approximately a 12 per cent reduction), the upper end of what has been achieved in programmes to date.

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[31] South East Water, June 2014, *Water resources management plan, Section 9: our preferred plan*

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[34] Assumptions. Costs of desalination: capital cost of £250 million; operating costs for 60 days of £2.8 million. This has been calculated based on opex representing 58 per cent of total costs if the plant were to operate at maximum capacity for 20 years, giving a figure of £0.000337/litre. Small additional costs were distribution and retail (based on Southern Water and Ofwat estimates), giving a total of £253.1 million for the cost of desalination. Displaced abstraction: Retrofits would reduce system costs by displacing abstraction for the entire 20 year period (minus the peak scarcity period in which abstraction would be needed). These avoided costs of water abstraction have a net present value (NPV) of £48.5 million. This is based on an average supply cost of £65/Ml, applied to 1,013,600Ml of avoided abstraction. This has been calculated on the basis of 140Ml of avoided abstraction per day for 20 years, minus 60 days (the once in 20 years period of peak scarcity during which abstraction would be needed). A discount rate of 3.5 per cent has been applied over 20 years to calculate the NPV. To find the break even cost of retrofitting, the total cost of 3.4 million retrofits minus the NPV of displaced abstraction (£48.5 million), was set to equal to the cost of desalination (£253.1 million). Rearranging requires 3.4 million retrofits to equal £301.6 million, which gives a cost of £88.70 per home.

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[60] See: www.europeanwaterlabel.eu/home.asp

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