Department
for Environment
Food & Rural Affairs

Analysis of responses to the call for evidence - Water conservation: measures to reduce personal water use

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Introduction

In July 2019, the government launched a consultation, including a call for evidence, on measures to reduce personal water use.

Respondents to the call for evidence were able to provide free text, plus further written evidence by providing uploaded documents via the Citizen Space portal, email, and hyperlinks (typically, these were commissioned research reports).

Information provided by free text and written reference sources were both considered as potentially relevant evidence.

Methodology

An initial assessment of the responses to the call for evidence identified 4 types of response:

- unsubstantiated written opinion in the form of free text, largely qualitative, with no accompanying supporting evidence. Opinions offered may, or may not, have been relevant for the call for evidence
- largely qualitative free text, plus supply of referenced information, for example, a research report
- largely quantitative opinion in the form of free text. Opinions offered may, or may not, have been relevant to the call for evidence. No reference sources supplied
- supply of one or more reference sources, but without supporting opinion in the form of free text. Reference sources of various degrees of relevance and quality

Respondents had the opportunity to respond to each of the eight sections of the call for evidence separately (A to H, as described later). Many chose to cover multiple sections in a single response.

It was identified that some reference sources intended to provide evidence for one section had the potential to provide evidence for other sections.

Because of the nature of the evidence supplied, as described above, 2 screening or categorisation methods were used – one for the free text, and one for the supplied reference sources:

- free text responses submitted were organised against each of the 8sections of the call for evidence. A matrix was developed to identify the type of respondent, screen out blank and irrelevant responses and then categorise each remaining response. The

categories of respondent used were an organisation, individual or not stated or not clear (categorised as anonymous)
- screening for relevance, left blank, response not relevant to the call for evidence, response relevant to the call for evidence (including those who had provided reference sources)
- categorisation of robustness: evidence contained largely unsubstantiated opinion, or cited evidence

Very few free text responses directly offered enough detail to provide evidence of the impacts that measures to reduce personal water use could accomplish.

Where information from free text responses are referred to below, its origin is stated.

A total of 117 reference sources were provided by 21 respondents, comprising 111 unique references.

Key points of information were recorded from each using a matrix system. These included:

- metadata, author and year of publication
- types of publication: published academic paper, other research report (for example, written by a consultancy or industry body), informal reports (for example, presentation slides), marketing materials, guidance document, technical manual and webpages
- relation to specific intervention: the interventions the reference source discussed (which may have been, singular, multiple, or none)

Key points of information requested in the call for evidence:

- expected reduction in water use, associated impacts and costs (economic, environmental, public health and social)
- distribution of geographical and demographical impacts. As well as when these impacts are likely to occur
- the likelihood that these measures will deliver the savings predicted
- associated risks for each measure. How these risks might be mitigated
- the 'best mix' of measures and the overall reduction in water use that this could achieve
- barriers to achieving these water savings and how these barriers might be overcome
- what impacts the measures could have on personal water use outside of the homes - for example individual use in business settings (toilets, showers)
- relevant impacts on individuals

The matrix system allowed a side-by-side comparison of the content of the reference sources. Each source was then categorised as follows:

1. relevance and quality: high - Evidence is highly relevant, is based on transparent and adequate quality research methodologies with clear reporting. For example, research reports directly providing quantitative information requested in the call for evidence, research based on quantitative analysis, highly relevant case studies, detailed literature reviews
2. relevance and quality: moderate - Evidence has some relevance and/or contains information for which the research methodology is unclear, or of lower quality, or with reporting lacking some clarity.
    a) For example, those providing supplementary information not directly relevant to the call for evidence, citing other literature sources but without a clear research methodology, relevant topics, but lack of clarity regarding information sources, relevant quantitative information based on data over 10 years old, research based on small sample sizes
3. relevance and quality: low - Evidence has little or no relevance or is not demonstrated to be based on transparent research, or reporting is unclear.
    a) For example, discussion of topics not of direct relevance to the call for evidence, marketing materials, does not adequately cite reference sources, information based on opinion, provides largely qualitative information or disorganised information

The resulting analysis focusses on the reference sources that were assessed to be in category 1, above, supplemented where appropriate by category 2 references.

The selection of reference sources was further refined as the understanding of the body of evidence increased during the analysis process, including where other reference sources had adequately addressed topics.

Documents referred to in the main report section are listed in the references section. The full list of reference sources supplied by respondents is provided in the bibliography section.

The main sections of this report are organised to mirror the 8 sections of the call for evidence:

A. more ambitious water efficiency standards in Building Regulations for new homes, including retrofitting
B. introduction of a mandatory, government-led water efficiency label linked to building standards, fixtures, and fittings
C. changing water fittings regulations to improve water efficiency of homes. Defra is keen to understand what changes would be required

D. options that deliver an increase in metering penetration
E. more widespread rainwater harvesting and water reuse schemes
F. the use of water company incentives
G. information provision to customers about water saving measures they can undertake and change to a water saving culture
H. any other relevant measures that could be used to reduce personal water use

The nature of measures to reduce personal water consumption is that they are complex, nuanced and often linked.

Commonly, the reference sources provided do not discuss one measure in isolation, so there is necessarily some overlap in content between sections of this report.

The evidence has been analysed both on its own merits and how interventions affect each other, where reference sources combine several interventions into scenarios.

The selection of sub-section headings under each call for evidence question was driven by the content of the evidence provided by the respondents.

The written call for evidence was followed by a series of 4 workshops designed to gain further insight into the evidence of the more complex measures.

The number of delegates was limited to facilitate highly focused discussions. Attendees were invited as experts with knowledge or experience of efficiency interventions in an operational or research environment.

The four topics were:

- water efficiency labelling
- household infrastructure and Building Regulations
- metering penetration and incentives
- per capita consumption (PCC) targets

These workshops were held in central London between 22 November and 2 December 2019. As with the written evidence provided, measures to reduce personal water consumption are linked and there is necessarily some overlap between the sections.

Findings from each workshop are discussed at the end of each section in this report. Findings from the per capita consumption (PCC) targets workshop is discussed separately in the section ‘per capita consumption target workshop summary’.

Summary of findings

Water efficiency standards

Building Regulations

Evidence submitted suggests that a potential update of Building Regulations, in conjunction with mandatory water labelling and tightening water supply fitting regulations is the most cost-effective measure to save water.

There is evidence to support the view that updating and tightening these regulations will reduce water consumption without mandatory water efficiency labelling, reducing consumption by 14 litres per person per day by 2065.

As opposed to 31 litres per person per day by 2065 with mandatory labelling.

It should be noted that there is some evidence to suggest that a home built to a set standard of water efficiency will not necessarily perform to this standard in practice.

Retrofitting

Retrofitting has greater marginal cost than installing water efficient fixtures and fittings into new build homes.

It is more cost-effective than installing rainwater harvesting or greywater recycling measures within individual homes.

During workshops, retrofitting was suggested to be most cost-effective in community scale schemes due to savings on labour and the ability to bulk buy devices.

Barriers were identified regarding the engagement process to encourage consumer take-up of these options.

Water efficiency label

Evidence submitted suggests that a government-led mandatory labelling scheme with incremental minimum standards for new buildings and products is the most cost-effective option to reduce personal consumption, with a cost benefit ratio of 1:200.

A scenario underpinned by Building Regulations which set personal consumption at 85 litres per day was found to be favourable.

This approach would provide a cost benefit ratio of 1 to 68 and savings in water and hot water energy bills of up to £17.4 billion and £8.8 billion respectively over 25 years.

This would also result in savings for water companies of up to over £1 billion in marginal cost.

This scenario was noted to deliver the greatest water savings at 8,987 billion litres of water over 25 years, equivalent to a cumulative 31.2 litres per person per day.

Examples from labelling schemes used abroad were drawn upon to provide evidence.

Australia's Water efficiency labelling and standards (WELS) scheme was provided as an example of a labelling scheme backed by a robust legislative framework and enforcement.

Concerns raised include cost-effectiveness of replacing existing schemes and enforcement of a mandatory scheme.

In the workshops, mandatory water efficiency labelling was highlighted as a key requirement to increase water efficiency.

And that is widely considered to be the only mechanism which can effectively tackle consumption across homes and non-domestic buildings.

Water fittings regulations

Evidence submitted suggests that changes to the water fittings regulations should be implemented alongside measures such as labelling and metering for higher levels of water savings and cost-effectiveness.

Changing building and fittings regulations without any labelling initiatives is predicted to reduce consumption by 14 litres per person per day by 2065.

Compared to a reduction of 31 litres per person per day by 2065 when linked to a mandatory government led labelling scheme.

The evidence suggests that without changing these regulations, it is not possible to cost-effectively reduce consumption below 100 litres per person per day.

Leakage from toilet cisterns was highlighted as a key concern among water company representatives.

These representatives suggested that the existing regulations had shortcomings that enabled products to be put on the market that could leak soon after installation and where leaks are hard to detect.

Evidence submitted to the call for evidence found that retrofitting variable-flush devices to older single flush toilets could help achieve a reduction in water demand of 8.5% per property.

However, this has been countered by more recent research which suggests that leakage from dual flush toilets contributes between 1.65% and 4.63% to personal consumption.

The evidence submitted stated that without tightening building standards and fittings regulations, it is not possible to find a way of cost-effectively reducing household consumption below 100l/h/d.

Smart metering and labelling were observed as to reinforce behaviour by:

- communicating leakage to customers
- triggering removal of products with short lifespans, prone to leakage from the market

Measurable options that deliver an increase in meter penetration

Smart metering with voluntary switching combined with mandatory labelling (with minimum standards for new buildings and products) offered the greatest water reduction forecast to result in a reduction of personal consumption to 82 litres per person per day by 2065.

Equivalent to a reduction in volume of 2,380 megalitres per day in England. This scenario, however, has a negative cost-benefit of £391 million.

Submitted studies suggested that metering could reduce household consumption by 10% to 16%.

This is likely due to behavioural change triggered by a variation in prices and more effective detection of leaks.

During workshops, water company representatives stated that behaviour change occurred after meter installation, but before charging by volume was implemented.

This suggests that behaviour change is not triggered solely by price variations.

Rainwater harvesting and water reuse schemes

Rainwater harvesting

Evidence submitted suggests installing rainwater harvesting (RWH) systems to existing homes is less cost-effective and provides less water savings than other measures.

Widespread home retrofitting of RWH or greywater reuse systems were predicted to save 875 thousand megalitres of water by 2065, and community rainwater harvesting systems in new developments 182 thousand megalitres by 2065.

The evidence suggested that RWH becomes more cost-effective when installed at the point of construction, workshop attendees shared this view, suggesting that RWH systems should be installed in all new buildings.

Non-potable water re-use

Evidence submitted generally assessed non-potable water reuse alongside rainwater harvesting systems (discussed above) when considering water efficiency potential.

Water reuse was raised in the workshops, and it was deemed crucial that all forms of water reuse are considered (including black-water reuse).

Community level water reuse schemes were stated to often be more appropriate than individual property reuse units because operating at a larger scale averages out variations in water use caused by changing behaviour and occupancy.

The use of water company incentives

Evidence submitted suggests that innovative tariffs could save 1,451.4 thousand megalitres of water by 2065 and individual and community incentives could save 562.3 thousand megalitres of water by 2065.

In the reference source which provided this data, the definition of innovative tariffs was deliberately left loose due to lack of evidence on their effectiveness.

Individual and community incentives were considered together.

Evidence submitted suggests that the use of water company incentives is most effective when delivered in partnership with other organisations (for example, local authorities) and delivered in conjunction with other water saving measures (for example, retrofitting).

In most cases, the impact of this measure will be limited to metered households.

Individual and/or community incentive schemes are difficult and costly to apply to all households and therefore are less cost-effective compared to other measures.

Both innovative tariffs and individual and community incentives had an estimated mid-level reduction of litres per person per day.

However, feedback from workshops suggested that innovative tariffs are unlikely to be appropriate in England for the near future as they are difficult to implement effectively.

Information provision to customers about water saving measures they can undertake

Evidence submitted supports a sustained and coordinated national campaign which uses multiple media and is integrated with enforcement of legislation and other water demand reducing initiatives.

Integration of water reduction targets as seen in the 'Target 140' and 'Target 155' campaigns in Australia were recognised for their success in achieving double the expected 10% reduction.

Creating campaigns based around water consumption behaviour alongside smart metering with consumption-based charging were also noted to prove useful.

National and regional media campaigns were both estimated to result in the same reduction of around 4 litres per person per day, due to a lack of evidence on the effectiveness of such measures.

A concerted myth busting process to provide consumers with adequate information was stated, during workshops, to make consumers more open to change which will boost other interventions.

Other relevant measures that could be used to reduce personal water use

Reference was made to several technologies, but without evidence of their effectiveness. These were: 'big data', including:

- data from smart metering
- improvements rainwater harvesting systems using research knowledge from overseas
- an online calculation tool to aid professionals in the home-building industry to design more water-efficient dwellings

The concept that water neutrality of new developments should be considered in the future was raised at the workshops.

Further, there was consensus from the workshops that the most appropriate way to reduce water demand using a target-based approach was to have:

- one national target for a percentage reduction in water demand
- individual water companies set their percentage reduction targets in their existing planning processes to contribute to the national reduction target
- other sectors and organisations commit to targets for water reduction in line with the national target, as is being seen for energy

Feedback from the workshops also indicated that a multi-stakeholder approach is needed, and that a combination of a mandatory water label linked to minimum standards for fixtures and fittings in Building Regulations along with a smart metering roll out were the key enablers.

Per capita consumption target workshop summary

In the PCC workshop, consensus was found for several topics regarding a potential personal consumption target:

- there is a need for a standardised target calculation methodology and demographic data sources
- a national percentage reduction target would be most appropriate
- targets need to be aimed at more economic sectors than water companies alone

Feedback from workshop delegates was that, if a challenging PCC is to be achieved, then water companies cannot act alone.

They would need support from government in the form of a mandatory water efficiency label linked to minimum standards for fixtures and fittings in Building Regulations.

Water efficiency standards

This section summarises evidence related to more ambitious water efficiency standards in Building Regulations for new homes, and what level of retrofitting would be needed should at different levels of water efficiency standards in Building Regulations for new homes be implemented.

Summary

Evidence submitted suggests that a potential update of Building Regulations in conjunction with mandatory water labelling and tightening water supply fitting regulations is the most cost-effective measure to save water.

There is evidence to support the view that updating and tightening these regulations will reduce water consumption without mandatory water efficiency labelling, but to a lesser degree.

Reducing consumption by 14 litres per person per day by 2065 as opposed to 31 litres per person per day with mandatory water labelling.

It should be noted that there is some evidence to suggest that a home built to a set standard of water efficiency will not necessarily perform to this standard in practice.

Retrofitting has greater marginal cost than installing water efficient fixtures and fittings into new build homes.

However, it is more cost-effective than installing rainwater harvesting or greywater recycling measures within individual homes.

During workshops, retrofitting was suggested to be most cost-effective in community scale schemes due to savings on labour and the ability to bulk buy devices.

However, there are barriers around booking appointments with customers to start these conversations.

Responses overview

A total of 34 relevant responses were received, comprised of 20 organisations, 9 individuals and 5 who were anonymous.

Free text responses comprised a diverse range of opinion, anecdotes and recommendations, which were submitted on a variety of sub-topics.

Six respondents referred to further written sources of evidence. A summary of these, and additional relevant references provided for other sub-sections of the call for evidence, has been provided in this section.

Building Regulations

The Pathways to long-term PCC reduction report for Water UK by Artesia Consulting (2019) presents the results from a Water UK study that assed the savings, costs and benefits of six scenarios for England and Wales/

The modelling incorporated several key assumptions, including:

- water company led interventions will start from 2025
- savings (and costs) are based on a peer-reviewed report by the Energy Saving Trust
- targets for home audits for some water companies reduced from 12.5% to 5% (interpreted to mean the number of households audited out of the customer base) to avoid double-counting of audits against current ambitions
- there is a decay in savings related to home audits
- water companies will carry out ‘one round’ of water audits, water company current ambition for metering
- different meter costs and savings to account for first time installations and upgrades to smart meters

The study applied confidence grades and sensitivity analysis to the savings estimates to take account of the reliability and accuracy of the evidence.

Costs and benefits were considered and assessed relative to the ‘current ambition baseline’ under which the national average personal consumption reduces from approximately 138 litres per person per day in 2021 to 113 litres per person per day in 2065.

It was further reported that current ambition will deliver the demand reductions that the National Infrastructure Commission recommend, achieving a national average personal consumption of 118 litres per person per day by 2050.

This is equivalent to a reduction in volume of 1,379 megalitres per day from 2020 to 2021.The focus of the report is the scenarios (combinations of interventions) but it also provides some results for individual interventions (whole life cost, water saved, and marginal cost are present values, discounted over 47 years):

- 'new homes standards – mandatory' refers to a requirement for developers to install devices to meet specific standards
    - mid-level saving of 20 litres per person per day at 100% take up
    - capital costs of £406 per household
    - operational costs of £2.10 per household per year
    - whole life cost: £2,011
    - water saved: 404,200 megalitres
    - marginal cost: £4,975 per megalitre saved
- 'new homes standards – voluntary' refers to a voluntary scheme for developers to install devices to meet specific standards:
    - mid-level saving of 20 litres per person per day at a 35% mid-level take-up
    - capital costs of £406 per household
    - operational costs of £2.10 per household per year
    - whole life cost: £704 million
    - water saved: 140,800 megalitres
    - marginal cost: £5,000 per megalitre saved

Both of the 'new homes standards' interventions would be linked to minimum standards in the 'mandatory water labelling – associated with Building Regulations and minimum standards'. Therefore, there is some overlap between these two interventions. The report's 'mandatory water labelling – associated with Building Regulations and minimum standards' intervention referred to water labelling of relevant products operated in association with Building Regulations and changes to The Water Supply (Water Fittings) Regulations 1999) (whole life cost, water saved, and marginal cost are present values, discounted over 47 years):

- mid-level saving of 27.230 litres per person per day
- capital costs of £0.00 per household
- operational costs of £0.10 per household per year
- whole life cost: £58 million
- water saved: 8,803,900 megalitres
- marginal cost: £7 per megalitre saved

The report concluded that, "on their own (without any labelling initiative), changes to these regulations alone would reduce consumption by 14 litres per person per day by 2065, equivalent to a volume of 1,052 megalitres per day" (p. 90).

With regards to the uncertainty of the effectiveness of reducing water consumption through building standards, two respondents to the call for evidence provided documents (Waterwise in its briefing note 'Advice on water efficient new homes for England' (Waterwise, 2018) and Policy Connect in its 'plan of action' 'Bricks & Water' (Policy Connect and Westminster Business Forum, 2018).

Which highlighted Thames Water research in 2018. The research assessed the water consumption of homes built to a standard of 105 litres per person per day under the Code for Sustainable Homes.

It was found that the occupants consumed water within a range of between 110 and 141 litres per day, depending on occupancy 5 to 25% more than the standard.

The research methodology was not stated in either of the references and the documents should be treated with caution.

Changes to Building Regulation combined with other interventions

Of all the scenarios analysed by Artesia Consulting (2019), a mandatory government-led scheme to label water-using products, linked to tightening Building Regulations and water supply fittings regulations ranked most highly on two of their key metrics:

- volume of water saved
- benefit-cost ratio
- marginal cost

Under this scenario water labelling of relevant products would be mandatory and managed by government.

The scheme would be operated in association with Building Regulations and minimum standards (based on changes to The Water Supply (Water Fittings) Regulations 1999).

This would mean that only products performing at a baseline level will be allowed on the market and referenced in the Building Regulations.

It is assumed that there would be 3 minimum standard intervention years over an 11-year period with the first minimum standard coming into force in year 5, then year 8 and finally year 11.

The intervention would reduce the marginal cost of a water labelling scheme by over 50% to approximately £7 per megalitre.

Further, “a scenario which combines a mandatory water labelling scheme (with minimum standards) and smart metering (with voluntary switching) offers the deepest reductions in water use” (p. ii), with PCC forecast to be 82 litres per person per day by 2065.

“This scenario has a negative cost-benefit of £391 million and a marginal cost of £450 per megalitre.

In comparison, without minimum standards for new buildings and products it is only possible to achieve a personal consumption of 87 litres per person per day by 2065 with a very significantly worse negative cost benefit of £3.34 billion at a marginal cost of £800 per megalitre” (p. ii).

In its free text response to the call for evidence, Waterwise said it supports a combination of mandatory water labelling (linked to tighter standards for fittings and in Building Regulations) and faster roll out of smart metering.

Providing unreferenced information, the organisation said the marginal cost per megalitre for this approach (£450 per megalitre) is far lower than supply side measures. For example:

- £633 per megalitre for a river abstraction
- £839 per megalitre for a water transfer
- £1,729 per megalitre for a new impounding reservoir

The impact on customer bills of the recommended option is calculated as £25.46 per year, largely from the cost of smart metering, but offset by household savings on utility bills of around £40 per household per annum - if its preferred mandatory water labelling option was implemented.

In its briefing note, Waterwise stated that requiring all new homes to be built to a PCC of 110 litres per day under Part G Building Regulations would cost a maximum of £9 per home (the costs of building homes at 80 litres per day would be higher.

However more research is required on the current costs and benefits of rainwater harvesting and water reuse) (Waterwise, 2018).

In contrast to enforcing stricter standards through the Building Regulations, Policy Connect referred to its Bricks and Water document (Policy Connect and Westminster Business Forum, 2018) and stated that according to:

“…the recent initiatives by Anglian Water and Severn Trent Water to discount the infrastructure charge (£750 per house) to developers.

If they built to tighter water efficiency standards (100 and 110 litres per person per day respectively), and/or do not connect to the surface water system shows (Note: not verified) that tighter targets are wholly achievable, and (referring to Artesia Consulting 2018).

Indeed even drastic reductions to 50 to 70 litres per person per day are feasible by 2065, and the technologies to achieve this already exist" (p. 32)."

Policy Connect concluded that installing water efficient fixtures and fittings into new build homes is easier and cheaper than to retrofit these measures within the existing housing stock.

Retrofitting

The report 'Evidence for Large-Scale Water Efficiency Phase II Final Report' (Waterwise, 2011) included analysis of data from 9 water company-led water efficiency retrofitting trials using a five-step methodology:

1) consult stakeholders to understand the gaps in the current evidence
2) collect evidence from water companies and other water efficiency practitioners, and then assess the quality of the evidence
3) analyse the data
4) assess the background trend in demand as described by water company consumption data presented in 2010 June return submissions [1]
5) construct scenarios and analyse the costs and benefits, in terms of water savings, for these scenarios using the spreadsheet tool developed under the UKWIR 'A Framework for Valuing the Options for Managing Water Demand' WR25/3 project[2].
6) The method of calculating average incremental social cost[3] (AISC) was stated to be consistent with the framework for valuing the options for managing water demand approach, the 'Economics of Balancing Supply and Demand' planning method used by water companies in England for supply-demand planning and included in the Water Resource Planning Guidelines since 2004.

[1] Until 2010 to 2011, each company sent Ofwat detailed information about their performance each year. This annual data submission (or 'June return') was published to allow customers and stakeholders to understand each company's performance.

[2] A project to: 1) develop a best practice framework for assessing the contribution of demand management to long-term supply/demand balance planning and 2) develop an online evidence database for demand side measures and develop a wider understanding and consensus for the improved use of economic analysis in considering the role of demand management in water resource planning and the supply and demand balance.

[3] A calculation method of comparing the costs and benefits of options. The variables are net present value of the capital expenditure, net present value of the operating cost, net present value of the operating expense saving, net present value of the social cost of the scheme, net present value of the total water saved in megalitres.

It was found from trial data that:

- measured water savings of up to 34.0 litres per property per day are possible from applying multi-measure water efficiency retrofitting using current technology and means of engaging customers to encourage behaviour change
- the average cost of energy saved ranged from £1.30 to £44.30 per property per year
- there was a wide variation in the cost of retrofitting, which ranged from £41 to £240 per property
- in monitoring, over 2.8 years, it was found that the likely half-life of the water savings (the rate at which they would decay to half their value) would be about 8.4 years
- highlighting variation in what might be achievable by individual households, the analysis indicated that using current methods alone would mean, "…it is unlikely that households consuming 400 litres per day or more would be able to reduce their consumption sufficiently to meet the (historic Labour government)long-term government ambition of 130 litres per person per day" (p. 86)

Waterwise's Water Efficiency Strategy for the UK (Waterwise, 2017) referred to, 'Guidance on Water and Associated Energy Efficiency for the Welsh Housing Quality Standard for Retrofit Programmes', published in 2012.

The guidance set out the key reasons for saving water in social housing and detailed what providers can do in procurement and retrofit programmes.

It estimated that if every social housing property in Wales had water-efficient taps and a retrofitted toilet and shower, combined energy and water bills could be reduced by £3.5 million a year[4].

The Bathroom Manufacturers Association (BMA) noted the advantages of a bathroom scrappage scheme, stating that "this has the potential to be the best path to take on the road to water efficiency.

The ceramic product/material that would be taken out is able to be grounded and turned to dust, this material can then be used within the manufacturing of new products, therefore reducing the amount of waste created and entering a variety of waste streams".

[4] The report stated that if 32% of social housing in Wales represented "over 70,000" homes. Extrapolating to 100% equals >218,750 properties and <£16 per property.

Retrofitting case studies

The Preston water efficiency initiative (Waterwise, 2009a) was a water demand-management pilot project which aimed to reduce levels of water consumption of tenants living in social housing and provide recommendations for future retrofitting of water efficiency devices in existing stock.

The key components were:

- the installation of new dual flush toilets and water efficient showers to 160 dwellings retrofitting of water efficiency devices, such as a dual flush conversion product and a leakage alarm, to 205 properties
- installation of a pilot rainwater harvesting system to a block of 12 flats (which also received a bathroom refurbishment, comprising a dual flush toilet and low volume showers)
- a limited promotional and awareness campaign

Retrofit devices reduced water use by 14% (23 litres per person per day based on an original estimate of 165 litres per person per day by the project team) providing the best value for money savings (£1.10 per m^3).

Dual flush toilets and showers resulted in 25% water savings (41.25 litres per day based on an original estimate of 165 litres per person per day) and provided relatively good value for money savings (£1.70 per m^3).

Rainwater harvesting showed an additional (to the bathroom refit) 5% savings, which was concluded by Waterwise to have provided poor value for money (£30 per m^3, which does not include costs of maintenance and pumping).

Rainwater harvesting also experienced a range of technical issues in installation and maintenance.

An Environment Agency report, 'Water Efficiency in the South East of England – Retrofitting Existing Homes' was submitted and reviewed.[5]

A review of methods used by the Environment Agency to estimate domestic personal consumption of countries reported to have lower average personal consumption than England and Wales found that "retrofitting older cisterns with variable flush mechanisms

[5] https://waterwise.org.uk/wp-content/uploads/2019/09/EA-2007-Water-efficiency-in-SE.pdf

should be promoted as a way of reducing toilet flushing volumes to levels comparable with the countries reviewed" (p. 27). Which, on average can lead to an 8.5% reduction.

It also found that, amongst other measures, "building codes, such as the Code for Sustainable homes, designed to achieve water efficiency will need to be used" (p. 4) (Aquaterra, 2008).

However, more recent research revealed that leaks from dual flush toilets are now contributing between 1.65% and 4.63% to personal consumption, somewhat negating these predicted savings (Ricardo, 2015).

Specific technologies aimed at reducing water use

Some respondents referred to reports focussed on specific water consumption reducing technologies.

For example, research into retrofitting toilets (Environment Agency, 2005) describes a trial for which two devices – Ecoflush and Variflush – were retrofitted and trialled in 133 domestic properties with feedback collected from 271 customers.

In the weeks after the devices were installed, water demand fell by an average of 8.5% per property.

Feedback from customers and installers was reported to be generally positive. The report concluded that the devices could help reduce domestic demand for water.

However, the overall benefits would depend on how the devices are promoted and distributed.

Impact on per capita consumption

In relation to per capita consumption, Artesia (2019) concluded that (for England and Wales):

- the current ambition in the latest water company plans will deliver the demand reductions that the National Infrastructure Commission recommends[6], achieving a

[6] The National Infrastructure Commission report, preparing for a Drier Future recommended reducing the demand for water by around 1,400 million litres per day by 2050. This would result in a per capita consumption rate of 118 litres per head per day by that year.

national average personal consumption of 118 litres per person per day by 2050. This is equivalent to a reduction in volume of 1,379 megalitres per day from 2020 to 2021

- tightening Building Regulations and water supply fittings regulations is particularly important. Without changing these regulations, it is not possible to find a way of cost-effectively reducing personal consumption below 100 litres per person per day
- "the single most cost-effective intervention to save water is a mandatory government-led scheme to label water-using products, linked to tightening Building Regulations and water supply fittings regulations. This would reduce consumption by 31 litres per person per day or 2,012 megalitre per day by 2065"[7] (p. 1). It is forecast to result in a PCC of 82 litres per person per day by 2065, equivalent to a reduction in volume of 2,380 megalitres per day
- on their own (without any labelling initiative), changes to the regulations alone would reduce consumption by 14 litres per person per day by 2065, equivalent to a volume of 1,052 megalitres per day (p. 2)

In its written free text response, Policy Connect referred to its Bricks and Water inquiry (Policy Connect and Westminster Business Forum, 2018) and recommended that:

"The government should mandate a maximum consumption of 100 litres per person per day and enforce this through Building Regulations using a fittings-based approach".

The recommendation in 'Bricks and Water' was on the basis that "it was viewed by many respondents (to the organisation's inquiry) that more ambitious targets are feasible and necessary.

The recommended intervention was adoption of "a new mandatory 'Bricks and Water' Sustainability Code" which the document infers could include mandatory water efficiency labelling for fixtures and fittings, but details of which are imprecise.

Policy Connect also referred to research by Artesia produced for Ofwat (Artesia Consulting, 2018) , which considered the potential for making deep reductions in household water consumption and water lost from customer supply pipe leaks, up to 2065.

It was based on a wide consultation with experts in the UK and abroad and a review of research. Future household demands were estimated through the use of scenarios and modelling of water use in the home.

The report highlighted that, “there were many who advocated the importance of tighter building and planning control around new developments and ensuring all homes are water efficient - with all retrofits to be to a specified standard” (p. 18).

The report concluded that it is possible to achieve average household consumption of between 50 to 70 litres per person per day in 50 years without a reduction in the level of utility or quality of water use (though it is not clear from the report if that conclusion was from stakeholder analysis or modelling, or to what extent changes to building relations would be a factor).

The report further concluded that technologies and services exist now that can deliver these savings. Potential costs and implications were outside the scope of the research.

In its written free-text response, Waterwise proposed that “government adopt a target to get personal water use below 100 litres per day by 2050.

In line with the commitment made in the 25-year Plan for the Environment (“to set an ambitious personal consumption target and agree cost-effective measures to meet it”).

To achieve that, it recommends:

- bringing forward proposals for a mandatory water labelling scheme linked to tightening water efficiency standards for fittings and in Building Regulations
- promoting a faster roll-out of smart meters
- removing restrictions on metering outside areas of ‘serious water stress’ so water companies can switch customers to metered billing

Beyond 2050, Waterwise would welcome halving personal consumption in the longer term. It referred to recent review work (Artesia Consulting, 2019) and highlighted that, “based on current ambition in water company Water Resource Management Plans, average PCC will be at 118 litres per person per day by 2050.

Compared to 143 litres per person per day now and, with a more supportive policy framework, it is very possible to achieve water use levels of around 92 litres per person per day by 2050, getting to around 82 litres per person per day by 2065.”

The Home Builders Federation wrote further reductions in per capita water usage will necessitate compromises with water fitting delivery performance versus customer expectations.

This will have cost repercussions as manufacturers rise to the challenge of introducing improvements in fixtures, fittings and appliances that provide greater reductions in water usage.

To achieve 80 litres per person per day without compromising homeowner expectations may well require expensive offset solutions such as rainwater harvesting”.

Leaky Loos Phase II (Ricardo, 2015) described the findings from a physical investigation into water leakage from domestic toilets in the UK.

The research approach was the physical investigation of leaking toilet cisterns. This helped to find out the scale of the issue followed by a targeted investigation of the cause of the leaks. The research was followed up by a stakeholder consultation and strategy development.

The key finding was that the overall contribution of toilet leakage to the average PCC is 1.65% to 4.63%, which is less than the previously recognised rate of 9%.

As such, the report concludes that targeting toilet leakage may not be as cost-effective an approach to reducing customer consumption as initially anticipated.

Feedback from workshops

A series of 4 workshops were held between 22 November and 2 December 2019 to discuss the themes in this call for evidence in greater detail.

Four main views came forward from the workshops with regards to Building Regulations:

- there was consensus that part G of the Building Regulations is not fit for purpose and does not drive best practice around water efficiency. None of the attendees (including water companies, housing developers and government departments) felt that it was appropriate
- the calculation-based approach should be removed from part G of the Building Regulations as part of the equation is behavioural data which developers do not have access to. The fittings-based approach, which is already included in part G, was deemed adequate. But it was felt that the most appropriate method was to link Building Regulations to minimum standards in a mandatory water efficiency label. No participants disagreed with this statement, however there were comments around the need for adequate testing of fixtures and fittings, which multiple water company representatives had evidence to show was not happening at present
- the representative from the Ministry of Housing, Communities and Local Government referred attendees to a GOV.UK web page stating that the Building Regulations are due to be reviewed. Water company attendees were working under the assumption that this would likely happen before a water efficiency label was made mandatory (if this happens at all). Attendees made it clear that it would be crucial to build in a means to update the Building Regulations if a mandatory water label is introduced after the Building Regulations are updated in order to drive best practice through minimum standards linked to the mandatory water label
- participants were generally in agreement that having a litres per person per day figure in the Building Regulations was not appropriate as it does not allow for futureproofing. It was also agreed that having two figures to account for water stressed areas was not

appropriate and that the UK was likely unique in having this arrangement. Attendees agreed that the water stressed area designation was not fit for purpose for setting building standards as an area can be in water deficit without being water stressed

Water efficiency label

This section summarises evidence related to the introduction of a mandatory, government-led water efficiency label.

Summary

Evidence submitted suggests, based on modelling, that a government-led mandatory labelling scheme with incremental minimum standards is the most cost-effective option to reduce PCC, with a cost benefit ratio of 1:200.

A scenario which set PCC at 85 litres per day with a labelling scheme underpinned by Building Regulations was favourable with a cost benefit ratio of 1:68 and savings in water and hot water energy bills of up to £17.4 billion and £8.8 billion respectively over 25 years.

This would also result in savings for water companies of up to £1,012 million in marginal cost.

This scenario was noted to deliver the maximum water savings at 8,987 billion litres of water over 25 years, equivalent to a cumulative 31.2 litres per person per day.

Examples from labelling schemes used abroad were drawn upon to provide evidence. Australia's WELS Scheme was provided as a good example of a labelling scheme backed by a robust legislative framework and enforcement.

Concerns raised include cost-effectiveness of replacing existing schemes and enforcement of a mandatory scheme.

In workshops, mandatory water efficiency labelling was highlighted as a key requirement to increase water efficiency and as the only mechanism which can tackle consumption across homes and non-domestic buildings.

Responses overview

A total of 15 respondents provided a relevant response, comprising 9 organisations and 6 individuals. Among these, 3 responses were signposts to other questions or to responses provided by other respondents and did not provide a specific opinion.

In the free text responses to the call for evidence, there was a mix of responses regarding a mandatory government-led water efficiency label.

Of those who did not support a mandatory government-led water efficiency label (two individuals and three organisations) some cautioned against cost-effectiveness of replacing an existing voluntary scheme with a new system.

Which might be evaded by consumers through illegal alternatives purchased on the internet.

Eight respondents referred to further written sources of evidence. A summary of these, and additional relevant references provided for other sub-sections of the call for evidence, has been provided.

Costs and benefits

An independent review of the costs and benefits of water labelling options by the Energy Saving Trust (Energy Saving Trust, 2018) reviewed various scenarios (see Table 2:).

That compared different water labelling approaches including government versus industry led schemes and mandatory versus voluntary schemes.

According to the review, a mandatory labelling scheme (Scenario 2) was observed to have the lowest costs per million litres saved at £380 and a cost to benefit ratio of 1:200, the highest among all scenarios assessed.

These costs include set-up, administration, manufacturing and static costs for standards/policy development such as:

- research advisory groups
- marketing
- enforcement
- research and development activities

An average incremental social cost (AISC), ranked the mandatory labelling scheme scenario the highest with an AISC of -£0.755/m^3.

Table 1: List of scenarios developed by the Energy Saving Trust's Independent Review (2018)

Scenario	Characteristics
1	Mandatory, government-led scheme with no associations (with any other schemes, for example, minimum product standards)
2	Mandatory, government-led scheme associated with Building Regulations and minimum standards (changes to The Water Supply (Water Fittings) Regulations 1999)
3	Mandatory, government-led scheme associated with consumer incentives
4	Voluntary, government-led scheme with no associations
5	Voluntary, government-led scheme associated with Building Regulations
6	Voluntary, industry-led with no associations (Business as Usual - BAU)
7	Voluntary, industry-led associated with intensive marketing
8	Voluntary, industry-led associated with requirements for funding

The extension study of the above independent review (Energy Saving Trust, 2019) built on the 2018 cost and benefit analysis discussed above to compare a different set of scenarios looking at targets (Table 3).

These scenarios were either described in terms of litres per person in line with the Buildings Regulations part G water efficiency calculator for new homes or based on other existing standards and calibrated to give an equivalent rating.

Table 2: Descriptions of scenarios used in the extension study (2019)

	Scenario	Description
1	110 litres per day	Current optional Building Regulations
2	100 litres per day	(No description provided in the report)
3	95 litres per day	(No description provided in the report)
4	85 litres per day	(No description provided in the report)
5	CSH 3	Code for Sustainable Homes 3 Water Standards (103 litres per day equivalent)
6	AECB Good Practice	Associate of Environmentally Conscious Builders Good Practice Water Standards (100 litres per day equivalent)
7	AECB Best Practice	Associate of Environmentally Conscious Builders Best Practice Water Standards (93 litres per day equivalent)
8	AECB Best Practice and Behaviour	Associate of Environmentally Conscious Builders Best Practice and Behaviour Water Standards (86 litres per day equivalent)

The baseline was based on a blended scenario between councils that have opted for the 110 litres per day and the regulatory 125 litres per day.

This study showed that the 85 litres per day scenario has the highest “estimated absolute cost of £405 million over 25 years”.

However, the benefits include a “cumulative £17.4 billion saving from household water bills and £8.8 billion saving from household hot water energy bills” (p. 31).

The saving estimated for water companies for not having to supply the additional water is “£1,012 million in marginal cost”.

The total cost of implementing the 95 litres per day scenario over 25 years was estimated at £358 million with “cumulative £16.2 billion saving from household water bills and £7.4 billion saving from household hot water energy bills”.

Water companies’ savings are estimated at £910 million. But both scenarios showed an identical cost benefit ratio of 1:68.

Stakeholder views

Referring to the success of energy labelling of white goods, Policy Connect (Policy Connect and Westminster Business Forum, 2018) emphasised the need for a mandatory water efficiency labelling scheme for household appliances to help consumer choice and relatively quickly eliminate least efficient products.

They discuss the potential for water efficiency in new builds through design standards and labelling.

The report Water Efficiency Strategy for the UK (Waterwise, 2017) said that “a mandatory label would increase use of water-efficient products in water company incentive and retrofit programmes and via new build planning regulations” (p. 30).

Stakeholder engagement from the extension study of water labelling (Energy Saving Trust, 2019) revealed that a mandatory labelling scheme would make the current self-regulating industry more stringent but not necessarily more successful.

Stakeholders claimed this would be due to, “reduced product choice as the range of performance within the product bands would be reduced, the cost would increase due to 3rd party verification and testing and the challenges to policing the system” (p. 51).

Other points of concern raised include:

- policing and enforcement of the scheme, with reference to challenges in the industry and failures to monitor and update
- barriers to international trade from a UK-only label
- compulsory buy-in from all stakeholder groups for promoting and adhering to the scheme
- need for a coherent and accessible rating system for consumers
- a comprehensive and complementary behaviour change campaign

The Bathroom Manufacturers Association (BMA) said in its response that “labelling products such as the Unified Water Label can be a great way to increase awareness of both energy and water usage”.

It went on to say that “this is only part of the issue, having a label on a product can offer information on that particular product, but it cannot change the behaviour of the consumer”.

It also stated that a comprehensive approach is needed for reduced water usage. Consumers will also need to understand the system, as to understand what, how and why they are saving water, taps and showers are only the delivery method, many consumers do not understand the processes behind them”.

The BMA stated that there are advantages of a voluntary water label over that of a mandatory label, including that a voluntary water label would take less time to deliver Eco-design policy directives, therefore costing less overall.

They also noted the benefits of a combined water and energy label, “not only to enhance knowledge of the product itself but also the use of water”.

The BMA raised concerns that water use cannot just be reduced as this may lead to public health concerns, more stagnant water found within the pipes reducing the product efficiency and lower water quality based on a lower turnover from the system.

And that any suggestions put forward/initiated must be evidence-based in order to provide the best data and protection.

Case studies outside of the UK

International water labelling schemes, including the Water Efficiency Labelling Scheme (WELS) in Australia were referred to (Energy Saving Trust, 2019).

The WELS scheme demonstrates a cost to benefit ratio of 1:29 for the period of analysis (2006 to 2010) and is projected to be 1:96 towards the end of the scheme’s lifetime by 2026.

This high ratio is attributable to its benefits and linked policies and initiatives. Benefits from the WELS Scheme were linked to prices for water, electricity, natural gas and greenhouse gas emissions.

Total bill savings exceeded the costs at an “estimated net benefits of over AUD 23 billion (£12.3 billion) for the entire project duration” (p. 13).

Customers benefited from cheaper bills, and water utilities from “decreased need for supply side augmentations.”

However, it was also noted that lower socio-demographic groups may not benefit from water efficiency in the homes as much as other groups.

Other benefits were standardised information at point of sale, regulated water efficiency products and reduction in volumetric water consumption.

The principal costs associated with the scheme were “registration of products, compliance monitoring and enforcement, communications, setting Australian standards and policy advice” (p. 9).

The funding mechanism for the project ensured that “costs are mostly incurred by wholesalers, manufacturers and importers whereas the benefits are for customers and

water utility companies" which according to the Energy Saving Trust is "potentially relevant" to the UK (pp. 9 to14).

The mandatory WELS scheme is based on an 80:20 costs sharing model between industry and government.

Overlapping and complementary labelling schemes that function in parallel with each other (for example, Smart Approved WaterMark, Australia's Equipment Energy Efficiency) and a robust legislative framework for implementation and enforcement through the WELS Act 2013 were identified as factors that contributed to the success of the Australian labelling scheme.

Unlike the WELS scheme, the Watersense label in the United States of America is a voluntary scheme that is fully funded by the government.

For every federal dollar spent, "consumers have saved 51,000 gallons (193,000 litres) of water and USD 1,100 (£851)" (p.15).

The US model is based on the 30% domestic water use for outdoor purposes such as irrigation (up to 70% in dry climates).

The report suggested that the way water is used in the UK is different from the United States and suggests more indoor than outdoor use. This implies that the focus will shift from external use products to indoor use.

A review of various international water efficiency labelling schemes (IWA Efficient Urban Water Management Specialist Group, 2019) identifies the Australian and American labels discussed above as successful with quantifiable water savings and in their ability to widen their market and change consumer behaviour.

This study was a stakeholder analysis based on research and workshops involving panel discussions on comparisons of different international labelling approaches and best practice.

While many factors affect the success of voluntary schemes, the review found that mandatory schemes were often more successful.

Their success as per this study is "possibly linked to the nature of the scheme lead" (government, industry or NGO). Voluntary schemes that are government-led show most success (p. 51).

The success of the voluntary Watersense scheme was attributed potentially to its "standing as a quality mark rather than a rating scheme" making it easier for manufacturers to test their products against the scheme criteria.

A major contributor to failure of some schemes was identified as lack of public awareness.

Impact on per capita consumption

In its 2018 independent technical review, (Energy Saving Trust, 2018), the Energy Saving Trust observed that:

- scenario 2 (representing a government-led mandatory labelling scheme with incremental minimum standards) demonstrated the highest water savings of up to 160,324 megalitres over a ten-year period
- scenario 2 also showed the "the highest savings per household per day throughout, achieving 14.4 litres per day reduction in 10 years, rising to 68 litres per day in 25 years". When translated as personal consumption, this translates to reductions of 6.3 litres per person per day and 31.4 litres per person per day respectively
- the business as usual (BAU) scenario with voluntary schemes (Scenario 6) showed the least water savings at 8,316 megalitre over a ten-year period

The extension study by Energy Trust (Energy Saving Trust, 2019) noted that an 85 litres per day scenario demonstrated maximum water savings at 8,987 billion litres of water over 25 years, equivalent to a cumulative 31.2 litres per person per day.

This involves currently available technology using "fitting assumptions extracted from the Australian water labelling scheme database (WELS)" (p. 31).

In contrast a 95 litres per day scenario that uses fittings that are "commercially available and routinely fitted in a domestic situation" (p. 31) saves 8,082 billion litres of water over 25 years, or 27.2 litres per person per day.

Artesia Consulting (2019) favoured a mandatory government-led scheme to label water-using products, linked to tightening Building Regulations and water supply fittings regulations as the "single most cost-effective intervention to save water".

They concurred with the Energy Saving Trust's (Energy Saving Trust, 2018) Water Labelling Phase 2 Project – Technical Report (p. 90) because it tested and then used the same base data.

A combination of data analysis, stakeholder consultation and modelling conducted for Ofwat by Artesia Consulting (2018) evaluated a number of 'response measures' that could address the need for deep reductions in household water consumption (see Figure 1).

The findings of the report listed mandatory labelling as one of the "first steps" to achieve greater reductions in household water consumption.

In addition to leadership for concerted action, metering and tariffs, behaviour change and open data among others.

The Leaky Loos Phase II report (Ricardo, 2015) considers product labelling essential in "fully understanding the causes of toilet leakage and in reducing potential future leakage

associated with non-compliant products" (p. 44) as the lack of labelling of products (such as components of cisterns) makes it difficult to verify product compliance at installation.

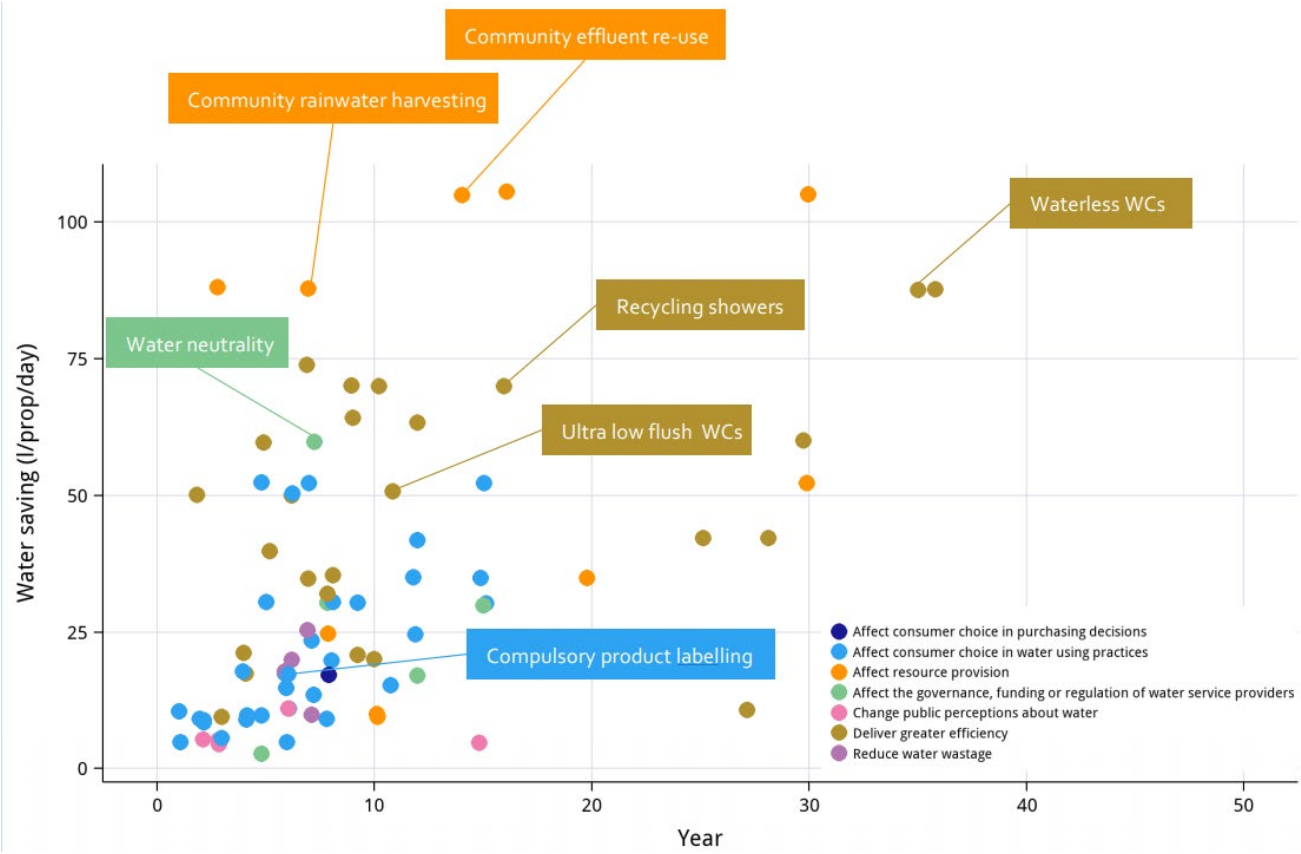

Figure 1: Artesia Consulting report's (Artesia Consulting, 2018) chart comparing measures for reductions in household water demand and potential impact in terms of water saving and time for widespread delivery.

Feedback from workshops

The BMA were unfortunately unable to join the workshop, but as a significant contributory body to this area they were given the opportunity to submit a written response to the workshop. Their full response can be found at the end of this report.

Six main views came forward from the workshops with regards to a mandatory water efficiency label:

- there was unanimous agreement between attendees that a mandatory, government-led water efficiency label is the largest water saving opportunity for the UK from a cost-benefit perspective in terms of the volume of water saved, and is the only mechanism which would influence customers and manufacturers universally. Delegates referred to a report commissioned by Water UK (Artesia Consulting, 2019) as the key source of evidence. It must be noted that the Bathroom Manufacturers Association were not in attendance

- the priority should be to label bathroom fixtures and fittings and white goods, then to extend to all water using products in the home and outdoors, including products such as coffee machines
- a mandatory water efficiency label has long-term rewards through triggering behaviour change, therefore rendering the need for retrofitting obsolete. Water company representatives suggested that through influencing buying decisions towards more efficient products and thus influencing manufacturers to continue innovating to develop increasingly efficient products, in 20 years' time the natural churn of products would ensure the majority of households do not need to be retrofitted
- the label should ensure that products are both fit for purpose and efficient to avoid unintended consequences. For example, when energy efficient lightbulbs were rolled out, problems with performance led to consumers avoiding these 'A' rated products, and favouring products with lower energy efficiency due to the belief that these would perform better
- a mandatory water label was stated to have the widest impact across all sectors (household consumption, commercial consumption, product manufacturing, building developers), when linked to minimum standards in Building Regulations
- there was consensus that the label would need to be administered by an independent body due to the number and range of products which would be covered by it (making it inappropriate to be administered by a trade body, as is the case for the voluntary label at present). The Australian WELS scheme was cited as the best example, and it was suggested that development of a UK scheme should start with contacting the organisers of the WELS label to talk through logistics, as well as consideration of the ISO standard based on this label. The report by the Energy Saving Trust (2019) was also referred to regularly and sets out how schemes are monitored internationally. Annex 7 of the Energy Saving Trust report (2019) provides an Action plan for mandatory labelling set up and refers regularly to the energy efficiency label for examples of monitoring and other aspects

Water fittings regulations

This section summarises evidence related to changing water fittings regulations to improve the water efficiency of households.

Summary

Evidence submitted to the call for evidence noted that retrofitting variable-flush devices to existing toilets could help achieve a reduction in water demand of 8.5% per property.

However, this has been countered by more resent research which suggests that leakage from dual flush toilets contributes between 1.65% and 4.63% to personal consumption.

Evidence submitted suggests that to achieve water consumption below 100 litres per person per day for households, changes to water fittings regulations are essential.

Evidence submitted suggests that changes to the water fittings regulations should be implemented alongside measures such as labelling and metering for higher levels of water savings and cost-effectiveness.

Leakage from toilet cisterns due to product compliance shortcomings associated with the existing regulations was highlighted as a key concern among water company representatives.

Responses overview

A total of 17 respondents provided a relevant response, comprising of 8 organisations, 7 individuals and 2 who were anonymous.

Free text responses from organisations, including a regulatory body and water companies, advised that the existing regulations were outdated and needed to be reviewed to include water efficiency within their remit.

In their free-text responses, three respondents raised concerns around the risk of decrease in functionality of fittings due to reduced flow.

Responses from five remaining respondents were unclear, with some of them providing names or links to specific water efficient devices with no specific opinions on the water fitting regulations.

Three respondents referred to further written sources of evidence. A summary of these, and additional relevant references provided for other sub-sections of the call for evidence, has been provided.

Tackling toilet water cistern leakages

Most of the evidence for this section of the call for evidence focussed on leakage from toilet water cisterns due to changes in the water fittings regulations.

The Leaky Loos Phase II (Ricardo, 2015) investigation reviewed the effectiveness of the 1999 Water Supply (Water Fittings) Regulations and recommended government and water company interventions including:

- the re-introduction of the requirement for an external overflow into the regulations
- increased enforcement of current regulations
- increased water regulations inspections

In a position summary on ‘leaky loos’ (Waterwise, 2019a), Waterwise called for improvements in the enforcement processes in addition to other measures.

This was a summary position statement by Waterwise that reflected on the problems caused by ‘leaky loos’ and the need for a UK-wide approach including a national campaign, a testing regime and scaling up of best practice.

The Environment Agency’s report (2005) on a trial of water saving flushing devices noted that, “retrofitting variable-flush devices to existing toilets in domestic properties achieved an average reduction in demand for water of 8.5% per property” (p. 27).

However, the report adds that while low flow fittings help reduce water demand, their “overall benefits would depend on how the devices are promoted and distributed.

It might be necessary to conduct pilot studies on a wider scale to establish the take-up rates by customers” (p. 5).

Waterwise’s (2017) Water Efficient Strategy for the UK recommends updating the fittings regulations to require that “all dual-flush and low-flush WCs (toilets) use syphon mechanisms” (p. 35).

Costs and benefits

Environment Agency’s (2007) research on water efficiency measures in south east of England found that:

“the average incremental social costs of retrofitting water efficiency measures compare favourably with the costs of traditional resource development schemes” (p. 1).

While legislation was not specifically analysed, results from statistical analysis (specific to the south east region of England) using a variety of measures showed that:

- compulsory metering combined with fitting of variable flush retrofit devices and subsidising the end of life replacement of toilets with low flush models returns yields of 77.2 megalitres per day (+/-25.3 megalitres per day) for £1.36/m^3 (+/- £0.39). The same scheme, but with metering on change of occupancy, can save 31.9 megalitres per day (+/-10.5 megalitres per day) for £1.15/m^3 (+/-£0.30)
- savings from compulsory metering, combined with a range of low water use fittings, were just as high but cost more: 77.5 megalitres per day (+/-25.8 megalitres per day) for £1.62/m^3 (+/-£0.49). Low use fittings combined with metering on change of occupancy is estimated to save 22.4 megalitres per day (+/-6.6 megalitres per day) for £1.50/m^3 (+/-£0.42)
- there is a 95% chance of achieving savings of approximately 65 megalitres per day from each of the combined schemes when implemented with compulsory metering and a 75% chance of achieving approximately 70 megalitres per day

Impact on per capita consumption

Artesia’s research for Water UK (Artesia Consulting, 2019) states that reducing consumption to below 100 litres per person per day for households is not possible without changing the water fittings and Building Regulations.

They added, however, that “changes to these regulations alone would reduce consumption by 14 litres per person per day by 2065, equivalent to a volume of 1,052 megalitres per day.

They would reduce the marginal cost of a water labelling scheme by over 50 percent to approximately £7 per megalitre” (p. ii).

Results from their modelling showed that interventions linking changes to regulations with labelling through a mandatory water labelling scheme, associated with minimum standards for fittings regulations.

Show the highest water savings at an additional 31 litres per person per day (or 2,012 megalitres per day) - a PCC of 82 litres per person per day by 2065.

While this intervention ranked second after ‘increased media campaigns and schools’ education’ in terms of lowest marginal cost, it delivers the highest (discounted) water savings at 8.8 billion litres over 47 years.

Independent of labelling, water savings from changes to regulations would be 5 billion litres.

Feedback from workshops

Four main views came out of the workshops with regards to water fittings regulations to improve water efficiency of homes:

- discussion of water fittings regulations commonly focused on the problem of ‘leaky loos’. In most cases, manufacturers self-report against these regulations and only make half of the system – cistern or bowl. Test standards can only be conducted on a whole toilet, so when manufacturers are not making the whole toilet it is not possible to do the required tests. Changes must be made to ensure testing is fit for purpose
- the representative from Thames Water stated that testing for existing regulations should imply a product lifespan of 42 years, but many (particularly dual-flush) toilets are breaking after 12 months (meaning periods of leakage occur more frequently). Thames Water has been collecting faulty parts and building a database on these issues
- a mandatory water efficiency label should be linked to minimum product standards, including time before leaks occur, which would help remove products with short lifespans from the market
- smart metering allows identification of leaks, enabling the water companies to communicate with customers to tackle those leaks

Options for changing water meter use

Summary

Evidence submitted compared three options for metering penetration. Smart metering with voluntary switching combined with mandatory labelling (with minimum standards) offered the deepest water reduction forecast to result in PCC of 82 litres per person per day by 2065, equivalent to a reduction in volume of 2,380 megalitres per day.

This scenario, however, has a negative cost-benefit of £391 million.

Studies suggested that metering could reduce household consumption by 10 to 16%.

This is likely due to behavioural change triggered by a variation in prices and more effective detection of leaks.

During workshops, water company representatives stated that behaviour change occurred after meter installation but before charging by volume was implemented, suggesting behaviour change is not triggered solely by price variations.

Implementation of metering and other related interventions will require regulatory or legislative support and early communication and responsiveness to individual needs of customers for successful uptake.

Responses overview

A total of 14 relevant responses were received, comprising 6 organisations, 6 individuals, and 2 who were anonymous.

The topics raised by the respondents in their free text responses were diverse, including:

- advocating the use of water meters in general, including its cost-saving potential
- beliefs such as that fixing leaks from toilets should come first and that water meters should not be universal

Two respondents referred to further written sources of evidence. A summary of these, and additional relevant references provided for other sub-sections of the call for evidence, has been provided.

Options

Three potential options were considered by Artesia Consulting (2019) to assess ways to change use of smart metering in households among other interventions to achieve reductions in personal consumption. These options did not reflect government policy, but were considered by way of example of what could be done or has been done in other countries.

1. Metering by region by water companies supported by government - water companies would install smart meters in 90% of homes. Bill comparisons over a two-year period are used to encourage homes to switch to meters, after which they are automatically switched to a metered bill combined with support through home visits, over the telephone and safeguards for vulnerable and low-income customers. All existing metered households would also switch to smart meters.
2. Voluntary metering by region by water companies - water companies would install meters in 63% of homes, reflecting the proportion of households "likely to have a lower water charges on a metered bill, compared to an unmetered bill" (p. 20). Bills over a two-year period are used to encourage customers to make the switch themselves with support and safeguards as explained in 1. While this is a voluntary scheme, companies will be able to charge by meter after a change in property ownership (although water companies can change to metered charges on change of occupancy). All existing metered households would also switch to smart meters.
3. Full universal metering –would require a change in policy and regulation. Flats and other difficult to meter properties would be included which would as a result require "technology innovation or extensive (and expensive) pipework separation" (p. 2). All existing metered households would also switch to smart meters.

The 3 options were compared for their estimated savings and uptake or coverage (which determined the percentage of households that would end up with the intervention).

Table 4 shows the outcomes of the comparison. A mid savings rate and mid coverage was taken as the midpoint between the upper and lower values.

Table 3: Comparison of saving estimates and up take rates

Option	Lower estimate saving	Mid estimate saving	Upper estimate saving	Savings units	Lower take up	Mid take up	Higher take up
1	12%	17%	22%	% of PCC	70%	90%	95%
2	4%	6%	7%	% of PCC	70%	90%	95%
3	12%	17%	22%	% of PCC	80%	90%	100%

The report notes that extensive interventions such as option 1 above require regulatory or legislative support for successful implementation.

The ability of water companies to implement them will depend on the degree of regulatory change implemented to support demand management measures.

Defra's rapid evidence assessment (REA) in 2018 (Defra, 2018) reviewed existing academic and other literature about behaviour change approaches to reducing household water demand.

The review was based on the assessment in the Joint Water Evidence Group's (JWEG) guidance document and the Population, Intervention, Comparator and Outcome (PICO approach).

Documents were analysed using a synthesis tool followed by interviews of six water experts.

The report discussed that lack of trust in the motivation of water companies was a barrier to the uptake of metering and that water efficiency initiatives should be a combination of integrated solutions rather than the installation of a meter or water efficient devices in isolation.

Referring to one of the studies reviewed, the REA noted that early communication and responsiveness to individual needs creates a positive experience for customers with "concerns regarding the financial impact of meter installation" (p. 66).

The interviews conducted during the REA (Defra, 2018) further identified gaps and challenges, which included:

- lack of clear evidence on the extent of water savings through metering and behavioural factors contributing to these savings
- distinguishing water savings due to reduction in leakage from those due to behaviour change
- lack of information on social issues around smart metering such as "risks and benefits of smart metering"

One of the key conclusions of the review included the need for "better understanding of the ways in which consumption-based charging can drive changes" with the increase in the spread of metering (p. 75).

The Efficacy of Water Efficiency Retrofitting research project (Waterwise, 2009b), which analysed data from a 2008 United Utilities home audit trial (see costs and benefits below) and the Waterwise evidence base for large scale water efficiency.

This was a study aimed at understanding the relationships between water use and water appliances, water savings and water appliances and water savings and customer

attitudes. It did this through home audits and Analysis of Variance (ANOVA) and regression analysis of the data gathered.

Metering was used as an example of an economic instrument for water demand management due to its proven impacts on water consumption trends.

It works as a financial incentive since the motivation to save money rather than to save water, which is an environment incentive, was demonstrated to be the dominant driver.

“Funding a massive metering programme” was observed to be an important consideration due to the potentially high capital and operational costs associated (p. 16).

The report also noted that there is no long-term evidence to suggest metering continues to moderate demand. However, it must be noted that this is among the older references provided in this call for evidence.

Costs and benefits

In its free text response to sub-section a) of the call for evidence, Waterwise said it would, “like government to adopt a target for personal water use below 100 litres per day …. in line with the commitment made in the 25 year Plan for the Environment”.

As well as other measures including, promotion of a faster roll-out of smart meters and removal of restrictions on water companies outside of areas of ‘serious water stress’. So that they can switch customers to metered billing.

Artesia Consulting (2019) stated that extensive smart metering, outside areas of serious water stress, could reduce water use by between 368 and 482 megalitres per day at a marginal cost of between £2,000 per megalitre and £3,200 per megalitre (in addition to the increase in metering already planned by water companies).

The report provided modelling results of a scenario which combined a mandatory water labelling scheme (with minimum standards) and smart metering (with voluntary switching).

This scenario offered the deepest reductions in water use by reducing demand - forecast to result in a PCC of 82 litres per person per day by 2065, equivalent to a reduction in volume of 2,380 megalitres per day.

However, this scenario has a negative cost-benefit of £391 million and a marginal cost of £450 per megalitre. In contrast, it was estimated that water labelling only (with minimum standards) could produce the greatest net social benefit (NPV or net present value of approximately £3.9 billion) because of its lower costs.

Customer bill impacts were estimated for scenarios and for individual interventions used in the scenarios.

Smart metering was observed to have the largest impact on customer bills resulting in an increase of £29 per household per year.

The report stated that the scenarios which included smart metering would have a customer bill impact in the range of £25 to £30, depending on the mix of other interventions.

Behaviour change mechanisms

In 2010, Southern Water started a programme to meter households across its supply area (south east England), an area determined by the government as experiencing serious water stress.

A universal metering programme (UMP) was implemented by Southern Water by gradually switching unmetered customers to metered charging.

Billing and consumption data were analysed to observe changes in consumption patterns between January 2011 to October 2016 and included comparisons.

It was found that there was decrease in consumption of between 16% and 20% (Ornaghi & Tonin, 2017). Meter installation generates water savings because of:

1. behavioural change triggered by a variation in prices
2. more effective detection of leaks.

There was also evidence that the percentage reduction in consumption is very similar across income groups.

The results were substantially higher than those based on National Metering trials conducted in England in the late 1980s to early 1990s that resulted in an average reduction of 11%.

But in line with the results of a similar programme in the Isle of Wight between 1989-91 that resulted in a reduction of up to 21% (Ornaghi & Tonin, 2017).

Defra's REA on water efficiency and behaviour change (Defra, 2018) referred to earlier also examined the evidence for behaviour change approaches to reduce household demand for water and their effectiveness.

With regards to metering, consistent findings were that metering results in a reduction in domestic water use of around 10 to 16% per year. It found that the mechanisms by which these savings have been achieved are not clear.

Work by Artesia Consulting (Artesia Consulting, 2018) found three specific proposals featured strongly in stakeholder feedback:

1. mandatory labelling for water using products

2. tackling the growing problem of ‘leaky loos’
3. increasing the current proportion of metered households, to reduce mean consumption by 16%

One mechanism highlighted was smart metering and customer engagement technologies, which could inform the customer and the water company that their supply pipe may be leaking.

With the potential to reduce customer supply pipe leakage to around 8 litres per property per day from the current losses of 30 litres per property per day.

The Bricks and Water report (Policy Connect and Westminster Business Forum, 2018) recommended moving more quickly toward as close to 100% water metering as is possible.

It stated that 82% of people with a water meter reduce their water usage to save money and that metered households use 15 to 20% less on average than non-metered households (127 litres per person per day compared to 160 litres per person per day).

It further recommended that this would need to be accompanied by financial assistance to the vulnerable in society.

The efficacy of water efficiency retrofitting research project (Waterwise, 2009b) hypothesised that a meter buried in the ground does not give any information to the consumer and that better visibility would reduce consumption.

However, through ANOVA analysis of a dataset made available from the United Utilities home audit project in 2008, it was concluded that water meter visibility was not significantly connected to water consumption.

Evidence from outside of the UK

Research published by the Environment Agency (Aquaterra, 2008) found that the major differences between the water sectors in the countries with lower personal consumption than in England and Wales were the extent of metering and scale of demand management measures.

All the countries reviewed had universal metering (although in most cases flats are not individually metered).

The report stated that metering could reduce consumption by 10% to 15%.

However, the report concluded that metering alone would not be enough to lower PCC to the desired then government target of an “average of 130 litres per person per day by

2030, or possibly even 120 litres per person per day depending on new technological developments and innovation" (p. 4).

Additional measures, such retrofitting toilets would need to be considered.

Feedback from workshops

Six main views came forward from the workshops with regards to metering penetration:

1. a key point raised by water company and academic representatives was the difference between installing smart meters, and metered charging. There are many benefits which come from installing smart meters and this is mainly due to increased data availability and understanding. Linking the installation of meters to charging by water used is a long-term goal in some areas, but this isn't the main driver for behaviour change
2. Thames Water stated that smart metering has resulted in PCC estimations having to be completely reconsidered in some areas because it has revealed fundamental differences between assumptions and observations around water use and leakage
3. there have previously been barriers to metering because of concerns around social inequality. Water companies stated that they now have mature mechanisms in place to protect these customers and that it is often metering which helps to identify vulnerable customers
4. only areas determined to be seriously water stressed have been able to roll out compulsory metering and smart metering linked to charging by volume. Attendees argued that the water stressed designation should be removed
5. there was a preference for smart metering to be included in demand reduction measures
6. due to budget planning timescales, some companies know that they do not have funding in place for a smart metering roll out in the next five years. These companies would need a clear drive to include this in their plans for Price Review 2024

Rainwater harvesting and water reuse schemes

This section summarises evidence related to more widespread rainwater harvesting and water reuse schemes.

Summary

Evidence submitted suggests installing rainwater harvesting (RWH) systems to existing homes is less cost-effective and provides less water savings than other measures.

The evidence suggested that RWH becomes more cost-effective when installed at the point of construction.

Respondents shared this view, suggesting that RWH systems should be installed in all new buildings.

Water reuse was raised in the workshops, and it was deemed crucial that all forms of water reuse are considered (including black-water (effluent) reuse), instead of only considering greywater reuse.

Views were that the most appropriate option will vary on a case-by-case basis.

Community level water reuse schemes were stated to often be more appropriate than individual property reuse units because operating at a larger scale averages out variations in water use from behavioural and occupancy rate factors.

Responses overview

A total of 35 relevant responses were received for this section of the consultation, comprising 13 organisations, 16 individuals, and 6 who were anonymous.

Eight of these responses were very brief, referring to comments in a previous question or comprising general agreeing remarks.

In their free text responses, themes raised by respondents included:

- requiring all new households and properties to incorporate rainwater harvesting systems in their designs

- using financial incentives to increase rainwater harvesting system uptake in existing homes. Many praised the use and water saving potential of water butts, and believed that these should be subsidised by local government
- suggestions to look at other countries' examples of water reuse (Australia, New Zealand, Germany, Belgium, France, and Mexico), where they have made (or are planning to make) national mandatory requirements for rainwater harvesting

Two organisations (Water Regulations Advisory Scheme Limited and Yorkshire Water Services Ltd) warned of the contamination risk of using, and critically, installing, water reuse systems at the home.

They stated that installation and maintenance must be done by those who are competent and trained to do so in order to avoid unintended consequences of contaminated drinking water.

Six respondents referred to further written sources of evidence. A summary of these, and additional relevant references provided for other sub-sections of the call for evidence, has been provided.

Costs and benefits

Among the evidence submitted, there was widespread agreement that installing rainwater harvesting systems is not cost-efficient and provides less water savings than other measures.

For example, one report concluded that "rainwater harvesting, greywater recycling and community wastewater recycling could be useful interventions in certain situations where other options are limited but are not able to deliver the savings from labelling or metering, and water reuse or recycling is less cost-efficient than labelling or metering" (p. ii) (Artesia Consulting, 2019).

Out of a list of 18 water saving measures, retrofitting homes with rainwater harvesting/greywater recycling systems, community wastewater recycling, and community rainwater harvesting systems scored 14th, 17th and 18th place respectively, in terms of marginal costs.

A separate report (Waterwise, 2009a) arrived at a similar conclusion, and produced the below table to demonstrate its point:

Table 4. Cost benefit analysis of different water saving measures. Source: (Waterwise, 2009)

Output	Retrofit	Refurbishments	Rainwater harvesting
Water saved (litres/property/day)	50	90	11
Cost (per property)	202	1,386	2,956
Asset life (years)	10	25	25
Total water saved (m^3 per property)	182	821	100
Cost (£ per m^3)	1.10	1.70	30.00

One report shared findings from a trial of rainwater harvesting installation on a block of 12 flats using one storage tank, and concluded that "due to the technical and maintenance issues experienced and the relatively poor value for money, the installation of rainwater harvesting to existing housing is not recommended" (p. 3) (Waterwise, 2009a).

In a 2010 guidance document entitled Harvesting Rainwater for Domestic Uses: An Information Guide, the Environment Agency provides guidance and information on the benefits of rainwater harvesting systems, their design, installation, maintenance requirements, water saving potential and cost.

It also contains examples of systems that have been installed and are in use.

In this report, they argue that an RWH system should not be viewed as a substitute for water efficiency, and that simpler water saving measures can provide significant benefits at much lower cost.

They recommend following a hierarchy, prioritising first 'reduce', then 'reuse', and finally 'recycle' (which includes RWH systems).

The first two measures (such as reduce and reuse) include "low flow taps, aerated showers, rainwater butts and low flush toilets" (p. 27), and offer shorter payback periods and should be considered before rainwater harvesting (Environment Agency, 2010).

Furthermore, as most rainwater harvesting systems require energy to operate, generation of this energy may emit greenhouse gases.

One report concluded that "the carbon emissions that result from using a typical rainwater harvesting system are, on average, around 40% greater than emissions from using mains water" (p. 18) (Environment Agency, 2010).

In terms of benefits, there was overall agreement that costs are significantly less if the rainwater harvesting system is installed during the construction phase of a building, echoing the respondents' opinions that rainwater harvesting systems should be installed in all new buildings.

Artesia Consulting included "update planning rules to require new developments to be water efficient.

For example, through community rainwater harvesting and water reuse" (p. 2) as one of their 9 recommendations to deliver deep reductions in household water demand (Artesia Consulting, 2018).

One report noted that the technologies and systems needed to collect this water can mean that its use is more expensive than that of water already within the system.

It also noted the risks to consumer health and safety of grey and black water, and the consequent need for good regulation.

Another report also added that cost-effectiveness improves with the scale of the project, inferring that rainwater harvesting may be better suited to larger buildings and communities rather than individual homes (Environment Agency, 2010).

However, no reports were submitted of trials installing rainwater harvesting systems during the construction phase of new flats.

Impact on per capita consumption

The evidence submitted generally argued that rainwater harvesting has a potential to reduce demand for mains water, but that it does not greatly affect overall water consumption.

The rainwater harvesting trial on the block of 12 flats reportedly achieved only 5% water savings (Waterwise, 2009a).

However, there is some conflicting information, as another study found that "rainwater harvesting systems achieved 40% to 50% reductions in mains water consumption compared to homes without rainwater harvesting system" (p. 25).

And "substituting mains supply for rainwater when flushing the toilet could potentially reduce pressure on mains supply by approximately 39 litres per person per day (26%), reducing the average daily use of mains water to 111 litres per person per day" (p. 6) (Environment Agency, 2010).

One individual claimed that: “I live in a large detached house and have invested in rainwater harvesting (7 years ago) and my water bill 'in real terms' has halved, I am metered.

The payback period has been about 5 years”.

However, details on how they calculated this payback period for example, installation, running and maintenance costs) were not provided.

Distribution of impacts

According to various sources of evidence, “only customers with water meters will benefit financially from using a rainwater harvesting system” (p. 5) (Environment Agency, 2010).

The report goes on to conclude “at the time of writing (2010) this applies to approximately 37% of domestic properties and almost all industrial and commercial customers.

Therefore, in England and Wales, for the majority of domestic customers, there is no financial incentive to install a rainwater harvesting system” (p. 5).

Feedback from workshops

Four main views came forward from the workshops with regards to more widespread rainwater harvesting and water reuse schemes:

- non-potable water reuse needs to cover all sources, not just rainwater harvesting and grey water reuse. Each situation will suit different reuse options, and all need to be considered when starting a review of options
- community scale and neighbouring system links were deemed most efficient in terms of labour, investment, time spent and water efficiency. Operating at a larger scale averages out variations in water use due to behavioural and occupancy rate factors
- there are currently issues with implementation because this is a niche market, resulting in a lack of skilled labour and a risk of contamination. Germany provides a key example of how this was overcome with incentives to increase demand for rainwater harvesting systems, which stimulated an increase in supply of skilled labour
- new builds should be futureproofed to allow simple retrofitting of non-potable water reuse and dual plumbing to ensure these systems can be installed in the future

The use of water company incentives

Summary

Evidence submitted suggests that the use of water company incentives is most effective when delivered in partnership with other organisations (for example, local authorities) and delivered in conjunction with other water saving measures (for example, retrofitting).

In most cases, the impact of this measure will be limited to metered households. Individual and/or community incentive schemes are difficult and costly to apply to all households and therefore are less cost-effective compared to other measures.

Both innovative tariffs and individual and community incentives had an estimated mid-level PCC reduction of 4 litres per person per day.

However, due to differences in predicted uptake, greater total water savings are predicted for innovative tariffs.

Feedback from workshops suggested that innovative tariffs are unlikely to be appropriate in England for the near future as they are difficult to implement well.

Responses overview

A total of 9 relevant responses were received for this section, comprising 4 organisations, 4 individuals, and one which was anonymous.

Most of these responses were very brief and anecdotal, generally supporting the use of water company incentives, and only one referred to further written evidence.

A summary of these, and additional relevant references provided for other sub-sections of the call for evidence, has been provided.

One respondent suggested that as water companies are profit-driven, the use of incentives should be carried out by the government instead.

Types of incentives

Several types of water company incentives were proposed in the submitted evidence, summarised below:

- providing households with free water saving devices, services and communications (through partnerships with other organisations or via water companies acting on their own)
- variable infrastructure charges
- innovative tariffs
- behaviour change campaigns.

In their report, ‘Water Efficiency for Local Authorities: The Opportunities and Drivers’, Save Water South East (2017) presented various case studies of successful water company initiatives promoting greater awareness of water issues and water efficiency in the home.

The report explains how the designation of the entire south east of England with “serious water stress” status allowed for the development of a framework for water companies to charge customers based on their consumption of water use.

In order to manage demand, several water companies delivered water saving devices and services, often free of charge.

For many of these initiatives, the report showed how local authorities were key partners in these case studies.

For example, one programme that benefitted from this kind of water company incentive through a partnership was ‘Tap into Savings’, a combined water and energy retrofit programme run in partnership with:

- Waterwise
- Global Action Plan
- GLEEN
- The Environment Agency
- Raven Housing Trust
- Reigate and Bansteed Borough Council

It was carried out in Merstham and Redhill in Surrey.

The programme offered free water saving devices to 600 social housing tenants and 350 non-social housing residents and three primary schools and saw average water savings of 40 litres per day per home visited.

The programme found that delivering in a partnership “could offer combined water and energy packages making it more attractive to the consumer. Additionally, cost savings were made such as communication materials could be made for several parts of the project”.

Other types of services/water company incentives delivered via a partnership include:

- providing free support and training for staff and contractors
- providing free literature and communications about water efficiency measures - including promotion of free devices - to all residents

Working in partnership with other organisations and/or local authorities proved advantageous for these types of water company incentives, with many claimed benefits.

For example, “combining resources means the project could make a bigger impact”.

However, a negative point raised was that “partners may have a range of objectives and thus it can be more time consuming to ensure all the partners bought into and agreed on objectives at the outset” (Save Water South East, 2017).

Water companies can also provide these kind of incentives (free water saving devices/services and communications) on their own.

For example, Thames Water conducted a trial whereby it provided 4,000 households with a pamphlet by post explaining how to identify a ‘leaky loo’, along with a response form to request a free fix from them.

The trial alone saw savings of 9,328 litres a day, with potential savings of 212 litres of water per toilet per day.

Another water company incentive suggested was a “Variable Infrastructure Charge”. This is particularly suited to the construction of new properties. As part of the scheme, developers can meet a voluntary PCC target, for example, 95 litres per person per day, for new homes.

If they do so, then the water company can give the developer an infrastructure charge discount (for example, 40%) on the standard network connection charges (one-off charges when properties are connected for the first time into the water supply or the public sewerage system).

In order to plan for new housing developments to meet future needs, particularly in a context of a “water stressed” region, Eastleigh Borough Council and the Environment Agency decided to use variable infrastructure charges to encourage water efficiency in new developments.

This incentive gave a clear price signal for the developers to drive demand reduction. Co-benefits included assisting developers to fulfil their BREEAM Communities standards for their proposed schemes.

By adopting this voluntary target, developers could achieve a “beyond compliance” approach to sustainable water management (Save Water South East, 2017).

Innovative tariffs can be developed with support from regulators. It is important to note that this intervention assumes smart metering as a pre-requisite.

In their report, Artesia Consulting claimed that, “the definition of ‘innovative tariffs’ has been left deliberately loose because there is a lack of research and evidence on smart meter tariffs and their effectiveness” (p. 2) (Artesia Consulting, 2019).

Finally, water companies can operate on their own to deliver behaviour change campaigns (see case studies section below).

In this case, householders are encouraged to change their water use behaviours and practices.

The incentives could either be individual or community based. Individual schemes could be similar to a loyalty scheme where customers receive a reward if they achieve a certain percentage reduction in consumption.

Community schemes could provide towns, villages or neighbourhoods with a reward, for example, match funding towards a new community resource – based on consumption across that area (Artesia Consulting, 2019).

Again, this incentive will necessarily only apply to metered households.

Distribution of impacts

The evidence provided showed that water company incentives are normally delivered in conjunction with another water saving measure, such as retrofitting and smart metering.

Indeed, one report observed that water company incentives will likely only have an impact in households that have smart meters.

Otherwise it would be difficult to measure any change in water consumption due to the chosen incentive (Artesia Consulting, 2019).

One exception where incentives are delivered to unmetered customers is water company incentives through partnership with local authorities.

A review of these trials showed that, savings were made “despite tenants not having any financial incentive to reduce their water consumption, as all the tenants were ‘unmeasured’ and paid for water as part of their rent” (Save Water South East, 2017).

While there was no financial incentive to reduce water consumption, customers responded positively to free retrofit devices that led to reduced water consumption.

Impact on per capita consumption

Thames Water's successful trial of free 'leaky loo' fixes led the company to continue offering free 'leaky loo' fixes as part of their 'Smarter Home Visits'.

By rolling out this service to the whole business in 2015 to 2016 they fixed more than 3,000 'leaky loos' free of charge, with water savings of 700,000 litres of water per day. (Save Water South East, 2017).

The free retrofit devices reduced water use by 14%, whilst the installation of free dual flush toilets and showers resulted in a 25% water savings (average savings of 41 litres per person).

The installation of free rainwater harvesting showed an additional 5% savings but there were some technical issues in installation and maintenance of the system.

Reductions in water use from the innovative tariffs[8] and water company incentive schemes are shown in Table 6 and costs in Table 7.

While the litres per person per day savings are similar for each option, as the take-up of innovative tariffs was set at 100%, the total water saved is higher than that for individual and community incentives, which had an estimated take up of 38% (Artesia Consulting, 2019)

[8] The definition of innovative tariffs was deliberately left loose by the reference source's author for their stated reason of a lack of evidence on their effectiveness. Individual and community incentives were considered together.

Table 5 Saving estimates for interventions. Source: (Artesia Consulting, 2019)

Intervention type	Mid estimate savings (litres per person per day)
Innovative tariffs	4
Individual and community incentives	4.14

Costs and benefits

Out of a list of 18 water saving measures, 'innovative tariffs' have the fourth-lowest marginal cost at £60 per megalitre of water saved[9].

Water company-led interventions or incentives without any specific government input (individual and community incentives and assisted household audits) are found to be less cost-effective.

Compared to other interventions, they are harder to apply to all households, making them more costly (Artesia Consulting, 2019).

[9] After 'increased media campaigns and school's education', 'water labelling – with minimum standards' and, 'water labelling – no minimum standards.

Table 6. Cost-benefit analysis of incentives. Source: (Artesia Consulting, 2019)

Intervention type	Whole life costs (£m)	Water saved (000s Ml)	MC (£ per Ml saved)	MAC ranking
Innovative tariffs	87	1,451.40	60	4
Individual and community incentives	366	562.30	651	8

Case studies

In 2016 and 2017, Greenredeem launched two pilot schemes to understand how customers could be motivated to reduce the amount of water they consume at home and how water company-led incentives could reduce PCC.

They developed a programme whereby water efficiency was measured and rewarded based on individual smart meter data received on a weekly basis.

Following a registration process, customers became Greenredeem members and were rewarded on two levels, direct and indirect action.

Direct action were points rewarded for reducing the actual amount of water that they used (for example, one point for every 10 litres 'saved').

Indirect action were points rewarded for 'learning and earning' activities, such as taking a pledge or watching a video online.

Through indirect activities, members could increase their awareness of actions to reduce the amount of water they consumed.

Points were then redeemable for use in local shops and businesses, as donations for national charities, or to win prizes through a prize draw (Greenredeem, 2018).

These incentives provided by the water company were generally liked by customers and provided households with noticeable water savings.

By reviewing weekly smart meter data, Greenredeem was able to ascertain that the impact following registration was a saving of just over 5% per household for trial 1 (campaign for individual households, 25% uptake in pilot area), taking the average household consumption from 343 litres per household per day to 326 litres per household per day.

Trial 2 (campaign delivered to a whole District Metered Area saw a 20% uptake) saw higher savings of 6.1% (Greenredeem, 2018).

No information was provided regarding the costs of the programme.

Another case study looked at how water company incentives combined with local authority support can reduce PCC.

In Australia, rebate schemes have been very successful in driving market transformation and the uptake of products that are more water-efficient.

“The rebate scheme in Western Australia was funded by the state government and delivered through the water company and resulted in 170,000 new water efficient washing machines being installed.

The number of Perth households installing dual-flush toilets increased from 36% in 1992 to 84% in 2006 and purchase of front-loading washing machines increased from 7% to 25%” (p. 30) (Waterwise, 2017).

This study was found to deliver water saving in the home while also lessening the economic burden placed on those who choose to use and install typically expensive water saving measures in the home.

Feedback from workshops

Eight main views came forward from the workshops with regards to the use of water company incentives:

1. rising block tariffs are difficult to implement well and will likely be inappropriate in the UK for the near future. Israel provides the best example of a nation doing this effectively
2. water company representatives stated that to install smart meters an appointment is often needed with the householder, which is difficult to achieve, but use of incentives as a motivation to keep appointments is a potential solution
3. there was consensus that there is no ‘one size fits all’ approach to incentivising individuals to change their behaviour. Some are motivated by personal financial incentives, some by environmental motivators, some by community rewards, and some by charity donations
4. one water company has found that they were achieving approximately 6% extra demand reduction for those on smart meters and using incentives compared to those only on a smart meter
5. the incentives discussed were the same that were mentioned in the consultation document (with the addition of charity donations to Water Aid)
6. Water company representatives also noted that installing a meter in the ground appears to incentivise behaviour change to increased water efficiency, even before

metered charging commences. As such, people are changing their behaviour before it will have any impact on their bills.

Information provision to customers about water saving measures they can undertake

Summary

Evidence submitted supports a sustained and coordinated national campaign which should use multiple media, be integrated with enforcement of legislation and other water demand reducing initiatives.

Integration of water reduction targets as seen in the 'Target 140' and 'Target 155' campaigns in Australia were assessed for their success in achieving double the expected 10% reduction.

Campaigns based around water consumption patterns, and behaviour and smart metering with consumption-based charging were also noted to prove useful.

National and regional media campaigns were both estimated to result in the same PCC reduction of 4.14 litres per person per day, due to a lack of evidence on the effectiveness of such measures.

A concerted myth busting process, to provide consumers with adequate information, is believed to make them more open to change which will boost other interventions.

Responses overview

A total of 18 respondents provided a relevant response to this section of the consultation, comprising 6 organisations, 7 individuals and 5 which were anonymous.

In their free text responses, respondents suggested a variety of options for information provision, including:

- appropriate leafleting through home-owner packs for new homeowners
- through utility bills
- through popular media
- through educational institutes such as schools

One respondent, a university body, did not favour information provision as they believed that it is limited in scope to bring about a cultural change.

Four respondents referred to further written sources of evidence.

A summary of these, and additional relevant references provided for other sub-sections of the call for evidence, has been provided.

Impact on per capita consumption

Through comparative case studies, Waterwise (Waterwise, 2019b) identified successful examples of communication and behaviour change campaigns across the world which included targets as part of the wider public engagement and water efficiency campaigns. For example:

- in Australia, the success of the 'Target 140' and 'Target 155' campaigns (eponymous with the per capita water reduction target in litres per person per day) was attributed to their "strong focus on research into the attitudes of the target audience and integration with other initiatives, including restrictions on outdoor water use" among others. It achieved double its target of a 10% reduction from 179 litres per person per day to 129 litres per person per day of which 140 litres per person per day was achieved only four weeks after the launch of the program. The 'Target 140' campaign ran for eight months while the 'Target 155' is ongoing
- the experience of the Valencia Water Company in California, USA, provides an example of how percentage targets to reduce water use helped focus innovative programmes "including tailored customer drought reports and bills outlining saving they needed to make, a GIS (Geographic Information System) 'Watermap' to target high consumption areas and customers, and online education workshops for customers". The success of the programme meant that their 2016 target to reduce use was zero
- with the objective of reducing Denmark's water consumption to 100 litres per person per day, the Greater Copenhagen Utility ran a successful online "water hero" campaign which set out actions under categories like kitchen, washing, garden and bathroom and included a "range of suggestions on how consumers can decrease their water consumption and hence their water bill, given the high water prices locally"

Artesia (Artesia Consulting, 2019) covered three 'awareness' interventions:

1) increased media campaigns and school education
2) national coordinated programme
3) individual and community incentives.

The third option is covered in the previous section of the call for evidence report.

- Option 1 is water company baseline activities but would be higher profile, more consistent and co-ordinated at a regional and national level.
- Option 2 is a government-led intervention to deliver suitable messages to target different customer groups via mainstream and social media using behavioural economics and social science principles.

Due to a lack of evidence on the effectiveness of these individual measures, the estimated mid-level saving is the same for both options, at 4.14 litres per person per day and no difference in take up was predicted.

Waterwise's Water Efficiency Strategy for the UK (2017) emphasised the need for consistent messaging through a coordinated joint action by water companies and adequate customer participation to "get customers to help deliver water savings" (p. 16).

For example:

- the Save Water South East's partnership between water companies, the Environment Agency and Waterwise focussed on joint communications and projects to develop and raise awareness of water saving culture wherein water saving should become the norm and "wasting water should be seen as going against the norm"
- Ofwat's "Tapped In"[10] report on engagement that details the need for water companies to turn passive customers to active participants

Additionally, the strategy recommended a UK water sector 'Leadership Group' that should develop a tool to develop customer participation and as a result "improve the tracking and quality of customer service" (p. 17).

Further, the strategy raised a proposal to communicate "water demand and water storage for each water company to help raise awareness of water resources amongst the general public" (p. 19) which could potentially be done with the help of the Water UK Discover Water dashboard.

In the Energy Saving Trust's in-depth analysis (Energy Saving Trust, 2015) of domestic water consumption by understanding customer perceptions it is noted that "personal bathing (33%), taps (31%) and toilet flushing (22%) are the highest areas of consumption" (p. 6).

This report is an extension to a 2013 study exploring water usage patterns at home, this earlier study investigated key areas such as:

- perceived and observed water-use behaviours
- preferences and priorities of households to inform water efficiency intervention
- barriers to these and perceptions of householders of their water

[10] Ofwat (2017), TAPPED IN, From passive customer to active participant

This was achieved through a combination of water monitoring and semi-structured interviews with a sample of 69 households, 34 of which took part in both the monitoring and interview stages.

Their surveys aimed to assess the accuracy of self-reported consumption and the awareness of water saving actions.

In this, it was found that the households could not identify the highest water-using activities in their home and that “where equipment is provided but is unsuitable for installation, underperforms against expectations, or breaks in use, appear to demotivate individuals from pursuing similar solutions” (p. 6).

Barriers to the uptake of water saving measures identified in this study include “lifestyle compromise, competing priorities, imperfect solutions, information gap, physical constraints, personal circumstances, and negative perceptions” (p. 33).

Another finding relating to the “way in which “solutions” are presented” was highlighted in light of the perception of some respondents “that adequate solutions were often not available” (p. 6).

Waterwise’s study on water efficiency retrofitting (Waterwise, 2009b) analysed data from a 2008 United Utilities home audit trial (see costs and benefits below).

This study and the Waterwise evidence base for large scale water efficiency noted a direct correlation in the average water savings among respondents to their survey who changed their behaviour with water savings of up to 16.7% at 0.0534 m^3/day (53 litres).

They also recommend further studies to investigate the interaction between house design and household consumption behaviour.

Defra’s Rapid Evidence Assessment of the role of behaviour change in water efficiency (Defra, 2018) found that rates of device installation and water savings were higher in interventions where “trained staff provided information while installing or supplying retrofitting measures”.

It also observed that “looking at water use in terms of social practices” (p. 73) is a useful approach to identifying and targeting consumers based on their water use.

Some studies reviewed revealed that metering results in water use reduction of up to 10 to 16% per year when combined with “recent literature and personal communication from water company staff” (p. 72).

But there is an urgent need for “better understanding of the ways in which consumption-based charging can drive changes towards reduced water use” (p. 75).

Artesia Consulting's report for Ofwat (2018) mentioned the "need for increasing legislative and regulatory reform" (p. 18) as an important enabler of a successful national campaign on water efficiency reforms - which could include a "concerted effort of 'myth-busting' at a national scale ("always raining", "we get lots of rain", "it should be a free resource")" (p. 17).

The report highlighted the example of the 'The Smarter Drop' campaign by Anglian Water which included "advertising, education and other 'outreach' work, plus installation of smart meters" (p. 22).

The campaign is aiming to achieve average consumption of 80 litres per person per day in Newmarket.

Twenty65, a research collaboration between University of Sheffield and University of Manchester, produced a paper 'Mobilising publics for resilient water management'.

Noting water company's engagement with publics are 'primarily measured in terms of the nature of public participation with price review processes'. The paper assessed the benefits of the public becoming active participants in a range of measures including a water efficiency project.

The outcome of mobilising the public to become involved was that 'relationship developed through mobilisation activities have enhanced their (water company) understanding of some publics and their understanding of their needs'. (p.15)

Costs and benefits

Very few of the provided studies explicitly associated costs and benefits with information provision.

United Utilities (Carmen Waylen et al., 2008) conducted a study into the effectiveness of domestic water efficiency devices in 2008, which included determining the practicality of fitting and promoting water saving devices.

A combination of home visits and audits of participating households, some metered and some not, and regression analysis of the data collected, was undertaken for 393 customers from the Association of Community Organizations for Reform Now (Acorn) demographic categories[11] 1 and 2 (wealthy achievers to comfortably off) in the Greater Sankey area of Warrington.

[11]Acorn is a consumer classification that segments the UK population.

The average incremental cost and average incremental social cost for the study were calculated at £120.2 /m^3 and £107.1 /$m^{3,}$ respectively.

The net present value scheme costs were £55,775 for water savings of 45,628 m^3 over a 5-year half-life profile.

Defra's Water Efficiency and Behaviour Change Rapid Evidence Assessment (Defra, 2018) refers to a "Top tip list from EU Life projects".

Which indicates money that customers can potentially save by making improvements to their water fittings or water use practices. For example, a four-person family can save £75 on their water bills by switching to a water efficient shower head from a high flow one.

Case studies

The 'Target 140' campaign exemplified the use of multi-media, multi-strategy communication approaches over 8 months.

During this period 50% of the US$3 million (AU$4.2 million) budget was spent on ensuring "consistent and engaging messaging across multiple channels to gain maximum outreach" including 40% on "direct mail-out of shower timers and information booklets".

The remaining budget was spent on market research, communication collateral, website and consultants. (Waterwise, 2019b)

Greenredeem's case study, that piloted behaviour change by motivating customers to reduce their water use, rewarded points on their website (Greenredeem, 2018).

A 'user experience' through registration, campaign marketing and promoting water efficient products alongside the 'rewarding awareness' and reporting of leaks was designed to promote measured water reduction.

Up to a 6.1% reduction in water use was achieved through these pilots since the start in 2016 and 2017.

Feedback from workshops

Eight main views came forward from the workshops with regards to information provision to customers about water saving measures they can undertake and change to a water saving culture:

- historically, water companies have mainly been silent providers to avoid the risk of complaints and associated fines. However, they are now undergoing a major step

change to become much more visible to customers to try to increase water efficiency - although others could also push this message

- water company representatives stated that installing smart meters was found to be a keyway to start the water efficiency conversation with householders
- partnering with housing associations or social housing was found by water companies to be a good way to reach customers – the need to book an appointment is a barrier but through this method there is no need to book an appointment
- at the start of any consumer engagement, at a personal level, it was necessary to carry out some simple myth-busting to give consumers information that they are missing. This has led to consumers being very open to change and understanding why change was necessary. In contrast to consumers who were questioned about their water use - they became defensive and shut off to the conversation – the outcome was more positive
- reports from three water companies[12] provided evidence that once people have the information on how to become more efficient or have been notified of a leak, they very quickly change their behaviours or fix their leaks
- it was agreed that due to the nature of water consumption across a population, the mean PCC is higher than the modal PCC. As such, talking about average PCC can have the unintended consequence of normalising a higher value of consumption than most use. However, PCC has been used as part of communications campaigns internationally
- smart metering provides data required to identify and target those with the highest consumption
- use of a national water use reduction target could make water of national importance, to help with messaging at regional levels

[12] Thames Water, Severn Trent Water, Anglian Water

Other relevant measures that could be used to reduce personal water use

Summary

Reference was made to several technologies, but without evidence of their effectiveness.

Respondents mentioned ‘big data’, including data from:

- smart metering
- improvements in rainwater harvesting systems using research knowledge from overseas
- an online calculation tool to aid professionals in the home-building industry to design more water-efficient dwellings

Feedback from the workshops raised the concept of that water neutrality of new developments should be considered in the future.

Further, there was consensus from the workshops that the most appropriate way to reduce water demand using a target-based approach was to have:

- one national target for a percentage reduction in water demand
- individual water companies should set their percentage reduction targets in their existing planning processes to contribute to the national reduction target
- other sectors and organisations could also commit to targets for water reduction in line with the national target, as is being seen for energy

Feedback from the workshops also indicated that a multi-stakeholder approach is needed.

And that a combination of a mandatory water label linked to minimum standards for fixtures and fittings in Building Regulations along with a smart metering roll out were the key enablers.

Responses overview

A total of 17 relevant responses were received for this section of the consultation, comprising 6 organisations, 6 individuals, and 5 which were anonymous.

Free text responses comprised a diverse range of opinion, anecdotes and recommendations, which were submitted on a variety of sub-topics.

Most respondents took the opportunity to reinforce their opinion and suggest that a combination of measures would be most effective to reduce water consumption in the home.

Only one respondent (Yorkshire Water Services Ltd) provided further documentary evidence to this section of the call for evidence.

A summary of other relevant measures identified in reference sources submitted across all sub-sections of the call for evidence has been provided.

Supporting the development of technology

One report, Waterwise's Water Efficiency Strategy for the UK, highlighted the importance of supporting the development of technology for water reduction in the home.

Echoing the views expressed by some of the respondents in their written responses to the call for evidence.

The report stressed that, "the UK has a long history of innovation in manufacturing and includes several technology hubs that could be used to develop smart water products including point-of-use measurement and behaviour change feedback devices" (p. 34) (Waterwise, 2017).

They also made the point that as climate change is causing more extreme weather and drought internationally, the UK can become an exporter of these technologies.

The same strategy document identified several technological approaches to reducing water use.

Three of which are plausibly well-aligned to have the potential for reducing personal water use, but quantitative evidence regarding their effectiveness was not discussed:

- the potential that 'big data' has to better manage water. "These technology trends can potentially revolutionise the water sector, by providing highly detailed data and actionable insights throughout the water lifecycle from production and distribution, through to consumer engagement" (p. 63) (Waterwise, 2017). Data gained from smart metering can have other benefits when used with other data sources (for

example, weather, energy) and systems (for example, smart home, Cleanweb, open data) to further increase opportunities for extracting value (Waterwise, 2017).

- rainwater harvesting systems were discussed in a previous section. The evidence suggested that they are not currently cost-effective. However, it was highlighted that there is currently a gap in research, skills and accreditation for these systems, compared to other countries such as the USA and Australia, who have supported bringing them to the market on a wider scale. Undertaking further research on the costs and benefits of rainwater harvesting and greywater reuse is therefore needed. (Waterwise, 2017)
- it was identified that there is a need to modernise the "Water Calculator" (developed by Waterwise and the Bathroom Manufacturers Association to link the water label with Part G of the Building Regulations and the Code for Sustainable Homes) so that it reflects: the latest water efficiency technology and changes to building standards. Opportunities to link with incentive schemes around water company developer charges and public procurement (Waterwise, 2017)

Feedback from workshops

Seven main views came forward from the workshops regarding other relevant measures that could be used to reduce personal water use:

- water neutrality of new developments should be considered in the future. Water neutrality is where a new development should offset its predicted increase in total water demand by reducing demand in the existing community and has been demonstrated in the Thames Water region. This would be a compromise in that it does not prevent new development but prevents increasing pressure on the water network in areas where additional water is not available
- during the PCC-themed workshop on 2 December, there was complete consensus in the room that the most appropriate way to reduce water demand using a target-based approach was to have:
    - one national target for a percentage reduction in water demand. It was agreed that for energy, while people may not know what the target for energy reduction is, everyone knows they should reduce their energy consumption. This national driver and unifier are also needed for water
    - individual water companies setting their percentage reduction targets in their existing planning processes to contribute to the national reduction target. This was felt necessary as while water companies can reduce demand to a degree, they need back up from other sectors and, crucially, the government. It also must be acknowledged that there are large differences in circumstances for water companies across England, meaning a % target is more appropriate than a litres per person per day target
    - other sectors and organisations could also commit to targets for water reduction in line with the national target, as is being seen for energy. This would help

prevent household consumers feeling unfairly targeted and mitigate against unintended consequences of demand transfer from domestic to non-domestic consumption.

- it became clear throughout the workshops that many water companies have been working hard on the water efficiency and consumption reduction agenda. As government committed to in the 25 Year Environment Plan, water companies need action and support from government and other sectors to avoid extreme drought
- it was repeatedly raised that a wide range of stakeholders should be engaged in this process
- it was repeatedly emphasised by water companies, Water UK and consultants that a combination of a mandatory water label linked to minimum standards for fixtures and fittings in Building Regulations along with a smart metering roll out for enhanced data availability were the key enablers to help water companies work with customers and allow them to make informed choices. This will drive consumer behaviour change. In isolation, none of these measures will solve the supply/demand imbalance
- water efficiency was also repeatedly linked to climate change and it was agreed that the general public would not make this link at present. However, if the link was presented to them this could be a driver for improved water efficiency. Centralised recognition of the link between drought, floods and climate change could help drive this engagement

Per capita consumption target workshop summary

Summary

Consensus was found for several topics regarding a potential PCC target during the PCC workshop:

- a standardised target calculation methodology and demographic data sources
- a national percentage reduction target would be most appropriate
- targets need to be aimed at more economic sectors than water companies alone

Feedback from workshop delegates was that water companies cannot act alone if a challenging PCC is to be achieved.

They would need support from government in the form of a mandatory water efficiency label linked to minimum standards for fixtures and fittings in Building Regulations.

Feedback from workshops

The final call for evidence workshop of the series of four was held on 2 December, specifically to discuss evidence regarding a potential PCC target. Eight main topics were discussed:

- a PCC figure allows the public to relate to a number and could provide a communications piece. However, the mean PCC is higher than the modal PCC, so talking about average PCC can have unintended consequences of normalising a higher value of consumption than most use. A public target would need to be made relevant to everyone so that no one gets complacent, or can ask why other groups (for example, commercial water users) are not being asked to reduce also
- calculating PCC relies on understanding occupancy rate and behavioural/demographic data. This data is often unreliable and different water companies use different data sources. There was unanimous agreement between attendees that this is not a reliable measure. An example was given from the Severn Trent region that when a water company was dissolved: the population this company covered was divided between two other water companies. Despite the same people living in the same houses using the same amount of water, their calculated PCC changed due to the differing calculation methods of the three companies. To set a nationwide PCC target, attendees agreed that an accurate nationwide data set of occupancy would be

required, alongside a standardised methodology for calculating PCC that all water companies had to use

- a model, such as that used for leakage reduction targets (percentage reduction in leakage), was deemed preferable to a PCC target, with an overarching national target which water companies can set their own targets in contribution to. As there are multiple other sectors which use water (examples given were construction and food and drink industries), these could also set reduction targets in line with a national target, as is happening for carbon reduction at present
- as smart metering rollouts are changing the understanding of PCC in some regions, it was suggested by water company representatives that any PCC target proposed at this point may be deemed inappropriate in the future as more data becomes available. This point supports the need for a percentage reduction target instead of a litres per person per day target
- there was no consensus in the room on who would be accountable, but a hypothesis that government would set a target, Ofwat would regulate, and water companies would be accountable was unanimously disagreed with on the basis that the target needs to be wider than just water companies
- in order to achieve national water efficiency savings, a PCC approach was not deemed broad enough to engage individuals and prevent unintended consequences
- there was a consensus that a national percentage reduction target would be most appropriate. The example was given that the public are aware that there are Government-led energy reduction targets, and that even though they may not know what the relevant number is or how it applies to them, they know they should reduce their energy consumption. This message is needed on water as well, and a government level target would drive this
- to achieve an ambitious PCC target, water company representatives stated that they cannot act alone but need support from government in the form of a mandatory water efficiency label linked to minimum standards for fixtures and fittings in Building Regulations. The representative from Water Resources South East also stated that there will be critical interdependencies which must be considered – when setting and regulating targets
- water companies need government to act in a timely manner – they need a decision within the next year or two as they are already planning for their next 5-year periods. Draft Water Resource Management Plans 2024 are due August 2021, to be put out to consultation in 2022. Due to planning timelines they may only have 12 months to understand all the variables Defra's consultation has considered. Some are working proactively to consider multiple scenarios, but they need a steer on what is realistic

BMA labelling workshop written submission

1. The Bathroom Manufacturers Association (BMA) welcomes the opportunity to contribute in writing to Defra's workshop on water efficiency labelling. Our organisation has 70 members ranging from SMEs to large multinational corporations. Manufacturing around the globe, all our members have a UK entity and collectively directly employ 10,000 workers here, making a significant contribution to "UK plc". Many of our members supply the water delivery products which appear in the bathroom.

2. Consumer behaviour change is fundamental to a more efficient use of the water supply. Consumer choices during the purchasing cycle are one aspect of this change. We believe water efficiency labelling has an important role to play in helping consumers make informed choices when they purchase water delivery products. Therefore, the BMA founded the Water Label Company over a decade ago, to improve the water consumption information on products available at point of sale.

3. That Water Label initiative has slowly evolved and has now been combined with three other European labelling schemes to form one 'Unified Water Label' (UWL). The European Commission is working with the industry towards a 'voluntary agreement' to promote adoption of UWL as a harmonised label in all member states. Within the EU, the share of the market covered by the UWL is 62%, and we understand coverage of the UK market is consistent with this. At the same time, the UWL is being adopted as best practice in water scarce regions around the globe, such as Turkey, Egypt and Hong Kong. The UWL is also one of the cornerstones of an international standard under development for water efficiency labelling schemes (ISO PC31600).

4. Crucially, the UWL is helping to tackle water scarcity now. It is difficult to quantify the water savings achieved by the UWL because isolating the impact of individual initiatives from others is methodologically problematic. However, we understand from our members that the UWL, in combination with the commercial imperative, is encouraging the sector to use its detailed understanding of the nuances of bathroom products (for example, flow regulation at different water pressures), to work towards breakthroughs on water efficiency.

5. This success has been achieved through a voluntary scheme that could be enhanced further if Defra and other stakeholders were to assist in promoting the initiative. In 2018 the European Commission found that if take up of the UWL was increased to 80% market coverage in the next decade it would achieve a water saving of 36% by 2030. Indeed, the IWA's 2019 Review of International Water Efficiency Product Labelling found that Government-backed voluntary schemes, such as Watersense in USA, achieve the best results. For this reason, we do not support a mandatory scheme but would encourage the Government to take full advantage of the momentum behind UWL.

6. If, despite our opposition, the Government pursue a mandatory labelling requirement the framework must be flexible. We and our members are very strongly opposed to mandating any individual Government or third-party run scheme. It is important that as products develop new capabilities and the market demands additional or different information, schemes are footloose and can adapt. A statutory system would by necessity be less agile in order to comply with public law. Mandating manufacturers to use a specified third-party run scheme would be anti-competitive given that schemes such as UWL are already operating successfully in the UK. Instead, requiring use of any ISO PC31600 compliant labelling scheme would ensure quality and allow flexibility.

7. This approach would also avoid the expense to manufacturers (passed on to consumers) of double-labelling products. Most water delivery products are imported to the UK and are not produced for the UK market alone. Any mandatory requirement for labelling must allow the labels that are expected in other major markets including in the EU, Watersense in the USA.

8. It is important that any mandatory labelling scheme is about informing the consumer and not limiting their choice. Supplying meaningful information will help consumers make more water efficient buying choices, particularly as environmental awareness is improving. The phasing out of the worst performing products will be organic. If the implementation of a mandatory labelling scheme also entails removal of certain products from the market it will create unintended consequences, as was the case with the banning of incandescent lightbulbs in 2012. Then, sales of the lightbulbs boomed before they were outlawed, as consumers stockpiled. Grey imports continue to this day. Banning certain bathroom products would cause greater water use through grey imports, the removal of flow regulators and longer use times.

9. It must be understood that water efficiency labelling of any description is not a panacea to the water resource management challenge. As bathroom products have a long lifecycle, any in-efficient installations may remain in place for years to come. BMA is eager to work Defra and stakeholders to address this problem and would welcome any incentivisation to consumers to install more efficient fittings. Moreover, as major reports have found, individual water fittings alone cannot achieve water saving breakthroughs, a whole system approach is necessary.

10. Finally, we recognise that passionate and articulate advocates are encouraging the government to take certain courses of action on the water efficiency agenda. The BMA shares in this enthusiasm to seek solutions to what is undoubtedly a grand challenge and we want to play our part. However, government must not jump ahead to solutions without evidence. We would urge most strongly that any policymaking impacting Bathroom Manufacturers and our customers should be evidence-led with published, peer-reviewed data available to all.

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