

The Arqiva logo is positioned in the top left corner, featuring the word "arqiva" in white lowercase letters on a red triangular background. The background of the entire slide is a teal color with a subtle water ripple pattern.

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Smart water metering and the climate emergency

How smart meters can help save 0.5%
of the UK's greenhouse gas emissions

The Waterwise logo is located in the top right corner, consisting of the word "waterwise" in blue lowercase letters inside a white oval shape.

waterwise



Summary

Smart metering¹ of our water supplies can play a fundamental role in helping us manage water demand and meet the challenge of the climate emergency.

Emerging evidence, presented in this jointly authored report from Arqiva and Waterwise, demonstrates how smart metering can help us adapt to a changing climate and mitigate our impact on the environment.

Data from smart meters already fitted shows they can help significantly reduce household water consumption; support leakage reduction and therefore bring down greenhouse gas emissions linked to water supply and use. They can help customers reduce their utility bills and enable us to leave more water in the environment.

Our analysis shows that **fitting just one million smart water meters in the UK each year for the next 15 years could result in saving at least one billion litres of water a day (1,000 Mld) by the mid-2030s and we could reduce the UK's current greenhouse gas emissions by 0.5% (2.1MtCO₂e).**

This roll-out programme is both achievable and realistic based on current technology and services. It should form a key part of our green recovery post Covid-19, and UK government and regulators should act to support and enable the water industry to achieve these savings which will help the UK reach its net zero climate targets.

But we must act now and make the following changes to ensure that we realise these benefits and help tackle the climate emergency:

- In England, we want the link between metering, charging and water stressed area classification to be removed and the PR24 investment planning process used to enable water companies to accelerate the roll-out of smart meters;
- In England, this change should form part of a mandated programme to ensure that all households have a smart meter by 2035, with appropriate support in place for vulnerable customers;
- In Scotland, Wales and Northern Ireland we urge the devolved governments to review their current positions and take action to encourage and support the industry to adopt water metering, thus taking into account the wider benefits for society, the environment and in particular their commitments to address the climate emergency as the UK attempts to meet its net zero ambitions.

1. Smart meters are water meters that can be read remotely without having to directly access the meter installation for a manual reading. They can use automated meter reading (AMR) where the meter can be read on walk past or drive by or advanced metering infrastructure (AMI) where data can be read remotely through a fixed or mobile communications network. The latter AMI meter type offers the greatest potential for demand savings due to the availability of high resolution, visible usage data.





Introduction

When the Water Industry Act was passed in 1991, section 145 set a deadline of 31 March 2000 for water companies to move from charging customers based on the rateable value of their property to charging them based on the amount of water they actually used?

This deadline was removed from the Water Industry Act 1999. This decision has meant that for every household that wasn't metered by 31 March 2000 we have missed the opportunity to save on average over 285,000 litres of water³, along with around two tonnes of CO₂e⁴. Twenty years on, and amidst the climate emergency, we must ensure that we don't miss a similar opportunity again.

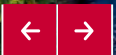
Smart metering our water supplies is increasingly recognised as a crucial element in helping us manage water demand and meet the challenge of the climate emergency. Evidence from areas around the UK that have already implemented smart water meters has demonstrated huge water and carbon saving potential.

This joint paper from Waterwise and Arqiva discusses how smart metering can play a fundamental role in helping us both adapt to a changing climate and mitigate our future impacts on the environment; setting out what we feel needs to change to make this a reality.

2. <https://www.legislation.gov.uk/ukpga/1999/9/notes>

3. Based on missing the chance to make a conservative 10% saving on an unmetered PCC of 171lppd ([see here](#))

4. Based on saving 10% of 1 tonne CO₂e per property per annum due to water use (2.64 kg/prop/day)



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Smart meters and the climate change adaptation challenge

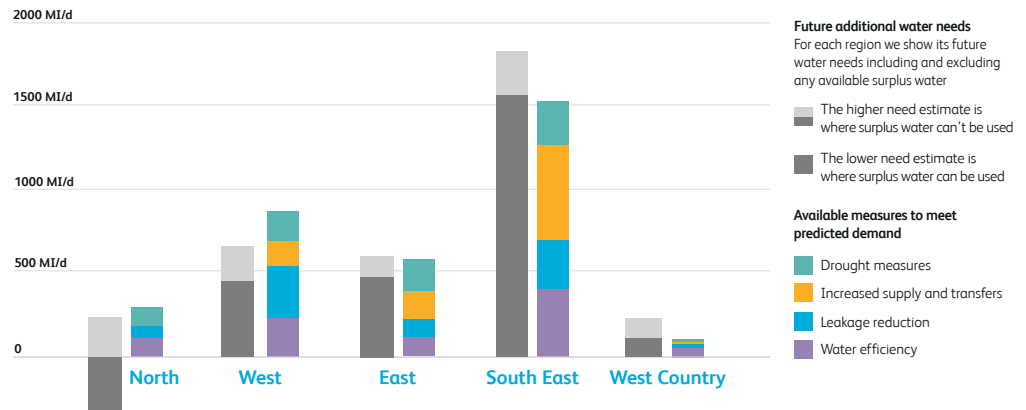
What is the adaptation challenge?

The National Framework for Water Resources published by the Environment Agency (EA) in March 2020⁵, identified that without action we will face a water supply deficit of over 3,400 million litres of water a day (3400 Mld) in England by 2050 due to population growth, climate change and the need to protect and restore the environment. Failure to act now, poses severe risks to our economy, society and to the environment.

Reducing water demand through leakage reduction and water efficiency was identified as crucial in meeting our future water needs.

⁵ https://www.gov.uk/government/publications/meeting_our_future_water_needs-a-national-framework-for-water-resources

Figure 1: Future additional water needs in each region and the different measures that can contribute to meet the predicted demand (National Framework for Water Resources, 2020)



Please note for clarity three future demand scenarios were modelled (High, Central, Low) the table above shows the central demand scenario.



How can smart water meters help?

Smart meters can help us adapt to climate change by helping us reduce demand for water. This means the industry needs to abstract less water and allow the water that we do have to go further and support future growth.

6. National Metering Trials final report 1993

7. https://waterwise.org.uk/wp-content/uploads/2019/09/The-Effect-of-Metering-on-Water-Consumption_June2017.pdf

8. <https://www.tonline.co.uk/news/smart-meters-help-thames-water-slash-leakage>

9. <https://www.anglianwater.co.uk/siteassets/household/about-us/public-affairs-2019/defra---pcc-water-consumption---october.pdf>

10. <https://nic.org.uk/app/uploads/Analysis-of-drought-resilience-1.pdf>

The evidence that water metering can help reduce demand has been with us for over 30 years. The National Metering Trials that took place in England in the late '80s and early '90s reported an average reduction in demand of 11%, following the installation of so called “dumb” meters⁶. Ornaghi and Tonin (2017) reported demand reductions of 16-20% from Southern Water’s universal metering programme from 2010 to 2016⁷.

More recently, Thames Water reported in 2020 that customers with smart meters were using around 17% less water than those without a meter⁸. Based on their experience with smart metering, Anglian Water predicted an 18% reduction in consumption in its forward investment plans due to smart metering⁹. Of this 18%, they attribute 3% specifically to the extra insights into consumption that they get from smart meters compared to “dumb” meters that allow them to target behavioural change initiatives. The National Infrastructure Commission in their 2018 review of drought resilience¹⁰ state that standard “dumb” meters can reduce average consumption by 15% and smart meters by 17%.



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Metering can also help with the management of water usage and supplies during peak demand. Hot weather and shifts in consumer behaviours caused by unexpected events can push up peak demand and in recent years have posed a significant challenge for water companies trying to maintain supplies.

Artesia analysed the extreme hot weather period¹¹ in 2018 and found that peak demand increased by 10% less for metered customers. Similar patterns are expected for the Covid-19 pandemic.

As well as reducing consumption, the greater resolution data from smart meters is also key in helping water companies find and fix leaks. Smart metering can play a key role in helping water companies achieve their commitment of 50% leakage reduction by 2050¹². A great example of this benefit comes from Anglian

Water, where customers that were already on dumb meters saw an additional 11.5% reduction in demand when they switched to a smart meter¹³. Three-quarters of the additional water saving was down to the company being better able to spot and sort leaks. Another example comes from Thames Water who reported that in 2019/20 their smart meters helped detect 13,500 leaks on customer supply pipes and saved nearly 18 million litres each day¹⁴.

The water savings that smart meters can deliver through reduced consumption and leakage are significant when stacked up against the deficits identified earlier. An 18% reduction in consumption delivered by smart metering across England would save around 71 Mld for every million smart meters fitted. Meaning that if 15 million meters were fitted over the next 15 years, the savings would be over 1000 Mld (one billion litres per day) or 30% of the deficit identified in the National Water Resources Framework (see Figure 1).

The fact that smart meters can help with both leakage reduction and increasing water efficiency is hugely important and was recognised in Artesia and Eftec's 2019 work for Water UK¹⁵. Their review looked at a range of approaches to reduce household water demand before concluding that "...the best strategy for maximising demand reductions involve government and water companies working together to deliver mandatory water labelling and increased smart metering, beyond the current ambition in water company plans".



Thames Water reported that in 2019/20 their smart meters helped detect 13,500 leaks on customer supply pipes and saved nearly 18 million litres each day.



¹¹ <https://www.artesia-consulting.co.uk/blog/New%20report%20provides%20insights%20into%20what%20drives%20peak%20water%20demand>

¹² <https://www.ofwat.gov.uk/households/supply-and-standards/leakage/>

¹³ Information provided by Anglian Water for the Newmarket area

¹⁴ <https://wwtonline.co.uk/news/smarts-meters-help-thames-waters-leakage>

¹⁵ <https://www.water.org.uk/wp-content/uploads/2019/12/Water-UK-Research-on-reducing-water-use.pdf>

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Smart meters and the climate change mitigation challenge

What is the mitigation challenge?

As well as adapting to a changing climate we also need to mitigate our ongoing impact on the climate by reducing greenhouse gas emissions. In 2019, the UK Government and the devolved administrations committed to a legally binding net zero national target as recommended by the Committee on Climate Change (CCC).

The Climate Change Act was amended such that the UK now has a legal commitment to achieve net zero greenhouse gas emissions by 2050¹⁶. The UK water sector has shown real leadership in its recent commitment to reach net zero by 2030 for its own operational emissions¹⁷.

16. <https://www.gov.uk/government/news/uk-becomes-first-major-economy-to-pass-net-zero-emissions-law>

17. <https://www.water.org.uk/routemap2030/>



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Table 1: Sources of emissions relating to water use in the home (adapted from Artesia)¹⁹

Source of emissions relating to water	kg CO2e/property/day at 138 litres per person per day ⁵	MtCO2e UK emissions per annum based on 28 million properties ²¹	Approx % of total emissions
Abstraction, treatment and distribution	0.12	1.23	4%
Water heated centrally in homes (not for space heating)	1.30	13.29	49%
Water heated for electric showers	0.78	7.97	29%
Washing machine use	0.26	2.66	10%
Dishwasher use	0.16	1.64	6%
Wastewater collection, treatment and disposal	0.05	0.51	2%
Proportion from water company operations		1.74	6%
Proportion from how water is used in the home		25.55	94%
Total:	2.67 kg or approx. 1 tonne CO2e/prop/year	27.29	

Note: the above figures in Table 1 do not include emissions due to heating water as part of central heating systems which are largely non-consumptive of water.

Of the UK's total greenhouse gas emissions of 435 MtCO2e¹⁸, around 6% are from household water supply and use (circa 27 MtCO2e per year)¹⁹. Approximately 90% of these water related emissions are from how we use water in the home (around one tonne CO2e per household per year).


The other 10% are emissions from water companies supplying water and removing and treating wastewater which are covered in the sector's Net Zero 2030 Routemap.



18. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/875485/2019_UK_greenhouse_gas_emissions_provisional_figures_statistical_release.pdf
 19. <https://www.water.org.uk/wp-content/uploads/2019/12/Water-UK-Research-on-reducing-water-use.pdf>

Changing behaviours to reduce emissions

By highlighting household water consumption, smart meters are helping to change behaviours, reduce usage and drive down CO₂ emissions.



It follows that reducing household (and business) water consumption, even by modest amounts, can help deliver significant reductions in greenhouse gas and carbon emissions, particularly in the decade or two until energy supplies are decarbonised and our homes have moved away from using fossil fuels to heat water. Currently, less than 5% of the heat used across the UK's 28 million homes is derived from low-carbon sources²⁰.



20. <https://www.ons.gov.uk/releases/familiesandhouseholdsintheuk2019>

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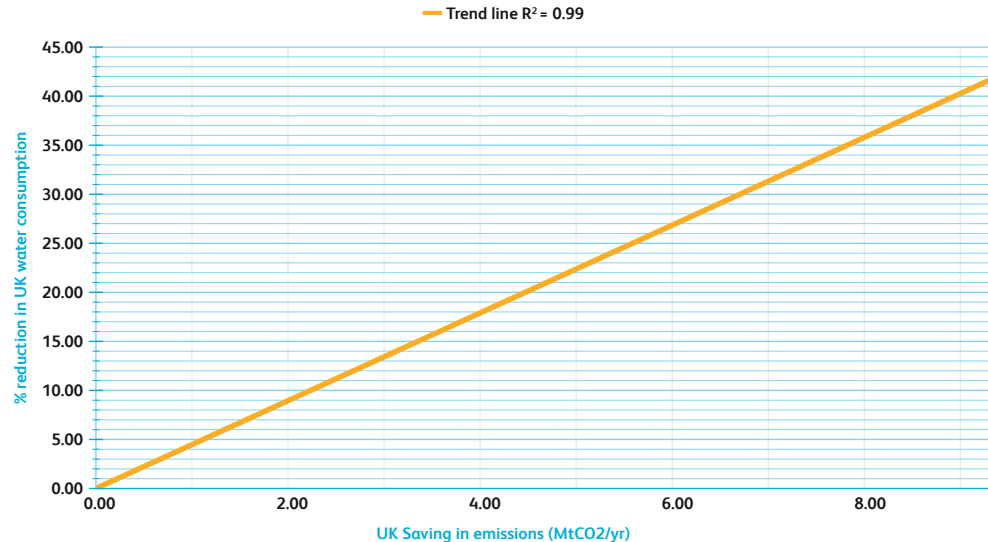
We know smart water meters can have a big role to play in reducing water demand and, based on figures taken from Artesia and Efttec's 2019 report to Water UK²¹, we can crudely approximate how reductions in UK household water consumption translate to annual UK savings in greenhouse gas emissions.


A modest 5% reduction in UK household water consumption could deliver just over 1 MtCO₂e per year. This can be compared to the 1.2 MtCO₂e decrease in total UK emissions from all residential properties between 2018 and 2019²² or the 1 MtCO₂e decrease in residential emissions the previous year.

A 10% reduction in UK household consumption could deliver around 2.2 MtCO₂e per year, comparable to the total annual operational greenhouse gas emissions from UK water companies' own operations which are around 2.4 MtCO₂e²³.

21. <https://www.water.org.uk/wp-content/uploads/2019/12/Water-UK-Research-on-reducing-water-use.pdf>
22. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/875485/2019_UK_greenhouse_gas_emissions_provisional_figures_statistical_release.pdf
23. <https://www.water.org.uk/routemap2030/>

Reductions in household consumption vs annual savings in emissions





If we look at the 17-18% drop in demand typically arising from the installation of smart meters where customers pay for what they use, an extrapolation across all 28 million properties in the UK, would deliver a 4 MtCO₂e reduction in emissions annually.

However, some households, particularly in England, already have meters so if we focus on a more realistic scenario where one million smart meters are fitted per year over the next 15 years to homes that currently aren't metered then we could secure an annual saving of around 2.1 MtCO₂e per year by the mid-2030s. This is nationally significant and amounts to around 0.5% of the UK's total greenhouse emissions in 2019²⁴. If the UK is to meaningfully reduce its greenhouse emissions and achieve net zero then this option, which is both practical and achievable using existing technology and services, needs to be pursued.

²⁴. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/875485/2019_UK_greenhouse_gas_emissions_provisional_figures_statistical_release.pdf

²⁵. Pers Comm

Thames Water, in their 2021 Green Recovery submission to Ofwat, proposed bringing forward into AMP7 the installation of an additional c.810k smart meters (split across new and replacement household, bulk meters and non-households installs). Working with the Energy Savings Trust they calculated this would achieve an additional reduction in CO₂ emissions of 965 tCO₂e over AMP7 due to a reduction in pumping and treating water into supply. Importantly a further 196,000 tCO₂e could be saved over AMP7 through reductions in hot water use in customers' homes²⁵.



A more realistic scenario where one million smart meters are fitted per year over the next 15 years to homes that currently aren't metered then we could secure an annual saving of around 2.1 MtCO₂e per year, equivalent to 0.5% of the UK's total GHG emissions.



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What about customers?

Arqiva and Waterwise believe that metering is the fairest way of charging for water providing those that struggle to pay are protected.

This is also the position of the Consumer Council for Water (CCW) which represents the interests of water customers in England and Wales. Their position²⁶ is that “metering is the fairest basis for water services charging and that all users should have this option. However, we also believe that where there is compulsory metering, customers should be offered the option to postpone switching to their new measured bill for two years while they get used to the new system and understand what that means for their budget. We are encouraging water companies to take a customer focused approach to installing compulsory meters”.

It is important that we move away from the view that smart metering is just about customer billing and charging. The technology enables customers to see and understand how much water they are using and to make behavioural decisions informed with that knowledge. Data from a 2018 UK survey²⁷ of 2238 people found that 66% of respondents agreed that the installation of a household water meter would help them reduce their use of water. Where customers do reduce their usage they will see the financial benefits in terms of lower water and energy bills. The greater resolution and more visible data offered by smart meters can help customers proactively seek help (or water companies can offer help) if usage is going up and there are affordability concerns. It can also help spot leaks in customers’ properties so they can be sorted before they become a bigger problem.

A 2019 survey of 1,000 people in Wales²⁸ found that respondents with a water meter installed were more likely to report taking action to reduce water use. 82% of these respondents cited having a water meter as a motivating factor for reducing water use. Respondents who had a water meter were then asked whether they thought all households should be required to have a water meter. The majority of respondents agreed with this statement (79% agree vs. 8% disagree).

26. <https://www.ccwater.org.uk/priorities/your-priorities/working-to-support-customers/compulsory-metering>

27. <https://www.statista.com/statistics/885895/views-on-household-water-meters-uk-2018/>

28. <https://gov.wales/public-attitudes-water-efficiency-wales>



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What needs to happen?

Data from smart meters already fitted shows they can help significantly reduce household water consumption, help with leakage reduction, and therefore bring down greenhouse gas emissions linked to water supply and use. They can help customers reduce their utility bills and enable us to leave more water in the environment. But we must act now if we are to realise these benefits and help tackle the climate emergency.

- In England, we want the link between metering, charging and water stressed area classification to be removed and the PR24 investment planning process used to enable water companies to accelerate the roll-out of smart meters;
- In England, this change should form part of a mandated programme to ensure that all households have a smart meter by 2035, with appropriate support in place for vulnerable customers;
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About the authors

Arqiva is a communications infrastructure and media services company, operating at the heart of the broadcast and utilities industries in the UK.

Arqiva is at the forefront of network solutions and services in an increasingly digital world. Arqiva is the only large-scale provider of smart water infrastructure in the UK. It has contracts with some of the UK's largest water companies, including Anglian Water, Thames Water and Yorkshire Water.

Arqiva builds and monitors the digital infrastructure which facilitates the operation of smart water networks, through its dedicated and secure radio network. In addition, Arqiva has a growing portfolio of complementary services designed to support both water companies and consumers to manage water use and minimise leakage and also address issues across the network from clean water generation through distribution to waste water and sewage.

Waterwise was founded in 2005 and is the leading authority on water efficiency in the UK. It is an independent, not-for-profit organisation and its vision is that water will be used wisely, every day, everywhere.

Waterwise works in a range of areas including: influencing and shaping policy and legislation; driving strategic and practical ambition in the water sector; designing and delivering research; media, campaigns and promotion; running demonstration projects; promoting water-efficient technology; helping businesses be more water-efficient; facilitating partnerships; brokering new solutions; and training water efficiency practitioners.

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