Water efficiency engagement in the UK: barriers and opportunities

by

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List of acronyms

BBC	–	British Broadcasting Corporation
DEFRA	–	Department for Environment, Food and Rural Affairs
EDC	–	Every Drop Counts
ESW	–	Essex & Suffolk Water
IPCC	–	Intergovernmental Panel on Climate Change
MAC	–	Message Actor Channel
OECD	–	Organisation for Economic Co-operation and Development
Ofwat	–	The Office of Water Services
PCC	–	Per Capita Consumption
UK	–	United Kingdom
UN	–	United Nations
US	–	United States
WRMPs	–	Water Resources Management Plans

Glossary

Behaviour	The way individual publics act in relation to water use.
Combined water efficiency engagement	Actions and interactions between water utilities and their publics that involves the combination of educational and technical measures to reduce water use.
Communal interests	Things that people perceive as the social benefits of taking a line of collective action.
Education	A form of engagement delivered by water utilities which involves information sharing and/ or dialogue.
Educational water efficiency engagement	Any interaction between water utilities and the public which involves information sharing to motivate better water values and a reduction in water use.
Household water efficiency	The reduction in the quantity of water used by a householder for a particular domestic task.
Householder	The owner of a property served by a water utility.
Individual interests	Things that people perceive as personal benefits of taking a desired line of action.
MAC heuristic	The Message-Actor-Channel framework for understanding water efficiency engagement practices in the research.
Plumbers	Approved personnel responsible for delivering water efficiency engagement by paying home visits to households to audit and retrofit water systems and encourage efficient water usage via conversation.
Practices	When used in relation to the public, practices refer to domestic activities involving the use of water. When used in relation to water utilities, practices refer to actions and activities relating to achieving water efficiency.

Publics	Water users who are usually the target audience for household water efficiency engagement activities.
Resident	An individual living in a house served by a water utility.
Socio-technical water efficiency engagement	Any activity which addresses water demand from a perspective that domestic usage practices are diverse and influenced by complex factors including institutions, norms, resources, environment, technology, and household water systems.
Technical water efficiency engagement	Any intervention which involves the use of technology to nudge or force people to reduce their water use, for example, the installation of water efficient products or the water meter in houses.
Water efficiency education	Support offered by the water utility to its publics that is aimed towards increased awareness about water, water values and water usage. This support is subject to negotiation by the parties.
Water efficiency engagement	Any interaction between water utilities and their publics which are oriented towards reducing household water use.
Water efficiency home visit	A visit paid by plumbers to households on behalf of water utilities, to retrofit water systems and ‘educate’ publics about water efficiency.
Water managers	Staff of water utilities responsible for designing water efficiency engagement initiatives.
Water utilities	Companies which at the very least provide water services to the public.

Thesis Abstract

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Water efficiency engagement in the UK: barriers and opportunities
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Future water security is a growing concern throughout the world. In the UK, this concern is particularly concentrated in south-east England where water scarcity is exacerbated by population increase, high household usage, and low rainfall due to climate change. Traditional technical interventions to ensure water supply are proving insufficient to meet the public's water needs and water utilities' contemporary activities to encourage people to reduce their usage have been cast by industry and academia as difficult to deliver. In response to these challenges, this thesis aimed to increase the understanding of barriers and opportunities to improve water efficiency activities in areas facing water scarcity. This was achieved through developing and refining an analytical framework called the 'MAC (Message, Audience, Channel) heuristic for understanding water efficiency engagement.'

Drawing on existing literature about communication theory and water efficiency, the nature of the message, the anticipated audience, and the channel of communication were identified as three vital components through which communications about water efficiency could be studied. The MAC heuristic was thus developed to: (1) explore the intended audiences and processes for water efficiency engagement in UK utilities operating in areas of serious water stress, (2) identify the factors that aid or stifle water efficiency engagement in a seriously water-stressed utility, and (3) to further the concept of water efficiency engagement and support practice in the field.

The MAC heuristic supported this research, both the systematic analysis of Water Resources Management Plans developed by UK water utilities operating in areas of serious water stress (Phase 1) and the case study of water efficiency home visits in Essex & Suffolk Water, a seriously water-stressed utility (Phase 2).

The study of plans for water efficiency engagement in seriously water-stressed areas indicated that central government policy was the main driver for utilities to consider household water efficiency as a key strand of water demand management. These utilities' target audience for water efficiency engagement were customers with whom they had functional relationships such as bill-payers and meter owners and they intended to motivate water efficiency heavily using metering and retrofitting and by promising them the intrinsic or extrinsic benefits of protecting water resources or reducing water bills, respectively. However, the utilities' plans for water efficiency education were less robust and their understanding of customers was based on sociodemographic characteristics, with limited knowledge of their sociocultural characteristics or household materiality.

The case study revealed that in practice, water efficiency engagement was motivated by local environmental events and related circumstances. Specifically, the water efficiency home visit campaign in Essex & Suffolk Water was initiated due to the occurrence of droughts and flatlined water savings from retrofitting. The research findings showed that whilst employing technically skilled plumbers was beneficial for retrofitting functions, and collating installation data during home visits advanced the understanding of measured water savings, the main factors that stifled water

efficiency engagement during the campaign were: (1) mis-selling of home visits as an opportunity for customers to obtain freebies from the utility, (2) insufficient preparation for water efficiency education including the plumbers' knowledge deficit in water efficiency education and limited soft skills, and (3) the absence of effective feedback mechanisms between the plumbers and the water managers. These barriers meant that some customers lost trust in the utility, the plumbers' engagement strategy required improvement, customers were not better understood by the water managers following the home visits, and practice improvement was stifled.

Overall, the thesis contributes to sustainable water management by advancing the conceptual understanding of water efficiency engagement and aiding water managers to think creatively about water efficiency engagement by proffering ways to improve practice in the field. It presents opportunities for socio-technical change that can be achieved through the reimagination of water efficiency engagement as a complex of measures to address the interconnected factors such as norms, values, socioeconomic conditions, institutions, resources, environment, technology, and water systems that produce household water usage. And part of this socio-technical change includes increasing training and upskilling of plumbers as a key communication channel and custodian of insight about customers and creating a learning culture between the plumbers and the water managers to enhance water efficiency engagement.

Declaration

No portion of the work referred to in the thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.

Copyright Statement

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1 Introduction

> *"Faced with rising demands there is a pressing need, in England and Wales, to engage the public on water conservation issues if future environmental problems are to be avoided."* (Howarth & Butler, 2004:44).

> *"Water companies need to lead the process. They should not wait to be required to manage their own demand and enhance supply. Success will require them to engage with customers even more actively."* (Sir James, Bevan, Chief Executive of the Environment Agency, 2019)

Like many developed countries, the United Kingdom (UK) is facing a water scarcity crisis due to climate change, population growth and increasing household demand. Whilst climate change and increasing population could be complex to address, as the quotations above emphasise, increasing water demand is becoming recognised as within the influence of people who use water and their water utilities.

In the south-eastern region of the UK, household water demand is of concern because of particularly high levels of water-use and population increase combined with low rainfall in those areas. This has led to DEFRA[1]'s (2008) classification of seven UK water utilities operating in the region as seriously water-stressed. These are Affinity Water, Anglian Water, Essex & Suffolk Water, South East Water, Southern Water, Sutton and East Surrey Water, and Thames Water.

It is useful to clarify terminology from the outset. Used interchangeably with water conservation and demand management in the literature, the term 'household water efficiency,' or 'water efficiency' for short, will be used throughout this thesis to refer to actions reducing usage and wastage of water by households, as described by Gleick (2003a). Water efficiency actions might be carried out by individual householders or commercial water users or a range of other organisations seeking to help save water, including water utilities but also government and NGOs. But commercial use of water and actions by government and NGOs to support water efficiency are not the focus here. This thesis is focused on water utilities' actions to help householders save water because unlike commercial water use which has steadily reduced, reductions in household water use has flatlined in recent years (Staffell *et al.*, 2015; DEFRA, 2018) and more than ever before regulatory policy mandates water utilities to increase support provided to the public to reduce their usage (Ofwat, 2011; 2018). Given this, the term 'water efficiency engagement' or 'engagement' for short, is used here to refer to any activity by water utilities' to motivate a reduction in household water use.

[1] The Department for Environment, Food and Rural Affairs is the government department responsible for environmental protection, food production and standards, agriculture, fisheries, and rural communities in the United Kingdom.

Multiple strands of water efficiency engagement are being implemented by UK water utilities including metering, retrofitting and education (Beal *et al*., 2013; Maas *et al*., 2017; Hamling *et al*., 2018). Whilst these three measures will be defined more fully later in the thesis (Chapter 4), what is important to note at this point is that in the context of this research, metering and retrofitting seek to achieve water efficiency through the installation of new technologies - water meters and water efficiency devices respectively, while education relies on informative action, whether one-way or two-way, to motivate householders' conscious reduction of their water usage. All forms of household water efficiency activity involve engagement: while clearly education can only be achieved through engagement, even the metering and retrofitting require some engagement with households, for example, to arrange a visit for technical installation.

It is important to acknowledge at this point that too often, there is ambiguity around the use of the term education in the promotion of water efficiency. The term invites connotations of water utilities telling people what to do in a school setting or in top-down ways. However, here, water efficiency education is understood to include a variety of interactions: traditional top-down communications are included, but so too are instances where the interaction between water utilities and the public is conversational and aimed towards supporting them to be more aware about water and become water efficient.

The attempts to reduce household water use through purely technical means, dubbed 'techno-efficiency' by Browne *et al*. (2019), have however been criticised as ineffective by social scientists and there have been increased calls by water professionals for traditionally technocratic water supply management regimes to evolve so they additionally harness education to address water demand (Jonch-Clausen, 2004; Waterwise, 2015). One justification for such calls is the invisibility of the work behind piped water provision from people's lives. Prevos (2017: 2), for example, highlights that the unintended consequence of normalised tap water reliability in places with well-functioning water supplies is that consumers do not need to spare any thought to their consumption and water and water services 'reside in the background of daily life.' What Prevos points out certainly holds true in the UK as studies have shown that water suffers a disconnection from the public due to how uninterrupted and cheap supply has affected people's perception and usage of the resource (Owen *et* al., 2009). Indeed, the normalisation of uninterrupted water supply has been cemented by the Water Industry Bill 1998/99 which prohibits the disconnection of water supply to homes (Downing and Richards, 1998) and Ofwat's [2] (2015a) use the supply interruption indicator to assess and compare utilities'

[2] The Water Services Regulation Authority, or Ofwat, is the body responsible for economic regulation of the privatised water and sewerage industry in England and Wales. After water services in England and Wales were privatized in 1989, Ofwat was created to set limits to water tariffs, and amongst other things ensure water efficiency (Byatt, 2013).

service performance. One of the resultant effects of this service expectation is that water and water utilities are even more invisible to the public as the resource is seen as a basic necessity and access is never a concern.

In what might be seen as an attempt to counteract the invisibility of water and water utilities to the public, and after the 2006 drought in the UK, there was an outpouring of academic literature highlighting the need for the public be more involved in efforts to achieve water efficiency (Medd & Chappells, 2007; Chappells & Medd, 2008; Taylor & Trentmann, 2008; Taylor *et al.*, 2009). Also, since 2011, regulatory expectations have made public engagement a key part of plans to tackle water scarcity in the UK (Ofwat, 2011). Water utilities thus have a responsibility to engage and motivate the public to make conscious decisions and lifestyle changes for water efficiency.

More than thirty years after the privatisation of the UK water industry, Sir James Bevan, at the 2019 Waterwise conference, made a compelling argument for why water utilities needed to proactively engage and support the public to reduce their water usage to escape the 'jaws of death – the point at which, unless we take action to change things, we will not have enough water to supply our needs.' It is therefore of little surprise that the imperative for water utilities to increase public engagement about water efficiency, identified by Howarth & Butler (2004) and Sir James Bevan (2019), quoted in the Chapter epigraphs, remains.

So why is it important to study how water utilities are engaging the public in water efficiency?

A faction of authors (see Kampragou *et al*., 2011; Willis *et al.*, 2011; de Miranda Coelho *et al*., 2016; Mirza & Mustafa, 2016) took a departure from focusing on how water users need to act for change to highlighting the role of water utilities in the success of water efficiency engagement by touching lightly on how people's water use may change in response to good engagement. Even a few authors such as Dessai and Sims (2010) pointed out that the public in seriously water-stressed areas felt that their ability to be water efficient suffered due to lack of water efficiency engagement from their utilities and these companies indeed appear reluctant to manage demand.

However, despite the public being recognised as capable of actively supporting water utilities to address problems (Sharp *et al.*, 2015) and despite the increasing emphasis on public engagement as a critical intervention for tackling increasing water demand (Hussey & Dovers, 2007; Capelos *et al*., 2015; Dean *et al*., 2016), metering and retrofitting are generally represented in the literature as highly effective water efficiency strategies while educational interventions are generally presented as a form of public engagement which is supplementary and an appendage through which water efficiency is reinforced. In other words, education is not at the fore and is adjudged separate and different from

metering and retrofitting even though all three interventions require public participation to achieve water efficiency and are not mutually exclusive.

The problem is that fostering public involvement in water decisions and projects comes with complexities (Von Korff *et al*., 2012; Jacobs *et al.,* 2016). Despite theories and policies that explain and promote how interventions such as smart metering (Fielding *et al.*, 2012), retrofitting (Roccaro *et al*., 2011), and water efficiency education (Michelsen *et al*., 1999) can lead to water efficiency on the part of the public, these are not effectively reflected in practice because information about the implementation of these engagement initiatives remains lacking (UK Environment Agency, 2005; Inman & Jeffrey, 2006; Roccaro *et al*., 2011).

Practice theorists such as Watson *et al*. (2020) have pointed out that institutions (such as water utilities) influence domestic water consumption. But whilst public engagement about water efficiency might be seen as gaining traction in the UK water sector, it is an aspect of water efficiency engagement that remains poorly understood because how it is planned and delivered has not been examined in depth. Even a few authors such as Lu (2020) have unequivocally called out the lack of scholarly examination of utilities' engagement practices as detrimental to the achievement of household water efficiency. It therefore remains unclear how utilities are rendering water efficiency support to the public despite increasing regulatory expectations and the theoretical know-how.

The dearth of studies exploring water utilities' activities to promote water efficiency can be linked to the industry's placement of responsibility for water efficiency on the public and the prioritisation of measured water savings over the quality of public engagement processes as measures of success in water utilities. The interaction between water utilities and the public for the purpose of water efficiency is thus not at the fore in the literature.

The lack of research on the implementation of activities to achieve water efficiency means that lessons that can be drawn from water efficiency initiatives are limited and practice improvement is stifled as a result. This gap has been highlighted by experts such as Syme (200), Roccaro *et al*. (2011), Biagini *et al*. (2014), and Waterwise (2015) and is consonant with evidence suggesting that while 'many water saving measures are well known, their application is not well established worldwide' (Roccaro *et al*., 2011: 1358). This is still the case: more recently, Moglia *et al*. (2018:11) asserted that 'research around how to best promote water conservation is still not well developed.'

Based on the gaps in the body of knowledge and in practice that are highlighted, this thesis will develop a conceptual understanding of the planning and delivery of water efficiency engagement, elucidate the factors that impact effectiveness, highlight opportunities for practice improvement, and

help water management practitioners think more creatively about implementing initiatives. The context of the thesis will be developed further as discussions emerge in the Literature Review Chapters 2 to 5 and the knowledge contributions from the research will be reflected upon again in the Conclusions Chapter (section 10.1 - section 10.3) of the thesis.

This chapter sets the scene for the research. The next section uses vignettes to illustrate why water efficiency engagement is a topic of interest. The second section provides a brief outline of the research aim and objectives. The third section outlines the structure of the thesis.

1.1 Illustration of water efficiency engagement

It was the summer of 2017 when six plumbers set out to pay scheduled home visits to households in Witham, a town in Essex, southeast of England. The home visits were part of the Every Drop Counts (EDC) water efficiency programme, run by Essex & Suffolk Water (ESW), a utility operating in an area of the UK with low rainfall causing serious water stress. The home visits aimed to retrofit household water systems such as taps, toilets and showers with water efficient devices wherever practical, and to engage residents in conversations to motivate them to reduce their water usage.

One of the visits was to a middle-aged man who was remodelling his entire house and was seemingly concerned about wastage. He said, "*I hate waste…because we are just using up commodities that we should not be using; water is the worst one*." As the home visit came to an end, the householder mentioned plans to put the house up for rent. As we walked down the path away from the house, the plumber bared his thoughts on his role in water efficiency promotion, saying "*I am an 'asset' to them [ESW]*." It emerged that the plumber's self-perception was due to the *customer-facing/ knowing* nature of the job, and due to having a better understanding of the public, much unknown to the water utility.

In another household was an unemployed lady who lived alone. Informing her of the motivation for the home visit, the plumber said, "*Witham has the lowest rainfall in Essex at the moment*." She – the householder - interrupted, "*Is it? I did not know… but it has been raining for the last few days, and it is raining now [pointing at the view through the kitchen window] …why not collect it [the rain]*?" Failing to recognise entry points for water efficiency education in this conversation, the plumber replied, "*I know. It is not looking too great; it is a bit cold now… I do not like the rain either…*" Although willing, the householder declined retrofitting certain water systems in the house because the Housing Association had warned about liability upon vacation of the property.

These vignettes of water efficiency home visits illustrate the reality of the water efficiency landscape in the UK today and open up the discussion about much wider issues around water efficiency engagement: (1) increasing water demand and wastage exacerbate the problem of water scarcity; (2) water efficiency engagement can be made more complex by customer diversity and red tape; (3) 'assets' are not only technological but include personnel such as the plumbers who are a primary gateway to insights about the public; and (4) the ability to have effective water efficiency conversations is a skill that is currently lacking due to the changing nature of the role of plumbers in water utilities.

In view of the water scarcity crisis, especially in the southeast of England, public engagement to reduce water demand is transcending 'hard' science into 'soft' humanities. In line with social scientists increasingly calling for changes to how water has been conventionally managed (Pahl-Wostl *et al.*, 2007; Rosa, 2008; Browne *et al.*, 2013), this research takes the normative position that water efficiency will benefit from water utilities positioning people and other interconnected factors that affect water use at the core of water efficiency engagement, thus providing value for money and better outcomes.

1.2 Research aim and objectives

UK water utilities especially in areas of serious water stress engage with the public to promote water efficiency beyond the use of technocratic measures or traditional one-way communications, but there is little research on the delivery of initiatives and maximising their effectiveness is stifled as a result.

The overall aim of this thesis is to develop a better understanding of water efficiency engagement in seriously water-stressed UK utilities, with focus on barriers and opportunities. This study will drill down into water efficiency engagement in the sense of determining its current nature and extent, with focus on project-planning activities, the implications of engagement processes (whether technological or educational), and the extent to which these align with or deviate from indications of effectiveness suggested in the academic and grey literature about water efficiency.

To do this, the objectives of the research are:

1. To explore the intended audiences and processes for water efficiency engagement in UK water utilities operating in areas of serious water stress.
2. To identify the factors that aid or stifle water efficiency engagement in a seriously water-stressed utility.
3. To further the concept of water efficiency engagement and support practice in the field.

The contexts of these research objectives will be discussed further in section 6.2 where they become relevant.

The next section outlines the structure of the thesis including key deliverables of each chapter.

1.3 Thesis structure

Following the introduction, Chapter 2 is the first segment of the literature review. It introduces the water scarcity problem and conceptual elements that underpin the communication of water efficiency, including their interdependence. It culminates in the development of the analytical framework for the research – the Message Audience Channel (MAC) heuristic for understanding water efficiency engagement.

Chapter 3 is the second phase of the literature review. It presents policy influencers of water efficiency engagement in the UK water sector.

Chapter 4 is the third aspect of the literature review. It discusses the main water efficiency engagement approaches identified in practice.

Existing knowledge about water efficiency engagement is the focus of Chapter 5. Researchers' assumptions and pre-existing understandings about the nature of knowledge influence the 'paradigm' through which they approach questions about engagement. This chapter explores how various paradigms have shaped existing knowledge about water efficiency. It culminates in a reflection on aspects of water efficiency engagement requiring new studies and makes a proposition that such studies will benefit from employing the Message Audience Channel (MAC) heuristic for understanding water efficiency engagement.

Chapter 6, Methodology, begins with the philosophical influences in the research and proceeds to contextualise the research objectives. The chapter then presents the scope, strategy, methods, and data for the empirical analyses, and reflects on the research limitations and expected contributions to knowledge.

Chapter 7 describes and discusses the findings from the first empirical analysis in the research which concerns understanding the intended audiences and processes for water efficiency engagement in UK water utilities operating in areas of serious water stress.

Chapter 8 presents findings about the processual aspects of Essex & Suffolk Water's Every Drop Counts home visit campaign which is the focus of the case study. It describes project-planning aspects

of the campaign including the plumbers' training and marketing activities and offers an insight into how the home visits were delivered.

Chapter 9 describes and discusses findings from the second phase of the empirical analysis in the research which concerns the factors that aid or stifle water efficiency engagement in Essex & Suffolk Water.

Chapter 10, Discussion and Conclusion, consolidates the new knowledge from findings in the first and second phases of the empirical analysis to further the concept of water efficiency engagement, and offers suggestions to support practice in the field.

2 Water efficiency and communication theory

The previous chapter introduced increasing water demand as an exacerbator of water scarcity in the UK. It elucidated water efficiency engagement as water utilities' activities to support or encourage the public to reduce and use water efficiently in households and rooted the rationale for this research in the absence of information about water efficiency engagement initiatives planned and delivered by utilities and the lack of knowledge about how the effectiveness of such initiatives can be maximised.

There is a close relationship between theory, policy, and practice as these three elements continuously reshape one another. This chapter develops the background for the research by exploring the context of water scarcity in the south-eastern region of England and goes further to begin showing these linkages by highlighting the theory of communication and how it relates to existing knowledge about water efficiency engagement. This role of this chapter in the thesis is therefore to help identify key components for consideration in water efficiency engagement that drive the subsequent policy and practice discussions in Chapter 3 and Chapter 4, respectively.

The first section discusses the problem of water scarcity in the UK including increasing water demand. The second section explores water demand management in the UK. The third section discusses water efficiency engagement in the UK. The fourth section explores how communication theory underpins public engagement. This section goes further in its subsections to explore models of communication theory offering knowledge about key elements that shape any communication and how these can be identified in and used to better understand water efficiency engagement. The chapter culminates with the fifth section which develops a heuristic for understanding water efficiency engagement practices using insights drawn from the preceding sections.

2.1 Water scarcity in the UK

Global population and the demand for the everyday use of water in the home (see Pullinger *et al.*, 2013a) are increasing, posing a threat of water scarcity in the Global North. In several of such countries, certain places have a water demand-supply imbalance due their disproportionate population growth and climate change-induced weather variations (Rijsberman, 2006; Distefano & Kelly, 2017).

The problem of water scarcity in the UK is of particularly great concern because there is an unequal distribution of water in the country. Principally in southern and eastern England, areas receiving the lowest rainfall also have the highest population density (Holt *et al.*, 2000: 316).

Increasing household water demand due to population growth is not just a phase. Historic water usage data shows a steady annual increase of 1% since the 1930s until 2006. Households currently account

for 21.7% of the UK's water usage (Staffell *et al*., 2015) and unlike industrial water usage which has decreased, DEFRA (2018) reported that reduction in per capita consumption has plateaued in recent years.

Almost two decades ago, Downing *et al*. (2003) reported that UK water demand is expected to increase significantly as global warming increases in the nearest future. More recently, Lawson *et al*. (2018), warned that considering expected extreme weather events, if the UK population increases by about 10 million in the next 50 years, then annual water supply will rise by half a trillion more litres of water. Evidence from the Office of the National Statistics (2018) shows that the UK population is projected to increase from 66 million in 2018 to 73 million people by 2041. We therefore know that there is a likelihood that the UK will experience skyrocketing water demand.

Particularly in the south east of England, population is projected to increase disproportionately, and more severe droughts are expected to occur. Due to their 'current demand for water being a high proportion of the current rainfall available to meet that demand or the future household demand for water is likely to be a high proportion of the rainfall available to meet that demand,' the UK Environment Agency and Natural Resources Wales (2013: 2) classified seven areas in southern and eastern England as experiencing 'serious water stress' (Figure 1).

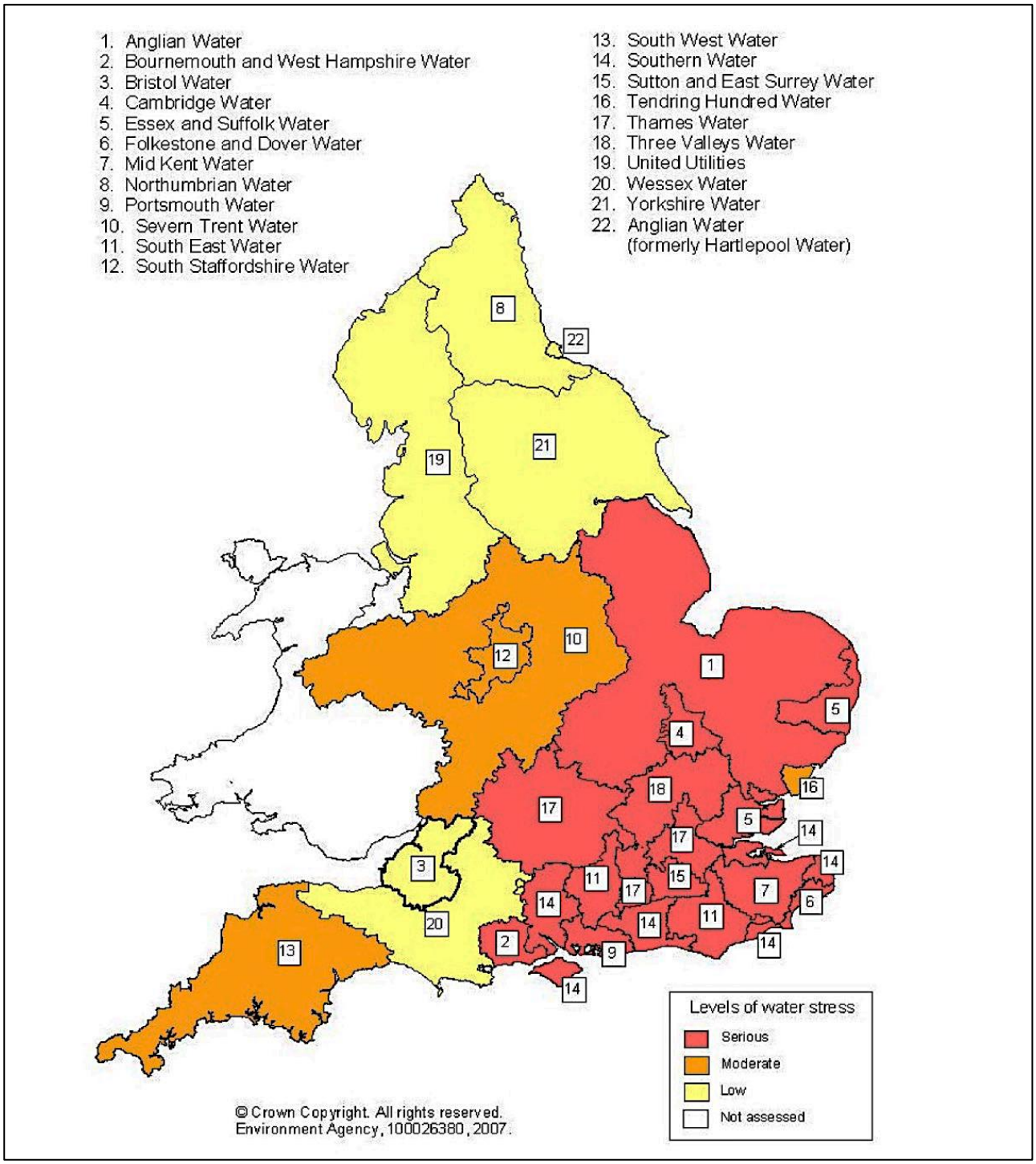


Figure 1 Classification of areas of relative water stress in the UK (DEFRA, 2008).

Figure 1 illustrates the intensity of water scarcity in the UK, with increased water stress in southern and eastern England.

At the time this research commenced (2015-16), water consumption levels were reported to be continuing to increase in almost half of the UK water utilities that are water-stressed (Consumer Council of Water, 2016) (Table 1).

Table 1 UK water utilities facing water scarcity (Consumer Council for Water, 2015-16).

Water utility	**Water supply areas**	**Customer population**	**Average usage (litres per person, per day (l/p/d))**
Anglian Water	East Anglia and East Midlands	2 million	135.4
Affinity Water	Central: North London, Essex, Hertfordshire, Buckinghamshire Southeast: Folkestone, Dover, Romney Marsh and Dungeness East: North East Essex	3.5 million	152.2
Essex & Suffolk Water	Essex, South Norfolk, and North Suffolk	1.7 million	150.7
South East Water	Kent, Hampshire, Berkshire, Sussex, and Surrey	2.1 million	161.2
Southern Water	Kent, Sussex, Hampshire, and the Isle of Wight	1 million	132.0
Sutton & East Surrey Water	Morden, South Croydon, Gatwick Airport, Cobham, Leatherhead, Dorking, Edenbridge and Bough Beech	675,000	157.9
Thames Water	London and the Thames Valley	15 million	149.3

From Table 1, it can be observed that most seriously water-stressed utilities had a high customer base and an average per capita consumption that ranged from 132l/p/d to 161.2l/p/d in 2015-16. That year, most of the seriously water-stressed utilities recorded per capita consumption levels higher than the 2015-16 England average of 140l/p/d. Also, all these water utilities' per capita consumption levels were higher than the 130l/p/d consumption target set by the UK Government (DEFRA, 2008).

According to DEFRA (2018), currently in England, the average person's per capita consumption is 143l/p/d (see Figure 2).

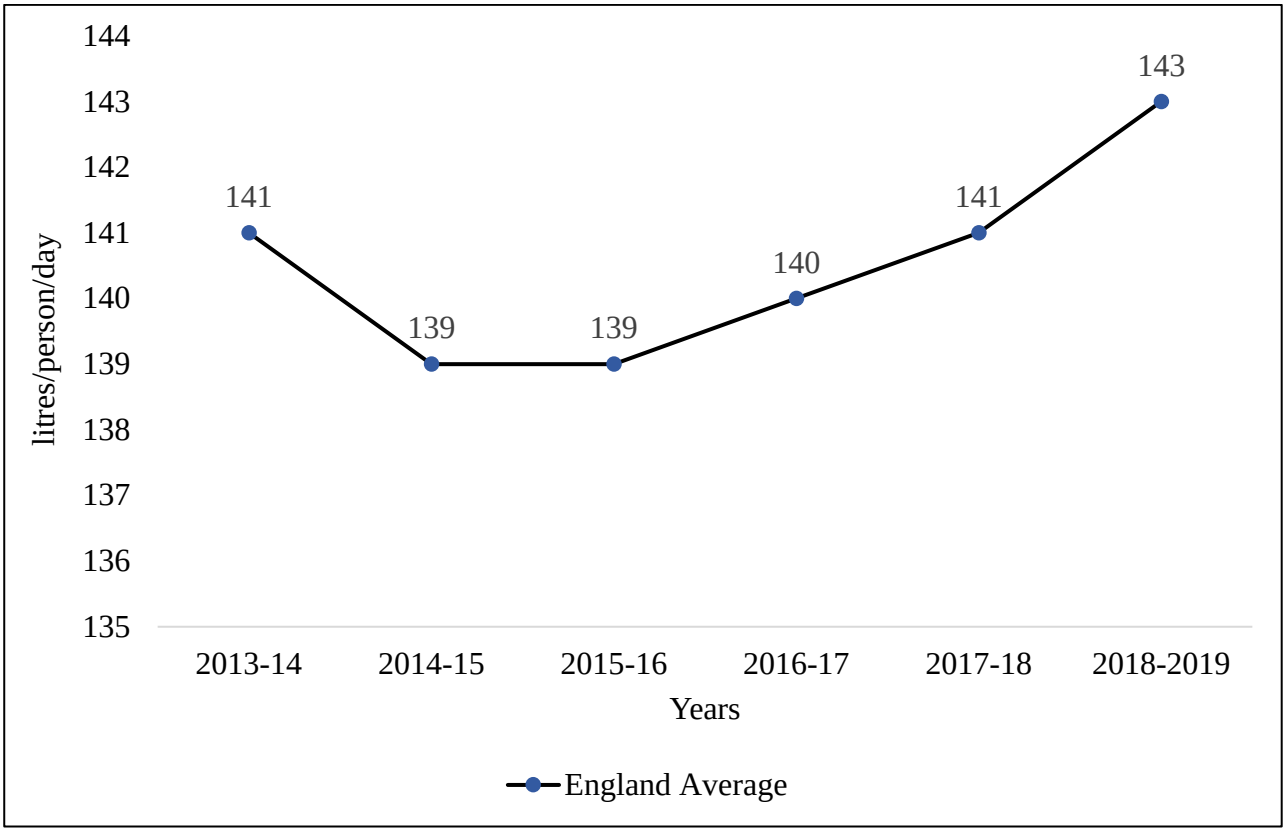


Figure 2 England's average per capita consumption in average litres per person per day in recent years (DEFRA, 2018).

Figure 2 shows that England's per capita consumption reduction in recent years has flatlined. This plateau is evidenced by the stalling of the average per capita consumption around 139l/p/d to 142l/p/d between 2015 and 2020. Currently, per capita consumption is higher than the UK Government's aspirational target of 130 l/p/d by 2030 (DEFRA, 2008) and is also 85 litres higher than the average usage recorded in the1960s (Lawson *et al*., 2018).

Discussions in this section therefore confirm that unmanaged household water demand poses threats to the security of future water supplies, making it one of the most significant concerns for UK water utilities (DEFRA, 2008; Browne *et al*., 2013).

The next section highlights the emerging iterations of measures to address the problem of increasing water use, particularly in the UK.

2.2 Water demand management in the UK

Up until the early 1980s, it was the UK Government's responsibility to ensure water supply to meet demand. Water utilities focused on ensuring water provision (Stephenson, 2012) using engineering expertise and large technical infrastructures. Such technocratic tradition meant that to meet water

demand, UK water utilities perpetually sought water resources to increase supply and prevent supply disruptions (Howarth and Butler, 2004; Read, 2005; Butler & Memon, 2005; Inman & Jeffrey, 2006), for example, the use of dams (Bakker, 2013; Linton, 2013). This predict and provide approach has been termed the 'hard path' by Gleick (2003: 1524).

This traditional way of fulfilling water demand was widely criticised for not focussing on how to make the most of available water resources (Butler & Memon, 2005) and for using mostly inflexible supply measures that may not aid resilience considering future uncertainties such as population increase and climate change (Pahl-Wostl, 2002; Dooge, 2009; Herrick *et al*., 2013; Linton, 2013).

According to Johnson and Handmer (2002), following the privatisation of the UK water sector in 1989, the burden of ensuring water security rested on water utilities and the emphasis on water efficiency at household level increased.

Currently, the seriously water-stressed utilities in the UK are attempting to balance demand and supply by finding new water sources and reducing leakage. However, more than ever before, they are compelled to increase their efforts to reduce household water demand.

Uncertainties such as climate change and population growth have been bringing to the forefront the need to intensify coping strategies including increased management of household demand (Pereira *et al*., 2009).

Another reason why the need water utilities are having to increase household water efficiency is pressure from the public, regulatory agencies, and from some governments to reduce new supply projects (e.g., building new reservoirs or inter-regional transfer schemes), implying that the emphasis should be shifted towards managing water demand by best utilising the water that is already available (Butler & Memon, 2005).

Also, water demand and scarcity predictions are not without challenges. It is the view of Vörösmarty *et al.* (2000) that the impact of increasing population on demand may be under-estimated and projections of future water availability based on the numerical modelling of population, climate change impacts, water budgets, and socioeconomic data are clouded with inaccuracies (Gleick, 2003). The validity of these water scarcity indicators has not been robustly examined (Damkjaer and Taylor, 2017) and cannot be entirely relied on.

Further, one of the problems facing water conservation in the UK is that the public uses water freely without giving much consideration to it and the natural resource is thought to be ubiquitous and a

human right (Owen *et* al., 2009). So, there is increased calls by academics and practitioners in the water industry for the public to improve how they perceive and use water.

It is however not enough to just emphasise increased household water efficiency for reasons pointed out decades ago by Johnson and Handmer (2002). The authors highlighted that growing emphasis on household water demand provides an avenue for water utilities to blame the public when there is a supply failure. The authors even cited the 1995 drought when Yorkshire Water blamed the public for being complacent and wasting water and the public in turn blamed the water company for mismanagement, inefficiency and for the drought itself.

Tackling the issue of water scarcity at the source through water utilities engaging the public to reduce water demand is one way to address the problem, without blaming the public for the issue. In so doing, the efficient use of water as a scarce resource is encouraged through 'the development and implementation of strategies aimed at influencing demand' (Stiles, 1996; Savenije & van der Zang, 2002: 99) for example, by promoting water efficiency engagement through metering, retrofitting as well as more directly promoting efficient water usage.

What is therefore now advocated in the industry is a contemporary water management tradition which works to achieve water efficiency to delay or avoid the need to develop new water resources (Howarth & Butler, 2004; Read, 2005; Butler & Memon, 2005; Inman & Jeffrey, 2006), thus prioritising water efficiency over sufficiency. This water efficiency tradition seeks to reduce water demand by managing consumption (Rijsberman, 2006; Jorgensen *et al.*, 2009) through the control of water users' usage and by water utilities spreading awareness about the value of water (Stephenson, 2012), in other words, water efficiency engagement. In this light, the water efficiency tradition is promoted as the flexible fostering of water ownership and accountability by both the public and water utilities considering current uncertainties.

The next section discusses the evolution of water efficiency engagement in the UK water sector.

2.3 Water efficiency engagement in the UK

The development of water efficiency engagement in the UK can be traced back to about seven decades ago during which water crises such as droughts (Butler & Memon, 2005) led to increased public engagement activities about water efficiency (see Marsh & Wilby, 2007) especially public awareness campaigns (Icaro, 2013).

This is evidenced by sequences of events recorded in the literature. For example, the 1933-35 droughts were characterised by public appeals to limit water use (Taylor *et al*., 2009). Subsequently, during the 1959 drought, appeals were made to the public to voluntarily reduce usage, drought orders were enforced in some districts, and some people were banned from using washing machines and taking baths. Thereafter, the 1975-1976 drought was met with widespread public campaigns to reduce water use (Pearce, 1982; Rodda & Marsh, 2011).

Responses to the mid-late twentieth century droughts therefore demonstrate that the public became recognised as an active participant in water efficiency over time. This drawn conclusion is also supported by Durant's (2015) assertion that increasing droughts have led to increasing expectations of the public and of water utilities in water efficiency.

In addition, sustainability-driven regulatory developments in the past few decades have driven water utilities to engage more with the public to reduce their water usage. For example, it was Ofwat's (2011) view that the public will benefit from greater support to become water efficient, and the UK Environment Agency and Natural Resources Wales (2013: 4) recommended that in all water utilities, 'there should be some activity to ensure that water is used more efficiently and effectively.' Also, the water sector regulator, Ofwat (2018) set a statutory annual water efficiency target to reduce per capita consumption by 1l/p/d between 2010 and 2015. Currently, DEFRA has an aspirational target for water utilities to reduce per capita consumption to 130l/p/d by 2030.

Furthermore, in the academic sphere, some authors who champion contemporary water management such as Herrick *et al*. (2013) have been promoting the need for water utilities to put learning and communication at the heart of their functions, to exploit openness and information sharing as an integrated communication tool, and to identify, understand and resolve gaps and failures in their water management activities.

So, as stakeholders continue to call for increased customer participation in water management (see Hartley, 2003; Walker & Salt, 2006; Groenfeldt, 2013) to develop long-term solutions to water scarcity (Falkenmark *et al*., 2007; Dean *et al*., 2016; Jacobs *et al*., 2016), water efficiency engagement offers UK utilities that are seriously water-stressed a means to provide such support to the public.

As stated in Chapter 1, water efficiency engagement refers to water utilities' interactions with the public to motivate behaviours and actions that can result in a reduction in household water use. Such water efficiency engagement can include the motivation of pro-environmental behaviours for example, through intentional education using comparison (giving normative feedback or making desirable behaviour look effective) or triggering (using water saving devices or the water meter to

prompt pro-environmental behaviour), or by increasing or decreasing people's control in performing a behaviour (e.g., using a low-flow shower head to control water used for showering) (Shu *et al*., 2017). The types of activities that constitute water efficiency engagement will be expanded upon in practice discussions in Chapter 4.

The next section initially discusses the conceptual elements that underpin the contemporary water efficiency engagement being advocated. Then, its subsequent subsections explore how some of these conceptual insights are evident in the literature about water efficiency engagement even though they may not have been intentionally informed or underpinned by theory.

2.4 Communication theory and water efficiency engagement

Communication is understood to be the process through which people interactively create, sustain, and manage meaning by sending, receiving, and interpreting messages including through verbal and non-verbal behaviours with intentionality (see Dainton & Zelley, 2011).

Theories exist and we can use relevant ones to understand water efficiency engagement better. Most importantly, communication theory provides an abstract explanation for how communication processes work (Miller, 2002) and its models can be used to better understand how the planning considerations for water engagement shape the delivery and outcome of initiatives.

Three models of communication theory are of particular interest in this study: Shannon-Weaver's model, Lasswell's model, and Berlo's model. Shannon-Weaver's (1949) communication model highlights that the sender, encoder, receiver, and noise are the key components of communication. Lasswell's (1948) communication model explains mass communication through the lens of who (communicator) says what (message) through which channel (medium) to whom (receiver) and for what effect (effect). Berlo's model of communication (1949) builds on Shannon-Weaver's communication model by highlighting the factors that can affect the elements of communication. Berlo postulated that certain factors influence communication: the skills, attitudes, knowledge, social system and culture of the communicator and the receiver; the content, elements, and structure of the message; and the interaction of the communication channel with the receiver's sensory interpretations. It is from such communication models that the 'message,' 'audience,' and 'channel' elements of communication became established in the literature. These elements will be defined and discussed in turn in the subsequent subsections.

The subsequent subsections expand the background to the research using examples of water efficiency engagement found in the literature to illustrate the influences of communication theory in

water efficiency engagement. The role of these subsections in the thesis is to elucidate the communication elements that ought to be given more consideration when planning, delivering, or seeking to understand water efficiency engagement in water utilities.

In each subsection, discussion begins with an exploration of the conceptual context of the communication element, followed by examples showing how it applies in water efficiency engagement.

The first subsection explores what water efficiency engagement is about (message). The second subsection examines who is engaged during water efficiency engagement (audience), followed by the third subsection which explores how engagement is done (channel). These three elements will form reference points for subsequent discussions about water efficiency engagement in policy and in practice in Chapter 3 and Chapter 4, respectively.

2.4.1 What water efficiency engagement is about (message)

In this thesis, the term message is understood as any communication or implication of actions by water utilities intended to orientate people towards reducing their water use.

As mentioned earlier in section 2.4, we know from the literature about communication theory that message is the intentional collation of thoughts, or the signal that the communicator expects to stimulate the receiver.

Indeed, any communication or marketing begins with a motif within which the message is embedded. Lammers (2011) argues that historically, the message was understood to be the delivery of a communication or an errand to the public and is attributed to the sponsor and its intent. But neo-institutional constructions of communication explain message as the signal that stimulates receivers (Lasswell, 1948), or a collation of thoughts (O'Keefe & Lamber, 1995) transferred under motivational circumstances (Lammers, 2011). The message is therefore a key component of communication.

In the same light, water efficiency messages and actions do not exist without being constructed using explicit and implicit 'frames' to encourage the receiver to have a desired line of thought (Nisbet, 2009).

So, how can the message be recognised in organisations' communications and what does mean for examining water efficiency engagement in water utilities?

Suddaby (2011) suggests that researchers can understand the message in institutions by scrutinising structures that normalise schemes, norms, and routines, or as Lammers (2011) suggests, by scrutinising key processes in their mechanisms and communication modes. For water efficiency engagement, this means that a critical examination of water efficiency messages should focus on the water utility as much as on what the engagement implies and how the audience receives and understands it, and then acts.

According to Orr *et al.* (2009), message frames are the context and approach used to construct communication and these can be either explicit or implicit. The concepts of explicit and implicit messaging in water are borrowed from authors who use these terms to differentiate whether intentions for water efficiency interventions are clearly expressed (explicit) or are not expressed but can be inferred from the way the initiatives are designed and delivered (implicit) (Ashton *et al*., 2015).

The difference between explicit and implicit water efficiency messages is usefully illustrated via an example. On the one hand, a water utility may install a water meter in a household with recorded high usage with the intention to motivate the bill-payer to become more conscious of the cost of water and reduce usage. Such activity therefore uses the price signal to send an implicit message that the water user should save water (Sharp, 2006; Russell & Fielding, 2010). But the water utility may not explicitly express to the bill-payer this intention to use metering to nudge water efficiency. On the other hand, the water utility may pay a water efficiency home visit to people who live in a household to explicitly motivate water efficiency. In this case, the literature suggests that to achieve water efficiency, people who may be unaware of increasing water demand should be clearly and explicitly informed through messages that are motivational. For instance, these explicit messages might dispel myths around water, compare the household with other people's usage, highlight the increasing cost of water provision and the impact of abstraction on the environment, or point out the need for collective action to address rising water demand in the context of climate change (Howarth & Butler, 2004) but must be positive or neutral rather than coercive to achieve effectiveness (Benzoni & Telenko, 2016).

The literature goes further to highlight four aspects of the message element that determines the outcome of water efficiency engagement: (1) tagline, (2) context, (3) social comparison, and (4) rhetoric combination.

First, taglines affect the effectiveness of initiatives that seek to change how the public uses water because some rhetoric resonate more with people than others do. For example, Icaro (2013) found that in order of public preference, people were motivated to be water efficient by: 'don't pour your

money down the drain' (44%), 'saving water today will ensure it will be there tomorrow' (28%), 'every drop counts' (27%); and then 'use water wisely' (26%).

Second, the problem and the solution must be framed in ways which are relatable to the public since living in an area of water stress does not automatically lead to the desire to reduce water use (Icaro Consulting, 2013; Long & Pijanowski, 2017). But according to Benzoni & Telenko (2016), when information and tips on how and why people should be water efficient is presented within their areas' drought context, people achieve water savings. Notably, the authors suggest that water efficiency engagement is more effective when the public is primed a few times to heighten their awareness about the environment before then being given water efficiency information. This demonstrates the need for water efficiency messages to position water as a communal resource with environmental implications that can be seen or felt locally.

Third, social comparison must be strategic to achieve effectiveness. Social comparison (a concept developed by Festinger, 1954) means a weighing up of usage or water efficiency with other people to normalise 'good' behaviour. Ferraro & Price (2013) reports that social comparison influences people's behaviours more than technological measures to reduce usage. Further even, Olmstead (2014) suggests that comparing people's water usage to their past usage can motivate a water usage reduction even by high-income people who are not sensitive to the price of water.

An illustration of the effectiveness of comparison based on historical usage was seen in Essex & Suffolk Water's Challenge Twenty12 project which sought to motivate water efficiency by providing 'customers with feedback on their usage over two months alongside the average usage for the sample involved in the project' (Orr *et al*., 2009; Ashton *et al.,* 2015). A similar example is Landon *et al*.'s (2018) study of fourteen neighbourhoods in Texas which revealed that persuasive messages comparing the public's water use with their past consumption delivered more water savings in comparison to messages comparing their usage with that of other people in their neighbourhood. This therefore means that for usage comparison to be effective, it must be personal and tailored rather than peered and distant.

Fourth, evidence shows that there is a method to combining water efficiency messages in any single engagement. For instance, in a study conducted on behalf of DEFRA (2014), Icaro Consulting developed and tested five water efficiency message frames with 4,011 people. The message frames included population increase, drought, demand, comparison of UK consumption with developing countries, and CO_2 emissions resulting from energy-water heating. Although the study fell short for failing to provide reasons, Icaro found that combining the five message frames was counterproductive

to motivating water efficiency. Rather, the triad of messages framed around consumption, population growth and climate change, and messages that linked water consumption to greenhouse gases emissions motivated people to think that increasing water efficiency was important.

Further, recent research indicates that for successful education of the public, messages should foster a sense of urgency for action (Syme *et al*., 2000), be persuasive (Ferraro & Miranda, 2013; Brent *et al*., 2015), be based on behavioural principles (Seyranian *et al.,* 2015), and be reinforced (Landon *et al*., 2018). And Howarth & Butler (2004) suggest that specific message frames are effective for certain segments of the public including those who are aware, unaware, and interested in water efficiency although the message frames were not specified.

So, this subsection has established the message as a key element of water efficiency engagement that is intended to motivate the public to reduce usage. It suggests that water efficiency messages can be framed explicitly or implicitly and might motivate a reduction in usage for individual reasons or for collective reasons, but they must be clear and appropriate and targeted to the recipient. Notably, these features are reflective of some of the factors highlighted by Berlo's model of communication (1949) (earlier discussed in section 2.4 - the content, elements, and structure) as the message-related influencers of communication. The subsection suggests that to better understand the message in any water efficiency engagement, consideration therefore needs to be given to how water efficiency information is framed and presented to the audience, including their implicit and explicit meanings. This brings to the fore the need to consider who the audience for water efficiency messages is.

2.4.2 Who is engaged during water efficiency engagement (audience)?

Several communication models have described the group to whom communication is directed as, variously, audience, receivers, interactants, or the public (Biocca, 1988; Rowe & Frewer, 2005; Lammers, 2011).

The civic engagement literature presents the public as people who are unaffected by or able to affect decisions but engage with the issues concerning decisions through discussion (Ikegami 2000).

For water efficiency engagement, this means that there is the public who are the audience at the receiving end of water efficiency information. This depiction of the public, although accurate within the sphere of civic engagement, appears deficient for the changing field of environmental management, particularly the aspect that recognises that the responsibility for the design of engagement lies with the sponsor and the people expected to take the sponsor's desired line of action for change may not always be homogenous.

The term ‘publics’ rather than the familiar term public is therefore used henceforth because it diversifies the more general category of people and better encompasses those who use water in homes and are utilities’ target audience during water efficiency engagement.

But what other terms do water utilities call their publics?

Water utilities’ frequent answer to the question about who they engage during water efficiency activities is ‘the customer.’ The generalisation of publics as ‘customers’ is not exclusive to the water sector as it has been noted in other sectors such as the energy industry (Cotton & Devin-Wright, 2010; Barnett *et al*., 2012).

The term ‘customer’ is frequently used interchangeably with ‘stakeholder,’ and ‘the general public.’ For example, a field study conducted in an anonymous US water utility by Goetz (2014) referred to the general public as ‘stakeholders who are a valid representation of the utility’s bill-paying customers.’ Also, the ‘the general public’ was described as household customers in several studies relating to communicating the value of water (see Chess & Purcell, 1999; Harvey & Schaefer, 2001; Means *et al*., 2008; Stewart, 2009; Mark & Adam, 2015).

Strictly, however, customers are only those individuals afforded recognition due to bill payment. But many people use water who are not bill payers – either as part of a household or in a commercial or public building, or as a tenant whose water bill is part of the rent. Indeed, the concept of household water efficiency implies that water users in homes, and on a wider scale across society, need to use less water to accomplish household tasks. Thus, rather than customers, a more encompassing entity for water efficiency engagement would be publics.

So, how can the audience be better understood in water efficiency engagement?

Researchers can draw on the civic engagement literature to begin to identify the audience targeted by institutions’ communications. How publics are understood through mass communication theory is quite different from how they are perceived in environmental management. Mass communication theory presents audience as either active or passive depending on their psychological and social features (Biocca, 1988), for example, the theory postulates that the active audience is perceived as rational and difficult to influence while the passive audience is gullible and easy to sway. Conversely, in environmental management, active publics are understood to be more engaged with environmental issues than passive publics. It is Biocca’s view that in environmental communication, the active audience is the most likely to act for change while the passive audience is hard to engage. It appears that in environmental management, the current understanding of engagement does not include the

influence of channel of communication. Rather, engagement with an environmental issue focuses on the audience and their conversance with the issue. What is thus in dearth is environmental management studies that identify the psychosocial structures that characterise active and passive publics and how these can inform activities to promote resource efficiency.

Despite the newness and small scale of studies to characterise publics in the water efficiency landscape, the limited customer segmentation in the literature still nuances the understanding of water users. Although, this aspect of the scholarship is still developing and more is yet to be known, findings from a collection of studies (see Owen *et al.*, 2009; Dolnicar *et al*., 2012; DEFRA, 2014; Gorham *et al*., 2014; Sofoulis, 2015; Dean *et al.*, 2016; Aprile and Fiorillo, 2017; Montginoul and Vestier, 2018) suggest that there are diverse segments of publics and their pursuit of water efficiency varies. Amongst these segments are active information-seeking/ engaging publics who may be Positive Greens, Waste Watchers, Concerned Consumers, and Cautious Participants, or passive publics who may be Sideline Supporters, Stalled Starters or the Honestly Disengaged.

Evidence from the literature suggest that Positive Greens are engaged people who most likely see water efficiency as the right thing to do and need encouragement and support to continue being water efficient. Waste avoidance drives Waste Watchers to water efficiency. Environmental concerns drive Concerned Consumers and Cautious Participants to become water efficient, but they can disengage when structural measures such as rainwater tanks are imposed for their households as opposed to being voluntarily installed by them. Likely publics to find in these clusters are young and older people, homeowners, meter owners, garden owners, friends of the environment, proactive people, the unemployed, and the retired.

Amongst passive publics are Sideline Supporters, Stalled Starters, and the Honestly Disengaged. Sideline Supporters are knowledgeable about water efficiency but are inactive, do not demonstrate much water efficient behaviours, and only take water efficient actions that they consider to be reasonable. Stalled Starters are active but not engaged in water efficiency as they think that other agencies such as the Government and water utilities should share that responsibility, but they can become motivated to act for change if there are financial gains involved. The Honestly Disengaged lack water efficiency information and are least the likely to be water efficient. Collectively, Sideline Supporters, Stalled Starters and the Honestly Disengaged are less likely to take up the smart water meter if their usage is high.

It is noteworthy that the understanding in the literature, as consolidated above, is based on publics' sociodemographic characteristics and their own reports about their disposition towards water. Very

few studies add a fundamentally different value to efforts to better understand household water usage and underpin water efficiency interventions with non-behavioural insights that depart from and are separate to what publics tell us about how they feel or think about water and use the resource.

Two of such studies is Browne *et al.*'s (2013) and Pullinger *et al.*'s (2013a) research which make a case for other ways to understand household water usage by exploring socio-materiality in water consumption beyond water systems, water efficient devices, and metering. In so doing, the authors call attention to the existence of societal data that can serve as proxies for people's habitual routines and everyday water-using practices such as showering, laundering, gardening etc. and how these can influence usage and efficiency. Suggesting that understanding the changing pattern of consumption of things that are associated with water-using practices can shed light on patterns of demand, some of the authors gave two examples:

> *'Consistently increased sales in outdoor lifestyle and gardening products across a number of years even in the absence of evidence for increased expenditure on water could indicate that there may be an increase in gardening water demand in a particular geographical area. This could lead to more targeted studies on shifting patterns of gardening and outdoor lifestyles (e.g., the emergence of 'garden rooms' (Chappells et al., 2011) in certain locales, particularly if this observation is linked up to and supported by water company consumption data. Similarly, an increase in showering products may show an increasing commitment to cleanliness and a potential increase in the recruitment of individuals into the practice of showering; similar patterns could be observed with laundry products and laundry.'* Browne *et al.* (2013:1022)

Collectively, these insights imply that the public's relationship with water and water efficiency is much more diverse than the contrasting dichotomic way in which they are currently understood and labelled by water utilities. And by implication, the authors point us in a new direction of who should be engaged and what they should be engaged about during water efficiency engagement. Water utilities will find it resourceful to employ such conceptual understandings to design engagement strategies that are more effective, prevent inefficiencies (for example, to avoid preaching to the converted or using unsuitable incentives for certain people (see Dolnicar *et al*., 2012), and better understand their target audience.

In reviewing how the communications literature refers to those to whom messages are targeted, this subsection has foregrounded publics as the audience of water efficiency engagement. The literature revealed publics' disposition towards water to be diverse and complex and indicate that their

interaction with water efficiency messages is influenced by attitudinal characteristics and other factors such as how they are engaged.

The subsection established that the person recruited for engagement and the message used to motivate them to participate in water efficiency can help us identify the audience in any water efficiency engagement and tell us about how they are perceived by their water utilities. But more so, publics' self-reports about how they feel or think about and use water as well as their sociocultural conditions can help us to better understand them and by implication, know how to better support them to reduce their usage.

The next subsection discusses the channel element of water efficiency engagement.

2.4.3 How water efficiency engagement is delivered (channel)

Multiple models of communication theory present what is here called 'channel' as the medium or route through which communication is delivered (Cameron, 2009).

The nature of communication that occurs through a channel can be understood using Rowe & Frewer's (2005: 252) classification of public engagement. The authors characterise public engagement based on the interaction between the sponsor of a message and the audience in terms of how information flows between the parties. For example, if information is only passed from the sponsor to the audience, the interaction is communication. If information is passed from the sponsor to the audience as well as from the audience to the sponsor, then the interaction is categorised as consultation. And if information flows between the parties in a manner that allows dialogue and feedback, then such engagement is classed as participation. The authors' insights suggest therefore suggest that public engagement activities can be characterised by one-way or two-way interactions, or both.

Thus, in this thesis, the term channel is used to refer to the one-way medium (e.g., media, leaflets, posters, websites etc.) and two-way mediums (e.g., face to face) through which water utilities communicate water efficiency messages to their publics.

So, how can the channel be recognised in organisations' communications and what does mean for examining water efficiency engagement in water utilities?

Researchers can draw on the theory of mass communication to begin to understand the channels used by institutions during communications. Of particular interest to this research is the theory of mass communication which differentiates channels of communication based on modality (for example,

face to face, telephone, post, online) and based on synchronicity, for example whether the channel allows feedback between the message sponsor and the audience in a communication process (see Berger & Iyengar, 2014).

As mentioned earlier in section 2.4, contemporary interest in the channel as an element of communication lies in how it facilitates feedback and shapes the understanding of the message. The literature suggests an inseparability of channel and message as the features and structures of communication channels influence the processing of the message (Salomon, 1979; Berger & Iyenger, 2014). For example, a successful reduction of household water use in Singapore was attributed to the promotion of water efficiency messages in talks, panels, exhibitions and in seminars held by water utilities (Howarth & Butler, 2004), with the emphasis being on where the messages were promoted.

But Kampragou *et al*. (2011) claimed that the type of channel used in water efficiency engagement is influenced by the level of urgency to achieve water efficiency. The authors suggest that advertisements, information and mobilisation campaigns, and community engagements are used in long-term planning to educate water users to be prepared during crisis management.

An example that illustrates urgency and inseparability between channel and message is the technological marriage between channel and message that can be seen in the use of metering and retrofitting to seek immediate water efficiency in households, sometimes with little or no conversation between water utilities and their publics. Rather, due to the visibility and continuous use of the smart water meter and water efficient devices in households, implicit messages are ‘received’ by residents, water bills are impacted, and usage reduces.

Some commentators in the literature about environmental management emphasise the role of the people who undertake communications. A further aspect of channel in water efficiency engagement that therefore ought to be explored is personnel in physical settings.

Referred to variously as communicators, environmental educators, information endorsers, or trusted messengers (see Mony, 2007; Corner *et al.*, 2015; Lamm *et al.*, 2016; Lu, 2020), these personnel have been described as having the attitudes, knowledge, communication skills and sociocultural abilities to work individually and collectively towards solving environmental problems and preventing news ones.

The authors note that such skills include identifying publics’ unique characteristics, and deciphering individuals who are most likely to attend to their message to adopt conservation behaviours and understand how to motivate water efficiency. For instance, in the context of conservation education

in zoos, Mony's study credits personnel for being sources of information with the power to determine how messages should be communicated.

Recently, Waterwise (2015) reported that water efficiency home visits which were conventionally done by several water utilities to retrofit water systems are now being delivered differently to communicate water efficiency messages face-to-face also. The implications of this new aspect of home visits for the understanding of channel of communication merits particular attention.

Face-to-face engagement during home visits is being promoted in the water industry as a measure to tackle increasing water demand since success is dependent on individualised change as much as it is on technical measures (see Waterwise, 2015). These home visits involve plumbers engaging with residents, delivering water efficiency education which emphasises the value of water and the role of the publics in water efficiency.

The nature of design of home visits expects publics to engage with water efficiency messages, with much less consideration given to the other factors at play such as complexities created by the plumbers who they engage with. It is therefore imperative to decipher the nature of plumbers as a channel of communication and their implications for the engagement experience and outcome.

We know from the literature about environmental conservation that docents can affect conservation messages communicated at a zoo for example due to their knowledge, communication skills, sociocultural systems, and attitudes (Mony, 2007). In this light, Mony and Heimlich's (2008) study of how personnel act as a type of channel and impact the effectiveness of institutional conservation messages at a zoo found that although docents perceived themselves as facilitators for learning at the zoo, they were not so successful at teaching information due to their limited awareness of conservation messages, the nature of the exhibition, and the short duration of interaction with members of the public. The authors even warned that these factors can introduce noise into the communication process and pose barriers to engagement as a result.

Particularly in the water efficiency engagement landscape, evidence suggests that face to face water efficiency education in which personnel act as the channel of communication are likely to be more effective water efficiency engagement than one-way communication of water efficiency.

For example, in establishing personnel's key role in facilitating water efficiency, Durham Region (1997) used survey techniques and direct observation to identify barriers to water efficiency in lawn care in the Durham region of Ontario, Canada. Durham Region gave water efficiency literature only to some residents while it paid home visits to other residents to discuss water efficiency. All residents

were asked to sign a commitment to lawn watering patterns and were given a gauge and a prompt to monitor their watering. The study found that residents who were paid home visits by personnel reduced lawn watering by 54% while those who were given water efficiency literature only increased lawn watering by 15%.

Nevertheless, it must be acknowledged that plumbers can be an intricate channel for messages because they affect the existence and effectiveness of water efficiency communication.

One of the challenges with evaluating and maximising plumbers as a channel of communication in water efficiency engagement is that although there are existing studies using communication and marketing strategies to foster how communication interventions can influence how the public uses water, these aspects of the water efficiency literature mostly focus on the people's response to the engagement, rather than on how utilities' engagement practices influence people's responses and other outcomes such as water savings.

For example, Howarth and Butler adapted Lewis' (1898) Attention, Interest, Desire and Action (AIDA) model to explore how water efficiency can be promoted to the public more effectively and Michie *et al*.'s (2011) COM-B system both focus on how the public's capability and motivation can change how they perceive or use water but did very little to address how utilities' engagement practices aid or inhibit the public's capability and motivation to reduce usage.

So, this subsection has presented the channel as an important element of water efficiency engagement that can affect the way the message is presented to and received by the audience. It established plumbers undertaking water efficiency home visits as a channel of communication and has presented a supporting argument for them as influencers of the effectiveness of water efficiency engagement. This subsection suggests that to better understand the channel in any water efficiency engagement, we need to examine the mediums through which water efficiency information is communicated to the audience, including their features and whether they aid synchronicity between the water utilities and their publics. It is noteworthy that these mediums can include technical water efficiency interventions and more importantly, plumbers with capabilities to shape and reshape water efficiency messages and how they are presented to and received by the audience.

Having discussed how the message, audience, and channel shape communication about water efficiency in this section, the next section brings this chapter to a close by juxtaposing these elements into a heuristic for understanding water efficiency engagement.

2.5 Conclusion: the MAC heuristic for understanding water efficiency engagement

This chapter introduced the intricacies of water efficiency engagement that form the basis of the thesis. It presented the message, audience, and channel as conceptual elements which structure water efficiency engagement and impact the delivery of initiatives. These elements tell us about typical water efficiency engagement patterns and allow them to be identified and characterised.

As highlighted earlier in section 1.2, one of the challenges with improving the practice of water efficiency engagement is that there is a dearth of information about the planning and implementation of initiatives. Studies examining water efficiency engagement in water utilities are lacking and lesson learning is therefore limited.

So, to begin to find ways to address this challenge, this section draws inspiration from the discussions about communication theory and water efficiency explored in this chapter to develop a heuristic, the MAC heuristic for understanding water efficiency engagement (see Table 2).

Table 2 The MAC heuristic for understanding water efficiency engagement (adapted from Ajia, 2017).

Influences on water efficiency engagement		
Message	**Audience**	**Channel**
▪ Motivations to conduct engagement. ▪ What is the rhetoric used and what do conversations imply? ▪ Perceptions of water and publics created within context. ▪ Any motivation for publics embedded in practices? ▪ Entry points for conversations e.g. rainfall, drought, scarcity, climate change, communal action. ▪ Explicit signals of urgency, persuasion, remote or distant usage comparison, myth-dispelling, and reinforcement identified in information ▪ What is the audience motivation to understand water efficiency and act?	▪ Identities of publics created when water efficiency engagement is planned. ▪ How do water utilities perceive their publics? ▪ Who is intended to be engaged? ▪ What do water utilities assume motivates publics to be water efficient? ▪ Expectations of publics who become engaged. ▪ How publics become understood after engagement? ▪ Self-reported motivations for engagement and indicators of water conservation behaviours that emerge – (Dolnicar *et al*., 2012). ▪ Psychosocial insights selectively used to understand publics (Corral-Verdugo, 2003); Observed dispositions of publics; any sociocultural insight complementing or refuting existing segments of publics (Dean *et al*., 2016; Gorham *et al*., 2014; Icaro, 2013)?	▪ Any mediums used or planned for engagement? ▪ What do mediums/ measures suggest about the desired line of actions and approach to achieving water efficiency goals? ▪ Technical measures suggestions of desired lines of thoughts and actions. Any deducible meanings? ▪ Delivery approach for engagement; education and how interactions are nuanced. ▪ Personnel as channels; characteristics that affect accuracy of messages and effectiveness of engagement (Mony, 2007; Mony and Heimlich, 2008). ▪ Messaging tactics and rhetoric combination techniques e.g., DEFRA's (2014) triad of messaging. ▪ Deducible barriers to engagement and opportunities for practice improvement.

Table 2, referred to as the MAC heuristic for understanding water efficiency engagement, or the MAC heuristic for short, highlights the pertinent features of water efficiency engagement as well as the aspects of initiatives that require stocktaking and scholarly focus. The MAC heuristic adds to the conceptual understanding of water efficiency engagement developed in this chapter by demonstrating the interdependence of communication elements in the effectiveness of initiatives in the sense that

the message and channel can make a difference to whether and how the audience takes follow-on water efficient actions after engagement.

The MAC heuristic suggests that examining how water efficiency messages are designed is critical to understanding water efficiency engagement. When consideration is given to methodical construction of water efficiency messages, information can be seen to embody intent, implicitness, and explicitness. The heuristic therefore points to a place to begin understanding the essence of engagement activities: the construction and presentation of water efficiency information to the public, and whether activities seek to produce synchronicity and feedback between water utilities and their publics. Further, evidence suggests that framing is important for establishing utilities' perceived motivations for the public to act and using communication tactics can influence the effectiveness of the water efficiency messages. In this light, the MAC heuristic goes further to suggest opportunities to better understand water efficiency engagement by examining the kinds of interest of their publics that utilities' engagement activities seek to appeal to, whether utilities create local context during engagement, and what is being asked of their publics and with what justification.

In addition, evidence suggests that when audiences for engagement activities are lumped together as the customer, they are imagined as either active or passive in water management, with characteristics that make them either ideal or challenging for engagement. Also, the current characterisation of the public in the literature is largely based on dispositions self-reported by the public.

The MAC heuristic however argues that the perception of active audiences as aware and desirable for engagement and passive audiences as typically hard to engage is constricting for contemporary management of water demand because the public is diverse, and water usage is influenced by the interaction between sociodemographic conditions and other interconnected factors such as whether and how the public values water, their socioeconomic conditions, the materials, resources and technology in their households, the nature of their environment, and even their perception of or interaction with their water utility. The MAC heuristic therefore suggests developing an enhanced understanding of publics by exercising criticality around who water utilities engage, how they are perceived and how they could be better understood based on these multiple influencers of usage highlighted here.

Furthermore, the literature established technology and personnel (in this case, plumbers) as communication channels in water efficiency engagement and suggest that their effectiveness can be enhanced and maximised when their capabilities are better understood. In this light, the MAC heuristic advocates examining how water utilities engage with the public in terms of the mediums of

communication that are used, the forms that interactions take, the nature of outcomes expected by the utilities, and what collectively, these tell us about factors that aid or stifle engagement.

Until recent years, little has been written about the message, audience, and channel elements in the water efficiency engagement literature, as the public is often imagined as complex and less of a participant in the management of water demand, and water utilities' activities are less scrutinised. There are very few studies which draw on communication theory to examine engagements about water (for example, Borca *et al*. (2016) who adapted Lasswell's model of communication theory to classify the website messages and communication schemes about future investments in a regional water operator in Romania).

However, there has been no research specifically bringing together the three elements of communication in the study of water efficiency engagement. Applying the MAC heuristic to the study of water efficiency engagement in this research will therefore aid the development of robust insight about publics as a departure from the conventional dichotomy and will help us better understand how utilities plan and deliver water efficiency activities. The MAC heuristic will be used to trace progress through the thesis and further versions of it will be developed to demonstrate the empirical contributions of Chapter 7 and Chapter 9.

As mentioned earlier in section 2, theory, policy, and practice continuously evolve and reshape one another. Policy principles proposed by regulatory organisations are the bedrock of water management in the UK. The next chapter examines such policies influencing water efficiency engagement.

3 Policies influencing water efficiency engagement

This chapter will describe the international and national policies that drive water management and will draw how collectively, these policies shape water efficiency engagement in UK water utilities.

The first section highlights the international regulatory policies that guide water management. The second section discusses national policy and processes that are influencing customer engagement in the UK, particularly the water sector regulator Ofwat's customer engagement policy statement and the price review process. The third section examines Ofwat's expectations for customer engagement. The fourth section concludes this chapter by reflecting on what the current policy means for the development of water efficiency engagement in the UK.

3.1 International water management policies

International water management policies shed light on how water efficiency engagement might occur. Specifically, the Dublin Statement and Articles 9 and 11 of the EU Water Framework Directive (WFD) steer water efficiency in some contradicting ways (Andrew & Cortese, 2013; Franco *et al*., 2013; Muller, 2015) (see Box 1).

Box 1

Policy influencing water efficiency engagement	**Guiding Principle**
The Dublin Statement Principle No. 1	Fresh water is a finite and vulnerable resource, essential to sustain life, development, and the environment.
The Dublin Statement Principle No. 2	Water development and management should be based on a participatory approach, involving users, water managers, and policymakers, at all levels.
The Dublin Statement Principle No. 3	Women play a central part in the provision, management and safeguarding of water.
The Dublin Statement Principle No. 4	Water has an economic value in all its competing uses and should be recognised as an economic good.
Article 9 of the EU Water Framework Directive (WFD)	Member States shall ensure that water pricing policies provide adequate incentives for water users to use resources efficiently.
Article 11 (c) of the EU Water Framework Directive (WFD)	Basic measures shall consist of measures to promote efficient and sustainable water use.

Box 1 shows some international policy statements of relevance to this thesis. Whist the first three principles of the Dublin Statement imply that water is a communal resource that is essential to life and should be managed through engagement, the fourth principle of the Dublin Statement and Articles 9 and 11 of the EU WFD suggest an emphasis on water as an economic resource, and hence the promotion of its conservation and discouragement of wastage through market regulation.

These policies are important in this thesis because they influence the formulation of national policies and in turn shape water efficiency engagement strategies enacted on a local scale. For example, the second and third principles of the Dublin Statement clearly encourage citizen participation in water management and the EU WFD is known to also advocate active involvement for water efficiency 'beyond organisations and institutions to individual citizens.'

Linkages can be drawn between water efficiency education activities and communal water management, and likewise between metering and the commodification of water. These will be discussed later in Chapter 4 where they become relevant.

3.2 Customer engagement policy in the UK

The UK water sector regulator, Ofwat, describes water efficiency on its website as the wise use of the precious resource to conserve it and highlights that water companies must plan how they will meet water demand including increasing water efficiency.

UKWIR (2015) reports that customer engagement policy has been gaining traction in the UK water industry since the 1990s. Few milestones were reached such as the Water Industry Act 1991 which mandates water utilities to statutorily promote household water efficiency and the Water Act 2014 which accords Ofwat a primary duty to promote measures to manage water sustainably and reduce demand.

Whilst the nature of customer engagement for water efficiency changed due to drought events in the 2000s (already discussed in the previous chapter), regulation for water efficiency was also developing. Knamiller (2012) previously reported on these water efficiency policy developments as including the setting of voluntary water efficiency targets for water companies by Ofwat and the setting of mandatory water efficiency standards for building by DEFRA and the Department for Communities and Local Government (CLG). Also, Hoolohan's (2017: 22-25) thesis on reframing water efficiency gives a brief account of water efficiency policy landmarks in the water sector. This account included DEFRA's 1992 consultation on 'Using Water Wisely,' the Deputy Prime Minister's ten-point plan which mandated leakage targets and vigorous promotion of water efficiency at the

Water Summit in 1997, the establishment of an industry funded organisation, Waterwise, to support sustainable innovation in 2002, and the introduction of the 130l/p/d water efficiency target by Future Water in 2008.

However, regulatory principles to shape water utilities' customer engagement activities were only introduced in the last decade. In 2010, Ofwat's formal water efficiency target for 2010 to 2015 came into effect. Following this, Ofwat developed its first customer engagement policy statement in 2011 to guide utilities' public participation during water resources planning and wider water management.

The price review is an Ofwat-led statutory process. It takes place at the end of the five-year Asset Management Plan (AMP) period. The first price review took place in 1994 to set limits for the prices charged to customers between 1995 and 2000, and subsequent ones take place every five years.

At the commencement of this research, the water industry was in the sixth cycle of the price limit period named PR14 which commenced on the 1st of April 2015 and ended on the 31st of March 2020. This thesis therefore explores how water efficiency engagement is in the UK over the past five years. At the time of this writing (summer 2019), the water industry was undergoing PR19 to set prices for the next AMP period 2020-25.

The significance of the price review process to water efficiency engagement is that the exercise runs while water utilities conduct their water resources planning to manage demand and supply (Hamling *et al*., 2018). So, water utilities informally draw from Ofwat's customer engagement policy for their delivery of price review activities especially consultation to understand customer communication preferences for water resources management options and willingness to pay water bills.

In 2007, the Water Resource Management Planning Regulations came into effect, obligating utilities to develop and maintain their Water Resources Management Plans (WRMPs). Feeding into the price review, the UK Environment Agency requires water utilities in England and Wales to develop their WRMPs setting out their water efficiency options within a 'twin-track approach' to balance demand and supply over the next twenty-five years. According to Jonch-Clausen (2004), 'no country ever completes the cycle,' meaning that water resources planning is an ongoing learning process. Thus, over the years, as the UK water demand continues to rise, WRMPs are reviewed periodically to address this issue.

Before producing their WRMPs, water utilities hold pre-consultations with Ofwat, licensed suppliers, non-statutory consultees, The UK Environment Agency, and the Secretary of State if their plans affect sites in England. If the water utilities' plans affect sites in Wales, then Ofwat consults Natural

Resources Wales and the Welsh Ministers. These Ofwat pre-consultations serve as an avenue for water utilities to discuss their plans to mitigate uncertainties such as weather variability, population increase, and housing growth to ensure water supply.

Then, based on feedback from their pre-consultation, water utilities produce their draft WRMPs, linking them with their business plans and drought plans. Afterwards, the utilities send their draft WRMPs to the Secretary of State of the UK or to the Welsh Ministers as applicable, for approval to be published for public consultation.

Once approved, the water utilities publish their WRMPs for public feedback within 26 weeks, after which each company produces a statement of response to its public consultation. The statements of response are meant to demonstrate that they have considered public feedback and to also show any changes that have or have not been made to the WRMPs as a result. Then, the water utilities send their statements of response and final WRMPs to the Secretary of State or Welsh Ministers for approval for publishing.

Since the development of discussions relating to water efficiency engagement in WRMPs are influenced by Ofwat's customer engagement policy, the next section discusses its implications for water efficiency engagement.

3.3 Ofwat's expectations for customer engagement in the UK water sector

It is imperative to note that the focus herein is on the customer engagement policy statement published in 2011 and applied during the PR14 price review process and the 2015-20 AMP period in the UK.

Customer engagement for water resource planning in PR14 was nuanced by policy expectations for who water utilities should engage on water issues, and how and when engagement should take place. This thus guided how the water utilities developed some of their household water efficiency engagement plans in three ways.

First, in a 'transfer-of-authority' manner, Ofwat (2011a) gave water utilities considerable leeway to implement engagement by steering clear of developing hard rules for engagement, suggesting thus: 'we have designed a framework that is intended to be non-prescriptive, while holding the companies accountable for managing and shaping customer engagement... it is the companies' responsibility to engage with customers…'

Second, the regulator recognised that customer priorities vary and thus used its engagement policy to highlight the complexities involved in engaging the diverse public, stating that 'different customers

in different areas have different concerns and priorities… while some groups may favour work to enhance the local environment…others want help managing water use... some people may need help communicating with their company.'

Third, in engaging customers, Ofwat made recommendations to water utilities about who to engage with, when to engage, and how to engage (see Table 3).

Table 3 Ofwat's principles of customer engagement (Ofwat, 2011a).

Principle	Evidence in policy	Interpretation
What to engage about (message)	'More extensive and targeted engagement involves a greater level of informing and educating customers. This is particularly relevant to companies' engagement on the resilience of their systems and services.'	Water efficiency education is key to sustainable water systems.
Who to engage (audience)	'We would like to see companies carefully consider how customers could help to co-create and co-deliver solutions to underlying challenges (for example, supply- demand imbalances), drawing on best practice in the water sector and other sectors.'	Water efficiency engagement and practice improvement is desirable.
How to engage (channel)	'Engagement should simply not take place at price reviews… is not a one-size-fits-all process…To some extent, the nature of the topic will dictate the type of engagement. There are issues on which it is appropriate, necessary, and efficient to engage customers more extensively, more proactively or in a more targeted way. Others will lend themselves more to gaining insights from operational data and ongoing communications….'	Engagement varies, but certain problems require intensive forms that are insight-led, tailored and are a continuum (after the final WRMPs are published).

Table 3 demonstrates that water efficiency engagement is a key component of water resources planning in the UK. The table establishes engagement as complex but essential and brings the non-prescriptive nature of the policy governing water engagement to the forefront. The flexible nature the customer engagement policy thus creates challenges with standardising the planning and delivery of engagement activities in water utilities.

Having discussed the policies influencing water efficiency engagement in the UK, the next section draws this chapter to a conclusion.

3.4 Conclusion

This chapter established that regulation shaped plans for engagement in the UK water sector, particularly Ofwat's customer engagement policy. For PR14, Ofwat wanted water utilities to plan engagement activities proactively, flexibly, and continuously. This contrasted with how consultation was conducted during the price review process which Ofwat warned was susceptible to becoming a tick-box exercise.

Despite Ofwat's (2015b: 5) claim that PR14 delivered the 'biggest customer conversation the sector had ever seen,' the policy continues to be non-prescriptive. Whilst the policy offered flexibility, it however put a burden on water utilities because it required them to not just act, but to choose what action to take in relation to water management.

As mentioned earlier in Chapter 2, theory, policy, and practice continuously evolve and influence one another. Chapter 2 and Chapter 3 have examined the theoretical and regulatory context of water efficiency engagement. The theorisation of water efficiency engagement appears to be more widely represented than its practice in the scholarship. This is because despite the possibility to better strategize using insight from the growing literature about water efficiency engagement, public engagement remains a daunting challenge for water utilities.

So, the next chapter examines the current understanding of the practice of water efficiency engagement.

4 The practice of water efficiency engagement

"Water efficiency can only be met only if high levels of public participation are achieved." (McKenzie-Mohr, 2000: 544)

Discussions in the Introduction Chapter demonstrated that water scarcity is a crisis in the south-eastern region of England. Theoretical discussions in Chapter 2 grounded water efficiency engagement as a contemporary measure for tackling water scarcity because in developed countries, the public is becoming more recognised as capable of actively supporting water utilities to tackle the problem. The chapter went further to reveal that the patterns of water efficiency engagement are underpinned by three conceptual elements of communication: message, audience, and channel. It was established that water efficiency messages can be communicated in implicit and explicit forms, to diverse publics, through traditional channels as well as through devices that can cause publics to think and take actions in relation to water efficiency. Chapter 3 highlighted that indeed policy plays a key role in shaping and driving water efficiency engagement and regulatory principles for engagement in the UK water sector are in line with aspirations for water efficiency in the literature. These policy expectations mean that in planning water efficiency engagement, water utilities are meant to consider who to engage, what the engagement is about, and how to engage.

Since the application of abstracted theory and policy principles can be understood by examining what is enacted, this chapter expands the background to this research through the lens of 'practice.'

Henceforth, the term practice is used to refer to water utilities' water efficiency engagement actions and activities.

The role of this chapter in the thesis is to identify water efficiency engagement approaches in the UK water sector and how the message, audience and channel elements discussed in Chapter 2 and Chapter 3 fit into the approaches.

This chapter begins with the first section which illustrates patterns of water efficiency engagement in the UK, followed by four subsequent sections which in turn explore the four emerging approaches for delivering water efficiency engagement. This chapter culminates in the sixth section with a reflection on the implications of these approaches for contemporary management of water demand in the UK.

4.1 Illustrations of water efficiency engagement

To successfully achieve water efficiency, there is a realisation in the UK water industry that the public needs to be aware of water efficiency or nudged to be water efficient. As such, academics and policy makers are calling for water utilities to intensify their activities to support people to reduce usage.

As highlighted in the Introduction Chapter, the literature suggests that UK water utilities are now relying on water meters, water efficient devices, and water efficiency education to reduce household water use (Beal *et al*., 2013; Maas *et al*., 2017; Hamling *et al*., 2018). Some accounts of these interventions feature in the water efficiency literature (Table 4).

Table 4 Examples of water efficiency engagement in the UK.

What the engagement was about	**Who was engaged**	**How the was engagement done**
Achieving water efficiency by highlighting the impacts of metering on usage	Metered customers	Water meter installation and In-home-display projects (Ashton *et al.*, 2015*;* UKWIR, 2016)
Achieving water efficiency by increasing awareness and encouraging water efficient behaviours	Residents	Door stepping, leaflet distribution and posters, media campaigns, outreach work (Bremner *et al*., 2012)
Achieving water efficiency by promoting and installing water efficient devices	Customers, mostly metered customers	Water efficient device fitting such as tap inserts, shower timers, tap aerators, shower heads, spray gun, leak alarms, water butts etc. (Ashton *et al*., 2015; Manouseli *et al*., 2018)
Achieving water efficiency through water efficiency education and addressing other influences connected to the target audience's water consumption	Residents, school pupils, residents	Face to face in places such as schools, talks (Orr *et al*., 2018), community events (Waterwise, 2015), homes (Ashton *et al*., 2015)

Table 4 illustrates that during interventions, water utilities communicate water efficiency messages in various ways, and to various audiences. There is however a distinction to be made between how the companies deliver such interventions and unpacking these intricacies is important to better understand water efficiency engagement.

Reed *et al.* (2017) asserted that design, scale, power dynamics and values of participants as well as socio-economic, cultural, and institutional factors influence the outcome of engagement encounters in environmental management work. Also, Rowe & Frewer's (2005: 252) classified public

engagement into communication, consultation, and participation. Rowe and Frewer suggested that during communication, information is passed from the sponsor of an initiative to the audience and vice-versa during consultation, while in the case of participation, there is dialogue and the flow of information between both the audience and the sponsor of the communication process.

The distinction of the various water efficiency engagement approaches can draw inspiration from these authors' insights discussed above to assess the nature of the measures relied on and the type of interaction that the measures foster between the water utilities and their publics.

Table 4 can be drawn upon to link into a broader differentiation between four water efficiency engagement approaches: the technical approach, the educational approach, the combined approach, and the socio-technical approach. So, in subsequent sections, this chapter draws on what the literature tells us about examples of water efficiency engagement activities in the UK, and uses the message, audience and channel elements suggested by communication theory (in section 2.4) to identify their patterns of engagement and distinguishing features.

4.2 Technical approach

Table 4 in section 4.1 suggests that amongst other measures, UK water utilities are relying on technical devices to reduce household water use. These devices, namely the water meter and water efficient devices serve to indirectly send implicit signals about water efficiency to publics. The reduction in usage through such devices has been described by Browne *et al*. (2019) as techno-efficiency. They will be considered in turn in this section.

4.2.1 The water meter

Although the installation of water meters was initially introduced in the UK water sector to simplify billing and operational control, it emerged to also be a tool for two strands of water efficiency. First, the conventional 'dumb' water meter aids the identification and reduction of leakage. Second, the contemporary 'smart' water meter allows monitoring, billing, and aids water efficiency by communicating detailed consumption information electronically to water utilities and their water users (Darby, 2010).

The difficulty with changing how people use water motivated the use of metering to curb wastefulness (Taylor *et al*., 2009). The UK Environment Agency began calling for water meters in all households in England and Wales in the mid-2000s (BBC, 2009). As of March 2014, 41% of the customers in England and 34% of customers in Wales were metered across water utilities (Priestley, 2016). More

recently, Water UK (2018) reported that about half of UK households have had a water meter installed at no cost to them.

It must however be noted that the achievement of increased metering and its related impact in the UK has been possible not because water efficiency engagement is at its pinnacle, but partly because all homes built since 1989 have water meters installed by default (Sim *et al*., 2005; Water UK, 2018).

Metering to reduce household water demand is explicitly advocated by policy and theory relating to water efficiency.

Switching more households from fixed to metered charging by installing water meters is considered an effective step to reducing demand for water resources in the UK (Parliamentary Office of Science and Technology, 2012).

In 2002, Ofwat reported a reduction in water demand due to metering and other factors (Inman & Jeffrey, 2006: 7) including the decline in the consumption of other material goods (Goodall, 2011). Ofwat's 2011 publication titled 'Push, pull, nudge: how to help customers save water, energy and money' highlighted that metering can encourage people to use less water.

In addition, the Consumer Council for Water's (2016) statistics showed that in 2014, water usage was lowest in Southern Water where meter penetration was highest while water usage was highest in Sutton and East Surrey Water which had the sixth least meter penetration levels out of the seven water utilities operating in areas of serious water stress.

Aside from being increasingly promoted as a measure to monitor water usage and hence to determine water bills accurately (Mayer *et al.*, 1999), the existing literature champions the smart water meter as a measure for gaining insight about how water is used (Willis *et al.*, 2011; 2006) because it collates real-time disaggregated household level demand data (see Cole & Stewart, 2013; Cominola *et al*., 2015). As such, there are suggestions in the literature that metering aids the development of a better understanding and characterisation of water users and water usage (Gato-Trinidad, 2011; Laniak *et al*., 2013; Harou *et al*., 2014; Hilty *et al*., 2014; Liu *et al*., 2016).

In addition, the literature asserts that metering can help nudge people to reduce their consumption (Rogers *et al*., 2002; Fielding *et al*., 2012). In this light, underpinning the concept of metering for water efficiency is a psychology behind how the water meter changes people's perception, value and use of water (Russell & Fielding, 2010). Because of the continuous electronic reading and display of usage as opposed to the manual reading of the meter dial on the traditional water meter (Hauber-

Davidson and Idris, 2006), it is Orr *et al.*'s (2018) view that smart water meters cause people to look at their spend and then think about their water bills and as a result (re)shape and reduce their water use. The water efficiency literature suggests that insights from metering has aided water utilities in supporting people reduce their water use (see Kossieris *et al*., 2014; Liu, 2015). For example, Maddaus' (2001) study revealed that installing water meters influenced the reduction in water use in California, USA. Similarly, studies suggest that people are driven to be conscious of their bill and as a result modify their water use following the awareness that a water meter has been installed in their household (see Inman & Jeffrey, 2006; Owen *et al*., 2009).

As McKenzie-Mohr (2000) asserted, highlighting the financial benefits of engaging in a specific activity [such as reducing usage] is indicative of water managers' promotion of sustainable behaviour for people's self-interest. The use of the water meter for the achievement of water efficiency can thus be said to be symbolic of the management of water as a commodity which can be consumed depending on its price and water users' income (Hoekstra & Chapagain, 2006; Michelsen, 2014: 38). The use of the water bill to promote water efficiency sends a price signal (Jordan, 2011) and positions people to be buyers of water who bear the responsibility to act for change or bear the financial consequences for not taking the water utilities' desired line of action. The views of these authors are in line with findings from other studies which link price increases to a reduction in water use in other countries in the Global North, for example, in East Germany (Lux, 2008) and in Canada (Dupont & Renzetti, 2013). Also, Willis *et al.*'s (2010) study illustrated how smart meters with an alarming visual display monitor motivated a 15.40 litre average reduction in shower volume in forty-four households in Australia.

It is noteworthy that despite metering's major contribution to reducing household water demand (Byatt, 2017), its proliferation has been met with barriers relating to sufficiency and longevity of impact.

First, metering is still not compulsory in the UK with exceptions for new property development, change in occupancy, and discretion afforded to water utilities by the Water Industry Act 1991. The 1991 Act allows mandatory installation of the water meter in properties having an automatic watering device, a swimming pool or pond, a large bath, reverse osmosis softening unit, power shower, or is an area of serious water stress. Further, knowledge deficit poses barriers to the uptake of the water meter in the UK. For example, over a decade ago, Owen *et al.* (2009) highlighted public resistance to metering in the UK due to lack of awareness about the water meter and public perception that water meters result in increased water bills. There has also been an increase in the number of anti-smart meter groups in the UK and policy to drive metering of households is non-existent (Koehle, 2012).

Second, although metering embodies economic principles of water efficiency that suggest that the variable water bill should influence how people use water, the entirety of household water use is known to depend on other drivers such as preferences and income (Grafton *et al.*, 2011) rather than price alone. Like what can be observed on the global scene, the UK public's ability to afford water can mean that their usage is insensitive to price. Water use by high-income and low-income families in the UK is less dictated by the pricing mechanism (UKWIR, 1996) because low-income families are already using the bare minimum and cannot make any substantial additional reduction to their usage, and price does not affect usage by affluent families (Inman & Jeffrey, 2006: 130). In view of this, Sønderlund *et al*. (2014) warned that focusing on metering to achieve household water efficiency even in controlled experiments may not be more effective than direct communication measures such as education to motivate behaviours that aid water efficiency.

Having discussed the use of the water meter in water efficiency engagement, it is necessary now to explore what the literature says about other technical devices used for same purpose.

4.2.2 Water efficient devices

The installation of water efficient devices is widely known in the water industry to help reduce the quantity of water used for everyday domestic activities and in some cases, motivate people to change the way they use water (Geller *et al*., 1983; Willis *et al*., 2013). Water efficient devices are readily designed either as part of household water systems (such as dual flush toilets, vacuum toilets, or taps with air devices, thermostats, and infrared sensors) or are retrofitted to old water systems (such as shower flow restrictors, faucet aerators).

According to Inman and Jeffrey (2006), the total replacement of household water appliances with water efficient ones can lower water use by 30-50%. Water efficient devices can achieve up to 50% water savings (Dworak *et al.*, 2007), especially shower devices and cistern displacement devices (2013, DEFRA). For instance, in Tampa, USA, retrofitting water systems delivered up to 47.9% reduction in per capita consumption (Mayer *et al*., 2004). In schools where water efficiency education failed, water efficient devices delivered up to 60% water savings (Roccaro *et al.*, 2011). Also, in Florida, USA, water efficient toilets, shower heads and aerators led to a 31% reduction in usage (Lee *et al*., 2013).

In the UK, the use of water efficient devices to drive water efficiency can also be seen across water utilities.

In 1998, Essex & Suffolk Water conducted the 'New Build Water Efficiency Homes' study in 24 households in Heybridge, Essex, to understand the effectiveness of water efficient devices fitted in the new homes. The Heybridge study revealed that water efficient devices achieved 5% reduction in per capita consumption (Smith & Shouler, 2001).

Likewise, in East Sussex, 5% and 6% water savings were achieved in new and old homes respectively by retrofitting toilets (Keeting and Styles, 2004). During the low rainfall period in south-east England in mid-2017, Affinity Water increased its scale of free water efficient devices offered to its customers (BBC, 2017).

However, the potential of water efficient devices to increase household water efficiency is limited by some challenges relating to scale of implementation and longevity of impact.

First, retrofitting water systems in selected households is not sustainable on a long-term basis due to housing growth. Proliferation is therefore only achievable if water efficient devices are present in homes or if the public's embrace of water efficiency is strong enough to motivate them to install these devices in their homes independently. This scale barrier was highlighted decades ago by Howarth and Butler (2004: 39) who stated that 'unless wasteful fixtures are regulated out of existence, people have to 'buy-in' to the environmental objective of saving water to purchase water efficient appliances in the first place.' In addition, this scale barrier is exacerbated by the fact that there is no incentive for most households in England and Wales to be water efficient (Dworak *et al*., 2007).

Second, although advocates of increased retrofitting to reduce per capita consumption do so due to the belief that changing how people see and use water without technological aid is no panacea in the management of water demand (Read, 2005), it is questionable whether water efficiency is always achieved through water efficient devices and if at all, whether such water savings can be sustained long-term (DEFRA, 2014).

Installing water efficient devices in households without addressing how people use water may not necessarily achieve water efficiency and may even trigger offsetting behaviours. For instance, without personalised water efficiency information, people may resort to taking longer showers if they know their shower head has a low flow (Geller *et al*., 1983; Campbell *et al.*, 2004; Inman and Jeffrey, 2006).

An illustration of the outcome of retrofitting without education was highlighted in Stewart *et al.*'s (2013) study. The authors revealed that loud shower alarms initially resulted in a 27% reduction in water usage, but usage returned to baseline levels after four months. Some social scientists therefore suggest that whilst the technical measures are important, the interface between people and technology

needs to be addressed because usage is influenced by the interaction between these two elements (Shove, 2004; Fielding *et al*., 2012; Browne *et al*., 2013).

The doubt about the longevity of the impact of water efficient devices can be seen in Essex & Suffolk Water in the UK, for example. Although water savings were initially recorded after retrofitting the 24 Heybridge households in 1998 (Smith and Shouler, 2001), a follow-up study conducted by Knamiller *et al*. (2006) revealed that many households had changed or disposed their devices which were installed during the Heybridge project due to lack of awareness or understanding about the fittings. Knamiller *et al*.'s findings therefore bring to the fore recent support for complementing technical interventions with water efficiency messaging which was made by Waterwise (2015): 'there will be a continued move away from giving out water efficient devices and 'top tips' towards more tailored and personal water efficiency delivery and home retrofit visits will become the norm.'

Collectively, the challenges with metering and water efficient devices thus raise a pertinent question about the centrality of technology in addressing the problem of increasing water demand and whether this approach is feasible long-term. In what appears to be reinforcing complementarity between the technical approach and an approach to water efficiency engagement that focuses on the how the public perceives and uses water, Cominola *et al*. (2015: 24) highlighted the immense role of the smart water meter in achieving water efficiency but also suggested that 'a better understanding for water users' behaviours is indeed fundamental to promote water saving actions…' It is therefore necessary now to explore what the literature says about promoting water efficiency using the understanding of the public.

The next subsection discusses the educational approach to water efficiency engagement.

4.3 Educational approach

There is a growing consensus amongst social scientists that valuing water is key to efficient usage and that the level of success of water efficiency engagement is dependent on people's motivation to use and save water (Jorgensen *et al*., 2009). The role of the public in successful household water efficiency engagement by virtue of being water users can therefore not be ignored.

Education has become a popular tool for promoting water efficiency and as Table 4 in section 4.1 suggests, at the heart of educational initiatives to motivate water efficiency are face to face engagement activities in various physical settings. These physical settings allow one-way and two-way engagement between water utilities and their publics whereby water efficiency messages are explicitly communicated.

It is on basis like how Browne *et al.* (2019) asserted that the reduction in household water use achieved via metering and retrofitting is techno-efficiency, that water efficiency achieved through education is 'edu-efficiency.' Edu-efficiency here refers to an outcome of water efficiency engagement that is reached because of educational strategies on the part of the water utilities and positive change in behaviours and actions that relate to household water usage on the part of their publics.

Water efficiency education can be led by a variety of philosophies. For example, Freire (2018) critiques education that has a fundamentally narrative nature whereby the teacher's tasks are to deposit contents of his narration into the student in a manner that amplifies his words rather than the meanings of his words for the student. The author suggests a humanist revolutionary alternative whereby the teacher and the student are partners in education and knowledge emerges from pursuing inquiry with the world, and with each other.

Ideal water efficiency education should align with Friere's view on partnership in learning, whereby face to face engagement activities are characterised by dialogue and participation between water utilities and their publics to enhance knowledge for the parties.

However, currently, the essence of education in the achievement of household water efficiency is mostly justified by proponents of the information deficit model who argue that people are usually unaware of their obligation, so informational campaigns and educational programs can motivate their active involvement in household water efficiency (Burgess *et al.*, 1998; Kampragou *et al*., 2011). The current nature of educational approach to water efficiency engagement therefore focuses more on changing how people view and use water than on the infrastructure or institutions that can influence water use.

Educational strategies have been identified as the most common policy instruments in household water efficiency (Russell & Fielding, 2010) and are emerging as the hallmark of water efficiency engagement in the UK.

Education is increasingly being delivered across water utilities compared to four decades ago when Geller *et al.* (1983) reported that even the simplest applications of low-cost measures to influence how people perceive and use water were uncommon.

Water efficiency education is considered impactful (see Howarth and Butler, 2004; Doron *et al.*, 2011) owing to behavioural change theory (see Fielding *et al*., 2012) which suggests that there is a difference between people's conscious water use and usage influenced by devices and that

interventions such as education can lead to behavioural change – an improvement in they people perceive, value, and use water.

Certain features that set water efficiency education apart from the technical approach to water efficiency engagement include message framing, information sharing, awareness building, and persuasion with the aim of motivating a sustained change in how people use water and maximising the effectiveness of other complementary interventions such as retrofitting if existent.

In the context of framing and information sharing, water efficiency messages can be embedded in strategies which Koop *et al.* (2019) describe as behaviour-influencing tactics. These tactics include, tailoring and knowledge transfer. Nisbet (2009: 15) and Shu *et al*. (2017: 641) highlight that message frames are interpretive storylines that set a thought in motion with regards to desired behaviour. The authors suggest that tailoring messages to specific channels and audiences is key to effective engagement because this helps the public to make sense of an issue. In the context of awareness building and persuasion, these behaviour-influencing tactics include priming, social norming, emotional shortcuts, and the increase of self-efficacy.

Water efficiency messages can be identified in conversations (e.g., the suggestion that people can protect the environment, build communal resilience, and develop sustainable environmental practices by spending less time showering or for gardening) or can be implied by actions (e.g., the installation of water efficient devices) initiated by water utilities but targeted towards the public's water use.

Educational water efficiency engagement is evidenced in the literature discussing actions targeted towards raising public awareness of water scarcity, towards motivating care and responsibility for water, and towards reducing water use (Pereira *et al*., 2012).

In the UK, for example, events like the 2012 UK hydrological drought prompted the promotion of the need for people to change how they use water via television news, national newspapers, and the radio news (Waterwise, 2013) unlike two decades ago when UK water utilities' water efficiency activities were characterised by infrastructural developments, media advertising, and the distribution of water efficiency leaflets (McKenzie-Mohr, 2000).

During the low rainfall period in the south-eastern region of England in mid-2017, Affinity Water was in the media advising the public to reduce their water use by stopping the use of sprinklers in gardens, taking four-minute showers instead of baths, turning off their taps while brushing their teeth, and only using dishwashers and washing machines on a full load (BBC, 2017). Around the time the fieldwork for this doctoral research was conducted in June 2017, water utilities were using the media

to encourage a change in how people use water in preparation for an impending water shortage due to a year-period of low rainfall in south-eastern England (BBC, 2017).

These accounts of water efficiency education described above illustrate new representations of water efficiency engagement as evidence of the impact of education also emerges. There are reports of water efficiency education resulting in the purchase of water efficiency appliances (Geller *et al*., 1983), leading to increasing environmental awareness and the growing of drought resistant plants (Syme *et al*., 2000), and motivating shorter showers and full washing machine loads (Liu *et al.*, 2016). Also, Essex & Suffolk Water's 2015 study of 1,495 customers in which half of them received messages relating to changing how they used water while the other half did not, led to an increase of water saving of 7l/property/day by the former group.

However, in the past few decades, there have been calls from multiple quarters (see Geller *et al*., 1982; Geller *et al*., 2002; Waterwise, 2015) for the UK water industry to combine their technical and educational water efficiency engagement approaches to maximise household water savings rather than relying solely on individual approaches. It is therefore necessary now to explore what the literature says about promoting water efficiency using the combined approach which is currently popular in the water industry.

4.4 Combined approach

Like observations of the UK water efficiency landscape described in Table 4 in section 4.1, Grafton *et al*. (2011) reported that many water utilities in countries belonging to the Organisation for Economic Co-operation and Development (OECD) now combine technology and water efficiency messaging to reduce household water use.

Proponents of the combined approach to water efficiency engagement push for water efficiency engagement that uses technological interventions in conjunction with educational interventions that centre around water utilities engaging people in conversations to enlighten them about water and motivate efficient behaviours and actions. Combined water efficiency engagement therefore relies on the use of the smart water meter, water efficient devices, and water efficiency education to reduce household water demand.

Combining the technical and educational approaches is critical to achieving both techno-efficiency and edu-efficiency. This is because there are reports of circumstances where retrofitting households with ultra-low flush toilets alone did not deliver water savings in the UK (UK Environment Agency, 1997). And there are also other studies which suggest that water efficiency education alone or without

technical interventions may not deliver desired water savings. For example, in a study of water use and wellbeing in households in Southern England, Chenoweth *et al.* (2016) found that educational engagement alone may not have an immense impact. Likewise, Hamling *et al*. (2018) suggested that water savings realised from water efficiency education, if not reinforced, may not be sustained long-term.

It is therefore unsurprising that there is information in the academic and grey literature to suggest that UK water utilities are increasingly using the combined approach to water efficiency engagement more than was seen decades ago when utilities promoted water efficiency either using technical measures or light-touch information campaigns as two separate interventions.

Notably, Waterwise's (2015) compilation of UK water utilities combining advice-giving, metering, and retrofitting to reduce household water use (Table 5) is a testament to ongoing joint activities in the water sector to move beyond isolated technical and educational water efficiency engagement, especially in areas of serious water stress.

Table 5 Water efficiency engagement in areas of serious water stress (collated from Waterwise, 2015).

Water utility	**Water efficiency engagement activities**
Anglian Water	Promoting household water efficiency through the Bits and Bobs retrofit programme, giving the customers water efficiency advice, installing water-saving products, and checking leaks in homes, giving customers Potting Shed Calendars with monthly tips on using water wisely in their garden.
Affinity Water	Free Home Water Efficiency Checks to help customers save water by fitting water efficient devices, repairing taps and toilets, and providing water efficiency reports.
Essex & Suffolk Water	'Industry-leading domestic retrofit project,' through which its customers can have a plumber visit their home to install and give advice on a wide range of water-saving retrofit products.
South East Water	All metered customers with high consumption levels after three months of installation receive a visit from a plumber to identify and repair leaks free of charge, and free water efficient devices are offered to customers.
Southern Water	Domestic metering integrated with targeted number of practical water efficiency audits, intervention measures and behavioural change advice for homeowners.
Sutton and East Surrey Water	Water audits at metered households with higher-than-usual water use; and free advice to customers on how to save money on their water bill.
Thames Water	Metering and offering customers behavioural change advice and free water efficient devices through retrofit schemes.

From Table 5, it can be observed that in the last decade, water efficiency engagement in areas of serious water stress in the UK has been delivered by combining the technical and educational approach with increased water efficiency home visits to households to retrofit water systems and encourage a change in how people use water.

Recently, some authors have even been exploring ways to optimise water efficiency in utilities by making iterations to the ideals of combined water efficiency engagement. Hamling *et al*. (2018), for example, proposed a model called the strategy train.

The strategy train supports water utilities to manually assemble how technical and educational interventions can be delivered over a period in such a manner that home visits are delivered every few years and enhanced with metering, and mains replacement and enhancement. Whilst models such as the strategy train is a slight departure from the ideals of combine water efficiency engagement wherein technology always goes hand in hand with education, one of Hamling *et al*.'s rationale that sticks out here is that they claimed that water efficiency education that centres around the provision of information and water efficient devices produces an immediate reduction in usage which then diminishes over time because people forget the water efficiency lessons learnt. As a result, the authors strongly recommended the delivery of follow-up home visits every few years.

Whilst Hamling *et al.*'s suggestion about continuous water efficiency education is great for longevity of impact, there are no published or publicised records of this occurring in the UK water sector. The challenge facing the advancement of combined water efficiency engagement as a practice is that although what is happening in water utilities is a shift away from technocratic water supply management, knowledge about the delivery of water efficiency measures is not established (Roccaro *et al.*, 2011: 1358; Biagini *et al*., 2014). Specifically, the educational component of home visits is still gaining traction and is yet to be examined in depth from an academic perspective using similar rigour demonstrated by studies examining the impact of retrofitting and metering.

The dearth of academic publications on how educational water efficiency engagement activities are delivered continue to be highlighted by several water industry experts (UK Environment Agency, 2005; Inman and Jeffrey, 2006; Ashton *et al*., 2015; Orr *et al*., 2018; Lu, 2020) as insights remain unknown, information sharing and lesson-learning are stifled, and practice improvement for subsequent initiatives is less enhanced. The next section explores what the literature says about promoting water efficiency using an aspirational in the water industry.

4.5 Socio-technical approach

There is a strong critique in the literature, especially by practice theorists, that individualistic water efficiency interventions delivered by wholly technical or educational water efficiency engagement approaches lack integration between different parts of the water system. Advocates of the socio-technical approach to water efficiency engagement (see Shove, 2010; Watson, 2020) call for more robust actions to address the multiple influences on demand, which are distributed amongst technology, people, and organisations.

In contrast to technical and educational water efficiency engagement, the socio-technical approach is led by the understanding that the teacher cannot think for his students nor can he impose his thought on them. Rather, only through communication are knowledge and authentic thinking produced (Freire, 2018).

So, what is this communication and authentic thinking in water efficiency engagement?

The socio-technical approach is informed by the perspective that the crisis of water scarcity is a crisis of water management. As conceptualised by Mollinga (2003; 2008), water management is based on technological infrastructure to control the flow of water, institutional management to guide the human behaviour that is part of water use, and socioeconomic and regulatory structures that define conditions and constraints for water management and any change in one of these elements affects the others.

Drawing insights from the works of Christina *et al.* (2015) and Foden *et al*. (2019), authentic thinking in socio-technical water efficiency engagement emerges from the public better understanding the water system, and using technology as well as knowledges from people and institutions (such as water utilities, water management contractors, local authorities, housing associations, manufacturers, and non-governmental organisations) to better address the collective and interconnected nature of water consumption and increase techno-efficiency and edu-efficiency. And the communication in socio-technical water efficiency engagement can be seen in the interaction between stakeholders to shape the planning, delivery, evaluation, and improvement of initiatives.

The principle driving the socio-technical engagement approach is one that is collaborative, uses publics and local experts to problem-solve and adapt initiatives appropriately, and sees publics as intelligent beings to be interacted with and with whom routes for water efficiency can be negotiated. As pointed out by Megdal *et al.* (2017), the role of stakeholder engagement and collaboration in developing solutions to critical water problems such as water scarcity is receiving increasing attention from regulatory, academic and industry stakeholders because this exercise improves the efficiency of

water management. This means that the socio-technical approach can inherently deliver other efficiencies in addition to water efficiency. This type of stakeholder engagement in the socio-technical water efficiency engagement approach is advocated in the growing literature about adaptive co-management which advocates a departure from centralised and bureaucratic water governance and promotes the formation of links that allow stakeholders in decision-making processes across various levels of organisations to co-produce knowledge, particularly water users and those who directly impact on the water environment (Pahl-Wostl, 2007; Whaley and Weathethead, 2016).

Although in its water efficiency strategy, Waterwise (2017) hinted at a need to advance water efficiency engagement from the combined approach to a more socio-technical approach, exploration of this new approach is still in developmental stage in water utilities. Whilst there are academic suggestions for socio-technical water efficiency engagement, practices that espouse all its ideals are yet to be seen in practice. Opportunities to advance the practice of socio-technical water efficiency engagement suffer for the lack of understanding about how water utilities deliver their activities. There is a dearth of information about how water utilities deliver water efficiency campaigns to begin with. So, it is difficult to determine what strategies are used during engagement processes and whether conceptual insights are applied. For example, do water efficiency campaigns target people with gardens? Do manufacturers design water systems or household material goods to address people's usage practices that relate to showering or laundering? Is the diversity in usage patterns between old persons, homeowners, or garden owners recognised and factored into engagement activities? In this view, water efficiency engagement in utilities, including barriers faced and opportunities to advance socio-technical water efficiency engagement are this research's focus.

Thus far, this chapter has identified four water efficiency engagement approaches in the water sector. The next section concludes this chapter by reflecting on the implication of these approaches for contemporary management of water demand.

4.6 Conclusion

This chapter elucidated the concept of water efficiency engagement including the four main approaches and how these demonstrate the evolution of engagement over time. Technical water efficiency engagement mostly allows indirect one-way communication of water efficiency messages to publics. The educational approach fosters more direct one-way and two-way communication of water efficiency messages to publics and relies on information sharing and knowledge improvement about water for the public to make positive changes to their norms and usage activities. The combined approach however tethers technical and educational interventions to address water demand and is

currently championed in the UK water sector for its aspiration for both technical interventions and water efficiency education to coexist. Whether the combined strategy advances the practice of water efficiency engagement has however come under question when the plethora of factors that influence household water efficiency are considered holistically (e.g., institutions, values, and household water systems). In consideration of the limitations of the combined approach, we see an emerging call for a socio-technical approach to water efficiency engagement.

Table 6 below presents water efficiency engagement approaches in practice in the UK. It draws on elements suggested by the MAC heuristic developed earlier in Table 2 to examine the forms that messaging takes, who the target audience is, and the channels typically used during the approaches:

Table 6 Patterns of water efficiency engagement in the UK.

Approach		**Channel**		**Explicit one-way message**	**Explicit two-way message**	**Implicit message**	**Audience**
Combined	Technical	Indirect	Water efficient devices	Never	Never	Always	Water users
			The water meter	Never	Never	Always	Bill-paying customers
	Educational	Direct	Leaflets, posters, literature materials, media campaigns	Always	Never	Sometimes	The general public (or customers, if delivered with the bill)
			Face to face in schools, town centre, homes	Never	Always	Never	Residents, school pupils
Socio-technical	The delivery of this approach in the water sector is unclear			?	?	?	Water users

Table 6 draws together the preceding discussion to highlight potential patterns of water efficiency engagement in the UK. Based on the literature, it suggests that two main patterns of engagement are likely to be observable: a 'technical pattern' associated with the installation of water meters and water efficient devices with the intention that these technologies send implicit water efficiency messages to water users; and an 'educational pattern' associated with informative actions to influence water users' conscious usage. It is recognised that in some instances these patterns might be found together in the 'combined approach'. There is a socio-technical literature that critiques all three approaches, however. It suggests that water efficiency engagement should address the multiple influences of household water consumption such as institutions, values, norms, household material goods, and water systems. In studying water efficiency engagement, it is useful to examine which of these four approaches are being used in what combination. Specifically, it might be considered whether the more traditional technical, education or combined approaches are giving way to the socio-technical approach.

Having identified the patterns of water efficiency engagement in the UK, the next chapter reflects on how the field has been studied in the literature. A proposal for a new way of studying water efficiency engagement is also put forward.

5 The study of water efficiency engagement

The previous chapter culminated by pointing out the challenge of lacking knowledge about the delivery of combined or socio-technical water efficiency engagement in the literature.

The role of this chapter is to understand how research philosophies has influence knowledge creation about household water efficiency and point out new ways to expand the scholarship.

As highlighted earlier in section 2.2 and section 2.3 respectively, water utilities and publics are key players in the achievement of household water efficiency – the water utilities being responsible for delivering initiatives to motivate their publics to reduce usage, and the publics being responsible for reducing their usage. This chapter thus explores the philosophical paradigms that influence these two aspects of water efficiency: positivism, post-positivism, interpretivism and the participatory paradigm. Discussions on critical theories will not be expanded upon as they do not apply here.

The first section introduces the paradigms influencing knowledge creation in the water management literature. The second section discusses how the positivism and post-positivism philosophical paradigms influence the study of the public's water use. The third section examines the influences of the participatory paradigm and interpretivism on the study of water efficiency engagement practices in water utilities. The fourth section discusses prominent methods used for investigating water efficiency in the literature. The fifth section explores a new approach for studying water efficiency activities. The sixth section proposes the MAC heuristic for understanding water efficiency engagement which was developed earlier in section 2.5 as a new way to study water efficiency engagement. The seventh section concludes this chapter by reflecting on the implications of shifting the focus of knowledge creation from being solely on outcomes (reduction in per capita consumption) to including the processual aspects of water efficiency engagement.

Collectively, discussions in this chapter will help put the research methodology presented subsequently in chapter 6 into perspective.

5.1 Paradigms influencing knowledge creation in water management

Evidence shows that positivism, post-positivism, the participatory paradigm, interpretivism, and critical theories are the paradigms that influence knowledge creation in water management (Uduma & Sylva, 2015).

A recent study by Meissner (2016) investigating paradigms in water governance suggested that the structure of arguments and recommendations made in existing research projects can suggest the type of paradigm prominent in the literature.

Meissner went further to summarise the differences between the five paradigms based on action and reality (Table 7).

Table 7 'The five paradigms summarised' (Meissner, 2016: 2).

Positivism	**Post-positivism**	**Interpretivism/ constructivism**	**Critical theories**	**Participatory paradigm**
Action is structured, linear and has a cause-and-effect manner (Eisner, 1990). There is an objective, apprehensible reality (Ponterotto, 2005).	Action is structured, linear and has a cause-and-effect manner (Eisner, 1990). There is an objective reality that we can only imperfectly apprehend (Ponterotto, 2005).	Action is contained in the lived experiences from the point of view of those who experience it. There is a multitude of apprehensible and equally valid realities (Ponterotto, 2005).	The status quo needs to be disrupted and changed. Researchers' tasks are to emancipate and transform reality (Ponterotto, 2005).	Action is the result of the researcher and the research participant's interaction during the research process to improve the human condition. There is a participative reality with a link between subjective and objective reality (Lincoln *et al*., 2011).

5.2 Positivism and post-positivism: focus on usage

Positivism is understood to be a traditional study approach that generates evidence that can be validated in the policy arena using concepts such as water scarcity (Sharp *et al.*, 2011).

The positivistic philosophical paradigm is evident in the water efficiency literature that commonly uses datasets such as population, rainfall, and per capita consumption to explain usage, and construct supportive arguments for technical water efficiency engagement.

For example, the statistical projection of water demand (OECD, 2012), Smith & Shouler's (2001) focus on water savings delivered through the installation of water efficient devices in the Heybridge study in Essex, and Knamiller *et al*.'s (2006) focus on the use of installed water efficient devices in

the follow-up study of the Heybridge households in Essex & Suffolk Water. Also, an evidence of the influence of positivism in the study of water efficiency engagement is Waterwise's (2015) examination of deliverables of water utilities' water efficiency programmes in the UK, which was based on the number of meters installed, the number of schools visited, and the percentage reduction in per capita consumption, but did not include an examination of the processual aspects of the programmes.

It must however be noted that the heavy influence of positivism in the existing literature is linked to the technocratic traditions that have historically driven water management to focus on per capita consumption as the problem and its reduction as the measure of success of water efficiency engagement.

Specifically, in the UK, the reliance on technical water efficiency engagement strategies that are dominated by metering and retrofitting (discussed earlier in section 4.2) is indicative of the positivistic centring of water scarcity around usage and technologies that can be used to achieve water efficiency. Further, the setting of a numeric annual water efficiency target by the regulator (Ofwat, 2018) contributed to increased creation of water efficiency knowledge through the positivist lens owing to its allowance of the generation of evidence of water efficiency engagement activities required by Ofwat.

However, the main limitation of the positivistic study of water efficiency engagement is that underlying factors that influence outcomes of interventions are often neglected, which is where post-positivism becomes relevant.

Even though action is linear from both positivism and post-positivism perspectives (Eisner, 1992), there is a divide between the positivism and post-positivism's philosophical paradigms (Sharp *et al.*, 2011). The philosophical divide is attributed to the fact that reality through positivism is physical and objective and apprehensible while reality through post-positivism is social, subjective and cannot be apprehended completely.

Post-positivism is therefore a newer philosophical lens compared to positivism and it offers context in research (Sharp *et al.*, 2011) because post-positivists seek to understand backgrounds, values, and meanings by examining concepts and decision processes.

The influence of post-positivism is evident in studies which complement the statistical contexts of increasing demand with psychosocial insights and recommend standalone educational or combined educational and technical measures to achieve water efficiency (discussed earlier in section 4.3 and

section 4.4, respectively). Post-positivistic studies in the literature therefore use social concepts such as measures or targets, and observations in case studies to understand past events, and recommend that interventions such as metering, and retrofitting should be complemented with water efficiency actions to address the root causes of increasing water demand.

Recent calls by water industry experts for new ways to address water scarcity via enhanced water efficiency engagement have contributed to the increasing influence of post-positivism in the water efficiency literature. This worldview for water efficiency means that researchers can generate more understanding of water efficiency engagement beyond statistics. An illustrative post-positivistic research is Anda *et al*.'s (2013) trial which acknowledged using smart metering and community based social marketing (feedback and thank you letters, and 'coaching' phone calls to participants) to motivate a 7-11% reduction in water usage in 1,043 households, and to evaluate participants' usage and behavioural changes in Margaret River, Australia.

So, discussions in this section have established that positivism and post-positivism imply different methods of knowledge creation in the water efficiency landscape. Whilst positivism enables researchers to make scientific predictions and understand water efficiency variables such as the litres of water used or saved as well as the number of water efficient devices retrofitted or water meters installed, post-positivistic studies enable the understanding of factors underlying people's water usage and thus aid researchers to identify routes for making desired changes.

It is however clear that thus far, positivism and post-positivism heavily influence the study of water efficiency on the part of the public, with little assessment of engagement activities on the part of water utilities. This thus begs the question about what paradigms influence the study of the role of water utilities in water efficiency engagement.

The next section brings the participatory philosophical paradigm and interpretivism to bear in the examination of water utilities' water efficiency engagement practices.

5.3 Participatory paradigm and interpretivism: focus on engagement practices

As highlighted in the previous chapter, there are few studies examining water efficiency practices in water utilities, but most concern water savings and behavioural change made by publics, with lesser focus on how water utilities deliver their engagement activities.

The influence of the participatory paradigm and interpretivism can be identified in few studies in the academic and grey literature relating to how water utilities deliver water efficiency engagement.

First, the influence of the participatory paradigm in the study of water efficiency engagement is advocated on the basis that water utilities and their publics should play a more active role in addressing water issues. For example, water utilities' staff can be interviewed about how they involve publics in water efficiency engagement activities and collaborative work between researchers and their staff can be used to draw insights and produce practice improvements.

Illustrations of the influence of the participatory paradigm in the creation of knowledge about water efficiency should ideally be found in the literature about action research in the field. However, there is a dearth of published details about such research activities and their follow-on actions.

An example of a research that tethers the participatory paradigm is a longitudinal study conducted by Sandelin *et al.* (2019) to examine tacit knowledge and knowledge sharing in a Finnish water utility in the face challenging operational environment and aging personnel. Using semi-structured interviews, the study found that over the course of a decade, employees' perception of tacit knowledge had shifted from being personal property to being sharable with their closest co-workers. But whilst the authors recommended the treatment of knowledge as a strategic asset to aid the understanding and improvement of procedures and practices in water utilities in general, the study fell short for not demonstrating whether or how the Finnish case study was supported to implement its recommendation. The study's shortcoming can however be justified based on its research questions which demonstrate that the authors set out to know how employees perceived, captured, and shared knowledge but did not aim to produce recommendations that will motivate follow-on actions in the water utility in the first place.

Second, the influence of the interpretivism philosophical paradigm in the study of water efficiency engagement is advocated on the basis that the processes involved in water efficiency initiatives should be increasingly examined.

An example of a research that used interpretivism to understand water utilities' activities is Subak's (2000) study of UK water utilities' perception of historical climatic events and their impact on resilience to future events. Susan Subak conducted her study by interviewing managers in ten UK water utilities and constructed her argument by generating in-depth qualitative data that contextualised perspectives of the professionals being studied as representative of their organisations' perspectives. Subjectivity was therefore evident in Subak's findings wherein outcomes were contextualised, for example, the study made expressions such as: 'several of the water companies report that they observed a trend towards drier summers in their regions…many water resource managers believe that the [climate change] scenarios…do not encourage a precautionary approach to

planning. Some managers believe that records of historical drought conditions…provide a better basis for planning.'

Another example of a research project that used interpretivism to understand gaps in water utilities' water management activities is Rayner *et al.*'s (2005) study of why water resources managers in the United States do not use climate forecasts in water resource planning despite the water demand challenge. To improve the process of using climate forecasting, the authors examined decision making in case studies using semi-structured interviews with water management staff in different agencies and organisations.

This current thesis is therefore in agreement with authors such as Bryman (2015) and Uduma and Sylva (2015) who argue that interpretivism is the only way to understand organisational activities within the context in which they occur because they are run by people and should therefore be understood by examining those people's experiences, for example, observing how water utilities' water efficiency home visits are planned and delivered. More on the conduct of the research will be discussed in the Methodology Chapter (section 6.8) where it becomes relevant.

This section has established interpretivism as the ideal paradigm for framing the study of water efficiency processes in which water utilities' practices are of interest. The section has deduced that a linkage exists between post-positivism and interpretivism in the sense of the framing and interpretation of reality. While post-positivism allows the contextual framing of social reality, interpretivism aids the subjective interpretation of interventions and this interpretation becomes part of the knowledge produced. Thus, the next section reflects on some of the methods used to examine water efficiency engagement in the literature to consider which aspects require further studies in a different way.

5.4 Methods used for examining water efficiency engagement

On the one hand, positivistic scientists create quantitative knowledge about water use by formulating and testing hypotheses to generate results that are context-free and not time-bound and can explain relationships between variables. Positivistic findings can therefore be extrapolated, and researchers offer mostly technical recommendations deemed rational and economically efficient (Fam *et al.*, 2015), with little consideration given to societal complexities.

Positivistic analyses are predominant in the water efficiency field partly because technocrats in the water industry value quantitative science that produces statistical evidence and replicable models for prediction (Meissner, 2016). As such, most positivistic water efficiency studies tend to recommend

technical interventions and nudges that appeal to people's self-interests with lesser consideration for the processual aspects of activities to encourage water efficiency.

For example, Adeyeye and Piroozfar's (2012) study of the attitude of UK households towards water efficiency, although seemingly a topic that could have benefited from in-depth investigation, was conducted using questionnaires that enabled the generation of quantitative data. According to the authors, a quantitative method was considered suitable due to 'the nature and range of variables under study' and a statistical analysis package was used to evaluate the collected data. The authors then proceeded to recommend an intervention in the form of a 'DIY' water efficiency tool but also highlighted that the study was limited by the inability to gain further and in-depth understanding of the factors that influence water consumption behaviours even though the study was aimed to study people's attitudes.

On the other hand, interpretivists in the water management sphere use qualitative methods such as intensive case studies (Sharp *et al*., 2011) to generate contextual evidence. According to Flick (2009), 'qualitative research is intended to approach the world 'out there' [as opposed to specialised research settings such as laboratories], and aims to understand, describe and sometimes explain social phenomena from 'the inside' in a number of different ways…'

It is thus clear that once knowledge creation from physical and social realities is sought, multiple truths and ways of doing things unravel. Examples of such qualitative studies that focus on water efficiency engagement processes in water utilities are but a few. Some illustrative examples however are Knamiller *et al*.'s (2006) follow-up study of the 24 Heybridge households retrofitted in 1998, and Browne *et al*.'s (2019) review of a UK camping music festival as an experiment to learn about how society might cope with disrupted water supply that is linked to climate change.

Discussions in this chapter thus far, suggest that most positivistic studies use quantitative methods to examine the reduction in per capita consumption. However, there are fewer studies from an interpretive perspective. There are few studies undertaking the post-positivistic study of the educational aspects of water efficiency engagement in the sense of understanding activities better for the purpose of practice improvement. This dearth of processual information in the water efficiency literature thus foregrounds arguments for other aspect of water efficiency engagement requiring focus, new ways to examine those activities, and the forms that such new knowledge may take. These will be discussed in the next section.

5.5 New approach for examining water efficiency engagement

The water efficiency literature articulates the conceptual ideals of engagement and shows that most studies examine the measurable outcomes achieved through combined water efficiency engagement (e.g., a reduction in per capita consumption) but lack clarity around the educational activities that those initiatives comprise of (see Ashton *et al*., 2015). For instance, Orr *et al*. (2009) highlight that existing studies show 'lack of detail on how some of the efficiency programmes have been developed and delivered (what were the messages, how were they delivered, how often etc.) … [and] without this information, the relative contribution of water device fitting, information provision and two-way sharing and engagement is unclear.'

In a recent study reviewing information-based water efficiency interventions in England and Wales, Lu (2020: 7) shared Orr *et al.*'s sentiment about the lack of information necessary for project evaluation, particularly the educational aspect of home visits. Lu highlighted how water efficiency education is included in combined water efficiency engagement, but its nature and impacts are not explored during the evaluation of project outcomes. The author even goes further to suggest that most water efficiency projects 'had no intention to study the role of information-based interventions' and the very few that attempted to do so lacked conceptual underpinning.

An illustration of the challenge about creating knowledge about water efficiency engagement highlighted by Lu (2020) is Manouseli's (2017) review of water efficiency initiatives in two case studies in the UK. Manouseli's study only focused on per capita consumption reduced by interventions, with little assessment of the educational and processual aspects of the initiatives. As a result, it was unclear whether insights from existing studies informed the planning and delivery of initiatives and whether any more insights were identified and documented during water efficiency engagement for practice improvement.

What is thus lacking is a study that zooms into the poorly understood '*whys*' and '*hows*' of the planning and delivery of water efficiency engagement, bringing to the forefront the need for such processes and activities to be better understood as well as the importance of using new knowledge to tailor subsequent engagement initiatives.

Discussions in Chapter 2 revealed the relevance of communication theory in effectively promoting of water efficiency and demonstrated that three interdependent elements shape water efficiency engagement: message, audience, channel. It is therefore imperative that an empirical study of water efficiency engagement hinges on an analytical framework which is designed around these three

elements. This brings back to the fore, the MAC heuristic for understanding water efficiency engagement developed earlier in section 2.5.

5.6 Proposing the MAC heuristic for new water efficiency engagement studies

The preceding chapters in this thesis validate the need for water efficiency research which normatively focuses on publics to now pay more attention to water utilities' engagement practices too. The Literature Review Chapters drew upon communication theory and illustrations of practices in the water management field to establish three fundamental and interdependent elements that underlie water efficiency engagement: what the engagement is about (message), who is engaged (audience), and how the engagement takes place (channel).

Chapter 4 goes further to illustrate how the message, audience, channel elements differentiate patterns of water efficiency engagement. Although there is an inseparability between these elements, they appear distinct and are thus understood in this research to nuance water efficiency engagement practices in water utilities. Collectively, the message, audience and channel elements are central to successful campaigns that promote water values and efficiency (Costanzo *et al*., 1986; Howarth and Butler, 2004; Willis *et al*., 2011) and impact whether and how publics that are engaged take a desired line of action.

This section therefore proposes the use of the MAC heuristic as an interpretivist framework to examine water efficiency engagement practices, drawing on considerations outlined in see Table 2 in section 2.5. Whilst there are a few models which explain the influence of individual elements of communication on the effectiveness of campaigns in the marketing and communication literatures outside the water sector (for example, Noar's (2012) Audience-Channel-Message-Evaluation (ACME) framework for health communication campaigns which explicates the interdependence of message, audience and channel in influencing the health of publics), there is a paucity of research applying the knowledge of communication theory in the study of water efficiency engagement. So, it is this thesis' ambition to use the MAC heuristic to pull together the three elements and explore their interdependent influences in water efficiency engagement specifically. How the MAC heuristic will be applied in the empirical work will be expanded upon in the methodology section 6.5 where it becomes relevant.

Having discussed how water efficiency engagement has been studied and can be examined going forward using the MAC heuristic for understanding water efficiency engagement, the next section concludes this chapter by reflecting on the aspiration to focus on the processes as much as the measured water savings outcome of initiatives.

5.7 Conclusion

This chapter sheds light on the philosophical influences in the creation of water efficiency knowledge, specifically the influence of positivism and post-positivism in the water efficiency literature.

Although positivistic studies evidence water savings realised from water efficiency initiatives unlike any currently seen, the quantitative nature of their methodologies and outputs means that they focus on technical water efficiency initiatives and reductions in per capita consumption without unpacking the many institutional and individual influences of water demand in households. The current contemporary water efficiency landscape does not discount how the positivism paradigm shapes the literature, but is simply building upon it, to include a consideration for a process aspect that needs to be studied for a sustainable water future. Post-positivistic studies that are driven by participatory policy agendas and seek to reveal the *whys* and *hows* of water usage and water efficiency engagement are therefore now advocated. To do this, an analytical framework that is process-focused is needed in the study of water efficiency initiatives. The MAC heuristic for understanding water efficiency engagement which juxtaposes and draws out the message, audience, and channel elements of communication in water efficiency practices is thus proposed to be employed in the empirical work for this research.

The next chapter discusses the methods used to fulfil the research aim and objectives.

6 Methodology

In previous chapters, the understanding of the problem of increasing household water demand was broadened and the necessity for water efficiency engagement was established. The theoretical, policy, and practice considerations for communication and water management were drawn upon to identify the elements underlying water efficiency engagement initiatives. The previous chapter culminated in suggesting the need for a new way to examine water efficiency engagement and offered the Message Audience Channel (MAC) heuristic as a tool for doing so.

The role of this chapter within the thesis is to present how the empirical work was carried out by describing the methods used to investigate intended audiences and processes for water efficiency engagement in areas of serious water stress as well as those methods used for the case study of water efficiency engagement in Essex & Suffolk Water. In so doing, the chapter demonstrates how the MAC heuristic will be applied to addressing specific questions in the research.

This chapter begins by laying out the philosophical assumptions that influenced how the study was conducted. The second section presents the conceptual grounding for the research objectives. The third section explains the scope of the research. The fourth section describes the research strategy adopted to deliver the two phases of the empirical analysis. The fifth section describes how the MAC heuristic was applies in the empirical work. The sixth to eight sections expand on the data sources, methods and analysis employed in the research. The ninth section reflects on the methodological constraints faced while the tenth section discusses the expected contributions to knowledge. The eleventh section presents the chapter conclusion.

6.1 Philosophical considerations

Considering the aim of the research to further the concept of water efficiency engagement and support practice in the field, understanding the contexts and perspectives that influenced the study is important.

As mentioned in section 5.2, positivism is founded on empiricism which argues for reality as quantifiable and universal for all individuals while post-positivism argues for reality as shaped by perceived and conceived experiences. While this research was open to quantitative research methods because they provide possible routes to unravelling household water efficiency (for example, in precisely measuring the reduction in per capita consumption resulting from the installation of several water efficient devices), the focus was on water efficiency engagement practices through the lens of water utility professionals. The research therefore drew on the post-positivism worldview which underlies context-dependent research (Chilisa and Kawulich, 2012) and promotes the understanding

of situations based on participants' perceptions (Bryman, 2015; Thanh and Thanh, 2015; Nicholson *et al*., 2016).

The research proceeded on the interpretivist epistemological assumption that phenomena and reality are subjective constructions by social actors (Darlaston-Jones, 2007), and due to the need to capture aspects of the social and 'soft path to addressing water scarcity' broadly and holistically through analyses that do not rely on numbers as highlighted by Gleick (2003), the qualitative analytical approach using mostly primary data was adopted.

It is recognised that developing a richer picture of the research will be inadequate without establishing the grounding for the research objectives. Thus, the next section presents the basis for the research aim and objectives outlined earlier in section 1.2.

6.2 Aim and objectives: context

The literature reviews conducted in Chapter 2 – Chapter 5 provided a conceptual basis for conducting the research. Discussions therein showed the need for a study that deviates from the status quo focus on per capita consumption delivered by interventions and instead, zooms into water efficiency engagement activities with close examination of the processual aspects of water efficiency education. The overall aim of the thesis is therefore to develop a better understanding of water efficiency engagement in UK water utilities operating in areas of serious water stress, with focus on barriers and opportunities.

As previously stated in the Introduction Chapter, the objectives to achieve the research aim are:

1. To explore the intended audiences and processes for water efficiency engagement in UK water utilities operating in areas of serious water stress.
2. To identify the factors that aid or stifle water efficiency engagement in a seriously water-stressed utility.
3. To further the concept of water efficiency engagement and support practice in the field.

Following the literature reviews, the understanding of these objectives can be better developed.

First, some authors have made suggestions about why the published literature lacks much information on the education aspect of combined water efficiency engagement. Explanations proffered include water utilities' activities not being underpinned by social theory and their reluctance to manage demand or their preference for implementing light-touch public engagement strategies that they can apply easily despite evidence suggesting that such activities do not increase water efficiency

awareness (Dessai and Sims, 2010; The Energy Saving Trust, 2011; Parker and Wilby, 2011; Browne *et al*., 2013; Lu, 2020). Such intentions can be detrimental to a resilient water system particularly in areas that are seriously water-stressed as their household water use is and will in future most likely be a high proportion of the rainfall available to meet demand, causing their water resources to be under pressure.

Objective 1 therefore seeks to examine water efficiency engagement agendas in the Water Resources Management Plans developed by these seriously waters-stressed utilities to decipher what motivated them to carry out water efficiency engagement, how they described the publics they might engage, what they anticipated might motivate publics to reduce usage including the implied meanings of such anticipations, which publics were engaged during the process of forming their WRMPs, and how they intended to engage their publics in the aftermath. The purposive sample selection was fundamental to focussing the study to address the problem (Yin, 2013) which herein concerns increasing water demand.

Second, discussions in the Literature Review Chapters revealed that better understanding water efficiency engagement will open opportunities for enhanced lesson learning and practice improvement. Some authors have asserted that water efficiency engagement, particularly during home visits, is poorly understood because although both technical and educational interventions are increasingly being combined and delivered in water utilities, educational activities to motivate people to change how they see and use water do not get equal consideration compared to technical measures (Browne *et al*., 2013), and records of such processes and outcomes are sparse or unclear (Mmojieje, 2015; Orr *et al.*, 2018).

Objective 2 therefore seeks to conduct a detailed case study of the project-planning processes and engagement activities of a water efficiency home visit campaign in a water utility that is seriously water-stressed (Essex & Suffolk Water) to identify barriers and opportunities for practice improvement.

Third, the existing literature grounds water efficiency engagement in the communication of educational messages and in the use of technical devices to send water efficiency signals to publics (McKenzie-Mohr, 2000; Orr *et al*., 2018; Icaro, 2013). Some authors have highlighted however that despite theoretical characterisations of the public, water users are still poorly understood and engaged (Owen *et al*., 2009; Dolnicar *et al*., 2012; Icaro 2013; Dean *et al*., 2016; Orr *et al*., 2018), and water managers are not guided by social science during the planning, delivery, and evaluation of their engagement initiatives (McKenzie-Mohr, 2000; Lu, 2020). Lu (2020) expresses frustration about the

lacking theoretical underpinning of water efficiency initiatives and even suggests that the advancement of educational water efficiency engagement has suffered for this reason.

Objective 3 therefore seeks to use insights from the research that relate to barriers to and opportunities for water efficiency engagement identified in the WRMPs and in the case study to enhance the understanding of the field and proffer new ways to advance its practice in areas that are seriously water-stressed.

The next section discusses the geographical scope of the research including the events that led to defining its scope.

6.3 Research scope

The geographical focus of this empirical study is England, although to some extent, insights have been drawn from contexts around the world, especially elsewhere in the Global North.

It is noteworthy that the scope of the research was shaped by the author's research journey. In the early phase of the research, in 2015, the decision was made to investigate how water utilities engage on all water issues including flooding, leakage and scarcity because these were and are still current global water problems. Thus, the research objectives outlined in section 1.2 were not the ones initially focused on before the research proposal underwent confirmation review in September 2016.

The initial wide focus on multiple water issues therefore meant that in the subsequent six months after the confirmation review, hard questionnaires and e-surveys were designed and administered to investigate water issues across the world. The wide investigation yielded few responses and 'scattered' insight. What however emerged from respondents was a hint that engagement on any issue begins with a designed plan which will vary across water utilities and across countries. This insight indicated a need to refocus the study in terms of subject and geographical location.

Parallel extensive investigation of the existing literature revealed that the problem of water scarcity was becoming more daunting around the world, with the Global North strongly focusing on engagement to reduce household demand. Particularly in the UK, while industrial water use had reduced, reductions in household water use had plateaued and was projected to rise in the next few years because of population growth and climate change.

As a result, the focus of the research was narrowed down to investigating how UK water utilities engage with the public to reduce household usage, bearing in mind that the experiences explored, and lessons learnt will be useful across geographical boundaries, especially to the Global North.

These changes in the research scope discussed above had some influence on the methodological choices including the selection of the problem of increasing water demand as the single issue of interest, the inclusion of an examination of utilities' intentions for water efficiency engagement as a preliminary stage of analysis, and the change in the type and conditions of inquiry i.e. from hard and e-surveys to face to face interviews and field observations, and the unmasking of the identities of water utilities studied.

Further, changing the scope of research implied that in addition to investigating water efficiency engagement plans in a group of water utilities, conducting a deep dive case study to investigate water efficiency engagement activities in a water utility was needed. Considering all highlighted herein, the research project was redesigned as a qualitative study to address the research questions.

The next section explains the composition of the qualitative study.

6.4 Research strategy

The empirical analysis for the research was conducted in two phases (see Figure 3).

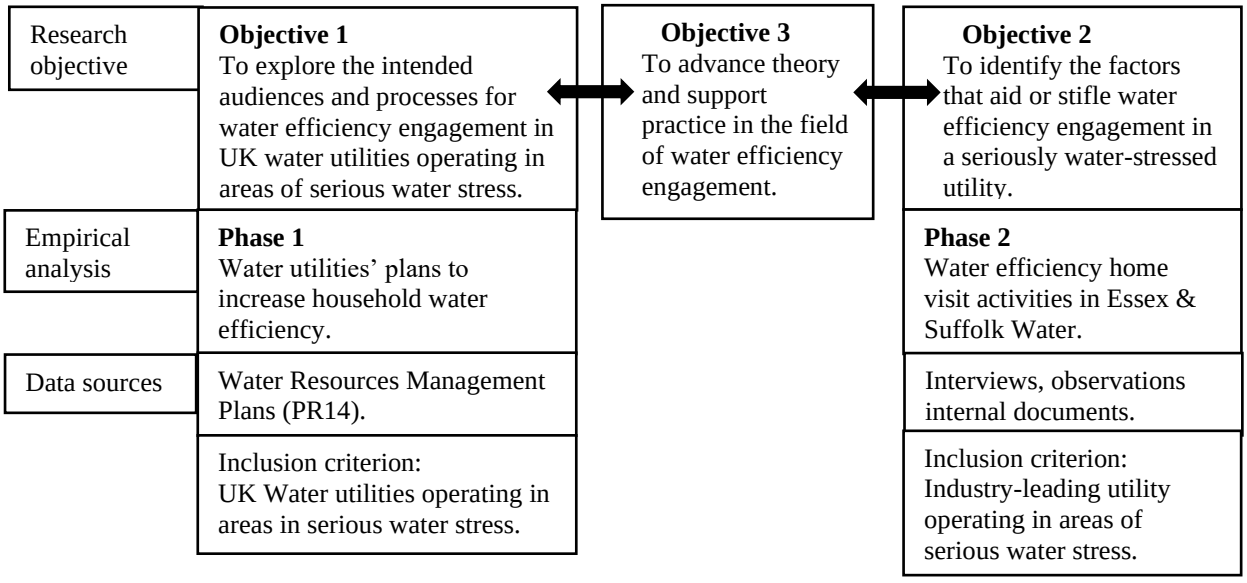


Figure 3 The research strategy.

As illustrated in Figure 3, in the first phase of the research, a documentary analysis of a pool of water utilities' Water Resources Management Plans (WRMPs) was carried out to understand the utilities' plans for water efficiency engagement during PR14. Insights generated from this phase of the empirical investigation thus addressed the first research objective which concerns examining the water utilities' intended audiences and processes for water efficiency engagement.

The decision to systematically examine several plans as a preceding analysis to the examination of home visits is based on Goodrick's (2014) suggestion that comparative case studies facilitate the understanding of how features within a certain context influence the success of a programme. Thus, the Phase 1 findings offered preliminary insights on how the water utilities' water efficiency engagement practices became shaped. Specifics relating to the research methods used to fulfil this research objective will be discussed further in section 6.6.

In the second phase of the research, personnel in the case study, Essex & Suffolk Water, were interviewed and observed and internal documents were examined to understand water efficiency engagement practices in the utility, including barriers to and opportunities for engagement. Insights generated from this Phase 2 of the empirical investigation thus addressed the second research objective which concerns understanding the factors that aid or stifle water efficiency engagement in a seriously water-stressed utility. Specifics relating to the research methods used to fulfil this research objective will be discussed further in sections 6.7 - 6.8.

Collectively, insights from the first phase and second phase of the research were used to produce knowledge for advancing the concept of water efficiency engagement and practice in the field, in fulfilment of the third research objective.

The next section discusses the conceptual themes underpinning the application of the MAC heuristic for understanding water efficiency engagement in the empirical work.

6.5 Applying the MAC heuristic in the empirical analysis

To better understand water efficiency engagement in water utilities, the three elements of the MAC heuristic introduced in section 2.5 was used as an analytical framework for examining water efficiency engagement.

The MAC heuristic juxtaposes three elements revealed in the literature and policy as underpinning communication about water – what to engage about (message), who to engage (audience) and how to engage (channel) and presents these as analytical lenses to systematically examine intended audiences and processes for water efficiency engagement set out in the WRMPs and water efficiency home visit activities in Essex & Suffolk Water using data from documents, interviews, and observations.

The MAC elements have been highlighted individually in the academic and grey water literature as key to effective public engagement and water efficiency and thus served as the overarching nodes within which themes were developed. Considering this, analyses were conducted and findings that

emerged will be described and discussed later in Chapter 7 and Chapter 8 where they become relevant.

The subsequent subsections discuss the application of the MAC elements in the analysis.

6.5.1 Message

The increasing interest in understanding how communication with the public on water issues influences water usage is evidenced by aspects of the literature recommending the variation but centring of water efficiency message design around context and awareness creation (Shu *et al*., 2017).

Discussions in section 2.4.1 established that message is a key component of water efficiency engagement including those 'communicated' through technical devices because evidence shows that poor message design has led to the failure of some campaigns in the water sector.

Messages exist in water efficiency measures which indicate assumptions about publics and their responsibility to water efficiency either as purchasers of water or communal owners of water (Sharp, 2006). This position is illustrated by studies which advocate the water meter as a sender of a price signal to the public, or water efficient devices as reducers of per capita consumption, or people as communal savers of water participating in civic duties.

A rationale behind water demand managers' construction of water efficiency messages is therefore important as such information influences how publics perceive water (see McKenzie-Mohr, 2000; Howarth and Butler, 2004; Icaro, 2013; Olmstead, 2014).

Messages can be recognised in contents of one-way and two-way communications (e.g., in literature materials posted to households or when plumbers have conversations with residents about water during home visits) or in actions (e.g., the installation of water efficient devices) initiated by water utilities but targeted towards their publics' water use. This first analytical lens therefore illuminates message tactics and constructs to motivate water efficiency used by water utilities within implicit and explicit frames.

Thus, to examine messages in water efficiency engagement, information in water efficiency literature materials developed by water utilities were analysed. This was in relation to intended engagements (Phase 1). And in relation to Essex & Suffolk Water's home visit campaign (Phase 2), communications between the utility's personnel and publics were observed, and contents of the utility's resource materials distributed to the public as well as messages implied by the installation of technical devices in households were thematically assessed. In both phases, attention was paid to how the conversation started - whether it began by highlighting low rainfall, population growth, increasing

demand, or something else; any taglines used; water efficiency tips and advice promoted; the implicit and explicit information communicated; the aim of the conversation; information that the utilities expected to motivate their publics; and communication tactics that can be identified in how any conversation is constructed.

6.5.2 Audience

The literature review discussions revealed that water utilities need to better engage the public to improve household water efficiency. However, ambiguity still lies around what type of audience is engaged because water utilities often blanket label their publics as customers, stakeholders, the public, or even as households. Also, it is unclear whether existing literature insights inform the targeting of audience during water efficiency engagement.

So, to deconstruct the public and identify publics of interest, this research drew on a linkage model developed by Grunig and Hunt (1984) which identifies stakeholders through their unique relationships with an organisation. Grunig and Hunt's model was selected because it explains the dynamics of public relations and therefore enabled the fleshing out of interactions between water utilities and their publics. The model posits that the relationship between stakeholders and an organisation is situational and dependent on the linkage between the parties. The authors identified four powerful relationships existing between stakeholders and organisations: (a) enabling relationship (having authority over the organisation), (b) functional relationship (having operational input in or output from the organisation), (c) normative relationship (having common interest with the organisation), and (d) diffused relationship (having occasional interaction with the organisation).

To bring the understanding of water utilities' publics into perspective, the stakeholder representations from Grunig and Hunt's model were grouped and adapted into three categories namely the public stakeholders, the enabling stakeholders, and the proxies:

- Public stakeholders: citizens, or people living in, working in, or passing through a landscape affected by water management and maintaining diffused and/or functional relationships with their water utility, for example, residents of communities, consumers, household bill payers.
- Enabling stakeholders: key players who have a stake and can make decisions that can affect the water utility, thus maintaining an enabling relationship with the latter, for example, engineers, water managers, suppliers, Government, regulators, Boards of Directors, and stockholders.
- Proxies: key players who protect the interests of the public and can make representations on their behalf, for example, the media, environmental groups, and charity organisations.

As described in section 1, water efficiency engagement concerns water utilities' actions or interactions with the public aimed towards household water efficiency. So, in keeping in line with this definition and following the classification above, public stakeholders were chosen to be the focus of the audience analytical lens. And as revealed earlier in section 3.2, the term publics is used in this research instead of public stakeholders.

The audience for water efficiency messages can be recognised by identifying the publics required to ultimately take action to reduce water use. How water utilities perceive, reach, and address their customers can tell us more about their audience. Further, publics' attitudes, values, beliefs and how they use water impact on their response to water efficiency initiatives and these dispositions can be used to reflect on the current delivery of water efficiency engagement and opportunities for practice improvement. This second analytical lens therefore offers opportunities to unearth existing and potential customer insight from how the water utilities plan to and 'dialogue' with publics, the role that they – the water utilities expect publics to play in effecting water efficiency (Bakker, 2003; Strang, 2004; Sharp, 2006), and the way that publics see or use water.

Thus, to examine the audience in water efficiency engagement, in Phase 1, publics who may be the target audience for water efficiency engagement were identified by interrogating plans for water efficiency engagement in WRMPs and who was expected to ultimately take action to reduce usage. In Phase 2 of the research, communication activities and materials were examined, and water managers and plumbers were interviewed and observed to understand their publics linkages to the water utility. The assumed public identities, the perceived understanding of publics, and the self-reported dispositions towards water and water efficiency were developed from these interview conversations with personnel and from field observations during water efficiency home visits. From developed insights, inferences were made about use of customer insight for engagement or the lack thereof. In both phases, attention was paid to who water utilities referenced as their target audience during the planning and promotion of engagement and their socio-material conditions that were targeted.

6.5.3 Channel

The channel used for water efficiency engagement illuminates how the public is engaged. The quality of the communication channel affects the message and influences the perception of the message when communicating conservation (Jacobson, 2009). In other words, as the Literature Review Chapters established, the channel of communication can reshape messages and affect the effectiveness of engagement and that the plumbers communicating water efficiency in physical settings are a channel

in their own rights by virtue of their characteristics and their role in the water efficiency engagement process.

The channel of communication can be recognised through the type of water efficiency engagement approach being delivered. Inferences that help with characterising channels further include whether publics are synchronously engaged in the true sense of participation rather than asynchronously communicated with, or whether engagement settings are sufficient to result in desired behaviours for certain publics or whether alternative mediums ought to be explored to enhance effectiveness.

To do this characterisation of channels, mediums for water efficiency engagement that emerged in the research were classified using Rowe and Frewer's (2005) typology of public engagement (Figure 4) which features communication, consultation, and participation.

	Flow of feedback	
Public communication		
Sponsor	→	Public Representatives
Public consultation		
Sponsor	←	Public Representatives
Public participation		
Sponsor	↔	Public Representatives

Figure 4 A typology of public engagement (Rowe and Frewer, 2005).

Figure 4 suggests that communicative channels enable one-way communication from the sponsor of an initiative (for example, a water utility) to the public. Consultative channels enable one-way flow of communication from the public to the sponsor of an initiative, following a process initiated by the sponsor, thus bringing engagement actions during planning and marketing into focus. When channels are participative, communication is two-way with synchronicity, meaning that there is some degree of dialogue in the process (Rowe and Frewer, 2005: 255; Berger and Iyengar, 2014). Rowe and Frewer's typology shown in Figure 4 thus offered a compass to scrutinise the actions and interactions between the utility's personnel and publics during water efficiency engagement. For instance, the identification of the extent of channels used in communications between water utilities and their publics and their implications in terms of effectiveness (e.g., a display in a shopping centre, a deliberative workshop, a water efficiency home visit, or a water efficiency leaflet posted to households).

To understand directions of information, communication activities during water resource planning as well as plans for future engagement activities were examined within Phase 1 of the study. Within

Phase 2 of the study, outreach activities done to promote water efficiency in Essex & Suffolk Water were examined.

In both phases, attention was paid to the measures that were used to communicate water efficiency, whether conventional or unconventional; what the communication channels say about the urgency to reduce household water demand and the key water efficiency message being promoted to publics; and whether the channels were expected to influence the public's processing of the message. Intended or delivered engagement activities were categorised based on whether communication was one-way or two-way and enabled communication to publics but not vice versa or encouraged exchange of information between the parties and based on whether household water efficiency was driven implicitly by devices or explicitly by education. Findings from the Phase 2 categorisation were used to develop the components of water efficiency engagement approaches and will be discussed later in section 10.1 where they become relevant.

Having discussed how the MAC heuristic was applied in the empirical work, the next section discusses the first phase of the research.

6.6 Phase 1: WRMPs and analysis

The first empirical phase of the research concerns the analysis of plans for water efficiency engagement developed by UK water utilities that are seriously water-stressed as expressed in their PR14 Water Resources Management Plans.

The role of this phase of analysis in the research was to fulfil the first research objective which concerns examining audiences and processes for water efficiency engagement in water utilities operating in areas of serious water stress, and to partly fulfil the third research objective to further the concept of water efficiency engagement and support practice in the field.

This section describes how the sample selection criterion was developed to narrow down the number of water utilities examined, and the selection of a standard document (the WRMP) for analysis across the sample selected.

6.6.1 Data sources - WRMPs

The pool of water utilities operating in areas of serious water stress was selected to explore their PR14 water efficiency engagement plans. This purposive selection of utilities that are seriously water-stressed is grounded in the need to use a criterion to narrow down the samples to include only those within which the objectives of the research can be extensively explored. The exclusion criterion was

therefore any UK water utility operating in areas classified as of non-serious water stress and not under pressure to reduce demand.

The assumption made was that because of the water stress classification of water companies in England and Wales in 2013, there is an undertone of higher expectation for areas that are seriously water-stressed to reduce demand than areas that are not of serious water stress. Therefore, water utilities operating in areas of serious water stress are obligated to and will most likely intensify their water efficiency engagement activities than other water utilities.

The data sources for Phase 1 were the Water Resources Management Plans developed by the seven selected water utilities that are operating in areas of serious water stress.

The seven WRMPs were systematically reviewed particularly because existing studies on WRMPs have been mostly statistical and initiated within the industry domain and have focused on examining all UK water utilities' plans to manage water supply as a collective. However, the sub-set of water utilities operating in areas of serious water stress and their plans for water efficiency engagement are yet to be examined in depth from an academic perspective. Thus, it remains unclear whether and how the intentions for and processes leading to the development of their water efficiency engagement initiatives can contribute to providing better insight about how to improve their engagement practices.

While there are alternative documents such as business plans, drought plans or internal project planning and implementation documents that could be examined to understand plans for water efficiency engagement in utilities, reasons for choosing the WRMP as the data source for the Phase 1 investigation will be discussed in the next subsection.

6.6.1.1 Why WRMPs?

The focus of Phase 1 was on the customer engagement content in the water utilities' PR14 WRMPs that only related to plans and activities to reduce household water use via the technical and educational water efficiency engagement approaches. This is because PR14 was the most recent price review at the time this empirical study was conducted.

Household water efficiency engagement involves plans that often include some form of education and persuasion to achieve behavioural change (Landon *et al*., 2016). The difficulty with reviewing water utilities' plans for water efficiency engagement, however, is that such plans do not exist. In other words, water utilities do not produce a single document described as a 'water efficiency engagement plan' or anything similar.

To review water efficiency engagement plans, a researcher is obliged to piece together what water utilities intend to do in terms of engaging their publics from any available source(s). Such sources include business plans, drought plans or water resources management plans.

First, business plans are created by water utilities to set out what they intend to deliver for customers and the environment over a five-year period in line with Ofwat's framework for affordability, customer service, resilience, and innovation. Business plans therefore focus on bills and ensuring that water services provide value for money for customers.

Second, water utilities produce drought plans every three years to demonstrate how they will provide sufficient water to the public however bad a drought may be. They are therefore a circumstantial reactive response to ensure water sufficiency in the event of a drought.

Third, as discussed in detail in section 3.2, water utilities develop their WRMPs every five years solely to explicate intentions to meet water demand over the next twenty-five years including aspects that can be categorised as water efficiency engagement. The selection of the WRMP was tactical as each UK water utility uses this document to evidence its motivations, intentions to balance demand and supply using various water efficiency engagement approaches.

Preference for WRMPs to be studied over business plans was due to their focus on the management of water demand as opposed to the business plans which consider multiple aspects of water management. Also, WRMPs were chosen to be studied over drought plans due to the proactive nature of their development to address the existing problem of water scarcity as opposed to the reactionary, futuristic, and imaginary nature of drought plans.

Further, UK Environment Agency *et al*. (2012: 1) has established that water efficiency sits within the broader aim for developing WRMPs in the sense that water utilities are required to demonstrate how they will 'implement alternative demand management options… [and] fulfil their obligation to promote water efficiency and plans…' But while WRMPs are more focused on addressing water scarcity, apart from Richardson's (2018) study which examined PR19 WRMPs and strongly criticised them for evidencing more of leakage reduction plans than water efficiency plans, there is no existing study examining plans relating to water efficiency in WRMPs.

In view of these comparisons, WRMPs were purposively selected for the preliminary study of how plans for water efficiency engagement for four reasons: (1) most alternative documents were inaccessible to the author as a member of the public, and in situations where water utilities such as Thames Water and Essex & Suffolk Water provided such documents, publication or circulation of

contents were not permitted; (2) engagement plans in some water utilities were found not to be documented or semi-unstructured; (3) because engagement plans were being examined across seven water utilities, it was important to apply fairness and objectivity by reviewing a standardised plan produced by all the water utilities following a universal guide and subjected to scrutiny by Ofwat – a feature provided by the WRMP; and (4) WRMPs have been the focus of policy considerations in industry discussions that relate to the management of water demand (Butler and Memon, 2005) and under the Water Industry Act 1991 (UK Environment Agency *et al.*, 2012).

The next section discusses the analysis of WRMPs.

6.6.2 Methods for analysing WRMPs

In line with Khandkar's (2009) note that qualitative data analysis involves 'noticing, collecting and thinking about interesting things,' between October 2016 – April 2017, documentary analysis was conducted to catalogue seriously water-stressed utilities intentions for water efficiency engagement, including the message frames and channels used in discussions about water efficiency activities, and targeted publics.

The MAC heuristic for understanding water efficiency engagement served as a framework to systematically and reiteratively review the WRMPs. The focus was on identifying emerging themes from the reiterative analysis, developing an understanding of implied message frames, water utilities' perceptions of how their publics see and use water, and plans for activities to be delivered over the next five years, and drawing an understanding about how these factors interplay.

First, the systematic review involved setting up two categories of the WRMPs' contents to be analysed: the water efficiency engagement that occurred during the preparation of the WRMPs (henceforth referred to as the pre-WRMP period), and water efficiency engagement intended to be delivered following the publishing of WRMPs (henceforth referred to as the post-WRMP period).

Then, using the MAC heuristic introduced in section 2.5, additional layers of coding were done to the contents in the WRMPs that were found to be MAC-related and relevant to water efficiency engagement. These contents fed into multiple themes: the water utilities' motivation for engagement; deducible public appeals from WRMPs and what these suggest about how publics were perceived and held responsible for water efficiency; message frames evident in WRMPs and their implications for how water efficiency conversations were to be communicated when initiatives were delivered during the post-WRMP period; the types of publics engaged during the pre-WRMP period; publics intended to be engaged during the post-WRMP period, water utilities' expectations of these publics,

and incentives planned to motivate water efficiency; patterns in engagement approach during the pre-WRMP period, including the channels of communication; and the variety of channels intended for communicating water efficiency during the post-WRMP period, including initiatives and related measures of success. The themes were then developed further and used as the basis for further examining the delivery of water efficiency engagement in Essex & Suffolk Water.

The next section gives a background to the case study, followed by the subsequent section which describes how the case study analysis for Phase 2 of the empirical work was conducted.

6.7 Phase 2: introduction to the case study

The literature review revealed that there is limited knowledge about how utilities deliver water efficiency engagement, thus stifling opportunities for practice improvement. To this end, a case study was conducted in Essex & Suffolk Water.

To support a better understanding of the next section which describes how the case study was analysed, this section explains why Essex & Suffolk Water was selected for the case study (first subsection) and gives background information about the water utility (second subsection), its water efficiency team (third subsection), and its water efficiency home visit campaign (fourth subsection).

6.7.1 Case selection

This second phase of the empirical work was a case study investigation of the Every Drop Counts (EDC) home visit campaign in Essex & Suffolk Water.

Yin (2013) highlights a case as key to maintaining focus of a study and recommends it when seeking to answer the 'how' and 'why' questions that can uncover contexts relevant to the phenomenon under study. Choosing a suitable case is therefore necessary for the development of new insights, rather than general insights which commonly emerge from loose comparisons made in water studies (Mollinga and Gondhalekar, 2012).

Essex & Suffolk Water was purposively selected for a case study because the systematic review of WRMPs in Phase 1 of the empirical investigation revealed that the water utility planned to deliver EDC home visits - an annual award-winning water efficiency campaign that is considered by water industry experts such as Waterwise as exemplary. This selection of a leading water utility was particularly important to ensure the production of research findings that are at the leading edge of practice.

The EDC home visit campaign was of interest to this research to contextually explore how water efficiency engagement is delivered in a seriously water-stressed utility. The focus on Essex & Suffolk Water's home visits was tactical because its annual delivery meant that opportunities to implement continuous improvement existed and the utility offered the author opportunities to work with its water managers and plumbers to draw on gaps and emerging lessons that can aid the improvement of work practices in real-time thereby, contributing towards the agenda of collaborative research projects that deliver industry-oriented solutions as well as academic knowledge contributions.

This phase of the empirical investigation was therefore particularly crucial to developing a better understanding of how water efficiency engagement is delivered including the lessons that can be learnt from processes and practices.

The next subsection provides more information about Essex & Suffolk Water as a company.

6.7.2 About Essex & Suffolk Water

Essex & Suffolk Water is one of the twenty-five water utilities operating in England, Scotland, and Wales. The water utility was formed from the merger of the Essex Water Company and the Suffolk Water Company in 1994. In 2000, the water utility became part of Northumbrian Water but maintained its Essex & Suffolk Water trading name in the south-eastern region of England where it operates.

Essex & Suffolk Water is a water-only supply company and operates in two geographically distinct areas namely Norfolk and Suffolk, and other parts of Essex and Greater London (see Figure 5).

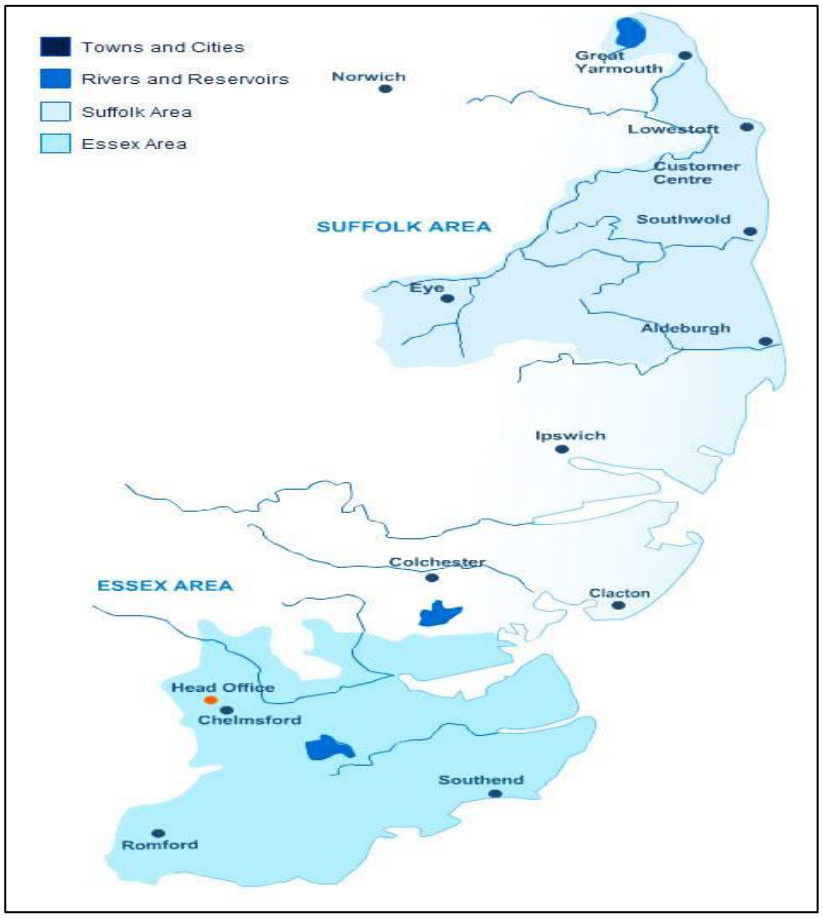


Figure 5 Essex & Suffolk Water's supply area (ESW, 2018).

Figure 5 shows that Essex & Suffolk supplies water to eleven towns and cities. Its operational areas extend over 2,861km^2. As at the time of this writing (summer of 2018), the water utility supplied water at a cost of £0.62 daily to a total population of 1.8 million in 794,000 properties in the south-eastern region of England, out of which 735,000 were household connections.

Out of the population served by Essex & Suffolk Water, 1.5 million lived in the rural and urban Essex area comprising of Chelmsford, Southend and the London Boroughs of Barking and Dagenham, and Havering and Redbridge. The remainder 0.3 million customers lived in the rural Suffolk area comprising mainly of Great Yarmouth and Lowestoft.

As earlier mentioned in section 2.1, Essex & Suffolk Water is one of the seven water utilities that the UK Environment Agency classified as operating in areas of serious water stress based on population estimates and weather variability (DEFRA, 2008). Arising questions thus concern the structures that are in place in the water utility to ensure a reduction in household water use and the barriers faced. As key contributors to the answering of these questions were members of Essex & Suffolk Water's water efficiency team, the next subsection introduces the set-up of the team.

6.7.3 Water efficiency team

According to Essex & Suffolk Water (2014b), the water utility's vision is to be the national leader in services provision and its business is driven by five core values including being customer-focused, being results driven, ethical, creative, and being one-team.

The water utility claims that its values are collectively demonstrated through exceeding customers' expectations, achieving excellent business results, being responsibly committed to the environment and to communities, being innovative with service delivery, and working together to achieve corporate objectives.

As at the time of this writing (summer of 2018), Essex & Suffolk Water had a Water Efficiency Team comprising of six professionals – a Water Efficiency Manager who was the general overseer of the team, a Demand Planning Project Manager, two Water Efficiency Analysts, a Water Demand Analyst, and a Meter Reader (see Figure 6).

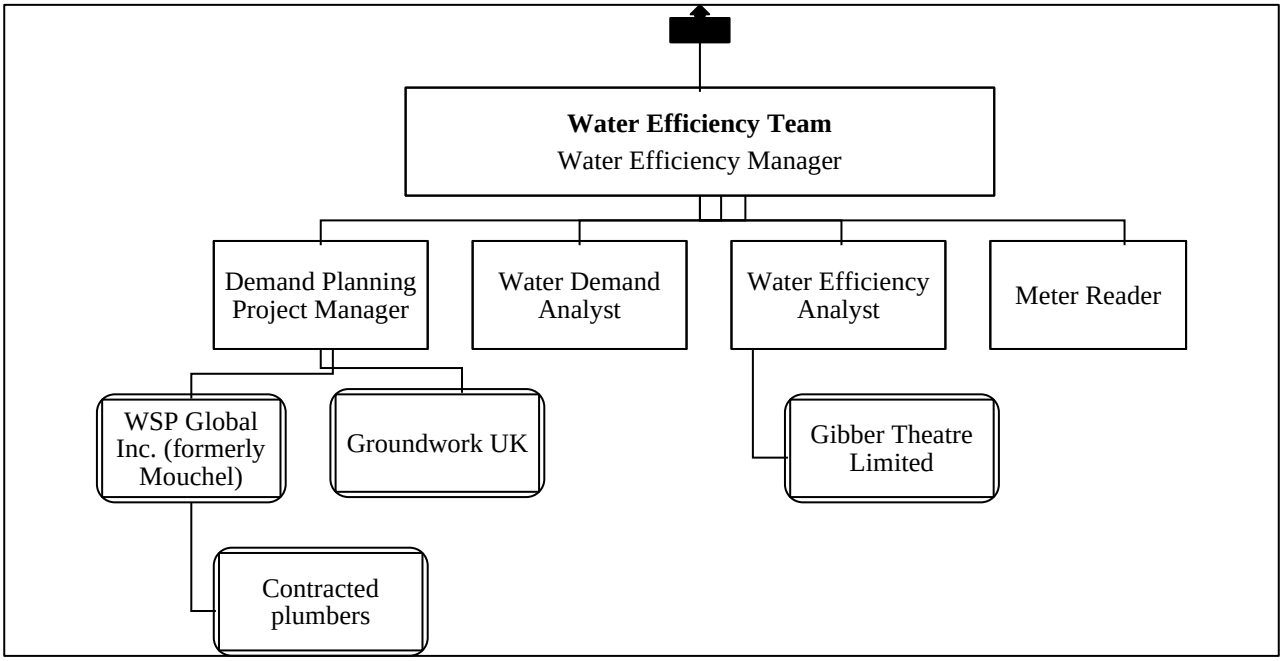


Figure 6 Essex & Suffolk Water's Water Efficiency Team. (A rounded double border to a rectangle indicates an external contractor).

Figure 6 illustrates the membership of Essex & Suffolk Water's Water Efficiency Team. Positions in rectangles were held in ESW and were responsible for managing external contractors which are shown in the rounded rectangles with double borders. The meter reader was tasked with visiting households to take meter readings before and after water efficiency home visits had been completed by plumbers.

The creation of the Water Efficiency Team in Essex & Suffolk Water arose due to the need to increase efforts to meet water demand, starting off as a small team of 2-3 professionals in 1997, and evolving in response to drivers such as the Abberton reservoir expansion project and the water efficiency targets set by Ofwat.

According to the Water Efficiency Manager, the team was created because it was important:

> "to demonstrate that whilst they [the water utility] were building a new big supply capital project… they were managing demand at the same time…then it moved on to the Ofwat water efficiency target in 2010-15 and since then it has just built momentum and gradually the team has built to where they are now… now working closely with the Customer Directorate… and the Customer Field Services Team responsible for installing meters and repairing leaks… and have seen the profile of water efficiency raised in the business."

For the home visit campaign, Essex & Suffolk Water employed two sets of contractors.

First, the water utility contracted Groundwork UK, a registered charity, and an environmental organisation reconnecting people with nature. Groundwork UK ran a 3-day campaign in Witham town centre to sign publics up for a home visit.

Second, the water utility commissioned a long-standing contractor WSP Global Inc. (formerly Mouchel) to pay water efficiency home visits to households, and WSP employed six qualified plumbers on a zero-hour contract basis to do this.

One of the six plumbers assumed a dual role as a plumbing supervisor and a remedial plumber. This plumber paid follow-up visits to households to carry out repairs which could not be done during the initial home visit due to time constraint, or to remove fitted water efficient devices no longer wanted by publics.

According to one of the plumbers:

> "the customers do not know Mouchel [WSP] exists. All the customer knows is Essex & Suffolk Water. We [plumbers] are not representing Mouchel [WSP] because they are just a contractor for Essex & Suffolk Water…"

The personnel in the team were therefore key facilitators of water efficiency engagement in the water utility and are considered as the most crucial participants for the research.

The next section introduces the water efficiency home visit campaign which was the focus of the case study.

6.7.4 The EDC water efficiency home visit campaign

Essex & Suffolk Water conducts home visits in a selected town during the summer season to encourage efficient usage, and consequently, help customers save water, money, and energy. This home visit campaign is an annual initiative. Each year, a town is visited which is different from that visited in the preceding year.

Approved plumbers pay free scheduled visits to households to audit water systems such as taps, showers, and toilets, to install suitable water efficient devices such as water butts, aerated shower heads, and dual flush devices for toilets, and to have conversations with residents about water efficiency.

Over the years, changes and improvements have been made to the EDC home visit campaign. Speaking of these changes, the Demand Planning Project Manager stated that:

> "It has been a gradual process… I do not think that behavioural messaging and discussion is new; it just has not been delivered like a conversation necessarily… this year, we have almost consolidated and learnt from what we did in 2016 and made it better…we have cut stuff that we do not think has worked."

The home visit campaign studied in this research was delivered in 2017 in Witham, a town in the UK with a population of 25,353. Witham is in the county of Essex (see Figure 7), the driest county in the UK. It is therefore noteworthy that there is a strain on water supplies in the town.

Figure 7 Map showing Witham town.

Figure 7 shows Witham town where the EDC programme was delivered in 2017. Essex & Suffolk Water chose to deliver the 2017 Every Drop Counts programme in Witham, paying 2,854 home visits to local households (Figure 8) (ESW, 2017c).

Figure 8 Witham households visited during the EDC campaign in 2017.

Figure 8 shows an aerial view of the water efficiency home visits delivered during the 2017 Every Drop Counts home visit campaign between 19th June 2017 and 20th October 2017.

Henceforth, the water efficiency home visits delivered in Witham in 2017 will be referred to as EDC Witham home visits.

The key processes and activities constituting the delivery of EDC home visits are outlined in Figure 9.

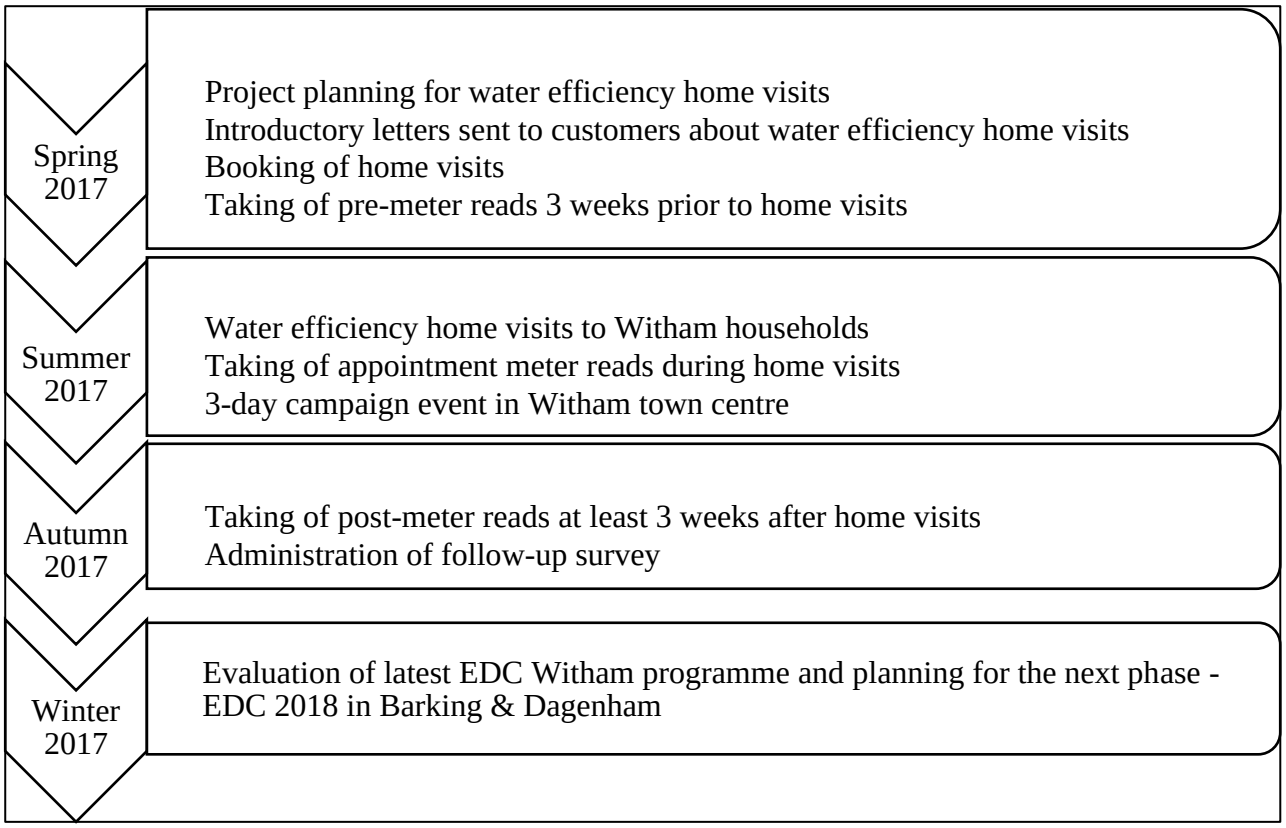


Figure 9 Timeline for the 2017 home visit campaign.

The next section describes the intricacies of the methods used for data collection and analysis in the case study.

6.8 Case study analysis

The literature review revealed that there is limited information about how water efficiency engagement is delivered and evaluated, thus stifling opportunities for practice improvement. To this end, a fieldwork investigation that included an action research in the case study - Essex & Suffolk Water was conducted.

The role of this phase in the research was to fulfil the second research objective which concerns identifying the factors that aid or stifle water efficiency engagement in a seriously water-stressed utility, and to partly fulfil the third research objective to further the concept of water efficiency engagement and support practice in the field.

6.8.1 Methods and data sources

Described as 'methodological triangulation,' King and Horrocks (2010: 146) suggests that addressing the same research problem is more effective with the use of different methods.

Considering the above, for the case study, a set of qualitative methods were used to unravel water efficiency engagement in Essex & Suffolk Water. In view of the research aim to enhance the understanding of water efficiency engagement, interviewing offered the main investigation method, and this was supplemented with documentary analysis and observation to make critical sense of the knowledge developed from the analysis. Therefore, the main data sources were the interview participants, publics in households observed (including their spaces), primary project documents, and secondary literature materials.

The subsequent subsections discuss the examination of documents, and the observation and interviewing investigative methods used in the case study. It must be pointed out at this point that the case study investigation involved a pragmatic approach in which all three methods were undertaken in parallel. The order of the subsections below, however, reflects how the fieldwork emphasis changed through time.

6.8.2 Documentary analysis

Secondary data derived from archival records and journal articles were analysed to capture the historical development of water efficiency engagement in Essex & Suffolk Water.

In parallel, the EDC campaign project materials from the previous year (2016) and in the fieldwork year (2017) were analysed to understand whether, how, and why the EDC campaign activities had developed.

The EDC project materials included the home visit project planning documents, promotional and campaign materials, samples of letters relating to water efficiency that were sent to customers, internal project evaluation documents, newspaper articles, photographs, and website and social media publications. The water utility provided these documentary evidence for the research project on the condition that some specific items such as the project planning and evaluation documents were not

shared onwards.

The entire documentary evidence was examined and excerpts relevant to the planning and delivery of water efficiency engagement were identified. Identified excerpts were then systematically analysed for content and triangulated with themes that emerged from the systematic review of WRMPs in Phase 1 (discussed earlier in section 6.6.2). The 'improved' themes then informed the building of a thematic framework in the Nvivo software.

The documentary evidence provided a background to water efficiency engagement in Essex & Suffolk Water and was used to refine the interview guide so that novel and informed questions could be posed to interviewees. The next section discusses this interview aspect of the inquiry.

6.8.3 Interviews

The second tranche of the case study investigation concerned semi-structured interviews held with personnel in the water utility to consolidate the understanding of water efficiency engagement from the perspective of practitioners. These personnel were responsible for designing and planning water efficiency initiatives (the water managers) and for delivering the home visits (the plumbers).

Interviewing is the most used qualitative research method across disciplines because it allows views, experiences, beliefs and/or motivations of individuals on specific matters to be explored and it provides a deeper understanding of social phenomena that would not otherwise be obtained from purely quantitative methods such as questionnaires (Gill *et al*., 2008). Interviews have been described as in-depth but of various forms, whether structured, unstructured, or semi-structured (Bryman, 2015).

Evidence shows that structured interview is commonly used in quantitative surveys using a questionnaire that contains a sequence of questions while the semi-structured and unstructured interviews dominate qualitative research (Edwards and Holland, 2013).

Although qualitative interviewing is stereotyped as a familiar method in the social sciences, it is used in this research based on the post-positivism philosophical assumption made in section 6.1 that reality is subjective, and its understanding is constructed based on participants' perception, and based on the interpretivist epistemological position that this study took.

Semi-structured interviewing was deemed suitable for this research due to its practicality because it allowed the author and the interviewees to diverge interview discussions to pursue an idea or response in further detail.

For the water managers, semi-structured interviews were conducted with four out of the five key members of the Water Efficiency Team to understand other initiatives planned to promote household water efficiency in the utility and their confluence areas with the EDC home visit campaign.

For plumbers, three out of the six in the cohort were interviewed to understand their perspectives about how engagement is delivered, barriers faced and potential ways to improve practices. The interviewed plumbers had been working on the EDC campaign for at least three years and thus had in-depth knowledge of the programme in comparison to the three other newly recruited plumbers.

It must be acknowledged that there is debate around the ideal number of participants for qualitative research. Indeed, the ideal number of research participants have been contemplated by research methodology experts.

For instance, in a paper published for the National Centre for Research Methods, Baker (2012) interviewed qualitative researchers how many interviews is enough when conducting an inquiry that is semi-structured. Amongst Baker's participants were renowned social scientists, pioneers, and early career researchers.

Baker reported that interviewees' riposte to the posed question of 'how many' was 'it depends.' The author concluded that the ideal number of interviews considered sufficient for a semi-structured qualitative inquiry is subjective to the research aims and objectives, available time and resources, and other epistemological, methodological, and practical factors.

In the context of this current doctoral research, the aim was to interview participants that were in the best position to give sufficient information that can help enhance the understanding of the EDC water efficiency campaign. In this light, the three plumbers with the most experience on the EDC campaign were selected out of the total number of six. Also, the decision to interview four members of the Water Efficiency Team was based on the need to interrogate the officers overseeing the key water efficiency campaigns for households. It is important to highlight at this point that there were two Water Efficiency Analysts, so the decision was made to interview only one of them.

Constraint faced due to the number of personnel interviewed will be addressed shortly in detail in section 6.9 where they become relevant and will be reflected upon again in section 10.4 in the Conclusions Chapter of the thesis.

Two interview guides were developed to focus the interviews with the water managers and the plumbers whilst still accommodating flexibility (DiCicco-Bloom and Crabtree, 2006). These

interview guides (see Box 2 and Box 3 below) comprised of core and associated topics of discussion relating to water efficiency engagement in Essex & Suffolk Water.

Box 1: Guide for semi-structured interviews with the water managers	**Box 2: Guide for semi-structured interviews with the plumbers**
1) What is the understanding of the cause of the problem of increasing water demand?	1) What is the understanding of the cause of the problem of increasing demand?
2) What are the motivations for the Every Drop Counts water efficiency initiatives?	2) What is the understanding of the customer before and after a home visit?
3) What are the intended aims of the initiatives?	3) Who is the perceived customer, what expectations does the utility have of the customer and customer engagement?
4) Who is the perceived customer, what expectations does the water utility have of the customer and customer engagement in relation to water efficiency?	4) What approach is taken in conducting the home audit and what behaviours and practices are targeted by water efficient devices and conversations?
5) Who are the target audience of water efficiency initiatives, and through which channels are those target audience reached?	5) Who is engaged during a home visit and what perceived behaviours do they have in relation to water use and efficiency?
6) How have the initiatives evolved, what has been achieved so far and what are the indicators of successful performance?	5) Who is an ideal plumber and what is an ideal water efficiency engagement?
7) What have been the challenges so far, and what are the potential areas of improvement?	6) Are home visits effective and what is the role of education in home visits?
	7) What have been the challenges so far, and what are the potential areas for improvement?

Box 2 and Box 3 show how semi-structured interviews conducted with the water managers and plumbers covered separate but linked topics.

With the water managers, topics of discussion (Box 2) focused on considerations for planning of the water efficiency initiatives that they oversee while with the plumbers, topics of discussion (Box 3)

focused on engagement practices. Recommendations for practice and process improvement were collectively drawn from both sides.

Described as 'conversations with a purpose' (Burgess, 1988: 102), semi-structured interviews were employed in the research. According to authors such as Mason (2002) and Edwards and Holland (2013: 2), semi-structured interviews use the narrative approach to unpack themes within the issue investigated, to (re)construct contextual knowledge of the subject and use face to face and observational dialogue with participants to investigate the subject further.

In addition to incorporating a semi-structured level of flexibility into interviews and using the interview guides, the structure of the topics of discussion was adapted during the interviews to ensure that the context of conversations allowed insight to be revealed in line with the interviewees' role in water efficiency engagement in the water utility.

For example, the Water Demand Analyst was interviewed in the context of water efficiency in the garden because this staff was responsible for the utility's gardening campaign, but she was also probed about how this aspect of work links with engagement during the home visits delivered by the plumbers. This was important because the interview discussions revealed a missed opportunity to join up water efficiency activities - whereby the Analyst did not have a database of households with gardens, and although the plumbers visited households and recorded whether they audited a garden or not, this information was not being fed back to the Analyst.

Each interview with the water managers and the plumbers was scheduled to last one hour, in consideration of their work. However, each interview with the water managers lasted an average of two hours because all interviewees suggested extending the duration to discuss more topics which were relevant to the research. Also, each interview with the plumbers lasted an average of one hour and ten minutes. This is because the plumbers volunteered their hour lunch breaks to be interviewed. This flexibility is considered appropriate in line with Gill *et al.*'s (2008) argument that the duration of interviews varies depending on the topic, the researcher, and the participant.

Once consent was obtained from interviewees, the interviews were recorded using a small unobtrusive audio recording device and hand-written notes were taken particularly to document non-verbal cues made by the interviewees. The decision to audio-record and take notes simultaneously was due to recording being an appropriate choice for capturing data (Gill *et al.*, 2008), and it made it easier for the interviewer to concentrate on the interview content and spoken prompts. Also, although relatively unreliable for being incomprehensive (Jamshed, 2014), handwritten notes were beneficial to the author for cross-referencing purposes at the data analysis stage.

The tape-recorded interviews were transcribed verbatim using the software named Wreally, in line with Pontin's (2000) recommendation that verbatim transcription prevents bias and provides permanent records of what was said and was not said. The transcripts of the interviews were then imported into Nvivo and thematically coded.

The content of the interviews provided detailed context of the water efficiency initiatives as they were planned, delivered, and adapted. These contexts are typically not disseminated externally and are not available in detail in the public domain. Thus, although the interviewing approach was resource-intensive for data collection and consequently, for analysis, it offered the needed deeper understanding of the phenomena (as recommended by Gill *et al*., 2008) that relates to documented and undocumented project planning and water efficiency engagement practices in Essex & Suffolk Water.

It must however be acknowledged that semi-structured interviewing poses both opportunities and challenges in research. For example, semi-structured interviews are high-preparation, high-risk, high-gain and high-analysis operations (Wengraf, 2001: 5) and are 'highly flexible but somewhat unpredictable' (Byrne, 2004). As a result, some of the methodological considerations concerning the depth and breadth of the semi-structured interviews and key debates relating to the research's strength of generalisability and hypothesis testing (typical to quantitative approaches) versus the research's strength of being explorative and subjective (typical to interviews) were brought to the fore.

The reason for using semi-structured interviews in the research however remains that the aim of the case study was to enhance the understanding of water efficiency engagement to foster practice improvement. Such investigation therefore required flexibility for the interviewer and the interviewees to branch into other subjects to further explore an idea or response and elaborate on information that is considered important (Gill *et al*., 2008). The research was however leveraged by the breadth of data collected from the interviews, and time intensiveness during interview sessions, and during transcription and analysis.

6.8.4 Observation

The final tranche of the investigation in the case study was the observation of the water managers and the plumbers as they planned for and delivered home visits, respectively.

The observation involved spending time at Essex & Suffolk Water and in customers' homes to critically understand how the water utility planned and delivered home visits, with specific focus on water efficiency education training given to plumbers, engagement practices delivered in households,

the use of customer insight across both settings, and the collaborative work between the water managers and the plumbers.

The water efficiency literature suggests that utilities are implementing measures such as education, public information, appliance retrofit and ordinances, with the expectation that these will reduce household water demand. However, the effectiveness of conservation education is poorly understood despite it being a common strategy used by water utilities (Mass *et al*., 2017: 399).

So, how can effectiveness be examined when knowledge of the delivery is lacking and opportunities for improvement are stifled?

It was considered necessary to observe engagement activities to supplement insight generated from the interviews conducted with the water managers and the plumbers because interviews alone may offer a discrepancy between real and reported behaviour (Friedrichs and Lüdtke, 1975), thus posing a methodological consideration.

Also, interview participants can mislead the researcher or withhold knowledge during interviews (Edwards *et al*., 2013: 31), but observation allows the researcher to engage with participants and produce supplementary insight that can corroborate research findings (Jamshed, 2014).

Observation was conducted in three instances: (1) at the plumbers' training workshops to understand how the water managers equipped the plumbers with the skills and knowledge to deliver water efficiency engagement; (2) at a town centre event to understand how the water managers and Groundwork personnel promoted water efficiency during campaigns to increase signups for home visits; and (3) at water efficiency home visits to understand how water efficiency engagement was delivered in households.

The first set of observation which was the plumbers' training will now be discussed.

Structured observations were conducted at the plumbers training workshops (Figure 10) organised by Essex & Suffolk Water. These workshops were delivered over two days (14th - 16th of June 2017) to equip plumbers with the knowledge and skills to deliver the EDC Witham home visits.

Figure 10 From left to right: plumbers training session, practical demonstration of product fitting, Every Drop Counts branded van assigned to plumbers.

The plumbers' training sessions, one of which is shown in Figure 10 was attended by the author, Essex & Suffolk Water's Demand planning Project Manager, two contracted Project Managers from WSP, and six plumbers. Three out of the six plumbers in attendance had worked on the Every Drop Counts home visit campaign previously.

Action research is a type of social inquiry in which the researcher (seen as an outsider) gets involved in the action process for a problem to be resolved for a practitioner (Eikeland, 2012). The researcher thus becomes a 'change agent' and is seen as an insider, contributing to 'both to the practical concerns of people in an immediate problematic situation and to the goals of science by joint collaboration within a mutually acceptable and ethical framework' (Rapoport, 1970: 499).

In what is a process of 'informal action research,' the plumbers training sessions were observed for content of discussions to develop a deeper understanding of the preparation that preceded the home visit campaign and to understand practices needing improvement.

However, the author made contributions to the plumbers' training by suggesting role-playing of engagement scenarios and conversations in the field. Insights gained from the observation of the plumbers' training will be discussed in detail in section 8.1 where they become relevant.

The second set of observation which is the Witham town centre campaign, will now be discussed.

After the commencement of the water efficiency home visit campaign on the 19th of June 2017, Essex & Suffolk Water held a three-day promotional campaign (25th – 27th July 2017) in Witham town centre. This public campaign was organised to supplement the utility's efforts to increase public

awareness and to recruit more households for home visits.

The town centre campaign set up a promotional stand on Witham High Street on the first and third day, and at the Tesco Supermarket in Witham town centre on the second day. The campaign events were under the supervision of a member of Essex & Suffolk Water's Water Efficiency Team.

It is imperative to note that Essex & Suffolk Water held seventeen of such public campaign events in total. However, this research focused on the Witham town centre event because it was held at the time of the fieldwork, meaning that the author had a first-hand account of the event as a primary observer.

On the 26th of July 2017, the author visited the Essex & Suffolk Water Stand at the Tesco supermarket in Witham town centre to observe the public campaign event. The campaign Stand was situated close to the entrance of the supermarket and manned by four Groundwork personnel engaging with passers-by.

The aim of the observation was to understand the context and scale of water efficiency messages communicated during the public campaign event, and to decipher whether there were any variations compared to how they were discussed in other settings such as in the plumbers' training workshops and during water efficiency home visits.

So, with approval given by the water utility, the unstructured observation was conducted, unknown to the Groundwork personnel. The author posed as a passer-by to avoid being singled out as a researcher and to eliminate any Hawthorne effect whereby the Groundwork personnel altered their behaviours because they knew they were being observed.

Posing as a passer-by has some parallels with mystery shopping which is rooted in cultural anthropology that seeks to understand the norms, attitudes and behaviours that are neither documented nor communicable through language (Wilson, 1998). Wilson notes that researchers use mystery shopping to observe processes and procedures used in delivering a service and have done this widely in the UK across sectors including public utilities.

A less structured approach to mystery shopping was however taken here to observe and discover 'new things that could have not been anticipated at the start of the study' (Seale, 2004: 198). However, Seale warns that such loosely structured observation can be problematic because a researcher's account of a situation may be different from how another may describe the situation – posing a methodological consideration for the research.

An ethical dilemma regarding consent during mystery shopping came to the fore during observation. To address this, fact-checking and 'delayed disclosure' was incorporated into the process. This means that the author's identity was disclosed to the Groundwork personnel after observation was complete.

Also, the author had a de-brief conversation with the utility's Water Efficiency Team member on the ground to discuss observation and give feedback about areas needing immediate improvement. Findings from this town centre observation will be discussed in detail in section 8.3 where they become relevant.

The third set of observation which is the water efficiency home visits will now be described.

To understand who was engaged and how water efficiency engagement was delivered during EDC Witham, some plumbers' water efficiency home visits were observed.

The public's water values, and usage practices can be tacit and third-party accounts from the water managers and the plumbers and from publics themselves about how publics perceive and use water, and how home visit activities are planned and delivered can be subjective.

It was therefore considered important to reconcile reported perspectives gained from interviews with observation that focused on the plumbers during home visits (see Table 8). This is because evidence shows that 'participant observation and field studies of actual behaviour supplemented with interview insights can give more valid information' (Kvale, 2008: 45) since people can often talk and reveal details about their practices (Hitchings, 2012).

Table 8 Home visits observed.

House	No. of floors	Water meter	Physical Space					No. of residents present during home visit
			Ground floor			Upstairs		
			Kitchen	Cloakroom	Garden	Bathroom I	Bathroom II	People
Home Visit 1 (HV 1)	2	×	✓	✓	✓	✓	×	1
Home Visit 2 (HV 2)	2	×	✓	✓	✓	✓	×	1
Home Visit 3 (HV 3)	2	×	✓	✓	✓	✓	×	3
Home Visit 4 (HV 4)	2	×	✓	✓	✓	✓	×	2
Home Visit 5 (HV 5)	2	✓	✓	✓	✓	✓	×	2
Home Visit 6 (HV 6)	3	×	✓	✓	✓	✓	✓	3

Table 8 describes the structure of houses visited in terms of the occupancy and the physical spaces where water efficiency engagement took place. This table is important because it presents home visits as not about the number of households, but more about the plumbers' interaction with the residents present during the home visits as well as about the structural features of the homes in which usage practices occur.

Essex & Suffolk Water visited 2,854 homes in 2017, out of which 32% were terrace properties. The water utility advised that observation is better maximised in terrace properties having typical spaces necessary for auditing, such as the kitchen, bathroom, and garden. The water utility thus permitted observation of six terrace houses after seeking householder permission via telephone. Each observation of home visits lasted an average of fifty-five minutes.

Essex & Suffolk Water's purposive selection of the six homes for observation was due to concerns about potential disruption to the plumbers' routine and auditing work in households. The water utility's rationale for allowing observation of a few home visits was that any observation will not span more than an hour, and plumbers are likely to engage in their habitual way, thus there will be minimal insight lost by not observing additional home visits. Observation of two old and experienced plumbers

was thus agreed, on three home visits each. It is important to note however, that the water utility's requirement for the research indicates that the water managers perceive home visits as uniform, with little recognition for variation depending on the dispositions of the people visited.

The limited number of home visits was considered acceptable and valid because the interaction between the plumbers and residents in the context of educational water efficiency engagement was more important to elucidate in the research than the observation of households.

The number of households visited is therefore of little consequence to the aim of this research. This decision aligned with the research strategy (discussed earlier in section 6.8.4) to use observation to supplement in-depth interviews with the plumbers and the water managers. And while the small number of home visits observed combined with the limited number of plumbers interviewed means the resulting categorisation of publics encountered cannot be anything more than indicative, their development nevertheless demonstrates how the plumbers' observations can provide insights about the public which could inform future water efficiency planning in the utility.

Findings from the observation of home visits will be discussed in detail in Chapter 9 where they become relevant.

The next section discusses the limitations and ethical dilemmas faced during the research.

6.9 Negotiating positionality and consent

One of the hallmarks of the field work was gaining insights about barriers and opportunities to enhance water efficiency engagement. So, whilst insights were to be generated from in-depth interviews with the water managers and the plumbers, observation of home visits was also key.

It must be acknowledged that although Essex & Suffolk Water could have found residents' self-selection of non-mandatory home visits to be a constraint on the home visit initiative, this did not have an impact on the study of the initiative. And although Essex & Suffolk Water purposively selected home visits to be observed in this study, it had minimal implications for the study as explained earlier in section 6.8.4.

Whilst residents' purposive agreement to have their home visits observed could mean that they were to some extent interested in water efficiency or at the very least, had the willingness to engage with the utility, evidence suggests that people participate in water efficiency for reasons other than environmental activism. Such reasons can include potential financial benefits or the desire to avoid wastage of water. But of course, willingness to engage aids water efficiency engagement and personal

commitment encourages water efficiency (Mohr, 2000) and people need the knowledge of environmental information to make behavioural changes (Doron *et al*., 2011). Self-selection and purposive selection of home visits were therefore more beneficial than detrimental to maximising home visits.

There was limited opportunity to broaden the household sample due to the business arrangements between Essex & Suffolk Water and its contractor WSP which prevented disruption of any kind. Whilst the few number of home visits observed can bring generalisability of findings about publics into question, this is not the case for the findings about home visits, neither is it the case for findings about water efficiency engagement plans in the WRMPs.

Phase 1 of the research examined all the water utilities' WRMPs. Findings from this phase therefore hold true for water efficiency engagement in areas of serious water stress. For the second phase of the empirical work, the positioning of the core of the research strategy around the plumbers and the water managers rendered the number of home visits observed as supplementary. This is because the research strategy centred the case study investigation more around interviewing and observing personnel in the water efficiency engagement process than around examining the residents encountered during the home visits observed.

A further aspect to acknowledge is the positionality of the author prior to and during observation of the plumbers' training workshop and the town centre event. This is because there was a progression from the author being an outsider to becoming an insider during the research. This is unsurprising since the research proceeded on an interpretivist rationale.

For example, prior to commencing the fieldwork, the author reviewed documents about the delivery of the home visit campaign in the previous year and plans for the implementation of the Witham home visits. This exercise was conducted to preliminarily identify lessons for practice improvement. However, the author did not share the findings with the water managers because the focus was to advance the research agenda as a neutral observer.

However, further down the line, at the beginning of the fieldwork, the author's positionality changed to becoming an insider. For instance, the author was described by the Essex & Suffolk Water's staff on the frontline as "*part of the team*" when mystery-shopping to observe Groundwork personnel delivering the EDC campaign in Witham town centre (see findings in section 8.3). Such instances brought about a realisation that the author's role had developed from being an external researcher into an internal agent. It must be noted that the author provided real-time recommendations for practice improvement while endeavouring to minimise immersion in the water utility's practices. When

change actions were reported on or discussed in external spaces such as in conferences, caution was taken when articulating views on Essex & Suffolk Water's practices whilst maintaining objectivity.

Rapoport (1970) warned that an action research wherein the researcher assumes the position of a change agent can prioritise the client's interest even when they do not necessarily benefit the researcher. This research found that even today, these concerns still hold true as the fieldwork included supporting the water utility staff to make real-time improvements to their practices. This means that rather than assuming the position of an external non-intervening researcher throughout the study, the author was on occasions, drawn into the water utility's internal processes, for example, in the training of plumbers for home visits and in the improvement of the town centre campaign. Such actions reduce the separation between the research and the researcher.

Furthermore, the newness of public engagement in the water efficiency field means that the empirical ways of studying it are still developing. There is yet to be any standardised interviewing or observational method for the examination of water efficiency engagement. So, whilst the research identifies gaps in engagement practices on the part of water utilities and suggests ways of improvement, it does not analyse the impact of those gaps or improvements.

In relation to the above, the research methods associated with philosophical paradigms is an important methodological debate in the water efficiency field. This arises from the dominance of existing positivistic and post-positivistic studies which set out to seek statistical and contextual understandings of the public's water use, respectively. Being aware of these positions however, the research proceeded on an unconventional line of inquiry by examining water utilities instead of publics, and by using the interview, observation, and documentary analysis methods to develop context instead of statistical packages. This thesis therefore brings distinct participatory methods of qualitative investigation to the fore of discussions to find new and deeper answers to questions about water efficiency engagement that have not been wholly answered by positivistic studies.

Finally, it is imperative to highlight that the planning of the fieldwork for the research gave due consideration to participants' consent. To ensure right to consent was understood, the plumbers who were observed in households and interviewed were supported with robust information about the research, and were initially given the promise of anonymity, and signed consent forms were obtained from them.

Nevertheless, although the plumbers' identities were initially masked, the purpose of granting anonymity was defeated because identities could have been easily deciphered by the water managers in the Water Efficiency Team since there were only three plumbers interviewed. But no risks were

posed in terms of employer-employee dynamics and power relationships because plumbers were not direct employees of Essex & Suffolk Water.

In addition, the anonymity given to the water utility as a company was eventually deemed unnecessary and was agreed to be removed due to the keen involvement of staff in the dissemination of the research outcome at conferences. Consent was also obtained from residents via the Essex & Suffolk Water. It however appears that residents granted consent under the impression that the plumbers were the focus of observations, without equal weight accorded to the fact that the focus also included residents' dispositions, conversations, and their households as a physical space. However, residents' identities were hidden under pseudonyms throughout the research.

Reflections on these methodological considerations and implications of the methodology for anonymity and consent will be revisited in the Conclusions Chapter (section 10.4).

The next section outlines how this research is expected to enhance the body of knowledge.

6.10 Expected contribution to knowledge

Discussions in the thesis thus far have collectively established the need to study water efficiency engagement using qualitative methods of documentary analysis, interviewing, and observation.

A recurrent theme throughout the Literature Review Chapters is that currently, water efficiency engagement approach in the UK water industry is not strongly underpinned by social science and the advancement of practice in the field suffers for the absence of contextual accounts of initiatives and lesson learning is stifled as a result.

By the nature of how the research strategy has been set up, this thesis is expected to further the concept of water efficiency engagement and proffer practical recommendations for the improvement of water utilities' engagement practices in areas that are seriously water-stressed.

Industry practitioners have for many years used technical water efficiency engagement such as the installation of water efficient devices to reduce per capita consumption. It is in this light that seriously water-stressed utilities' Water Resources Management Plans such as that of South East Water (2014) explicitly state that part of its core strategy is 'hard measures [including] the promotion of free cistern displacement devices (CDDs), water butts, shower regulators etc.' However, we know from the water efficiency literature that techno-efficiency can often mean immediate and short-lived reductions of water demand rather than the address of the deep-root causes of high usage on the part of publics or lacking educational support on the part of water utilities. And the evaluation of the effectiveness of

technical interventions offers little understanding or clarification about the broader promotion of water efficiency or the public's relationship with water and water efficiency. This thesis is therefore expected to elucidate water efficiency engagement from a processual perspective and offer ways to maximise water efficiency engagement.

The case study is expected to enhance the understanding of the existing water efficiency engagement plans and processes and identify barriers and opportunities to improve initiatives. It is expected that the research will bring utilities' practices into focus and provide learning useful to tackle complex water management issues (Muro and Jeffrey, 2008; Raadgever *et al*., 2012). This knowledge contribution is considered pertinent because the current academia-industry research arrangements in the water sector is criticised for lacking empirical evidence of the impact of collaborative work (Raadgever, 2009) and addressing this issue will contribute to the body of knowledge on how stakeholders can improve water management.

Moreover, while measures such as education to influence per capita consumption and usage-related behaviours are becoming popular in UK water utilities, we need to find ways of researching and evidencing them. The quantitative methods that worked for examining hard measures do not proof sufficient for contextually understanding 'soft' measures for promoting water efficiency. There is therefore sparse reporting of water efficiency engagement and the lack of instruments to investigate them somewhat diminishes the educational aspect of such initiatives, thus posing a problem to research agendas where public participation plays a role in contemporary water management (Von Koff, 2012). The empirical analysis which forms the core of the thesis is therefore expected to also highlight the value of a contextual analytical framework, and of qualitative methods such as documentary analysis, in-depth observation, and semi-structured interviewing in demonstrating how water managers' and plumbers' strategies can stifle or enhance water efficiency engagement.

Furthermore, evidence suggests that collaborative research will yield impact when the intended industry participants are keen to collaborate, learn, and influence the research (Raadgever *et al.*, 2012). In the same light, water industry practitioners have attributed their low engagement with academic research to the fact that solutions developed by academics are sometimes not desirably oriented towards the current problems faced by the industry. This criticism was widely expressed by water utilities attending the All Party Parliamentary Water Group meeting titled 'Are we planning for the skills for the future' held in House of Commons in December 2017. This meeting saw representatives of water utilities and academics highlight a disjuncture between knowledge/solutions production in academia and the looming problems in the water sector. Such discussions suggest that there is the need for solutions-based research such as this which is conducted through collaboration.

The next section presents a conclusion on the Methodology Chapter.

6.11 Conclusion

This methodology chapter presented the two-phase qualitative approach taken to fulfil the research objectives.

For the first phase, the systematic review of the water efficiency engagement content of the PR14 Water Resources Management Plans developed by the seven seriously water-stressed utilities was discussed and considered as most suitable for the first stage of the empirical work. This documentary analysis focused on understanding the utilities' intended audience and processes for water efficiency engagement.

For the second phase, the pool of selected seriously water-stressed utilities was narrowed down and the case study approach was discussed and considered as most suitable for the second stage of the empirical work which focused on water efficiency home visits. Data collection for this phase was based on project documents, interviews, and observations to understand the factors that aid or stifle water efficiency engagement in a UK water utility operating in areas of serious water stress – Essex & Suffolk Water.

Documentary evidence offered reflexivity throughout this research, providing an avenue to ratify the existing emerging empirical findings. Also, interview instruments were planned and developed to collect primary data. Whilst documentary analysis enabled contextualisation, the interviews about the water efficiency initiatives allowed the development of perspectives which were subjective to the author, to the interviewee(s) and other research participants, and to the moments in time.

Observations of the plumbers' training workshops, public campaign, and home visits allowed the development of an appreciable understanding of the current state of water efficiency engagement in the utility.

Collectively, the combination of documentary analysis, semi-structured interviews, and observations provided primary data to develop insights on the intricacies and complexities of household water efficiency engagement in Essex & Suffolk Water.

The methods employed in the research are indicative of a developing approach to addressing water scarcity that seeks to improve practices by contextually addressing the '*whys*' and '*hows*' of water efficiency engagement processes. Unlike many studies using alternative quantitative methods to examine water efficiency initiatives in water utilities, this chapter established the use of observation

and discussion to answer burning research questions. This is reflected in how the research project incorporated industry-academia collaboration to develop outputs that are of interest to both sectors.

Having previously established the context and conceptual basis of the research, this chapter has focused on showing how the research was undertaken. The stage is now set to present the research findings.

The next chapter discusses the findings from Phase 1 of the empirical analysis.

7 Intentions for water efficiency engagement in areas of serious water stress

As detailed in section 3.2, water utilities produce Water Resources Management Plans (WRMPs) every 5 years to consider future water resources for the subsequent 25 years. While much of WRMPs' contents focus on new resource development and leakage reduction, they are also concerned with household water efficiency engagement, and it is these aspects that are presented in this chapter.

This chapter describes and discusses the findings from Phase 1 of the empirical investigation which address the first research objective to examine the intended audiences and processes for water efficiency engagement in water utilities operating in areas of serious water stress. Also, new knowledge from the chapter contributes to partly fulfilling the third research objective to further the concept of water efficiency engagement and support practice in the field.

The role of this chapter within the thesis is to underscore the linkages between policy-driven plans and the water efficiency engagement activities delivered. Findings generated will provide a preliminary understanding of water resource planning in areas of serious water stress in the UK including the case study (Essex & Suffolk Water) that will be introduced subsequently in Chapter 8.

In the chapter, WRMPs refer to Water Resources Management Plans developed by the water utilities that were seriously water-stressed during PR14. Water managers are staff of the water utilities who design water efficiency engagement initiatives. The term 'plans' is used in the chapter in the context of the water utilities' expressed or implied intentions for promoting water efficiency in households following the development of their WRMPs. And the chapter uses the MAC heuristic (developed in section 2.5) to review the water efficiency engagement aspect of the seven UK water utilities' WRMPs (Affinity Water, Anglian Water, Essex & Suffolk Water, Southern Water, Sutton and East Surrey Water, South East Water, and Thames Water).

This chapter consists of seven sections. The first section presents findings about how the water utilities framed the water scarcity conversation during the pre-WRMP period in the context of why they needed to balance demand and supply and why the public should act. This is followed by the second section which discusses how the water utilities categorised their audiences for water efficiency engagement during the pre-WRMP period and what these suggest about who they intended to engage during the post-WRMP period. The third section discusses the rhetoric that emerged from communicative activities during the pre-WRMP period and what these suggest about the utilities' perception of what motivates their customers to be water efficient. In the fourth section, how the water utilities expected their publics to change after engagement are discussed. The fifth section presents findings about how the water utilities consulted with their publics during the pre-WRMP

period, followed by the sixth section which discusses the communication channels which they intended to use to promote water efficiency during the post-WRMP period. The final section concludes this chapter by giving a collective reflection on the Phase 1 research findings. A tabular summary of the findings presented in this chapter can be found in Appendix 1.

7.1 Motivations for water efficiency engagement

As the water utilities progressed with engaging their publics through communication and consultation during the planning pre-WRMP period, it emerged that their plans for water efficiency engagement were motivated by increasing regulatory expectations, water demand, increasing customer expectations, increasing population, and climate change (see Figure 11).

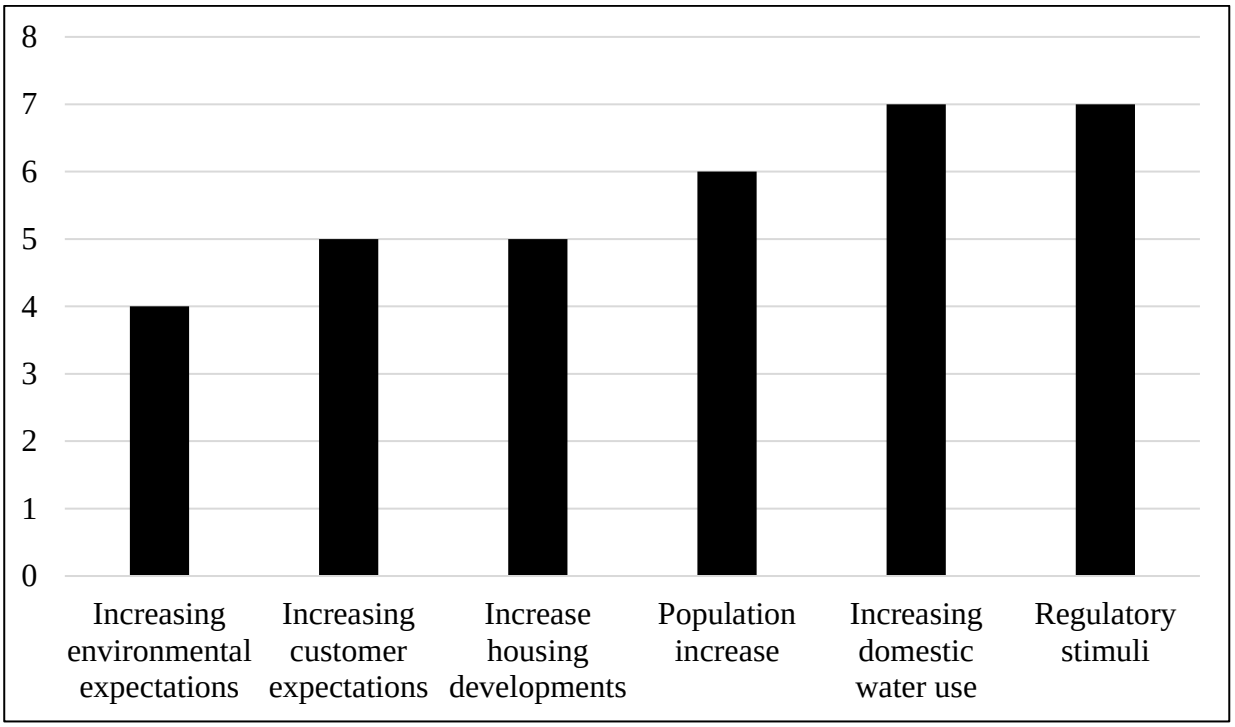


Figure 11 Factors motivating water efficiency engagement in areas of serious water stress.

Figure 11 shows how by far, regulatory expectations drove water utilities in areas of serious water stress to make plans for household water efficiency engagement.

Specifically, during the pre-WRMP period, the water utilities suggested that water demand and regulation motivated them to communicate about water efficiency with their publics. While it is unsurprising that these utilities were motivated to act due to increasing demand, some companies such as Affinity Water, Essex & Suffolk Water, South East Water, and Sutton and East Surrey Water identified regulatory factors such as Ofwat's water efficiency target, DEFRA's demand reduction

directive, and the Consumer Council for Water's expectations as the main drivers for increasing their plans for water efficiency engagement.

Further, as the water utilities consulted with their customers during the pre-WRMP period, they claimed that public support for technical and educational water efficiency engagement became apparent, and they reshaped their strategies for balancing demand and supply as a result. Such *restrategisation* was identified in Thames Water, Sutton and East Surrey Water, and in Affinity Water where customer feedback about preferred specific actions to reduce demand was a game changer. For instance, following statutory consultation with their water utilities, Thames Water's customers expressed 'preference for demand management,' Sutton and East Surrey Water's customers suggested that 'metering was the fairest way to charge [for water],' and Affinity Water's customers chose 'water efficiency over abstraction from rivers.'

These drivers that motivated water utilities to plan water efficiency engagement were also linked to how the utilities planned to promote water efficiency in households. The discussions in the water utilities' WRMPs which relate to plans for water efficiency engagement suggest two message frames within which water efficiency was to be promoted to the public during the post-WRMP period: the impact of increasing population, and the need for environmental action.

First, the water utilities' WRMPs (such as those developed by Affinity Water, Anglian Water, Essex & Suffolk Water, South East Water, and Southern Water) were characterised by reflections on the impact of population growth on water supply to justify plans for water efficiency engagement. For instance, Affinity Water (2014: 56) highlighted that water demand in the utility was 'on the rise, in part due to a growing population predicted to rise... This is in addition to our customers currently having one of the UK's highest per capita consumption (PCC) figures.'

Second, the water utilities discussed environmental issues, using climate change and low-level rainfall to explain the necessity of water efficiency engagement during the post-WRMP period. These environmental frames were nuanced by hydrological droughts in Affinity Water, by reduced rainfall in Anglian Water and Southern Water, by lacking water resources in Essex & Suffolk Water, by abstraction reduction in Anglian Water, and by environmental protection in Sutton & East Surrey Water. For example, Southern Water (2014: 88) highlighted that despite population growth, it had seen a lowering trend in water demand due to its work to increase 'customer awareness, changes in lifestyle… on-going water efficiency campaigns [and] domestic metering …' but demand in the utility still faced seasonal variation depending on weather conditions.

Collectively, discussions in this section suggest that water utilities drew up plans to address water scarcity because of increasing demand and regulation but were more likely to relay to their publics that population growth, climate change meant that they needed to act to achieve household water efficiency. But who were these publics that the utilities' water efficiency engagement activities intended to target?

The next section presents findings relating to the water utilities' characterisation of their customers during the consultation phase for PR14 (pre-WRMP period) and after the WRMPs were published (post-WRMP period) and what these suggest about who their intended audiences for engagement are.

7.2 Intended audiences for water efficiency engagement

Collectively, twenty and a half million people were served by the seven water utilities facing water scarcity at the time their PR14 WRMPs were developed. The language used by the water utilities in identifying these publics (see Figure 12) including their frequency of use is fundamental to understanding how the companies perceived their target audiences for water efficiency engagement and what their expectations of these publics were.

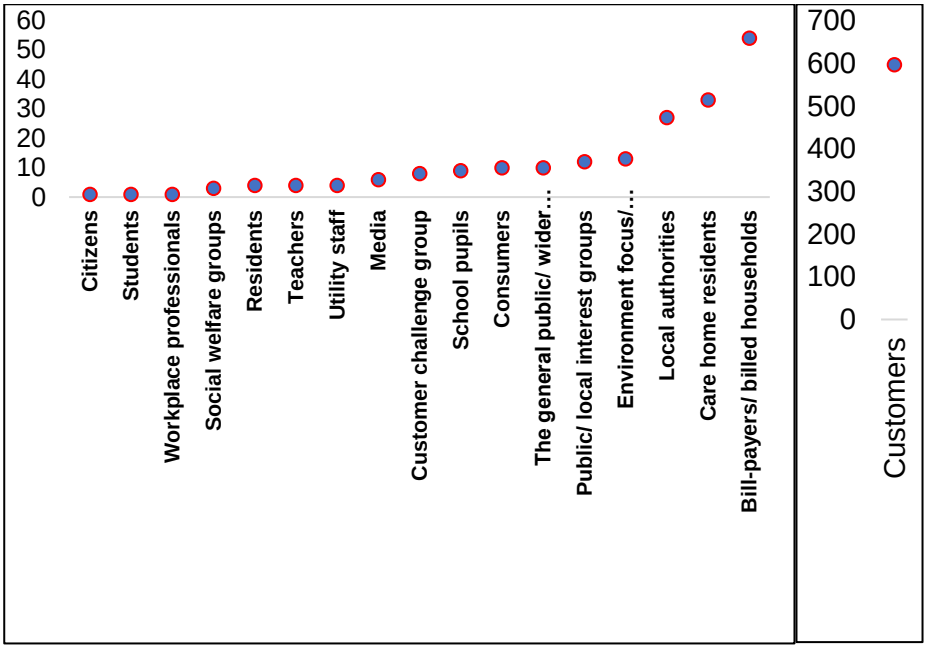


Figure 12 A count of the descriptors used for publics within water efficiency discussions in the WRMPs.

As illustrated in Figure 12, the 'customers' was by far the most dominant descriptor of publics in the WRMPs. The next most frequently used descriptor for publics was 'bill-payers,' and the water utilities infrequently used other terms such as 'the general public,' 'consumers,' or 'school pupils' to

describe their publics. Notably, there were very few references to publics as 'citizens' in the water utilities' WRMPs. These descriptions suggest the identity of publics targeted for water efficiency engagement activities, the nature of their relationship with their water utilities, and the message frames that the utilities assumed will be appealing to those publics.

During the pre-WRMP period, it was clear that the customer was ultimately the target audience for water efficiency engagement across water utilities. The water utilities' understanding of their target audience's identity varied as they consulted with their customers about water resources options and future water efficiency engagement activities. On these occasions, the companies commonly and interchangeably referred to their customers as 'the public,' 'residents,' or 'communities.'

For instance, after conducting statutory consultation on water resources options, Affinity Water (2014: 196) reported that 'customers tend to take water for granted…' In the same light, the water utility stated that 'water resource zones also define its communities' (ibid, 2014: 44), and described the general public as representative of its customers while explaining how it ran the Let's Talk Water campaign to gather customer feedback on its WRMP.

These findings therefore demonstrate that the term 'customer' is a blanket characterisation of several categories of the publics across water utilities operating in areas of serious water stress, and is an identity ascribed based on functions of water usage and bill payment. The context within which the water utilities discussed the role of their customers in their WRMPs in turn indicates that the companies perceived them as having certain responsibilities and capabilities i.e., to take water for granted or not, to pay their water bills or not.

Further, during the pre-WRMP period, the water utilities sought a deeper understanding of their customers to identify and have a better view of who to engage during the post-WRMP period.

Certain factors were found to influence the water utilities' characterisation of their customers: (1) the water meter, (2) spatial and geographic location, (3) water usage, and (4) sociodemographic factors such as economic status and vulnerability.

First, based on meter ownership, water utilities such as Anglian Water, Essex & Suffolk Water, and Sutton and East Surrey Water categorised their customers as metered/measured or unmetered/unmeasured. In Essex & Suffolk Water (2014a: 144) particularly, customers were segmented based on meter ownership: unmeasured customers, meter optants, new homes, selectively metered, or existing metered. Similar meter-based segmentation emerged in other water utilities:

> ‘Customers who are billed on the basis of measured supplies generally use less water than **unmeasured customers.**’ (Anglian Water, 2014: 32).
>
> ‘**Measured and unmeasured households** [have] a long-term reduction in consumption for toilet flushing, clothes washing, dish washing and external use, and a long-term increase in consumption for personal washing, mainly driven by an increase in the frequency of shower use.’ (Sutton and East Surrey Water, 2014: 87).

Second, because the water utilities’ customers live and/or work in the companies’ service areas, the companies characterised them based on the geographic space in which they were to be found and engaged. This is evidenced by how for example, Anglian Water and Sutton and East Surrey Water referred to specific publics as households, primary schools, or pupils (see Table 9).

Table 9 Space-based characterisation of publics.

Identity of publics	**Location-based characterisation in WRMPs**
Communities	‘We recognise that some of our communities have the highest unmeasured per capita consumption in the country…’ (Affinity Water, 2014: 61)
Domestic customer	‘Domestic customer groups across the demographic and geographic range of our customer profile...’ (Affinity Water, 2014: 75) ‘Domestic customers…were eager to control any bill increases and keep them to a minimum.’ (Thames Water, 2014: 5)
Households	‘Anglian Water has a water efficiency campaign ‘drop 20 litres’… to encourage households to drop their water consumption...’ (Anglian Water, 2014: 32)
Residents	‘We are pleased to have received a considerable number of responses from **residents** living in our area.’ (Affinity Water, 2014:34). The bolding of the word residents by Affinity Water suggests emphasis on the recognition of all people living in the area as their publics.
Primary schools and Pupils	‘The Education team [will] engage with primary schools in the company’s supply area…’ (Sutton and East Surrey Water, 2014:163) ‘[Affinity Water, 2014: 61] visits over 7,000 pupils each year by attending their schools.’

Third, a few water utilities such as Essex & Suffolk Water (2014a) and Southern Water (2014) went beyond using meter-based segmentation to understand their customers’ usage by using the socio-economic Classification of Residential Neighbourhoods system called ACORN to characterise them.

For instance, using the ACORN classification, Essex & Suffolk Water (2014a: 111-112) found an over-representation of the Urban Prosperity households in its customer base and Southern Water

(2018: 96) found that overall, the Urban Prosperity, the Comfortably Off, and the Moderate Means were its dominant categories of customers, and that a greater proportion of [its] metered households were Wealthy Achievers while a greater proportion of its unmetered households were hard pressed.

Fourth, whilst most of the water utilities often characterised their customers based on a single criterion, increased understanding based on multiple features such as meter ownership and vulnerability was observed in a few water utilities where customer feedback on water resources options was sought. For example:

> 'There is recognition that for some customers, a water meter may not be the cheapest option (for example, large families or customers with specific medical needs), and that they would like us to explore an appropriate transition programme before universal metering is rolled out...' (Affinity Water, 2014: 82)

Collectively, findings in this section suggest that during the pre-WRMP period, metering and sociodemographic definers shaped the water utilities' perception about how publics see and use water in areas that are seriously water-stressed. However, their plans did not spell out how they intended to target the segments of customers identified. So, whilst this multi-characterisation of customers demonstrates diversity of circumstances and usage, without primary observation of home visits for example, little is known about how these understandings in the pre-WRMP period go on to influence the water efficiency messages communicated to publics during the post-WRMP period.

But how else can we tell what messaging the water utilities intended to use to motivate their customers to take the desired line of action of becoming water efficient during the post-WRMP period? This lies in the appeals that the companies planned to make to their publics, discussed in the next section.

7.3 Perception of publics' motivation to reduce water use

How the water utilities discussed their plans to promote water efficiency during the post-WRMP period was indicative of the rhetoric with which they intended to create a connection between their audience and their message and cause them to reduce their water usage.

Findings revealed that the water utilities planned to make two appeals to their publics during the post-WRMP period: (1) reduce water use to reduce water bill, and (2) reduce water use to save the environment.

All the water utilities planned to use the money saving appeal for water efficiency engagement during the post-WRMP period.

The promotion of water efficiency by appealing to publics' individual interest in financial savings was seen in Affinity Water and South East Water where the anticipation was that by being water efficient, people will 'save cost.' For instance, Affinity Water (2014: 57-62) claimed that it planned 'to incentivise customers to reduce their demand for water… [because] people needed incentives to make small changes.'

Water utilities such as Anglian Water, Essex & Suffolk Water, Sutton and East Surrey Water, and Thames Water went further to explicitly indicate that a reduction in water bills is the cost-saving that their publics were to realise from reducing usage. For example, Anglian Water (2014: 20) suggested that the 'opportunity to reduce bills' is afforded to customers who take on a smart meter. In addition, Southern Water promoted the idea that people will benefit from being water efficient by 'getting value for their money,' thus alluding to an overhead cost due to other factors such as climate change and ageing assets which is passed on to the consumers.

As such, these water utilities' plans which sought to use financial benefits and incentivisation to motivate publics to become water efficient constructed water as a commodity. These plans are grounded in the commoditisation of water promoted by the last of the four principles of the Dublin Statement and by Article 9 of the EU Water Framework Directive (WFD) (see Andrew and Cortese, 2013; Muller, 2015) discussed earlier in section 3.1 which advocate the resolution of environmental issues through market mechanisms. As noted in section 4.2.1, commentators such as McKenzie-Mohr (2000: 545) have attributed the promotion of sustainable behaviour for economic advantages to the assumption that 'the public is rational and will act in their economic self-interest.' However, this assumption does not hold true always.

Another theme that emerged across the seven utilities that are seriously water-stressed was plans to use of the environmental appeal for water efficiency engagement during the post-WRMP period.

The promotion of water efficiency by appealing to publics' communal interest in saving the environment was seen for example, in Essex & Suffolk Water and in Thames Water, where customers were promised water savings and in Sutton and East Surrey Water which anticipated that its customers would enjoy 'saving a precious resource.'

More broadly, Anglian Water (2014: 10) suggested that 'increasing awareness of the link between domestic consumption and the environment will help to mitigate the risk of a drought related impact

on the environment.' And Sutton and East Surrey Water suggested that customer education about water efficiency would result in social benefits such as reducing the abstraction, leakage, and household input into the stretched sewage system, and as a result, protect designated sites and bring wider biodiversity advantages.

It is noteworthy that six water utilities anticipated that their customers' water efficiency actions will benefit the environment in different ways. For instance, aid 'sustainable abstraction' (Affinity Water), 'protect the environment… [and ensure] water security' (Southern Water), 'appropriately act for the environment' (South East Water), 'mitigate drought risks' (Anglian Water), 'avoid environmental damage' (Thames Water), and 'reduce abstraction… and reduce sewerage [contribution] to the environment' (Sutton and East Surrey Water).

Typically, such plans as these which intend to construct water as a communal resource (see Ludwig *et al*., 2009; Linton, 2013; Diaz and Yeh, 2014; Mehta, 2014; Olmstead, 2014; Baer, 2015; Mirza and Mustafa, 2016) are closely linked to perspectives that wastage leads to the 'tragedy of commons' (a concept introduced by Hardin, 1968) in the sense that any misuse of the resource causes depletion and detrimental impacts on the common good. And developing the sense of common ownership of water positions the public as owners of water who participate in water management (Heyd and Neef, 2004).

This construction of the save-the-environment appeal identifies in the WRMPs therefore confirms McKenzie-Mohr's (2000) claim that water managers who promote sustainable behaviour by appealing to the public's concern for the environment 'assume that by enhancing the knowledge of an issue, such as global warming, and encouraging the development of attitudes that are supportive of an activity… behaviour will change.'

Inherently, such planning processes perceive publics as motivated by altruistic motives (Shu *et al*., 2017: 645) and reflect the first three principles of the Dublin Statement, and Article 11 and Article 14 of the EU Water Framework Directive which position water as a communal resource and supports the United Nations General Assembly's Declaration of Water as a human right. The water utilities' promotion of these values during water efficiency engagement is therefore to key into the public's concern for others and for the environment and motivate them to achieve water efficiency by improving how they use water.

Yet, it cannot be overlooked that there are warnings in the literature that some water utilities managing water as a communal resource do so deliberately to avoid the use of price to control demand

(Olmstead and Stavins, 2009) and as such explore strategies that are of "low regret" (Parker and Wilby, 2011) and are 'first go-to-options' (Browne *et al*., 2013).

Collectively, what findings in this section suggest is that UK water utilities operating in areas of serious water stress perceived that their publics will be motivated to reduce usage by either extrinsic or intrinsic factors and these perceptions were likely to influence their choice of water efficiency engagement strategies. Following the logic argued in section 4.1, this means that their post-WRMP activities were to be characterised by actions and interactions seeking to appeal to publics' individual interests in reducing their water bill or their communal interest in collective action, respectively. What is however unclear from examining the water utilities' WRMPs are the insight that led to them adopting these water efficiency appeals and whether the rhetoric planned to be used in making the appeals are absolutes.

In the interim however, the water utilities' plans for water efficiency engagement revealed what they expected of their publics after the delivery of water efficiency during the post-WRMP period. Thus, the next section presents findings relating to those expectations.

7.4 Water utilities' expectations of their publics after engagement

The role of this section in this chapter is to develop an understanding of the water utilities' expectations of their customers after they have been engaged about water efficiency during the post-WRMP period. This is important because water utilities' expectations for how their customers should evolve after engagement are indicative of their conceptualisation of the 'ideal water user' and tells us more about how we can expect them to engage the public to meet those expectations.

Findings from examining the water utilities' WRMPs indicate that the companies had three expectations of their publics following the delivery of water efficiency engagement.

First, the water utilities expected their publics to reduce wastage during the post-WRMP period. For example, following metering, Affinity Water (2014: 31) and Southern and East Surrey Water (2014: 164) expected better usage and minimal wastage.

Second, the water utilities expected their publics to be water efficient following water efficiency engagement. For instance, Thames Water (2014: 35) anticipated that its customers will 'reduce wastage and inefficiency' following support to understand their water use and save water and Anglian Water (2014: 37) stated that 'metering and water efficiency [education]… will encourage customers to use less water.'

Third, the water utilities expected their publics to have positive water behaviours relating to usage following water efficiency engagement. Findings suggest that by far, this expectation was more pronounced across the water utilities. For example, South East Water (2014:10) expected its publics to become 'more mindful of the water they use' and 'adopt positive behaviours and reduce their water use.' Similarly, Affinity Water (2014: 196, 61) expected that its educational activities will stimulate customers to recognise 'the importance of water and the environment.' Also, Anglian Water (2014: 32) revealed that customers were expected to increase their 'awareness about the value of water' following the 'Love Every Drop' campaign, and 'drop their water consumption' following the 'Drop 20 litres' campaign. Further, Sutton and East Surrey Water (2014: 163) expected that its activities to encourage publics to use water wisely will result in 'changes to behaviour become[ing] the norm,' while Southern Water (2014: 139) expected its water efficiency campaigns to 'encourage a permanent change in behaviour.'

Discussions in this section establish two things: (1) the water utilities that are seriously water-stressed intended to deliver technical and educational water efficiency engagement during the post-WRMP period, and (2) following water efficiency engagement during the post-WRPM period, the water utilities expected reductions in water demand to be accompanied with increased improvement to how their publics perceive and use water.

Since communication channels are the connectors between the message and the audience, subsequent sections will present findings about how public engagement took place during the pre-WRMP period and water utilities' indications of future water efficiency engagement during the post-WRMP period.

7.5 Consultation channels during the pre-WRMP period

Findings showed that communication channels that were used by the water utilities before their Water Resources Management Plans were published (pre-WRMP period) varied depending on the need for synchronicity as public engagement progressed from communication activities to consultation activities and to participation activities (see Table 10).

Table 10 Channels for communicating water efficiency during planning (pre-WRMP period)

Communication ➡	**Consultation** ➡	**Participation**
▪ Affinity Water (2014) - **questionnaire** to investigate customers' device ownership and usage; **online survey** to investigate customers' views on water efficiency and metering. ▪ Anglian Water (2014: 9, 89) - **website** survey to discuss water resources options. ▪ South East Water (2014: 66) - **survey** to understand customers' water usage. ▪ Southern Water (2014) – online **survey** to build resilience to weather patterns. ▪ Sutton and East Surrey Water (2014: 14) - **questionnaires** to gather feedback on metering. ▪ Thames Water (2014: 28) - **survey** by **telephone.** ▪ Essex & Suffolk Water (2014a) - website to advertise water saving kits, and radio adverts and newspaper and magazine articles to promote water saving kits to the public.	▪ Affinity Water (2014: 74) - **focus groups** to obtain feedback on their water resources options. ▪ Anglian Water - **focus groups**. ▪ Affinity Water (2014: 205) - **deliberative forum** with customers concerning whether meters are a good way of changing behaviours and improving water efficiency. ▪ South East Water (2014: 6) - **workshops** to test the future customers' views on water and the utility's range of options to secure their supplies." ▪ Southern Water (2014: 40-44) - **focus groups** with customers to discuss the potential of water restrictions and water resources options.	▪ Affinity Water - community **drop-in events** to allow customers discuss the water resources options with the water utility. ▪ Southern Water (2014: 44) - **telephone** consultation about its water resources options. ▪ Sutton and East Surrey Water (2014: 14) - **telephone interviews and face-to-face discussions** to understand customers' views on using metering as the fairest way to charge.

Table 10 illustrates that the water utilities' initial interaction with publics during the planning of water resources options was for the sole purpose of gathering insights from customers about how to develop their water efficiency strategy. These activities thus occurred via the telephone, through website interactions, and in light-touch settings such as interviews, surveys, fora, events, workshops, and focus groups.

It is therefore clear that public engagement during the pre-WRMP period mostly hinged on virtual communication and consultation techniques that allowed one-way discussions between the water utilities and their publics. However, whilst the WRMPs claimed that their customer feedback shaped

their water resources management plans, they offered limited context around specific water efficiency engagement activities that could be expected during the post-WRMP period.

The next section discusses findings relating to how the water utilities planned to deliver household water efficiency engagement during the post-WRMP period.

7.6 Intended communication channels during the post-WRMP period

Evidence in the water efficiency literature suggests that water utilities facing water scarcity generally do not plan for water efficiency engagement with sole reliance on education to reduce usage. In studying plans for water efficiency engagement in WRMPs, the approach was informed by the literature to look not just for direct water efficiency education (understood as water utilities conducting informational activities to motivate water efficiency) but also the promotion of technical devices which were understood to 'tell' particular messages to publics.

The role of this section in this chapter is therefore to demonstrate how the water utilities intended to move beyond the traditional ways of communicating with their publics (as seen during the pre-WRMP period) to new communication channels during the post-WRMP period.

Whilst technical devices such as the water meter and water efficient devices were not primarily designed to be channels of communication, the water utilities expected that they will 'send' strong signals and nudge publics to be water efficient whilst also speaking to their individual interests. These will now be discussed in turn.

First, all the water utilities planned for metering to nudge customers to be water efficient, albeit with varying intensity and aims.

Evidence suggests that metering in the south-eastern region of England emphasises the economic value of water and places individualised responsibility for water efficiency on publics by suggesting that they can 'take control over their bill while altering the ways in which they use water' (Loftus *et al*., 2016: 328). This claim aligns with Anglian Water's (2014: 20) plan to deliver metering to 'give them [publics] the opportunity to reduce bills,' or with Essex & Suffolk Water's (2014a: 247) perspective that 'if you pay for what you use, you are most likely to use less.'

As such, the role of the water meter in achieving household water efficiency was evidenced by how most of the water utilities intended to use the device and the variable water bill to nudge their publics to be water efficient. For example, this was illustrated by Affinity Water's position (2014: 56-62):

> ‘We are running out of water, so something needs to be done. [Encouraging customers to take on a] water meter is a good start… [and customers’] behaviour in water use would be affected by the installation of a meter.’

Similarly, Sutton and East Surrey Water (2014: 163, 251) highlighted that:

> ‘To encourage behaviour change, the company also provides information on bills… it is of course much easier to engage with a metered customer in respect of water efficiency, because the customer can see and benefit from the results of making savings to their consumption.’

The risk of the water utilities’ over reliance on the water meter is however that it suggests the connotation of publics as buyers of a commodity rather than as owners of a communal resource that should be valued. As a result, publics may ‘hear’ the message about the opportunity to make cost-savings if they reduced their usage as implying that water is an economic commodity and that its usage can be dependent on the water users’ financial conditions.

Second, all the seven water utilities that are seriously water-stressed planned to use water efficient devices to ‘aid’ publics to be water efficient. Typically, the installation of water efficient devices discussed in the water utilities’ WRMPs were in the context of these measures aiding unconscious usage reduction and resulting in a reduction in the water bill. For instance, Affinity Water (2014) noted that the increasing presence of water using devices such as dish and pressure washers, power showers, and changing customer behaviours warranted water efficiency engagement. The water company thus planned to ‘derive about 4ml/d [water savings] through the distribution of water efficient devices.’ Similarly, Thames Water (2014: 40) planned to ‘help customers to save water with the distribution of water efficient devices.’

But some of the water utilities planned to go further than distributing water efficient devices to households. Such companies intended to retrofit household water systems and incentivise their publics to acquire home goods or products that are water efficient. For example, ‘retrofitting dual or variable flush toilets, repairing leaking toilets, and [issuing] water efficient white good discount vouchers’ (South East Water, 2014:14), continuing ‘water efficiency audits…fitting water-saving products including cistern displacement devices, tap inserts, aerated shower heads, trigger hose guns, and water butt kits’ (Essex & Suffolk Water, 2014a: 212-243), and delivering ‘home audits with retrofits [and] discounted water saving products’ (Southern Water, 2014: 138).

Third, all the seven water utilities that are seriously water-stressed planned to deliver face to face educational water efficiency engagement during the post-WRMP period. The examination of the

water utilities' WRMPs revealed a strong recognition of the role that educational interventions play in maximising the effectiveness of retrofitting and in helping publics make conscious water decisions (see Table 11).

Table 11 Water utilities' position on 'education' to promote household water efficiency.

Water utility	**Evidence of plans for 'education' in WRMPs**
Sutton and East Surrey Water	'Effectiveness of water efficient devices is often dependent on the level of engagement with the consumer and their understanding of the need to protect water resources' (2014: 251).
Anglian Water	'Anglian Water also has a broader campaign…to increase customer awareness about the value of water in the region.' (2014: 32)
East Surrey Water	"…Education and [encouragement of] consumers to use water carefully so that changes to behaviours in water use become the norm…" (2014: 163-164).
Sutton and East Surrey Water	'...Undertake high consumption visits to offer advice on water efficiency… Many of the customer-side options try to change customer behaviour through engagement and awareness raising of water efficiency' (2014: 163-164).

Table 11 suggests that most water utilities operating in areas of serious water stress planned for home visits to conduct audits and educate their customers to improve how they perceive and use water. Some existing studies argue that long-term reductions in water use require educational interventions for water users (Geller, 2002) and some authors have advocated such interventions because household demand can be insensitive to price since the ability to pay for water does not motivate water efficiency (see Nauges and Thomas, 2000) even though price increase can sometimes lead to a reduction in water demand (Gibbons, 2013).The current research findings are therefore in line with the social science view that people can make informed decisions regarding water when adequately empowered to do so.

Overall, water efficiency education activities were planned to be delivered at events and in spaces such as assemblies, gardening clubs, homes, libraries, schools, visitor centres, and online (Table 12).

Table 12 Participation channels planned for delivering water efficiency engagement.

Channel	**Setting**	**Water efficiency engagement practices**
Schools, visitor centres	Educational	▪ Affinity Water (2014: 9-61) - educational awareness and expand the role of its Education Centre team in Bushey to include more visits to local schools to 'educate' the next generation. ▪ Anglian Water (2014: 89) - educational campaigns. ▪ Thames Water (2014: 36) - educational campaigns, visitor centres at [the water utility's] sites. ▪ Southern Water (2014: 138) - education programmes in schools.
Gardening clubs, homes, libraries	Home audits, site visits	▪ Essex & Suffolk Water (2014: 237-243) - water efficiency talks often at schools, gardening clubs, university stakeholder events and libraries, and annual water efficiency home audits.
Assemblies Campaigns	Talk, tours, workshops	▪ Sutton and East Surrey Water (2014: 163) - free tours, talks, workshops and assemblies.

Table 12 shows links between the intended communication channels and the settings where the water utilities planned to engage their publics especially to improve how people perceive and use water. More illustrations of these linkages were highlighted by Anglian Water which claimed that 'combining metering with water efficiency [education] reinforces the water saving message and allows them [customers] to save even more money' (2014: 300). Likewise, the interdependence between the channel, message, and how publics use water was articulated by Essex & Suffolk Water (2014: 224):

> '[The water utility] fully understands the importance of engaging with customers to influence water using behaviour. The distribution and fitting of water saving products forms only part of the story. Influencing customer behaviour, through informing customers how much water they use, how they use water and challenging the habitual nature in which they use water, in turn delivers quantifiable and sustainable water savings.'

Of significant interest was Essex & Suffolk Water's (2014a: 214) explicit plan to conduct home visits to engage customers in conversations and convey water efficiency messages, in conjunction with retrofitting:

> '[A] retrofit audit involves a plumber attending an appointment at a customer's property with a view to fitting and/or delivering a wide range of water-saving products to ensure the household is water efficient. The customer is engaged in conversation and encouraged to spend time with the plumber whilst fitting the devices, to ensure that behaviour change messages are conveyed effectively.'

Without negating Shove's (2010) criticism that the promotion of behavioural change is individualistic and overly optimistic about people's ability to make choices without considering other factors such as society and infrastructures that shape demand, face to face water efficiency education is important because this channel allows for new understandings of publics which move further away from the blanket label customer.

The current research findings that, the water utilities' intended to position their personnel as communication channels in face-to-face settings, engaging with publics to better understand how they perceive and use water and offering tailored water efficiency support and advice. This ties in with why the plumbers in Essex & Suffolk Water considered themselves as assets to the water utility (narrated earlier in section 1.1).

But while the PR14 plans for water efficiency engagement in seriously water-stressed utilities established that the companies would rely on the water meter and water efficient devices as channels for communicating water efficiency during the post-WRMP period, and there were indications that retrofits during home audits were to be accompanied by some interactions to improve how publics perceive and use water, there was limited detail about how those processes will work during the post-WRMP period.

Collectively, findings in this section establish that in areas that are seriously water-stressed, water utilities planned to drive household water efficiency using the water meter, water saving devices, and face to face education during the post-WRMP period. The water utilities anticipated that incentivisation will be a motivation for publics to become water efficient. This incentivisation presented itself in different forms. For example, financial savings on the water bill for metered households, or free or discounted water efficient devices for households in general. Nevertheless, the water meter was anticipated to 'send' message signals to the public and improve how people use water while the water efficient devices were anticipated to propel the public to (un)consciously save

water. The water bill, the water meter, and water efficient devices were thus interestingly positioned as communication channels due to the signals that they are able 'send' to publics.

Despite their complexities, there was an increasing popularity of home visits for combining retrofitting and water efficiency education across the water utilities in areas of serious water stress. And this form of water efficiency engagement renders certain 'go-to' measures (such as the distribution of water efficient devices to households) dated.

The PR14 WRMPs demonstrate a consensus that the home is the key space for engaging publics in water-stressed areas and the toilet is a key area for attention for water efficiency as it is a hotspot for usage and leakage. Also, personnel delivering educational activities across the water utilities emerged as a newly imagined channel for communicating water efficiency due to the knowledge which they were expected to skilfully pass on to publics. The next section concludes this chapter by reflecting on the Phase 1 research findings and their implications for water efficiency engagement.

7.7 Conclusion

This first findings chapter has addressed the first research objective which concerns understanding the intended audiences and processes for water efficiency engagement in water utilities operating in areas of serious water stress, and knowledge generated also contributes to advancing knowledge about the field (third research objective).

Table 13 presents a summary of the evidence generated from this Phase 1 analysis and draws this chapter to a close with conclusions drawn.

Table 13 Contribution of Phase 1 empirical chapter to the thesis.

Intended audience and processes for water efficiency engagement				
Message	**Audience**		**Channel**	
Message frames and what they suggest about potential conversations during engagement	**Identities of publics created by processes during water resources planning**	**Perception of publics**	**Meanings deducible from plans for post-WRMP water efficiency engagement**	**Technical measures' suggestions about desired lines of action**
Policy was considered as a main driver, which was linked to tackling scarcity. Other drivers were contextualised around population growth and climate change impacts.	Publics were primarily identified as customers. The evidence suggests a lack of understanding of publics, except using segmentations based on location and meter ownership.	Metering and the reliance on the water bill to motivate water efficiency positioned publics as buyers of water with individual interest in money savings. There were comparatively few conceptions of publics as citizens and owners of water.	The status of the water meter and water efficient devices was raised to communication channels due to their capacities to 'communicate,' 'motivate,' 'nudge,' or 'force' habits desired by water utilities.	WRMPs suggest a wide reliance on metering and fitting water efficient devices to achieve water efficiency, particularly in kitchens and toilets.
Perceptions of water created within context	**Assumed motivations for publics to be water-efficient**	**Expectations of publics who become engaged**	**What channels/ measures suggest about approach and desired lines of action**	
Substantial evidence of the commodification of water but partial evidence of the management of water as a communal resource, with a strong connection to metering and education to motivate efficient usage, respectively.	Explicit financial benefit in the form of reduction in water bills floating around in the WRMPs. The intrinsic environmental benefits were construed impersonally and weakly linked to publics as separable entities.	Regardless of engagement approach, water utilities expected a reduction in usage and wastage, improved values and water use as outcomes.	As planning processes advanced, the level of public engagement progressed from communication and consultation through one-way channels. Increased participation and synchronicity planned for homes and schools especially, albeit the processual aspects were not explicit.	

Table 13 outlines the research findings about the intended audiences and processes for water efficiency engagement in areas that are seriously water-stressed.

The findings suggest that in areas of serious water stress, the water utilities' intended audiences for water efficiency engagement were customers with whom they had functional relationships, for example, bill-payers, meter owners, vulnerable customers etc.

Whilst the utilities expected their customers to improve how they use water following water efficiency engagement, they did not have a clear understanding of their publics at the point of producing their WRMPs. They thus relied on some key indexes for customer segmentation and their perceived understanding of their customers were based on sociodemographic characteristics such as dwelling, meter ownership, water bill payment, vulnerability, level of usage, age, education, and the location in which their target audience be found and engaged. As such, customers were variously characterised as domestic, new home occupants, metered, unmetered, bill payers, the vulnerable, high water users, the elderly, school pupils, etc. Whilst sociodemographic indexes are relevant for planning technical interventions, whether they are strong indicators of customers' attitudes towards water and whether they advance water efficiency engagement practice require further investigation.

Differentiation of customers based on their attitude towards water was lacking and it was unclear whether or which sociocultural characteristics or household materiality were expected to be used for targeting water efficiency during the post-WRMP period. Only few water utilities such as Southern Water used meter ownership to characterise their customers' usage. However, it was impossible to tell if this insight shaped the utility's home visit practices because this Phase 1 of this research only investigated the utility's planning of water resources but not its delivery of water efficiency engagement. Likewise, any attempt to understand Southern Water's usage in the existing literature is lacking.

It was thus clear that water utilities' understanding of the public in areas of serious water stress is problematic. Despite the public's diversity, water utilities often blanket label them as customers. This lends itself to the unclear understanding of the customer in the UK water sector.

In addition, the research found that although increasing water demand was the issue at hand, regulatory expectations, population growth, and environmental concerns such as climate change, low rainfall, and drought events were presented in the WRMPs as the motivation for water efficiency engagement. The utilities thus intended to motivate the public to be water efficient using rhetoric related to extrinsic or intrinsic benefits. In other words, they intended to promote water efficiency as

an opportunity for their customers to reduce their water bills or protect the environment. However, these calls to action have connotations for how the utilities portray water to the public.

First, it is known from the existing literature that the smart water meter makes the public pay attention to their usage because it presents 'the possibility to charge different prices to different customers based on the volume of water used' (Worthington and Hoffman, 2008: 5). And it is in view of this 'pay-for-use' advantage and its psychological implications for usage that metering, and the related economic imperative were by far the most dominant water efficiency strategies across the water utilities operating in areas of serious water stress. Yet, extrinsic benefits as a perceived motivation for the public to be water efficient in areas of serious water stress, particularly financial savings in the form of reduced water bills, position water as a commodity and condition publics as buyers of water.

However, from the Phase 1 research findings, it was unclear whether the water utilities' plans for proliferation of metering in households were about conventional or smart meters with IHDs. Making this distinction is however critical in water efficiency engagement as metering and metered charging have separate benefits for leakage reduction and usage reduction, respectively. For instance, there is evidence to suggest that metered charging results in significant water efficiency (Hanke 1970; Davies *et al*., 2014), but as the 'H_2ome smart program' study of 12,000 households in Australia showed, water efficiency declines over time in metered households without IHDs (Anda *et al*., 2013).

Second, intrinsic benefits as another perceived motivation for the public to be water efficient in areas of serious water stress, particularly the promise of the protection of water resources positions publics as owners of water, evokes the desire for communal action, and can influence the water utility's engagement approach in households, in most cases using water efficiency education.

The Phase 1 research findings however suggest that the plans for water efficiency education in areas of serious water stress were not as robust as plans for technical initiatives. While it was clear that the water utilities identified water efficiency education as the much-needed intervention to tackle water demand, they provided little context about their project plans. An exception was Essex & Suffolk Water where plans for engagement in schools, community spaces and homes were explicitly stated.

Examining the measures that water utilities put in place to motivate the public to take any desired line of action is key to developing a better understanding of water efficiency engagement. It will thus be useful in the thesis to investigate household water efficiency engagement further, with particular focus on the planning and delivery of its education aspect in any of the community settings.

Proactive preparation for education is one step towards preventing deficient water efficiency engagement that does not utilise existing insights about customers. For example, economic status from customer segmentation tools could have been triangulated with insight from meter ownership to better understand customers and the rhetoric that create optimum resonance rather than assuming that technical interventions solely can change how people use water, but there was no evidence of such targeting occurring from the pre-WRMP period.

Furthermore, water efficient devices and the water meter were positioned as instruments of change in all the water utilities operating in areas of serious water stress. These technical interventions are unconventional and suggest a reliance on implicit messaging to reduce usage. This is unsurprising because the existing literature in the past two decades has established that retrofitting and metering send implicit water efficiency messages to the public (Maddaus, 2001; Dworak *et al*., 2007; Willis *et al*., 2013; POST, 2014). However, evidence from the existing literature has also shown that the impact of technical interventions is better enhanced with explicit water efficiency messaging to guarantee long-term water savings (Knamiller *et al*., 2006, Hamling *et al*., 2018).

The problem that the Phase 1 research findings thus bring to the fore is that although the water utilities' clear intentions were to use technical interventions such as the water meter and water efficient devices to motivate their bill-paying customers to become water efficient, they expected to see a change in the behaviours and values that relate to how all water users perceive and use water. Across the water utilities, there was an acknowledgement of the need to increase awareness about water. Yet, their WRMPs heavily promoted how the impact of metering and retrofitting would lead to increased household water efficiency. This illustrates a disjuncture between the water managers' main interventions and their anticipated long-term outcome because such edu-efficiency is more likely to be achieved when water efficiency education is present than when lacking.

Although techno-efficiency can be achieved through alterations to systems of water provision (such as cistern displacement devices), it must be highlighted that these do not mean that changes to people's choices in relation to usage practices will be attained (Sharp, 2006). For instance, whilst publics' per capita consumption may reduce following the installation of low-flow shower heads in their homes, they may fail to reduce their usage if they compensate for reduced pressure by taking longer showers. But if people's water values are consciously reshaped using water efficiency education, particularly if this is done in parallel to technical interventions, water efficiency is more likely regardless of household water systems.

It was thus clear that whilst the water utilities planned for metering and retrofitting to achieve

household water efficiency with some degree of specificity and certainty, plans for water efficiency education during the post-WRMP period were still developmental and unstructured at the point of water resources planning.

Finally, although the water utilities used asynchronous consultation channels for water efficiency activities during the pre-WRMP period to fulfil the UK Environment Agency's demand for public engagement about water resources options, the research findings suggest that the delivery of engagement is no longer limited to conventional communication channels. Instead, it was clear that the water utilities intended to shift to the combined use of technical measures and personnel in face-to-face settings during the post-WRMP period. Home visits emerged as the space for this combined water efficiency engagement approach.

These Phase 1 research findings have thus established that in seriously water-stressed areas, utilities intended to deliver technical and educational water efficiency engagement in an inextricably linked manner. This means that water efficiency engagement during the post-WRMP period was expected to be delivered in a combined approach. This is pertinent to the UK Environment Agency's consideration that:

> 'Comprehensive demand management strategies aimed at changing behaviour and attitudes towards water use are needed to lower PCC in England and Wales to the desired level, rather than simply using technology and economic incentives' (2008a: 26).

The next chapter presents findings about the processes that feed into the home visits in the case study.

8 Preparation and description of the home visits

In Chapter 7, findings about UK water utilities' intended audiences and processes for water efficiency engagement in areas that are seriously water-stressed were presented. The research found that across the board, population growth, climate change impacts, and increasing water demand motivated the water utilities to plan for educational water efficiency engagement. The water utilities lacked an insight-led understanding of their publics, and their perceptions of customers formed through socioeconomic lenses of metering and geographic location were limited. Their water efficiency conversations in households in seriously water-stressed areas were expected to be characterised by appeals to publics' interests in bill reduction and environmental protection, however, the water meter and free water efficient devices were also expected to play key 'communicative' roles in the promotion of water efficiency.

Whilst the PR14 WRMPs provided detailed information about how metering and retrofitting would be undertaken, in line with the existing literature, findings showed that the WRMPs lacked information about the delivery of the water efficiency education aspect of engagement, particularly during home visits. This further strengthens the need to develop the understanding of such activities via a case study of one the seriously water-stressed utilities, Essex & Suffolk Water.

As highlighted in section 6.7.4, the water efficiency home visit campaign is at the core of Essex & Suffolk Water's water efficiency strategy. Essex & Suffolk Water's PR14 WRMP discussed earlier in section 7.6 revealed that the home visit campaign which aims to reduce household water use over the next two decades by conducting water efficiency audits and retrofits in homes and educating residents about water efficiency during those home visits. The Every Drop Counts home visit activities conducted in the summer of 2017 in Witham are thus the focus of this Phase 2 empirical work.

The role of this chapter in the thesis is to begin fulfilling the second research objective (to identify the factors that aid or stifle water efficiency engagement in a seriously water-stressed utility). The chapter will cover the project planning aspects of the home visit campaign and elucidate the on-ground processes that feed into the home visit campaign, thus providing the background, and understanding of how Essex & Suffolk Water prepares for and delivers the home visits which will be analysed in the subsequent chapter (Chapter 9).

This chapter is comprised of five sections. The first section introduces the plumbers' training. In the second section and the third section, the Message Audience and Channel (MAC) elements relating to the virtual marketing of home visits and town centre campaign are discussed, respectively. The fourth

section illustrates how water efficiency engagement was delivered in the home visits observed. The final section reflects on what the project planning of home visits can begin telling us about barriers and opportunities for practice improvement.

8.1 Plumbers' training for home visit campaign

Essex & Suffolk Water's plumbers' training was delivered by the Water Efficiency Team in conjunction with the contractor WSP. Essex & Suffolk Water designed the agenda for the plumbers' training which was intended to brief plumbers about: the water utility and its corporate vision, the home visits including water efficient devices to be fitted as well as behavioural change education, data capturing on the Personal Digital Assistant (PDA) device, and health and safety.

The PDA is a portable handheld device which WSP gives to each plumber for large scale data collection in the field. The device displays information on household visits that have been assigned to the plumber and allows them to record data in different fields mainly using drop down menus. In addition, the PDA device allows plumbers to place telephone calls to customers, has the functionality to document weekly van safety checks, has a location service notifying the project team about plumbers' whereabouts, and lone working functionality for hourly checks on plumbers.

On the last day of training, the trainers gave the plumbers a practical demonstration of product-fitting in the household (as depicted earlier in Figure 10). For the first time in the history of the campaign, the plumbers had water efficiency engagement role plays. Role playing was suggested by the author to motivate plumbers to think about scenarios in which they can engage publics better in households and make water efficiency the focus of the conversations they initiate.

In the role plays, the plumbers and trainers took turns to assume the role of plumbers and residents. They discussed how to introduce themselves to residents to create a good first impression, how to get residents to understand and be interested in the engagement aspect of the home visit, how to recognise what selling points may appeal to some residents' interests, what behavioural change to promote in relation to water efficient devices and usage practices, and how to recognise publics who may appreciate formal or informal interactions.

Parallel to the plumbers' training, the Water Efficiency Team conducted marketing campaigns to encourage Witham residents to sign up for a home visit. The next section presents findings from the documentary analysis of the campaigns' marketing materials.

8.2 Marketing of the home visit campaign

The findings from the review of materials about the virtual promotion of the home visit campaign are in line with findings from the review of the PR14 WRMPs which suggest that the intended audience for water efficiency engagement was bill-paying customers.

Essex & Suffolk Water invited 14,607 customers to sign up for a home visit via telephone, postal, online and face to face (in Witham town centre) channels. 22% of the total number of customers that were invited applied for a home visit (Figure 13).

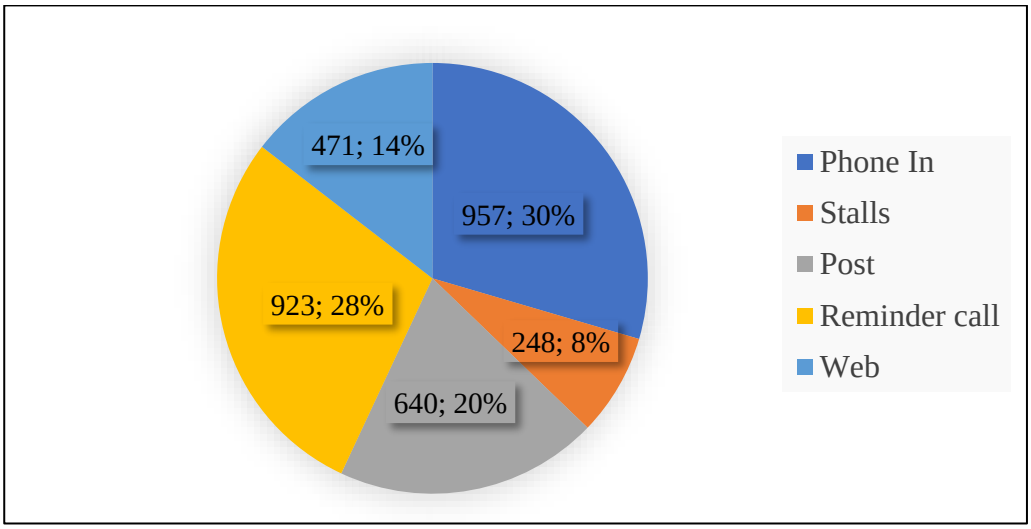


Figure 13 Opt-in applications received from various channels.

First, WSP employed a small, dedicated contact centre team on a temporary basis for the duration of the EDC Witham home visit campaign to answer customer queries, sign up customers for a home visit, schedule time slots for home visits, and to place marketing and reminder calls to customers.

Figure 13 above shows that the telephone was the most important channel for recruiting households for the campaign because it accounted for 58% of the total sign-ups. WSP reported that the contact centre gathered information from customers about the number of occupants and toilets and taps in households, and this information was made available to the plumbers for the home visits. However, details about these telephone conversations with customers were undocumented or unmonitored.

Second, postal and online (dedicated website) channels were used to publicise the Witham home visits, accounting for 20% and 14% of the total sign ups, respectively. The Water Demand Analyst described the dedicated website as a separate micro-site which introduces customers to what happens in a visit and allows them to sign up for a home visit within few seconds (see Figure 14). However,

this website did not collect information about occupants, nor about the toilets and taps in the house. The contact centre still had to call those who sign up online to request these details.

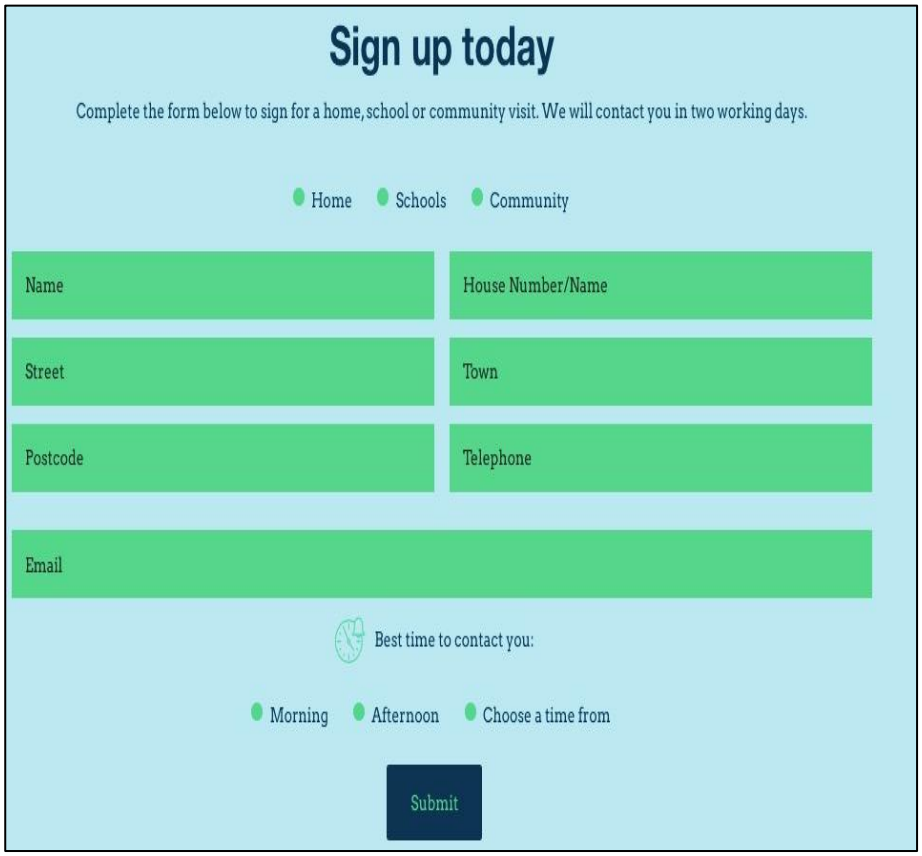


Figure 14 The Every Drop Counts Witham home visit: online sign-up (ESW, 2017c).

In parallel with online marketing depicted in Figure 14, the Essex & Suffolk Water sent a pre-mailing pack with a leaflet to Witham households informing them of the EDC home visit campaign, and then sent invitation packs to 14,607 customers, asking them to sign up for a home visit.

As the systematic review of PR14 WRMPs (discussed earlier in section 7.2) suggested, the water utilities in areas that are seriously water-stressed were likely to encourage their publics to be water efficient by appealing to their interest in either bill reduction or environmental protection during the post-WRMP period. This claim was substantiated by the marketing content of invitation letters posted to households and on websites (see Figure 15 and Figure 16).

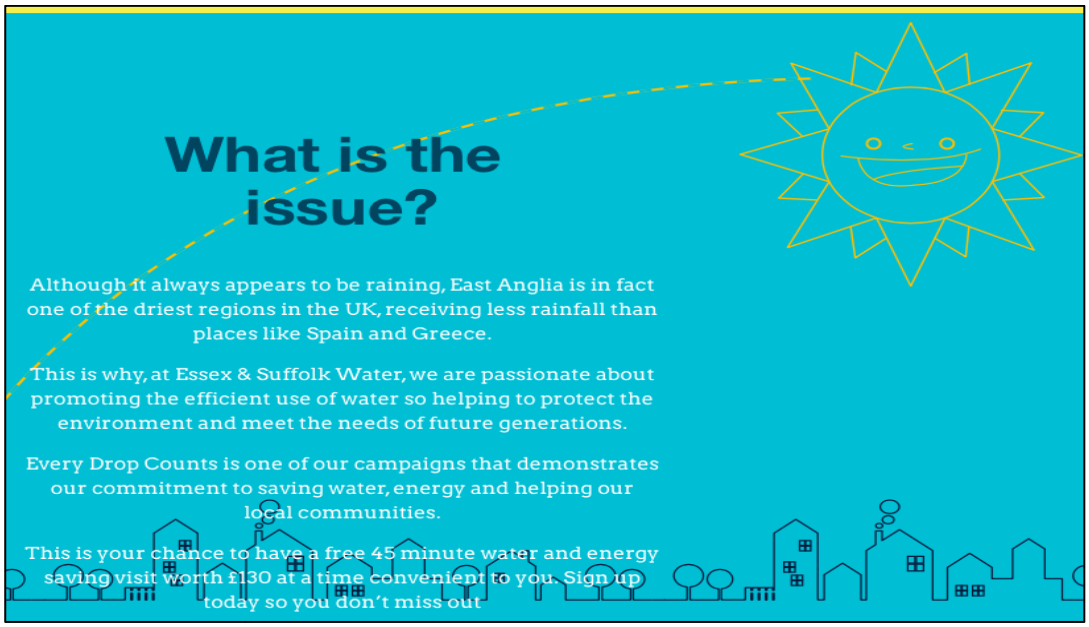


Figure 15 2017 EDC Witham website home visit: the problem (ESW, 2017c).

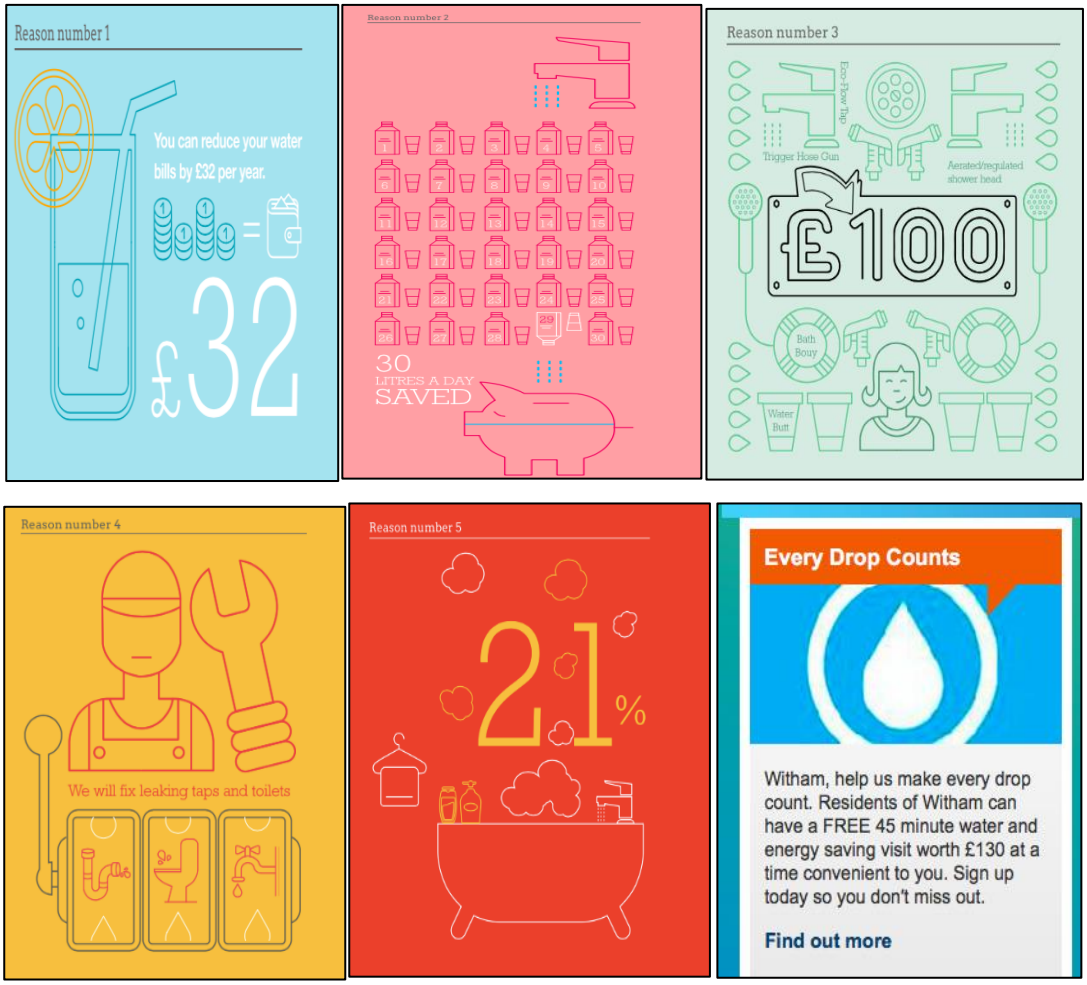


Figure 16 The EDC Witham home visit: potential benefits to customers (ESW, 2017c).

As shown in Figure 15, the only environmental concern mentioned was low rainfall in Witham. In contrast, evidence from Figure 16 suggests that the water utility was appealing to its customers' self-interests due to its references to the free home audit, free water efficient devices, and a reduction in water and energy bills as reasons to sign up for a water efficiency home visit.

In addition, Essex & Suffolk Water designed and posted promotional messages in packs to households based on the assumption that households were metered and that water efficient devices could be fitted there. The promotional messages were therefore predominantly framed using the 'save money' than the 'save water' rhetoric. This is evident in the 'what is in it for me' section of one of the disseminated literatures (see Figure 17) wherein benefits to the publics were centred around the emphasised word 'FREE' and around financial gains in the form of 'reduced water bills,' 'reduced energy bills,' and 'advice on how to further reduce your household bills.'

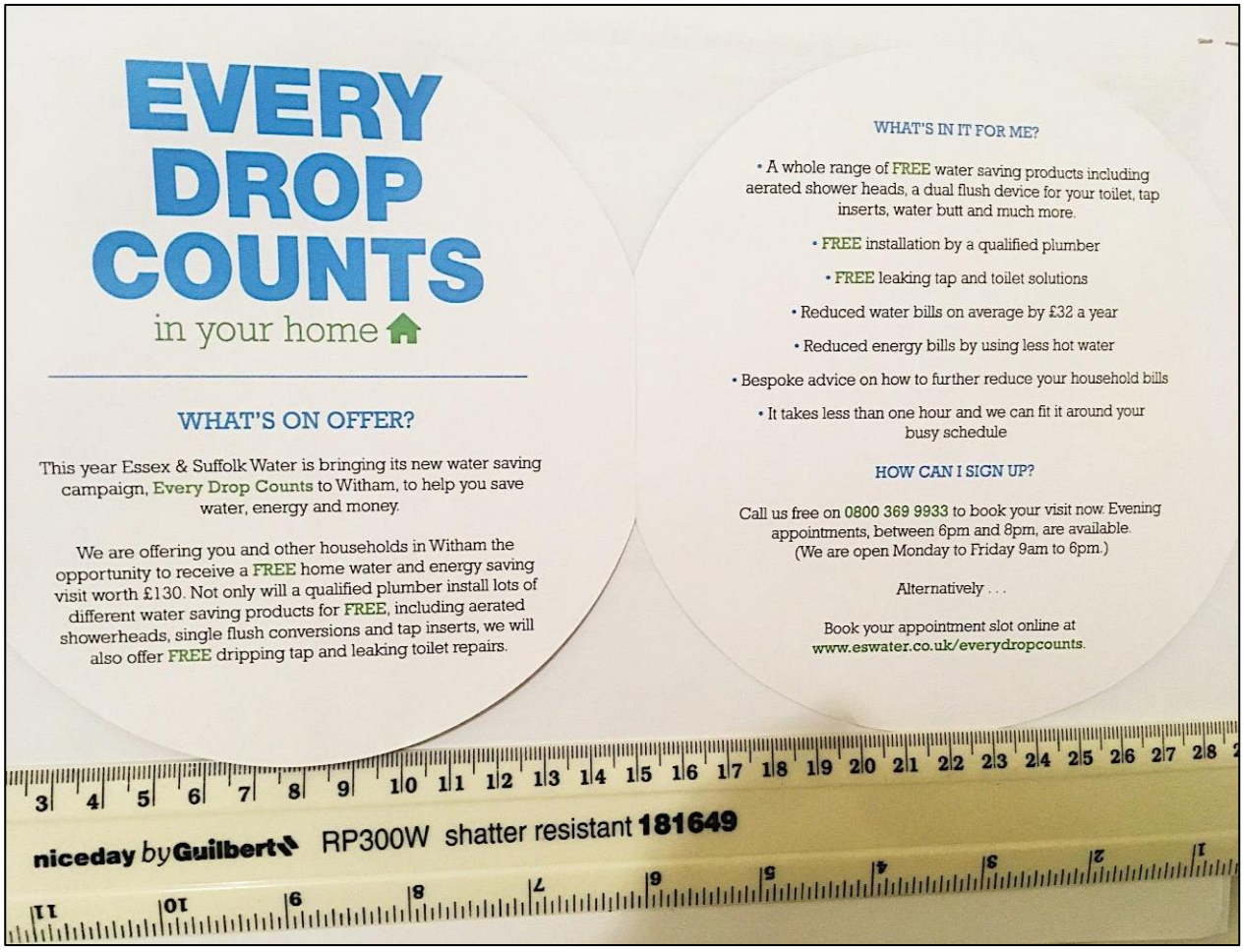


Figure 17 Literature sent to households.

Figure 17 shows Essex & Suffolk Water's generic marketing literature which promoted the costs and benefits of a home visit to its publics. The resource material was not targeted to any specific household. Considering that 42% of households served by the water utility were unmetered at the time, it becomes

important to highlight that some publics will not benefit from the 'reduce water bills' incentive but may reduce their energy bills as a result of using less hot water.

The findings from section 7.3 revealed that meter ownership, spatial and geographic location, and the ACORN socio-economic classification informed customer segmentation for water efficiency engagement in areas facing water scarcity. In contrast, messages in Essex & Suffolk Water's marketing materials suggests that the water utility perceived its publics based on uninformed assumptions about the presence of a smart meter and garden in their households. The design of marketing messages did not factor in the absence of the water meter or garden in households, neither was there any methodical dissemination of messages to households during the marketing of home visits.

As part of the marketing for the EDC Witham home visits, Essex & Suffolk Water delivered face to face campaigns to encourage residents to sign up for a home visit.

The next section discusses findings from the face-to-face campaign event held in Witham town centre.

8.3 Town centre campaign

As mentioned earlier in section 6.8.4, over a month after the EDC home visit campaign was launched, Essex & Suffolk Water stationed a stall and a customer engagement vehicle Flo (wherein publics could see a home visit demonstration) at the Tesco supermarket in Witham town centre. The main aim of this town centre campaign was to persuade residents to sign up for a home visit.

As expected, face to face was the main channel for communicating water efficiency at this campaign and personnel from Groundwork (the contractor) engaged with all types of publics encountered at the town centre regardless of whether they lived in an area served by Essex & Suffolk Water or not.

Once, the author visited the stall as a mystery shopper to observe the marketing campaign. Excerpts of conversations that ensued will now be discussed:

Author: *Hi*

Personnel 1: *Have you heard about us?*

Author: *Not really.*

Personnel 2: *Really? Where do you live if I may ask?*

Author: *Far away*

Personnel 1 and Personnel 2: *[Laugh]*

Personnel 2: *Most water suppliers are doing a similar system now. It is a nationwide problem really. But if they are [if my local water supplier is promoting water efficiency], what they are probably doing is [giving] several products which act as a free audit of your water usage and ultimately the idea behind that is to get everybody using less water so the environment… So, we have ten products; all of them are given away free of charge; they are worth about £130. So, do you know who your water supplier is?*

Author: *Yes.*

Personnel 2: *Okay, give them a ring and see if they are doing any sort of similar things now [like] water audits and generally saving water.*

Personnel 1: *It [the water efficiency audit] happens over the year.*

After the conversation above ended, Personnel 2 proceeded to give the author a demonstration of how some of the water efficient devices displayed at the stall were designed to enable water efficiency. The devices included the garden hose, the shower head, the water butt, and the dual flush. A sow pot was then given to the author as a freebie, with Groundwork Personnel 2 stating thus, "*It has nothing to do with saving water, but it will keep you thinking about water*."

When the author asked Personnel 2 whether the messages communicated would have been different for a local resident, the answer was not in the affirmative. Then, when asked if Groundwork delivered the public campaign and home visits since all personnel were wearing Groundwork branded T-shirts, the personnel responded: "*It is run by Essex & Suffolk Water, we are contractors*."

Further, when Personnel 2 was asked whether residents were expected to take home the free water efficient devices on display, the personnel replied: "*They [the free products] will be fitted if one [a resident] signed up for a home visit.*" Then, he – the Personnel 2 proceeded to explain what was expected during a typical home visit but described the retrofitting aspect alone. When Personnel 2 was probed further about whether the home visit was just about fitting products, his response was:

"*Yes, it is just about the products we have here today and fixing leaks*."

In line with findings from the analysis of intended processes for water efficiency engagement in areas of serious water stress, conversations by the contracted personnel at the town centre campaign reflects the assumption that incentives such as free water efficient devices and free plumbing services will

motivate residents to opt for a home visit or become water efficient. But the marketing strategy for the town centre campaign was unclear. This is because the Groundwork personnel's understanding of Essex & Suffolk Water's intentions for achieving household water efficiency as well as what happens during a home visit appeared to be limited.

First, Groundwork personnel had limited awareness about rhetoric used by the water utility during marketing and about plans to deliver water efficiency education as part of combined water efficiency engagement.

For instance, Personnel 2 claimed to give out "*a number of products which act as a free audit of water usage… [and that the home visits were] just about products… and fixing leaks*." This statement was both unclear, inaccurate and contradicts Essex & Suffolk's (2014: 224) expression in its WRMP that its water efficiency engagement approach planned for the post-WRMP sees the distribution and fitting of water saving products as only part of the story (discussed earlier in section 7.6). It was evident that the Groundwork personnel lacked knowledge about the key aspects of water efficiency engagement including customer diversity, multiple appeals for communicating water efficiency messages, water efficient devices and retrofitting, and the totality of what happens during a typical home visit.

Second, logistic problems with Flo (see Figure 18) emerged during the town centre campaign. Flo was stationed away from the entrance of the supermarket, in Tesco's car park. As a result, the vehicle went unnoticeable to most residents. This is because most residents who were engaged at the stand did not find it a natural progression to visit Flo since it was distantly located from the stall. The importance of demonstration has been proven by how interventions have used technology to revive personalised water efficiency messages. For example, in their study of the impact of vivid messaging on hot water usage during handwashing, Bailey *et al.* (2015) found that personalised messages alone did not make people reduce usage of hot water compared to when presented using virtual shower technology. The Essex & Suffolk Water staff overseeing the town centre campaign however explained that in the past, Flo had been co-located with the stall but on this occasion, the distance issue was not envisaged when the Tesco location was chosen by the water utility.

Figure 18 Essex & Suffolk Water's customer engagement vehicle, Flo.

Third, Essex & Suffolk Water's branding of the town centre campaign appeared to be within fragmented lines. Groundwork contractors who were casually dressed informed some residents that they did not work for the water utility. This approach whereby the contractor assumes a different identity, physically or verbally, is problematic for the water utility and can be confusing for customers who see the utility as part of their community. Also, this can be problematic for customers who are ideologically opposed to contracting out public engagement functions, or for those who are particular about getting value for money. A reconsideration of business arrangements can therefore be beneficial in terms of physical representation of personnel and message communication during face-to-face campaigns, to be in line with the ESW branding as is done with the plumbers and the home visits.

Finally, questions posed by the author to the water utility revealed that the cost-benefit of the campaign was questionable. For example, the Water Efficiency Team member overseeing the campaign was asked about 'how the performance of the campaign is measured and if it provides value for money' considering that four contracted personnel were observed at the campaign stand and they did not engage many residents. According to the staff, the performance indicator for these campaign events is the '*number of sign-ups for water efficiency home visits*.' More consideration however needs to be given to value for money because the seventeen marketing campaigns conducted in Witham yielded 305 sign-ups for a home visit, out of which 182 were successfully completed. This means that the ratio of marketing campaign to completed home visit yielded is 1: 11.

The next section describes and discusses the nature of water efficiency engagement delivered by the plumbers in the home visits observed.

8.4 Space-based navigation of engagement during the home visits

Essex & Suffolk Water's home visits were delivered face to face in households. As discussed in section 6.8.4, a total of 6 home visits were observed. The observations of home visits revealed further insights about the nature of water efficiency engagement in the utility. This section thus discusses some clear patterns in the home visits that emerged.

Observations revealed that typically, the plumbers arrived at a customer's home at the time agreed with the water utility, knocked on the front door, and presented identification to the customer. After wearing shoe covers and enquiring about pets, the plumbers enter the premises where they then discuss related safety measures and explain the aim of the home visit to the customer, drawing on the engagement script which they were trained to adhere to.

In all the home visits observed, following the reconnaissance, water efficiency engagement occurred in what appeared to be a 'follow-the-space' approach in five main physical spaces, beginning from the kitchen, to the cloak room downstairs if existent, then upstairs to the bathroom(s), thereafter downstairs to access the garden if existent, and finally retiring to the kitchen where engagement closed.

The assumption made by the water utility and promoted in the plumbers' training was that engagement patterns during home visits were shaped by the outline of the electronic forms in the Personal Digital Assistant device. On the contrary, the observational findings indicated that the navigation of engagement in households was rather space-based (Figure 19).

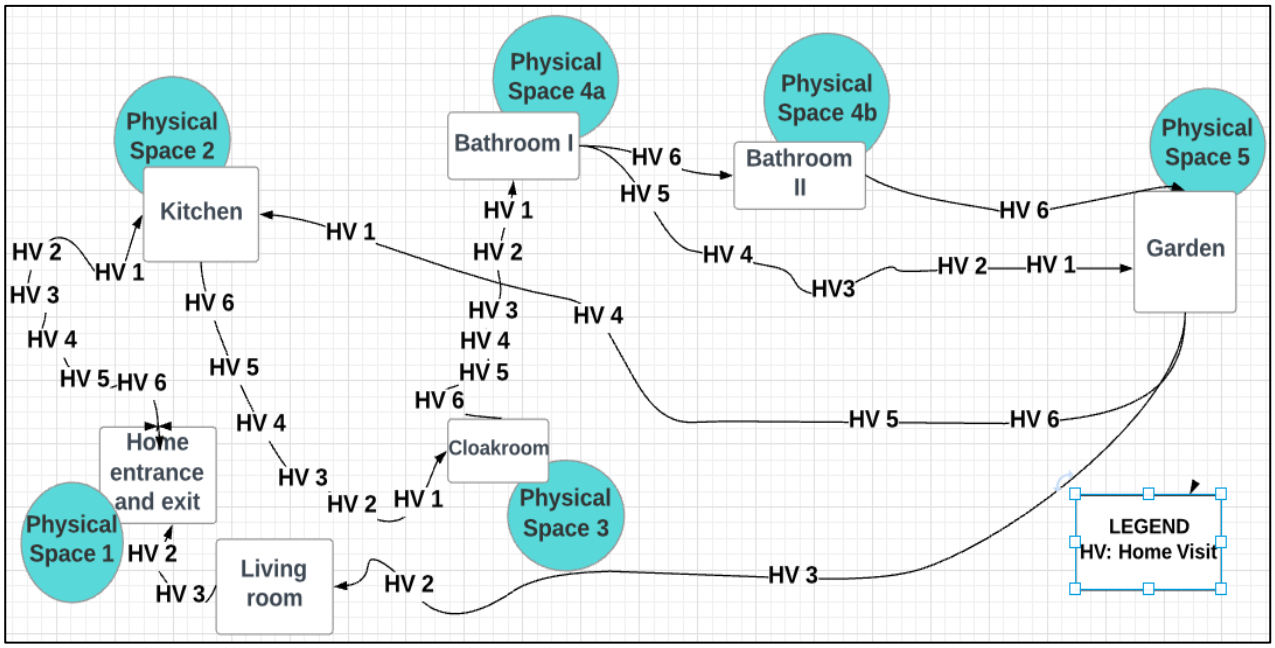


Figure 19 Physical space navigation during water efficiency home visits.

Figure 19 illustrates the movement of the plumbers as they retrofitted water efficient devices and had conversations about water with residents in the home visits observed.

The home visits were shaped by the water systems that were audited and retrofitted, by behavioural change instruments that were given to residents to help modify their usage practices, and by the type and timing of conversations between the plumbers and residents.

Findings from the observations however also revealed 'noisy linkages' between the physical space, the handing over of instruments to residents, and the communication of water efficiency messages to them by the plumbers. In other words, there were some inconsistencies in how the plumbers had conversations with residents about the usage practices that can be modified in certain spaces in their households.

Although Plumber 3 rationalised this space-based engagement approach as "*a routine stuck to for consistency in doing every job the same*," arguing that "*…each plumber will do it [work through households] in their own way which they know works best*," Plumber 1 stated that:

> *"The best place to start is the kitchen. I find that the kitchen is a normally big enough space and the toilet downstairs [cloakroom] is a bit cramped and you cannot introduce yourself there. A lot of the times, the boiler is in the kitchen anyway so if they [the householder(s)] do struggle with the questions I ask, the boiler is there so I can check, and I start downstairs,*

work my way up and do the garden last because you don't want to go in and out with your shoes on and off, putting footprints through the house."

However, it later emerged that this space-based pattern of engagement helped the plumbers to decipher residents' dispositions which in turn allowed them to identify the most appealing or relevant (to their usage practices) water efficiency conversations to initiate. The subsequent subsections examine this space-based navigation.

8.4.1 Water efficiency engagement at the home entrance

On arrival at the entrance of a property, typically, the plumbers informed householder(s) about water efficiency education as much as free retrofitting being the objectives of the home visit.

Findings from the observations suggest that this interaction between the plumbers and residents at the home entrance, although short, was crucial because it set the tone for engagement.

For instance, Plumber 2 noted that the home entrance presented the first opportunity to pick up cues about a householder's level of interest in water efficiency:

"When the person answers the door, you can tell from their body language whether they are interested or not… if they [residents] are not interested [in the water efficiency home visit], I go in the kitchen and tend to try and… get them on board with regards to the shower timer; if they are not being receptive… you [the plumbers] then try picking up their interest in what is going to be enticing to them… like 'are you interested in having a water butt'."

A significant finding from observations is that the plumbers tended to 'flash' a free device (e.g., the shower timer) at the entrance of the property to 'excite' residents, typically while exclaiming, "*Look what we have for you today,*" rather than present these devices in spaces where they become applicable.

The next subsection describes water efficiency engagement in the kitchen which is the next space which the plumbers moved to upon entering a property.

8.4.2 Water efficiency engagement in the kitchen

The plumbers considered the kitchen to be the preferable space to initiate conversations about water efficiency, usually because residents appeared to be more relaxed there.

For instance, after arriving at Household 5, the householder led the plumber straight to his kitchen and offered coffee. There, Plumber 2 opened a conversation saying, "*do you have an idea why we are here*?" to which the householder responded in the affirmative. The plumber then proceeded to state:

> *"We are cracking down on wasting water and want to save water and energy…" [householder nudges on] … What we are doing this year is looking at people's habits and it is little things you realise that you can do yourself."*

Furthermore, in the kitchen, the plumbers tended to inform residents about how they planned to navigate the physical spaces in their homes, and about the residents' right to remove retrofitted devices following their home visits. Then, the plumbers sought residents' permission to take photographs of water systems before and after retrofitting.

Plumbers then fitted water efficient devices in the kitchen if appropriate to modify how residents use water. Wherever appropriate, the Tap Magic (a rotational tap insert which does not reduce flow rate but has a spray function) was fitted to taps to make water flow appear faster than it is, thereby unconsciously saving water. Tap inserts have dominated the literature about technical water efficiency engagement (White *et al*., 2003; Turner *et al*., 2007) and has been reported by Essex & Suffolk Water (2014a) as its main water efficient device.

The next subsection describes water efficiency engagement in the cloakroom if the house had one, or otherwise in the bathroom.

8.4.3 Water efficiency engagement in the cloakroom and bathroom

From the kitchen, the plumbers typically moved on to cloakrooms and bathrooms. The water efficiency audits conducted by the plumbers in these spaces were quite similar because both are essentially water closets consisting of similar water systems – taps and flush toilets, with the exception that bathrooms have shower facilities.

In households with a cloakroom, following engagement in the kitchen, this physical space was the next stop mainly for tap retrofitting and conducting a leak test.

In most households, the plumbers then proceeded to the bathroom(s) to test the flush toilet(s) for leaks. Other than electric showers in the households which were not touched for health and safety reasons, the flowrates of the shower heads and the hot and cold taps were calculated by collecting some amount of water in a measuring shower-bag or cup over one minute. Thereafter, the plumbers would inform the residents of their approximate litre of water used per minute in the shower.

In toilets and bathrooms, the conversations between the plumbers and the residents were mostly tailored and centred around showering.

For instance, in response to one of Household 6's residents' question about whether having a shower is more efficient than a bath, Plumber 2 said that "*in theory it is supposed to be, but it is all down to the time [spent showering]*."

Following the home visit, Plumber 2 was probed further in a follow-up interview about showering and his strategy for using water efficiency messaging to target this water usage practice. The plumber explained that he carries out a shower test "*to [inform] every customer that if you are in there [the shower] for 20 minutes, that tops [is more than having] 3 baths a day*."

However, this in-depth or factual illustration was not incorporated into the message about showering that the plumber communicated to residents in Household 6. Similarly, upon closure of engagement in Home Visit 1's Kitchen, Plumber 1 mentioned to the householder that turning the tap off while brushing one's teeth "*can save up to 13 litres [of water] at a time*." But this conversation was not explored further as the engagement had already closed. This message would have been much powerful if discussed as part of practices in the bathroom when the householder was engaging and asking questions about how to become more water efficient. Therefore, it is debatable whether the usage advice given to the residents by the plumbers during Home Visit 1 and Home Visit 6 was sufficient to motivate water efficiency whilst showering or having a bath.

Wherever appropriate, five water efficient devices (see Figure 20) were fitted in cloakrooms and bathrooms to make existing water systems more efficient.

Figure 20 From top to bottom, left to right: tap insert, eco dual flush, save a flush, shower head, 5-minute shower timer, photo of bath measure, bath plug, bath buoy.

Figure 20 shows the main water efficient devices used by the plumbers for retrofitting and promoting water efficiency in bathrooms. Bath measures, bath plugs, and buoys were not provided to households because according to the Demand Planning Project Manager, there was a production delay and "*they do not form the core physical fittings for water efficiency*." However, other water efficient devices used were:

- Tap Insert: Tap inserts were fitted to basin taps to aerate dispensed water thereby reducing the quantity of water needed for washing hands or brushing the teeth. Tap inserts were fitted only where practicable. For example, during Home Visit 1, Plumber 1 advised the householder that a cloakroom such as his with a small basin was prone to water-splash and as a result, did not need a Tap Insert fitted. This observation is crucial because interviews revealed that the number of water efficient products fitted is one of Essex & Suffolk Water's measures of engagement efforts as well as of the plumbers' performance. This is a potential concern for effective water efficiency engagement as there is a risk that the plumbers may deviate from fitting the necessary devices to prioritising numbers.

- EcoBeta Dual Flush: In households with traditional flush toilets, the siphon in the water tanks were retrofitted by drilling into their top end to transform their lever into a dual flush system that enables flushing with half the quantity of water conventionally used. A dual flush sticker was also placed in the cloakroom during Home Visit 3, for example, to educate residents about how to use the dual flush system.

Surprisingly, Plumber 1 recommended that the dual flush sticker should be used only on EcoBeta flush systems, and not in toilets and bathrooms which already have dual flush systems, suggesting that a better approach was to "*educate the customer [only those whose traditional toilets have been retrofitted] about the function*."

Taking a similar approach, whilst being interviewed about messaging in toilets, Plumber 2 assumed that: "*if you do not know your toilet is dual flush, you have to be pretty stupid*." The plumber's interaction with the residents during a separate Home Visit 4 however proved his assumption wrong:

Plumber 2: *What do you do with this single button*?

Mother: *I do not know*

Daughter then replied, "*Press it*?"

Plumber 2: *You can press it [presses the button slightly] and then it [the water] trickles through like that and then it stops*

Mother: *Oh! We did not know it could do that*

Plumber 2: *Every time you do a full flush, you use six litres of (water) but when you use the single button, you use one litre of water and save five*

Mother: …*I have always wondered why I press the big or small button, if it makes any differenc*e.

It is noteworthy that similar discussions about the efficient way to use a dual flush system re-occurred during Home Visit 5 and during Home Visit 6, thus refuting Plumber 2's assumption that most people already know how to use their dual flush buttons and waging against Plumber 1's tactic to only have conversations about dual flushing with residents with the EcoBeta retrofitting only. Interactions such as these exemplars given herein thus highlight how uninformed assumptions about publics can pose barriers to water efficiency engagement. What is most noteworthy here is that such deficient practices do not align with the approach that Essex & Suffolk Water planned to take during the post-WRMP period, as it expressed in its WRMP that to make quantifiable and sustainable water savings, it intended to influence its publics' usage behaviours by challenging the habitual nature in which they use water (discussed earlier in section 7.6).

- Save a flush: The save a flush device is an attachment that is inserted into the cistern to displace water. Throughout the days during which the plumbers' training took place, the Save a Flush's functionality was metaphorically described as being like "dropping a brick in water," meaning that it is meant to make the cistern fill up with less water and as a result, flush with less water.

- Water-saving shower head: In households, and where needed, shower heads (see Figure 21) were replaced with a water-efficient 2-mode (jet and eco) shower head that is more restrictive in terms of the quantity of water dispensed and allows for a flow rate of 7.5 litres of water a minute.

- 5-minute shower timer: To wrap up bathroom engagements, a behavioural change instrument called the 5-minute shower timer (Figure 21) was sometimes given to some residents to monitor time spent in the shower. Explaining the essence of a shower timer to the householder during Home Visit 1, Plumber 1 said:

"On average, a shower is about 30-45 litres [of water] in a 5-minute shower [while] in a bath, each inch in a bath [bathtub] is 15 litres of water on average… so it is on average 165 litres of water… so

we are trying to push for people to have more showers [than baths] … shorter showers… an average of six minutes in the shower."

The next subsection describes water efficiency engagement in the garden which is the next space that the plumbers proceeded to if the property had one.

8.4.4 Water efficiency engagement in the garden

The plumbers considered the garden to be preferably the last space in the household to conduct a water efficiency audit before retiring back to the kitchen to close the entire engagement. According to Plumber 2, leaving the garden to the last minute minimises "*plodding through [the house] with your boots and bags*."

All homes observed had a garden, and the observations suggest that the water efficiency engagement that takes place in this space, mainly the audit of taps' flow rates, is relatively short-lived because the ways to use water in the garden are but a few. If the plumbers considered the water storing granules and spray gun to be necessary, they gave these instruments to residents to make plant watering more efficient (see Figure 21). Also, the plumbers discussed the water butt with residents and ordered one for the property from the supplier if requested.

Figure 21 From left to right: pack of water storing granules, spray gun.

Figure 21 above shows the water saving instruments given to residents in the garden. These are discussed in turn:

- Water storing granules: In the households, the plumbers gave a drought relief product called the swell gel to residents. The swell gel was to be sprinkled in the garden and in hanging baskets before

watering. Water storing granules are known to increase water retention and aid its slow release over time, thereby reducing the need to water the garden frequently.

Observational findings revealed that all the residents found the water saving granules intriguing and this sparked wider conversations about gardening practices and water efficiency with the plumbers. In some cases, residents expressed their desire to purchase more water storing granules.

For instance, during Home Visit 1, Plumber 1's discussion with the householder about how the water saving granules work led to a conversation about how to be water efficient even when the householder goes away on holiday and about how people's normative conception of a lush garden has implications for water usage.

Such interactions demonstrate a potential exodus from the tactic of using instruments to 'excite' residents when the plumbers turn up at people's home entrance for home visits (discussed earlier in section 8.4.1), to a culture where instruments facilitate meaningful water efficiency conversations between the plumbers and residents.

- Water efficient spray gun: The plumbers gave the residents a hose spray gun which has multiple settings for the spray pattern of water. Residents were expected to attach the spray gun onto a hose pipe to help reduce wastage during watering and to increase the range of reach during spraying of water in the garden.

- Water butt: The water butt provided freely by Essex & Suffolk Water came in two sizes: 100 litres, and 190 litres. Each water butt had a stand, child-safe lid, and either a down pipe diverter kit or linking kit to connect a new water butt to an existing one.

In households with back or front gardens, the plumbers assessed the practicality of having a water butt by checking for space availability and down-pipes for rainwater or any other water butt that another water butt could be attached to. This check was done to reduce the eventuality of water butts being ordered for residents but ending up unused.

Residents were then asked if they wanted a water butt for rainwater collection. If they responded in the affirmative, a suitable size of water butt was then determined by the residents' preference or by the plumbers' recommendation, and then ordered. The process described herein illustrates customer participation in decision making and is supported by studies which warn that imposing water management infrastructures without collaboration can cause publics to disengage from water efficiency (see Sofoulis, 2005).

The next subsection describes a second tranche of water efficiency engagement in the kitchen which is the space that the plumbers typically proceeded to, to close the home visit.

8.4.5 Closure of water efficiency engagement in the kitchen

To bring the home visits to an end, most of the plumbers returned to the kitchen at the end of the water efficiency home audits. In the kitchen, the sow pot (see Figure 22) and a resource pack containing water efficiency literature materials, the home visit survey, and a 'Recommend a Friend' (RAF) card were all given to and discussed with the resident(s) present. The survey in the resource pack had a pre-paid envelop for residents to return their questionnaires by free post.

In addition, a behavioural change instrument, the plate scrapper (see Figure 22) was given to residents to help them scrape pots and pans rather than washing food remnants down the drain or rinsing plates under the tap before placing them in the dishwasher.

Figure 22 From left to right: tap magic, plate scrapper, sow pot, sow pot resource material.

Figure 22 shows the behavioural change instruments that were provided to residents in the kitchen. It must be noted that the sow pot does not necessarily save water but can be used as a small indoor planter and serves as a visible reminder of the water utility and the home visit experience for residents. And whilst the literature materials provide information and advice on situations where water efficiency should be put into consideration (such as when buying a dish washer, or a washing machine, or a water butt, or when refurbishing a bathroom), studies have shown that intensive water efficiency booklets have no impact on household water consumption (Geller *et al*., 1983).

However, during Home Visit 1 for example, Plumber 1 advised that food waste such as tea bags can be composted in the garden. The use of a bowl in the sink for washing was also encouraged to save water as the plumbers informed residents that this "*can save up to seven litres of water*." This demonstrates how the linkage between the message, space of engagement and related water usage practices were sometimes made during the home visits.

It was clear that upon closure, and perhaps to leave customers with a great experience, the plumbers sometimes emphasised water efficiency advice that were applicable to the perceived living condition or lifestyle of the residents. For instance, during Home Visit 1 and Home Visit 3, closure discussions in the kitchen appeared to be health-related and included conversations about water quality, hydration, and the health benefits of drinking water because some of the residents were either interested in water quality or appeared to have a health condition.

Further, it was observed that plumbers tailored closure conversations during home visits. For instance, during Home Visit 1, the household was found to have single occupancy and hence, the householder may not necessarily have a pile of dishes or clothes to wash all the time; and because conversations revealed that the householder was a high-income earner, Plumber 1 recommended that dish washers and washing machines should be fully loaded when in use. Such recommendation is needed for the achievement of household water efficiency and is one of the communication strategies recommended by previous studies which have found that household income (Kenney *et al*., 2008; Willis *et al*., 2011) and the frequency of use of appliances such as the washing machine (Matos *et al*., 2014) influence water usage.

This section has established that the delivery of water efficiency engagement during home visits is space-led and patterned. It has demonstrated that the plumbers play a key role in creating the linkage between spaces, water usage practices and tailored water efficiency messages, however their ability to do this systematically needs improvement. This is because sometimes, 'disorganisation of conversations' was vivid when devices were brought to the fore to encourage or incentivise residents to participate in the engagement process or when usage practices are discussed as they come to the plumbers' minds. This brings to light the role of the plumbers as a communication channel during the home visits.

Having described the planning and delivery of the Every Drop Counts water efficiency home visits in this chapter, the next section draws the chapter to a conclusion by reflecting on the identified barriers and opportunities for water efficiency engagement.

8.5 Conclusion

This chapter presented preliminary findings that constitute part of the Phase 2 empirical analysis. It has set the scene for addressing the second research objective to identify the factors that aid or stifle water efficiency engagement in a seriously water-stressed utility by elucidating the project planning aspect of Essex & Suffolk Water's water efficiency home visit campaign.

Whilst the promotion of behavioural change was intentionally passive during the marketing of the home visits to increase signups, the promotion of retrofitting and customers' self-interests in reducing their water bills were pronounced. It was clear that bill-paying customers were the target audience for marketing activities for the home visit campaign. In this way, the plans for the home visits aligned with findings discussed in Chapter 7 (in relation to WRMPs) which suggest that during the post-WRMP period, publics having transactional linkages with their water utilities were likely to be the target audience for water efficiency activities in utilities that are seriously water-stressed.

The telephone was by far the most effective channel for recruiting households for home visits, accounting for over half of all sign ups. Whilst this gives credence to the importance of easy access to publics, the absence of records about the water utility's telephone interactions and the under-utilisation of the contact centre for customer insight development was a notable loss for the water utility. There is therefore an opportunity to promote water efficiency across all departments in the water utility so that every customer contact point is a low-cost opportunity to engage publics.

Barriers to the marketing of the home visit campaign particularly in Witham town centre were found to include contracted personnel's: lack of knowledge about the utility's brand; poor representation of the utility's identity, lack of knowledge about what happens during a home visit; and the communication of mixed, incomplete, and inaccurate information about home visits to residents. All these challenges are indicative of insufficient training for agents of contractors promoting home visits.

The home visit campaign kickstarted with information learning and knowledge transfer for the plumbers. The training was crucial as public engagement and behavioural change education were new terrains for the plumbers who by trade, were technically conditioned. The training saw an increased recognition of water efficiency education and of plumbers as a communication channel as water managers encouraged plumbers to have water efficiency conversations with residents. Also, novelty in the form of roleplay was applied to training the plumbers about how to engage residents in households. Yet, it must be noted that the technical content of the plumbers' training was more detailed than the water efficiency education aspect which appeared to be in its developmental stage.

Just as findings from Chapter 7 demonstrate that seriously water-stressed utilities failed to explore customer diversity for water resources planning, the preparation for the home visits was likewise lacking any attempt to examine the differences between customers' various characteristics and dispositions towards water. Documentary evidence showed that postal and online marketing of home visits used two message frames to motivate publics: tending to concern for low rainfall in the local area to protect the environment; and more pronouncedly, financial incentives for participation.

The delivery of home visits was typically characterised by retrofitting key spaces in properties with water efficient devices, especially the kitchen and toilets. But more importantly, the new knowledge herein is that whilst findings from the review of WRMPs in Chapter 7 suggest that during the post-WRMP period, the water utilities operating in areas of serious water stress will deliver initiatives that seek to appeal to either people's communal interests or to their individual-interest in reducing their water bills, the marketing and delivery of home visits allocated more resources for free water efficient devices and free plumbing services, compared to education. This brings into question whether much innovation takes place in between the two milestones of water resources planning (between the pre-WRMP period and the project planning for water efficiency campaigns during the post-WRMP period). If not much, then there is an opportunity to tighten the top-down regulatory structures that findings from section 7.1 suggest have successfully motivated water utilities to innovate.

Having described the planning and delivery of the home visit campaign in this chapter, the next chapter discusses the Phase 2 findings relating to the factors that aid or stifle water efficiency engagement in the case study.

9 Water efficiency engagement in Essex & Suffolk Water: barriers and opportunities

The previous chapter (Chapter 8) set the Phase 2 analysis in motion by elucidating how Essex & Suffolk Water prepared for its home visit campaign. So, to fulfil the second research objective which is about identifying the factors that aid or stifle water efficiency engagement in a seriously water-stressed utility, this chapter will examine and analyse ESW's water engagement practices for effectiveness.

The role of this chapter is therefore to identify barriers to and opportunities for the home visit campaign, using the MAC heuristic to examine findings from documentary analysis, interviews, and observations. It will expand the understanding about water efficiency engagement and provide a basis upon which the thesis conclusions will be subsequently drawn in Chapter 10.

This chapter comprises of seven sections. The first section presents the drivers of water efficiency engagement from Essex & Suffolk Water's perspective. The second section discusses the utility's expectations of its publics before the home visits. The third section examines the message frames used by the plumbers to communicate water efficiency during the home visits. The fourth section examines the role of plumbers as a channel of communication including challenges and opportunities for improvement. The fifth section explores the potential to better understand the utility's publics from an observational standpoint. The sixth section brings the chapter to a close with a discussion and conclusion.

9.1 Wider motivations for water efficiency engagement

Findings from the review of WRMPs developed by utilities operating in seriously water-stressed areas (Chapter 7) revealed that Essex & Suffolk Water was motivated to carry out water efficiency engagement due to regulatory expectations and the impact of population growth on water supply.

Documentary analysis in the Phase 2 analysis however expand on Essex & Suffolk Water's underlying motivations for water efficiency engagement. The research findings revealed historic supply-demand crises and re-investments in Essex & Suffolk Water that provide the context for the development of water efficiency engagement in the water utility. For instance, by 1906, there was insufficient water supplies to meet increasing demand, motivating the introduction of the Great Yarmouth Waterworks and Lowestoft Water and Gas Act 1907 (see The London Gazette, 1907) which permitted abstraction from the River Bure. Likewise, by 1918, water levels in drilled boreholes had dropped causing a demand-supply imbalance. According to ESW's own documentation, by the

1930s, the water company had drilled 36 wells due to increasing demand, and declining freshwater available for abstraction motivated the further development of the Hanningfield Reservoir (see ESW, 2016; ESW, 2017a).

According to Essex & Suffolk Water (2014a), the utility has been promoting water efficiency since the late 1980s in the form of the distribution of water saving packs to households. Events in the 1990s were however a game changer. 1990 was very warm and this resulted in lowered storage levels in the Abberton and Hanningfield reservoirs than the historic average for most of the year (see ESW, 2014a). Thereafter came the infamous 1995-1996 drought. Essex & Suffolk Water reported that in 1995, its 'total demand was higher than the 10-year average for 10 months in the year' (Wilhite and Glantz, 1985: 203). The water crisis of 1995-1996 led the utility to launch its first ever water efficiency engagement project. Following weather pattern analysis, the utility found that subsequent low rainfall, low reservoir levels, and increasing demand in 2003, and in 2005 exacerbated water scarcity (ESW, 2014: 202-203), thus motivating increased water efficiency engagement.

For starters, the water utility gave customers 'water efficiency packs containing information and gadgets to help customers measure and reduce usage.' These gadgets were given to customers with the intention of making water efficiency easier. For example, customers were given a measuring cylinder to help them measure leakage from taps and were given a hand-held hose control to reduce wastage from hosing (Sefton and Sharp, 2005).

According to the Water Efficiency Manager:

> "*If you go back 20 years ago, what all companies were doing was sending out save-a-flushes and a few other products to customers, [and] having information on their websites. I think in the early days, it was really testing out all the different ideas of what could work…testing out retrofits and the best way of delivering them and then on top of that, how you actually present them to customers, how you actually encourage engagement*…"

So, how did water efficiency education come into the mix?

Findings from the research interviews suggest that although in the mid-late 1990s, the water utility had conversations with its customers in relation to changing how they use water, those discussions were not as prominent as the conversations relating to water efficient devices.

According to the Water Efficiency Manager, "*it was in response to the drought [which lasted 1995-1998] that Essex & Suffolk Water started considering water efficiency on a wider scale*..." in 2007.

In addition, the Water Efficiency Manager claimed that the utility came to a realisation that "*the individualistic interventions [installation of water saving kits by customers] had plateaued*…" This claim is consonant with the 2006 re-examination of 18 out of the 24 households that were part of the 1998 New Build Water Efficiency Homes retrofit programme which showed that retrofitting did not lead to long-term water efficiency (Smith and Shouler, 2001; Knamiller *et al.,* 2006).

So, in 2007, the first phase of Essex & Suffolk Water's household water efficiency project called H_2eco (now renamed and rebranded as Every Drop Counts in 2015) was launched. Referred to as 'a key component to ESW's water efficiency strategy,' the project takes a whole-town approach to water efficiency engagement by retrofitting household water systems in specific towns with low levels of rainfall (Andrewartha, 2013). Running in parallel with this household water efficiency project was another project called ecoFIT which targeted households to convert their single flush toilet handle to a dual-flush device using an ecoBETA (ESW, 2012a).

Meanwhile figures showed that the UK water demand continued to rise in the 2000s. Thus, in October 2008 (in AMP5), Ofwat (2009: 51) introduced a water efficiency target mandating that from 2010, all water utilities were to make an annual water consumption reduction of one litre per person per day.

Today, Essex & Suffolk Water considers itself a pioneer for delivering water efficiency home visits using its whole-town approach. As summed up by its utility's Demand Planning Project Manager, the water utility now delivers technical, educational, and combined water efficiency engagement:

> "*We do everything else; there is supply – we can increase supply by building a new reservoir, building more boreholes, or we can transfer water…and therefore be more interconnected... on the demand side - water efficiency…metering, leakage reduction*."

This section has established that in addition to regulation, droughts and flatlined water demand reductions due to the sole reliance on technical interventions led to increased water efficiency engagement and motivated the development of the EDC home visit campaign in Essex & Suffolk Water. The next section presents the utility's expectations of its publics following engagement.

9.2 Expectations of the public before the home visit

Findings from the review of WRMPs developed by utilities operating in seriously water-stressed areas (Chapter 7) revealed that Essex & Suffolk Water expected its water efficiency education to improve how its publics perceive and use water. In addition, according to the information on the water utility's

website, the normative position that the utility takes with every customer encounter is to be customer focused. The ideal expectation of the utility in terms of customer centricity in water efficiency engagement is that it proactively collects feedback from its customers to anticipate how to engage them about water efficiency. However, findings from the case study demonstrate that some practices in the utility which will be discussed in this section are not consonant with customer-centricity.

There was a difference between how publics were perceived by the water managers prior to home visits and how they became understood by the plumbers during and after home visits. This is because the water managers did not provide the plumbers with information about the customers to really be customer-focus.

For instance, because minimal customer segmentation information was held and used for preparation within Essex & Suffolk Water prior to home visits, the utility made some assumptions about factors that will motivate its publics to be water efficient. This was compounded by the absence of information about customers' water habits and preferences at the point of scheduling home visits, and by the plumbers not being provided with the preliminary household information collected by the contact centre (such as the number of and type of flush toilets in the house, household occupancy, property type and age, and the ownership of the property).

According to Plumber 3:

> "*We [plumbers] get information upfront about how big a property is bathroom-wise… the address, a little bit about the size of their property, and if they have a water meter… sometimes it does say if they have pets. That is literarily the only information we [the plumbers] get."*

This was corroborated by the Demand Planning Project Manager who confirmed that other information held including "*building type, history of leaky loos*" were all gathered because these gave an idea of the potential duration of a home visit for planning purposes but did not inform the plumbers' visits.

The dearth of insight about publics prior to engagement brings the conversation about Essex & Suffolk Water's expectations of its publics to the fore. In relation to what the water utility expected of its publics for engagement to be considered successful, the water managers expectations differed from those of the plumbers. On the one hand, two out of the three plumbers said ideal publics had to be "*nice and friendly, welcoming, tidy and home-proud in terms of hygiene*" whilst only one plumber thought that ideal publics ought to be "*interested [in water efficiency]*." On the other hand, the water managers expected ideal publics to be "*informed, aware, and engaging.*" In this light, the Water

Efficiency Manager stated that customers who have been paid a home visit should "*be more informed about products… [and] water efficiency [should] be part of their consideration [when purchasing household products]*." The Demand Planning Project Manager thought that "*at the end of the visits, [ideal publics should*] *be aware of how to use products installed… and that this [water] is a resource that is costing money*." Likewise, the Water Demand Analyst thought that soon, ideal publics should "*have continued interaction [with the water utility] without the need to remind them [the publics], should [give] feedback, and should [achieve] a percentage reduction in their water use year on year*." This view on the need for continuous engagement is in line with Pereira *et al.*'s (2012) suggestion that:

> "[*Success achieved through water efficiency*] *must not be diminished since communities need continuing education and consciousness-raising in order to maximise the ongoing support… for water resource protection and preservation*."

Collectively, what the findings here reveal is the need for the preparation for home visits to include the consideration of what the utility expects of its publics and linking those expectations to insights about households and residents currently known and intended to be sought during the home visits. This can help reconcile the difference between the responsibilities that the water managers and the plumbers place on publics so that the plumbers do not separately focus on the aesthetics of home visits while the water managers focus on how publics are expected to change how they see and use water following engagement.

Having established that lacking insights about publics to be engaged inhibits the breadth of the plumbers' preparation for home visits and consequently limits their expectations of publics, the next section discusses how the plumbers sought to motivate household water efficiency via messaging.

9.3 Message frames used during the home visits

As revealed earlier in section 2.4.1, the message is the intent of communication recognisable in interactive conversations or implicit in non-interactive actions, for example, the installation of water efficient devices by water utilities to orientate publics towards reducing their usage. And messages do not exist without frames to get publics thinking a certain way or taking a desired line of action.

Findings from the review of WRMPs developed by utilities operating in seriously water-stressed areas (Chapter 7) revealed that Essex & Suffolk Water planned to deliver water efficiency engagement through metering, retrofitting, and education that relies on plumbers effectively having conversations with customers to challenge and influence their habitual water use and achieve behavioural change.

However, the water utility did not cite any behaviour-influencing tactics planned to be used by its plumbers neither did it indicate how the effectiveness of water efficiency conversations would be demonstrated. In this light, this section discusses the interpretations of findings relating to the message frames identified in conversations between the plumbers and residents during the home visits.

Evidence suggests that taglines affect the effectiveness of campaigns, yet water utilities do not appear to deliberate on this factor. Particularly, Icaro (2013) suggested that 'every drop counts' and 'use water wisely' are the taglines least preferred by the public. However, Essex & Suffolk Water used both taglines for its home visit campaign but did not explore their impact on effectiveness.

During the home visits, the call for publics to change how they use water to achieve water efficiency became more pronounced in comparison to during the marketing of and awareness campaign for home visits discussed earlier in section 8.2 and section 8.3, respectively. Speaking of the position of water efficiency education in the utility's engagement activities in the past and present, the water utility's Water Efficiency Manager explained:

> *"We have never forgotten about it; it just has not been as obvious as the products; but we are doing a lot of that better now… now we see water efficiency [education] as important."*

During the home visits, engagement proceeded beyond the scope of securing water supply for the future as the plumbers were seen attempting to increase the residents' awareness of the problem of increasing water demand. In this light, climate change and the need for behavioural change were the main entry points for conversations initiated by the plumbers, low rainfall was a suitable exemplar of climate change impacts and served as the most universal appeal made for water efficiency in households. Particularly, low rainfall allowed the plumbers to localise the problem of water scarcity and the subject was used to discuss the need for increased water efficiency.

Low rainfall was however disputed by residents on occasions. For example, during Home Visit 2, the householder contested the plumber's claim that Witham was facing a water scarcity problem, retorting:

> *"Oh really? but it has been raining for the last few days, and it is raining now [pointing at the view through the kitchen window] …why not collect it [the rain]?"*

Householder 2's perspective is in line with research findings that indicate a wide public assumption that the UK experiences high rainfall and there is enough water to meet current and future demands (Holt *et*

al., 2000; Icaro, 2013). Also, the householder's disbelief and detachment from water efficiency is an illustration of studies which have shown that publics' individualistic beliefs can impede their sense of immediacy to effect change (Spence *et al*., 2012). Further, the householder's expression "*why not collect it*" is indicative of the perception that adaptive response to climate change is beyond one's power (Taylor *et al*., 2014).

Visible rainfall during water efficiency engagement however low can be problematic because studies have shown that perceived rates of rainfall influence urban water use (White *et al.*, 2003). Also, water utilities may encounter push backs when they communicate with publics using a message frame that they – the publics do not resonate with.

For instance, the interactions in Household 2 are reminiscent of an ironic photograph of Thames Water's 'We are in drought' advert on a London bus (Figure 23) taken by an unknown individual on a rainy morning in April 2012.

Figure 23 'We are in drought' advert (Reddit/ United Kingdom, 2012).

Posted on Reddit's UK online community (2012), Figure 23 sparked a debate about the conflicts created by the British weather and the water messages that water companies communicate to the public. Many members of the Reddit online community who contributed to the conversation showed a lack of concern for the drought issue being publicised, thus echoing O'Neil and Nicholson-Cole's (2009) findings from focus groups that while communicating alarming imagery can stir up public concern, it can also increase public denial and indifference to the issue at hand (as also seen with Householder 2).

What was notable about the conversation in Household 2 was that failing to recognise the significance of Householder 2's rhetorical statement: ("*Oh really? but it has been raining for the last few days, and it is raining now…why not collect it [the rain]?"*), Plumber 1 replied: "*I know… I do not like the rain either…*" This was clearly a missed opportunity for the plumber to increase the householder's understanding of the issue of water scarcity by dispelling the myths around rainfall and abundance and by explaining how other factors asides climate change impacts, for example, population growth and increasing demand could have compounded the problem of water scarcity experienced in Witham.

It is therefore imperative to note that the findings herein suggest that seasonal timing is a factor to consider when delivering home visits as visible features such as rainfall can influence how some publics receive water efficiency messages from the plumbers. It is also important that plumbers are well equipped to navigate such conversations.

In this light, whilst discussing the effect of conducting home visits during wet periods on the public's perception of water scarcity, Plumber 2 suggested that water efficiency education was the key to creating context when customers point out factors that contradict their beliefs or do not resonate with them:

> *"I think it is important to engage with the customer for educational purposes..."*

If Householder 2 were more aware of environmental issues, the missed opportunity for the plumber to deliver the ideal water efficiency education (for example, challenge the resident's beliefs about rainfall and abundance) could have impacted on the quality of the home visit experience.

An example of a different navigation of a similar conversation was an encounter with a keen householder during Home Visit 4, wherein the mother (a homeowner) and her daughter seemed to be enthusiastic about water. Upon probing by the plumber, it emerged that they could benefit more from water efficiency education than retrofitting:

> Plumber 2: *Do you have an idea of what we are here to do?*
>
> Householder: *I do. I read the literature.*
>
> Plumber 2: *Right, we are here obviously to see what we can fit to your taps, toilets, and showers…financially, we are aiming to reduce £30 - £40 a year on your water bill… But I think this is where you come into it. We have for a long time been fitting products but this year, we are looking at people's habits including improvements that you can do yourselves including [plumber points to another occupant in the house] that can make a major*

difference; it is things like leaving the tap on when you brush your teeth, ah! shower time – this is what is interesting [Plumber pulls out a shower timer] …

Householder: *You will have to speak to my daughter - she showers, I have a bath [laughs and turns to the daughter] … How long would you say you are in the shower for?*

Daughter: *About fifteen minutes on the average…*

Speaking of this engagement encounter described in Household 4, Plumber 2 said:

"Education is key [compared with fitting of devices]. I feel bigger results have come out from 'how long are you in the shower,' 'don't leave the tap running while you brush your teeth,' and 'use the dual flush toilet properly;' more litre-savings have been taken out of that…because you [publics] can make bigger changes."

Whilst Plumber 2's advice is in line with Attari's (2014) findings that people believe that a reduction in practices such as taking shorter showers and turning off the water while brushing teeth are more effective measures for achieving water efficiency than retrofitting water systems, what is important here is the plumber's ability to probe the residents further to understand when, where and with whom certain water efficiency messaging will resonate.

Considering message tailoring, the utility's Water Efficiency Manager confirmed that "*message will be different for every customer. Some will want to see that from an environmental perspective, some will want to see that from a monetary perspective.*" Similarly, the utility's Water Demand Analyst highlighted that "*saving the environment is sometimes effective for some groups of customers especially if they live near a river and can actually see the difference - protecting the habitat.*"

An illustration of the tailoring of rhetoric emerged in the unmetered households visited, wherein the plumbers were the ones who initiated conversations around metering mostly at the early stage of engagement to confirm that there was no meter, and thus identify whether the 'reduce water use to reduce water bill' or the 'reduce water use to save the environment' rhetoric will be most appealing to the residents.

For instance, very early on during Home Visit 1, the householder informed Plumber 1 that the property was unmetered. Plumber 1 thus replied:

"Since you say you are not on the meter, we are not here to save you money on your bills but to save water in general; if we do anything [retrofit] to your taps… potentially we can save

you money on your energy bills. The reason we are in Witham is because it has low rainfall now…"

However, in supply areas like Witham, the water utility's assumption was that residents do not see a physical body of water that can contextualise the linkage between water usage and the depletion of rivers, and that publics take water for granted because they do not place an economic value on it and do not understand the processes involved for the utility to supply it to households.

So, to create an alternative visual representation of the problem of water scarcity, some of the plumbers found it helpful to compare the monetary cost of other beverages with that of water to evoke emotions about the value of the resource. In this light, Plumber 1 argued for constructing water efficiency messages within visual and familiar frames such as everyday life exemplars rather than regurgitating the content from the Essex & Suffolk Water's plumbers' training to the customer, stating thus:

"I talk to them about saving water, but I am not just reading the thing [literature]; I translate litres into coke bottles in a way that they can understand."

Similarly, Plumber 2 spoke of his approach to framing messages about the value of water to publics who may undervalue it, stating thus:

"Some people moan about the price of water and my argument is that the process that water has to go through to make it drinkable is quite a programme. I say you are paying £1.40 per cubic metre for water and yet you are going down to Sainsbury's and do not think anything of spending £1.68 on a litre bottle of coke."

It must be noted that because five out of the six observed home visits were in unmetered households, meaning that they could not make any financial savings on their water bills, the plumbers framed water efficiency messages predominantly around communal action. This was a shift away from the blanket message of cost-savings on water bills communicated to customers throughout the marketing phase of the home visit campaign.

This section has established that low rainfall due to climate change and the need for people to change how they use water were the plumbers' main entry points for conversations with residents during home visits. It highlighted that the plumbers' appeal for communal action was pronounced during home visits and the plumbers framed water efficiency messages around the value of water especially in unmetered households. However, it emerged that some plumbers could not recognise residents' expressions of their

perceptions of water and how these inhibit the achievement of water efficiency. This barrier was due to communication abilities and tactics that were lacking on the part of the plumbers.

The next section explores the challenges faced by the plumbers that inhibit effective communication about water efficiency with residents, and opportunities for improvement.

9.4 The plumbers as a channel of communication: challenges faced

Findings from the review of WRMPs developed by utilities operating in seriously water-stressed areas (Chapter 7) revealed that in Essex & Suffolk Water particularly, the plumbers were explicitly foregrounded as an important channel for communicating water efficiency messages and modifying customers' usage-related behaviours during the home visit campaign. As the plumbers deliver thousands of home visits annually, this section thus brings to the forefront the challenges they face during water efficiency engagement and more importantly, in facilitating water efficiency education.

The case study of Essex & Suffolk Water's home visits demonstrates that trained plumbers are a channel of communication as these personnel have two sets of expertise that are key to water efficiency engagement. First, by the nature of their work, they are technically astute to carry out retrofitting and educate residents about their water systems. Second, the plumbers' social skills are increasingly required as the nature of home visits has evolved to include public engagement.

During conversations with the residents, albeit with some distortions, the plumbers communicated water efficiency messages with pro-environmental intentions like how the literature describes that information endorsers, docents, communicators, environmental educators, and trusted messengers do (Mony, 2007; Lamm *et al.*, 2016; Lu, 2020). This was discussed earlier in section 2.4.3. Yet, the findings from observation of the home visits revealed that interactively engaging with the plumbers led most residents to recognise and acknowledge their responsibility for water efficiency.

Whilst the aim of this case study is not to measure the influence of plumbers as a communication channel using any criteria list, challenges that create ineffectiveness in the water efficiency engagement process during home visits were identified. These challenges will be discussed in the subsequent subsections.

9.4.1 *Insufficient information to prepare for home visits*

First, not being specialised in motivating publics to change their water usage behaviours and practices was a challenge highlighted by the plumbers. In this respect, we can see the plumbers as having received insufficient training or information to prepare for the home visits. The plumbers expressed that they lacked basic information that could have helped them know more about customers prior to

home visits. Speaking about how not being privy to information affects their ability to form a baseline understanding of customers, Plumber 1 said:

> "*For example, the contractor asks if customers have button toilets [dual flush] but they [the contact centre] do not put it on the PDA [Personal Digital Assistant] device for us to know… but they do know what we are walking into.*"

And why is this important?

The plumbers have expressed that their planning for home visits is very rudimentary because they do not have much information to prepare. For instance, information such as the presence of dual flush toilets can give the plumbers preliminary insight about the type of household being visited and this can help them to identify and target potential flushing practices to incorporate into messages for verification or enlightenment purposes.

A further aspect of this barrier is that whist multiple residents were often encountered during home visits and the plumbers had diverse conversations with them, emerging understanding of these publics were not recorded because the PDA device was designed to document more statistical information about the household infrastructure rather than information about the people or interactions in households. It must however be highlighted that in considering how to use the PDA device to document insights from home visits, data protection considerations come into play. This might be managed, however, by recording insights as pseudonymised entries.

Second, the plumbers were disadvantaged due to being unaware of who the water efficiency education would be delivered to in households. In this respect, still, we can see the plumbers as having received insufficient information for preparation. Not knowing who will be engaged during home visits is due to several factors under the control of the customer and the water utility. For example, Plumber 3 highlighted that in some cases, "*their wives booked it [the home visit] and left the husbands to do it [be present in the household]*." This statement shows that the water utility did not gather information on the number and role of residents in households. The water utility also failed to recognise that the number of people present in the household at the time of visit may not equate to household occupancy at other times. Contrary to the findings from observations about household occupancy during the home visits, the Demand Planning Project Manager stated:

> *"…The conversations I have with plumbers in the past show it is normally one person that they are going around with or not as the case may be but I have not got any number which I collect on who is going to be at the visit and how many people are there because I have not*

seen value in that before now that you are talking about behaviour and the need to know about the people in the household, not the household as the person who is at the visit."

When the plumbers were asked about why water efficiency discussions during home visits sometimes focused on the householder present rather than on the totality of residents, Plumber 2 replied:

"We can ask that (about the other/absent occupants) so we can dive into and work out whether they should be on a meter [for example] but we don't ask that [about other occupants] and maybe that is something [we should be asking]."

Only two of the six households observed had only one resident present; and in those households, conversations revealed that there were other residents unavailable at the time. These conversations even included third-party accounts of the absent residents' water usage practices. An illustration of this was seen during Plumber 2's visit to Household 5 where although being the only person present at home, the householder said the following:

"It is only two of us in this four-bedroom house… we might have 3-4 baths in a year, we just shower…I am only in there [the shower] very briefly – it is a splash and dash, but my other half washes her hair [so] she will be in there longer… We enjoy spending time in the hot tub outside…"

The water utility's Demand Planning Project Manager ascribed the utility's acceptance of plumbers' unverified views on household occupancy to:

"Not seeing the value in that before... [i.e., not seeing the values in] the need to know the individual people in the household, rather than seeing the household as the person who is at the visit…it is not normally the case that you have more than one person in the home when the plumber visits."

9.4.2 Mis-selling of home visits

Although Essex & Suffolk Water's WRMP suggests that metered households with high usage were to be targeted for home visits, it became clear that home visits were sold to all eligible households without any message frame designed to target those with high level of water use. During the EDC Witham home visit campaign, multiple factors thus impacted the communication of water efficiency with publics.

First, some plumbers and residents expressed reservations about how home visits were sold by Essex & Suffolk Water to the public on the grounds of free plumbing services or free water efficient devices or cost savings on their water bill. The water utility has conducted previous studies which show that its customers are not motivated by incentives (Essex & Suffolk Water, 2014a), yet it still mostly readily motivated its publics to be water efficient by seeking to appeal to individual interests in reducing their water bills or having free water efficient devices or plumbing services. This covert masking of the hard-sold home visits in non-guaranteed benefits can however be detrimental to water efficiency engagement if some publics' expectations for freebies were unmet.

Since the water utility's ultimate expectations of publics following home visits was for them to become aware, informed, and willing to engage with the company on a long-term basis, the plumbers framed communications to residents to appeal to their communal interest in saving water. Sometimes, the plumbers also targeted different habits and practices in households with multiple occupants by adapting their communication style and content using social comparison, visualisation, and contextualisation.

Problems in the communication process however emerged when some publics sometimes felt that their expectations were fluctuating, or that they had been unmet by the water utility throughout the engagement process. In these instances, some residents anticipated cost-savings at the point of receiving marketing materials through the post and were then made to understand otherwise during their home visits after the plumbers had identified their property as unmetered.

Obviously, the 'save money on water bills' message frame was untrue for unmetered households and misconceptions about the purpose of home visits meant that some publics became more fixated on obtaining free water efficient devices than on engaging with the plumbers on crucial subjects such as water scarcity, usage, behaviours, practices, wastage and efficiency.

Conflicting customer expectations was however unsurprising because most households recruited for home visits were unmetered, meaning that publics could not have expected to achieve savings on their water bills. However, it was the water utility's responsibility to give its publics accurate information on expected benefits so that conversations initiated by plumbers did not come as a surprise to them.

9.4.3 Insufficient knowledge and skills for water efficiency education

The research findings revealed that the plumbers lacked the knowledge and skills required for water efficiency education in comparison to the water managers. Behavioural change education as the water utility refers to the practice, was found to be a new terrain for the plumbers. As such, the plumbers this inhibited them from pushing the water efficiency agenda forward in households.

For instance, the plumbers' limited knowledge on climate change and metering inhibited their ability to educate some residents about water issues. It became clear in the field that these plumbers had mastered the sound bites for the water efficiency home visit campaign, without acquiring in-depth knowledge necessary for wider conversations, for example, climate change and metering.

For instance, it is known that people in the UK lack awareness about the water meter (Owen *et al.*, 2009), so it is unsurprising that some residents encountered during home visits were unclear about how to apply for a water meter. Yet, the ownership of a smart water meter was not actively promoted in water efficiency conversations neither were the plumbers able to provide clear guidance on metering when some residents brought up the subject of eligibility and application process. This problem to some extent can be attributed to insufficient training on the part of the water utility.

9.4.4 *Not having an eye for customer insight*

It was clear that the plumbers did not have an eye for recognising insights about residents in the field that could benefit water efficiency engagement. This was because the plumbers were somewhat accustomed to capturing only quantitative evidence during home visits partly because they were technically inclined by trade and water efficiency education was a relatively new inclusion in the home visit campaign.

For instance, during discussions with the plumbers, the researcher brought it to their attention that four out of the six households visited had a pet. The researcher therefore sought to explore with plumbers whether pet-ownership was information that the water utility could benefit from knowing to design a new and innovative product for residents to shower their pets efficiently, or to reflect the implications of pet-showering for water usage and efficiency in their messages.

In relation to spotting opportunities to advance water efficiency engagement, in an interview with Plumber 3, the researcher asked whether the presence of a dog in a home could have been incorporated into the promotion of water efficiency since three out of the four households with pets had at least one dog, and the presence of a dog in a household can have an impact on water usage if these pets are being taken on walks in muddy areas. Plumber 3 replied: "*I think it is not really significant… We just point out the facts around using kitchen taps*." This plumber's response brings to the forefront, their inability to think creatively about water management and appeals that can resonate with publics.

This explains why the plumbers were sometimes unable to weave behavioural change conversations during the home visits and sometimes missed cues for insight development from their conversations with residents. For example, even opportunities to address water scarcity contradictions during

conversations with residents were missed. It is thus clear that the plumbers, although technically astute, lacked some essential skills outside of practical water efficiency product fitting.

The water utility's knowledge about its publics after a home visit is thus not much better than it was prior to the home visit. And this is summed up by the Demand Planning Project Manager's statement:

> *"We do not know a huge amount more about the customer. Most of our data collection is at the visit."*

And in terms of where all the new qualitative insight from water efficiency home visits goes, the Demand Planning Project Manager portrays it as ultimately lost, stating thus:

> *"It [customer insight] stays in the plumber's head."*

This lost customer insight is a challenge in the water industry, with stakeholders expressing the need to better understand and manage water demand as one of the key research priorities for the water sector (see Brown *et al.*, 2010). Part of understanding water demand is developing knowledge about proxies of household water consumption and modifiable water behaviours that can constrain people trying to adopt water efficiency (Doron *et al.*, 2011; Browne *et al.*, 2013).

However, wherever conversations during home visits revealed insights about customers (such as reasons why customers do not have a water meter, novel water saving tactics innovated by publics, inefficient water habits and practices in households, or membership of community groups etc.), the insights can be lost for example, due to the absence of feedback mechanisms between the plumbers and the water managers to share new knowledge.

It must however be noted at this point that the plumbers' slowness to develop an eye for customer insight in the field was partly due to the water utility's prioritisation of recording numbers during home visits. The PDA device was robustly designed to capture statistical data such as flow rates of taps, but the device had little capability for capturing qualitative data on residents' water habits, practices, and preferences as well as new insights learned during home visits. In this respect, we can see that the PDA device having insufficient capabilities to record contextual information is a barrier to the water utility developing a better understanding of its publics. In other words, the water utility still knew little about its publics even after water efficiency engagement was delivered.

It is noteworthy that because of this study, Essex & Suffolk Water's water efficiency team introduced regular plumbers' training sessions into its EDC home visit campaign schedule and launched a plumbers' forum.

The plumbers' training session was to increase the frequency of knowledge sharing and information sharing, in contrast to the once a year 3-day plumbers' training that used to take place at the beginning of each annual EDC campaign.

The purpose of the plumber's forum was to serve as a space for the water managers and plumbers to share feedback about home visit experiences to improve project planning and engagement practices. The first plumbers' forum meeting was held a year after the EDC Witham campaign (during the delivery of the 2018 Barking and Dagenham EDC home visit campaign). Essex & Suffolk Water invited the author to observe the session. Discussions on the day concerned how the plumbers found that residents preferred water efficient devices such as magic taps and water butts, residents' frequently asked questions about metering, residents' attitudes to water observed in households, and the frequency of future plumbers' training. Interestingly, Plumber 1 brought a painting about water efficiency to the forum. The family who made the painting presented it to the plumber during their home visit. The forum then agreed to contact the family and feature them and their painting in promotional videos for the EDC campaign.

9.4.5 Mismatch between assumed and observed factors that motivate publics

It emerged from the research findings that there was a mismatch between the water utility's assumptions about its publics during the planning of water efficiency engagement and the public dispositions observed during the delivery of home visits.

For instance, the water efficiency messages communicated by Essex & Suffolk Water to publics (through marketing channels) prior to home visits were framed based on the utility's assumption that cost savings on the water bill, free visits from a qualified plumber, and free water efficient devices would motivate publics to apply for a home visit and ultimately become water efficient. The marketing of the campaign therefore implied that publics were strongly motivated by individual interests than their communal interests to save water.

But the case study revealed the contrary. Findings showed that publics were motivated to sign up for their home visits not only due to their interest in saving money, but also due to their interest in saving water, in validating their water efficiency efforts, and in addressing their water efficiency knowledge deficit.

In fact, a follow-up survey conducted by Essex & Suffolk Water 6-8 weeks after the EDC Witham campaign showed that there were five times more respondents who claimed to have signed up for a home visit due to their sole interest in saving water (81 respondents) than those who indicated that they signed

up for a home visit solely to reduce their water bills (17 respondents). Most respondents with reduced usage were motivated by their interest in saving both water and money, thus reinforcing that the mismatch between perceived and observed public disposition is a statistical anomaly.

This section has established that the challenges that the plumbers particularly identified as inhibiting their role as a communication channel in water efficiency engagement include: lack of sufficient information about residents to better prepare for engagement; unmet public expectations during home visits due to the water utility's covert selling of campaign by promoting freebies and reduced water bills; the plumbers' lack of soft skills to engage publics effectively; lack of knowledge and skills for water efficiency engagement; technology limitations that inhibit the recording of insights about publics on the PDA device; and the lack of feedback mechanisms between the water managers and the plumbers which stifles lesson learning for practice improvement.

The next section expands on how the Essex & Suffolk Water's understanding of its publics could evolve following home visits if feedback mechanisms between the water managers and the plumbers existed.

9.5 Water utility's understanding of publics after home visits

As revealed earlier in section 2.4.2, the audience in water efficiency engagement are the publics who are targeted by the water utility during activities.

Findings from the review of WRMPs developed by utilities operating in seriously water-stressed areas (Chapter 7) revealed that Essex & Suffolk Water segmented its customers using the ACORN classification (a sociodemographic segmentation model). However, the description of the preparation and delivery of the home visits presented in Chapter 8 expanded the research findings by showing that the ACORN classification was not used to tailor engagement to target publics, did not inform plumbers' conversations during the home visits observed, and it did not improve the utility's understanding of its customers visited. Chapter 7 concluded by questioning the relevance of sociodemographic indicators to water efficiency engagement practices in Essex & Suffolk Water. In addition, earlier literature discussions have also established that the understanding of the customer in the UK water sector is unclear. This section therefore examines other underlying reasons why Essex & Suffolk Water's understanding of its publics did not increase despite the home visits.

Whilst documentary analysis revealed that the Water Efficiency Team "*sees customers on different levels - pupils in primary schools… [or] secondary schools – [even though] obviously, they are not the bill-payers but they go home to the people who are paying the bills… [or] people who use water at a very basic level…[or] elderly people…[or] people who we work with on a day-to-day basis…*

[or] employees… [or] colleagues," the lack of insight about publics was evident in the Demand Planning Project Manager's reflection on the water utility's customers:

> *"I do not have a clear [idea of who the customer is] … there is no individual customer or group or a specific person… [the customer is] the people we supply water to – the household really."*

In addition, a member of the Water Efficiency Team's stated that:

> "*Primarily the customer is the bill-payer because they pay the bills and without the bills being paid, we cannot run a company*…"

The quotations above suggest that the Water Efficiency Team unknown to themselves, have divergent views of the water utility's publics.

But, whilst the water utility perceived its publics through the single lens of the customer or the household prior to home visits (as revealed in Chapter 8), further findings about engagement during the home visits demonstrate that indeed, segments of publics exist but customer characterisation is not a concept that is actively explored by the water utility.

Despite the understanding of UK publics being unclear, findings from interviews with the plumbers suggest that the water utility was disadvantaged for not getting more value from insights about the water utility's customers. This is because over the years, the plumbers in Essex & Suffolk Water were able to decipher different customer dispositions towards water and water efficiency.

For instance, all the plumbers stated that prior to water efficiency home visits, their understanding of publics came from who was named on the water bill, from information about the person who booked the home visit, from whether the household is metered, from the size of the house, or from the number of water systems (such as taps) in the house. And their expectations of the publics were related to the aesthetics of their properties (discussed earlier in section 9.2).

However, following the home visits observed, the plumbers began describing their target audience using some typical terms such as 'customers,' 'people,' 'residents,' or 'the community.' The plumbers expressed that they learnt more about households including residents' dispositions towards water and water efficiency engagement. In addition, they claimed that over the years, they had developed a bank of insight about the water utility's publics.

In other words, the home visits allowed the plumbers to gain a personalised understanding of publics. However, the water managers were not privy to these insights specifically because they had little to no communication with the plumbers. This brings to the forefront how a disjuncture between the water managers and the plumbers poses barriers to water efficiency engagement and renders publics poorly understood. This can be problematic because the water utility risks treating its publics as homogenous. A recent study of 1196 UK households by Russell and Knoeri (2020) found that habits were the most important predictor of water efficiency intentions. In this light, the alternative for the utility would have been to take advantage of the plumbers' knowledge, however anecdotal, to increase its understanding of its publics' diverse characteristics, habits, and water values to improve how they are engaged.

So, to demonstrate the value of sharing insight gained in the field between the plumbers and water managers, the plumbers' perceptions of residents over the years, along with the researcher's observation of the attitudes, beliefs, and habits of those encountered during the home visits were themed into five informal understandings of publics (keen, money-centric, unaware, unbothered, and zero-price chasers).

These segments of publics will be discussed in turn in subsequent sections. It is important to highlight that there were multiple residents present during the home visits (see Table 8), meaning that in some cases, characteristics that typify multiple segments of the public were observed in a single household. It must however be noted that these segments described below are not exhaustive and are not generalisable findings about publics. They are used herein to demonstrate how segmentation can provide opportunities to improve water efficiency engagement practices in a utility that is seriously water-stressed.

In particular, the classification of publics shows how Essex & Suffolk Water could utilise and develop existing categorisations in the literature (for example, clusters discussed in section 2.4.2) to inform its water efficiency engagement. A characterisation of publics which was systemised from and with the plumbers, and designed for their ongoing use, would have the advantages of being: (a) more clearly localised; (b) up to date and regularly updated; (c) focused on precisely the population who accept home visits; and (d) from an observational lens rather than from the self-reporting lens which most existing studies have used.

Before presenting the classification of publics, it is equally important to highlight the elements of observation (by the author, or as reported by the plumbers) that informed this casual categorisation:

- Residents' engagement with water efficiency literature sent to them by the water utility prior

to their home visit.

- Residents' statements about their perception of water and water scarcity.
- Residents' statements about their motivation for water efficiency.
- Residents' statements about how they use water.
- Benefits of being water efficient that the residents are interested in.
- The presence or absence of water systems in their properties.
- The presence or absence of water efficient devices in their properties, including the water meter.
- Residents' enthusiasm for fitting and understanding new water efficient devices.
- Residents' engagement with the plumber and with the home visit experience.
- Residents' interrogation of the water efficiency advice that the plumbers provided.
- Residents' discussion about water efficiency in their wider communities.

The elements listed above are important to highlight because they indicate the nature of feedback that the plumbers can provide to Essex & Suffolk Water following each home visit, in addition to the product installation data recorded in the PDA device. There is therefore an opportunity to incorporate these elements into the form that plumbers complete and submit on each home visit.

9.5.1 Keen publics

Attitudes described by Russell and Fielding (2010) enabled the identification of keen publics:

> "*…If people have a positive attitude towards water conservation, if they perceive that important others in their life think that it is a good thing, and if they think that it is something they can easily do, they will intend to engage in water conservation and their intentions should in turn translate into water conservation actions."*

Findings revealed that some keen residents were willing to engage with the plumbers, were interested in civic participation, and were interested in learning how to save water regardless of their current level of water efficiency. They were also eager to refer a friend for a home visit.

For instance, whilst Plumber 3's perspective was that *"some people are generally good and will say they are up for saving the environment,*" the enthusiasm of keen publics was recognised during Home Visit 3 when a disabled wife who was downstairs engaging the plumber conversations, insisted on hoisting herself upstairs to the bathroom to continue the conversation even though her husband made it known that he was happy to accompany the plumber upstairs by himself.

Likewise, another keen resident was identified during Home Visit 4. This resident described how they had been collecting rainwater for use:

> *"We do collect certain amounts of water in the bucket in the shed…"*

The above dispositions resonate with 'Positive Greens' and 'Concerned Consumers' in Owen *et al*.'s (2009) study. These segments of the public were characterised as people who understand the reasons for using less water and are more inclined to undertake more arduous behaviours such as using grey water in the garden.

In addition, some other keen residents expressed interest in telling their neighbours about the home visit campaign. For example, upon closing the engagement in Home Visit 1 and Home visit 4 respectively, the residents said:

> *"The young lady [neighbour] just had her bathroom done and will be interested in you guys going around [paying her a water efficiency home visit] … I will be speaking to people as I go around… I think you will get quite a few calls."*

> *"We have been here 30 years and like our neighbours, the kids have left the house… we will mention it (the home visits) to them."*

Similarly, in describing keen publics, Plumber 1 stated:

> *"Some people are [keen] like the bloke we visited first. He already said he will recommend six more people down the road."*

Furthermore, studies have shown that keen publics are like engagers who seek opportunities to use their reasoning skills and prefer to engage face to face because they appreciate other people's opinions and are able to discuss their reasoning process (Lamm and Irani, 2011; Gorham *et al.*, 2014). And an example of such keen publics was encountered during Home Visit 5, wherein Plumber 2 observed and acknowledged that the householder, a gentleman co-habiting with his partner in an inherited

house, was already water efficient. The gentleman then informed the plumber that his reason for requesting a home visit was for validation, stating thus:

> *"My main reason for inviting you here is for you to reaffirm what I am doing and tell me more about water shortage and what more I can do."*

It must however be noted that outliers are bound to exist wherein being keen to save water does not necessarily translate into taking water efficient actions. This is because studies have shown that positive water saving intentions may not result in long-term water efficiency (Russell and Fielding, 2010), and being in an area of water stress does not motivate people to go an extra mile to be water efficient (Icaro, 2013). For instance, in the case of Home visit 1 described in the Introduction Chapter, the house was unmetered and because the householder was planning to install intensive usage systems, the potential for increased water efficiency was debatable despite strong convictions expressed by the homeowner. Whilst it can be said that Householder 1's views are in line with findings from a study of 3,094 people in Australia conducted by Dolnicar *et al.* (2012) which revealed that people's wider environmental behaviours are driven by a feeling of moral sense of obligation and their desire to conserve limited natural resources drives them to save water, it can also be put forward that his desire to save water appears to be at conflict with the demanding water systems in the property and his usage can be skewed by his ability to afford water since demand is inelastic to price (Schleich and Hillenbrand, 2009; Arbues *et al*., 2010).

The observations about keen publics discussed in this subsection therefore stimulate a question for Essex & Suffolk Water's future consideration, namely: how can the enthusiasm of keen publics be supported so it is more consistently translated into water efficient actions?

9.5.2 Money-centric publics

Some studies have shown that appeals which promote financial incentives may convince people to behave sustainably (Shu *et al*., 2017: 640). But contrary to the impression created by Essex & Suffolk Water's planning processes that generally, cost savings will motivate publics to be water efficient, findings from the research suggest that the desire to reduce the water bill may only come into play when there is a water meter in the house. This was confirmed by Plumber 3, the longest-serving plumber on the EDC home visit campaign who reported that:

> *"Most people who will engage [with the plumber during their home visit] are on water meters - I think as soon as you mention money, you get their attention straight away."*

An example is Householder 5 who owned a water meter and was particular about the water bill reduction benefit of reducing his usage. Householder 5 was very engaging in water efficiency discussions with the plumber, and eagerly and repeatedly shared his most trialled water saving tip: "*If it is brown [human waste], flush it down but if it is yellow, let it mellow [can do without flushing]*." Also, he constantly translated his water efficient actions into water savings and cost-savings. For example, he stated:

> *"I have put my bath plug in, and I have stood in the shower and had my shower like I normally would and have looked to see how less water I use [compared] to having a bath…"*

It is noteworthy to mention here that other, but few unmetered residents, were observed to not be keen to go through arduous lengths to use less water if their self-interest (in this case, unspent money) is not at stake. And this resonates with findings from White *et al.'s* (2003: 25) community survey which revealed that people want to be convinced of the water-saving and cost-saving implications of being water efficient before taking water efficient actions.

These observations about money-centric publics therefore stimulate questions for Essex & Suffolk Water's future consideration, namely: how can the attention of unmetered money-centric publics be diverted from reducing their water bills to intrinsic benefits of communal action; and how can this segment of publics be convinced about reducing their water usage for the common good?

9.5.3 Unaware publics

The insight that enabled the identification of unaware publics is that personal capabilities such as age, education and income influence knowledge and skills that facilitate people's water efficient behaviours (Stern, 2000). The lack of these socio-economic advantages can therefore be indicative of a person's likelihood to use water inefficiently.

In addition to having apparent socioeconomic disadvantages, findings showed that some residents who were engaged during the home visits were unaware of water, and clearly had little or no knowledge about water efficiency despite admitting that they received the literature materials from Essex & Suffolk Water in advance of their home visits and even had discussions with a WSP contact centre advisor. An example is Householder 2 who was surprised to learn that Witham was facing water scarcity, stating thus: "*Oh really?*" but still objected to an EcoBeta fitting because the Housing Association forewarned tenants about liability for returning water systems to status quo when vacating their properties.

Likewise, Householder 4 attempted to explain why they had not been giving any thoughts to water efficiency in their household prior to their home visit, stating thus:

> *"We don't know these things, we don't do them, nobody tells you these things."*

Unaware residents were therefore found to lack knowledge of water related matters, were not the key decision makers in relation to approving the retrofitting of water systems in their properties and did not know what discretions they had to retrofit their water systems. This lack of autonomy over retrofitting has been pointed out as a challenge for water efficiency by Randolph and Troy (2008) who argued that residential tenants, unlike homeowners are less likely to have direct control over their homes or over the installation of water efficient devices.

Likewise, one of the residents in Home Visit 3, although interested in being water efficient, insisted on not retrofitting the water systems in the property. The resident who was old and of post-retirement age said:

> *"Do not touch our water systems because the Housing Association has warned that we will be held liable."*

The plumber then informed the residents that as tenants, they can decide to allow retrofits, after which they then obliged. This interaction is reflective of many knowledge deficit discussions in the water efficiency literature (Montginoul and Vestier, 2018) that highlight that lack of information can prevent people from taking water efficient actions.

Such stifling of retrofitting by local authorities and housing associations can be counterproductive to water efficiency engagement initiatives as it is not attuned to the wider calls for higher and long-term water efficiency that uses education and wider influences of devices to achieve water efficiency (Turner *et al*., 2007).

The observations about unaware publics discussed in this subsection therefore stimulate a question for Essex & Suffolk Water's future consideration, namely: how can unaware publics' information or knowledge deficit be addressed to enhance water efficiency and engagement?

9.5.4 Unbothered publics

The categorisation of unbothered publics was based on insights from studies have which established that water demand is price inelastic (Savenije and van der Zang, 2002; Worthington and Hoffman, 2008; Wichman *et al.,* 2016). Wichman *et al.'s* (2016) study examined how households respond to

price and non-price interventions and found that high-income households with high usage are insensitive to the price on their water bills.

This research found that amongst those observed, some unbothered residents were not overly concerned about high water usage because they were not paying for measured usage, or when metered, they were happy to pay for their usage because they could afford to do so despite being aware of the issue of water scarcity.

On the one hand, Plumber 3 linked customers' lack of concern for water to a gap in communication between the resident who booked the home visit and other residents, as well as to a shortcoming on the part of the EDC customer services team, stating thus:

> *"You ask some people if they know what this [home visit] is all about and they will say point blank 'I haven't got a clue'…or even the person who has made the booking will sometimes say they don't really understand it and I think 'I can explain this to you in literarily 5 seconds, why couldn't someone [in Customer Services] have done that over the phone [during sign-up process]?"*

On the other hand, observation of the home visits revealed that the publics' lack of concern for water could be closely linked to whether their usage was metered or not. The plumbers unanimously highlighted that unmeasured water usage fosters unaccountability and accommodates poor water values:

> *"…Because some people are not on a meter, some people [they] take it [water] for granted." (Plumber 1)*

> *"People who are not on the water meter still do not really care much…will leave their water sprinkler on in their garden all day because they are not paying directly for it [water]… we go to people without water meters and they just do not care to be honest with you, because they are not paying for what they use." (Plumber 3)*

An exemplar is Householder 3, whom due to having a large house and high occupancy, assumed that their water usage must be high. The plumber's suggestion of a water meter was therefore unwelcomed, with the householder retorting: "*We do not want a water meter*." Whilst this response is reflective of Owen *et al*.'s (2009) findings that people have a perception that their bills will rise if they own a water meter, it is imperative to note that the householder's assumption could have been

right or wrong. However, the plumber did not probe the householder why they did not want a water meter further.

The role of the education aspect of water efficiency home visits should however include plumbers discussing perceptions with publics should in case there are any myths to be dispelled on both sides. For example, whilst discussing water efficiency in the garden, the plumber said to the one of the residents in Household 4: "*Watering grass is a waste of water and time,*" to which the householder replied, "*just the beds; we do collect certain amounts of water in the bucket in the shed, so we use that*." The plumber thus advised:

> *"I can see you are doing your bits; this is why you should get on the water meter... it will take 2 to 3 hours to fit…you could be making the biggest savings – not water savings but financial savings... about £150 a year."*

The conversation reported above demonstrates that during home visits, the plumbers need to further conversations with residents to develop a clearer understanding of their perceptions about water, water efficient devices, and water usage practices, and to give accurate water efficiency advice.

It is important to highlight at this point that whilst most unbothered publics are more likely to be unmetered, not all unmetered publics are merely unbothered. For instance, during Home Visit 4, Plumber 2 informed the residents of the option to have a water meter. A conversation then ensued about paying fairly for water usage and having the opportunity to reduce their water bill.

Five out of the six homes visited were unmetered and when the residents were asked why they had not opted for a water meter, it emerged that they remained unmetered due to their lack of understanding of the process for applying for a water meter, lack of knowledge about the benefits of the water meter, or due to making mere executive decisions not to own a water meter.

For instance, whilst Householder 1 said that the process for getting a water meter was unclear, Householder 4 claimed that they "*never really thought about it*." But others such as Householder 6 chose to remain unmetered due to the large size of their home and the number of occupants, with one of the residents stating that despite their recognition of the value of water, they "*just do not want a water meter*." Similarly, Householder 3 described how their house size and occupancy had prevented them from applying for a water meter:

> *"If we go on the water meter, we will forever be thinking 'oh we cannot have a wash'…"*

Large households' avoidance of becoming metered is unsurprising. Indeed, previous studies have shown that households with more occupants use more water (Jeffrey and Geary, 2006). It is however interesting that Household 3 had low occupancy, all elderly. Clearly these elderly people had concerns about the potential for an unexpectedly high bill if they became metered but rather valued the certainty that their fixed water bill provided.

There is a possibility that the elderly residents' usage may not have been as high as they thought because other authors have suggested that older people are more likely to be water efficient (Aprile and Fiorillo, 2017), some people worry significantly about their first water bill after switching to the water meter (Knamiller and Sharp, 2009), and some people's perceived water use may not be an actual representation of their exact usage due to various reasons such as water users' identity and patterns of water usage practice (Beal *et al*., 2013).

However, the plumber who visited the elderly residents in Household 3 missed the opportunity to enlighten them further about metering and water efficiency, most likely due to his lack of knowledge about the factors that nuance people's perceptions of their water use. This missed opportunity again, highlights a barrier to water efficiency engagement highlighted previously in section 9.4.3– plumbers' lack of knowledge about how people use water diversely and the lack of soft skills to navigate conversations during water efficiency engagement.

Furthermore, when some unmetered residents probed the plumbers about the water meter, it became apparent that the plumbers lacked detailed knowledge about water metering. For example, in practice, UK water utilities are legally required to fit water meters in households for free. However, during Home Visit 1, the householder asked Plumber 1 whether there was a charge for having a water meter, to which he replied: "*There should not be but if there is, decide [whether you - the customer wants the water meter or not]*."

Similarly, fifteen minutes into the home visit in Household 1, the householder enquired whether it is "*compulsory that if someone has a pool in the garden, they go on the water meter*?" to which Plumber 1 replied: *"I am not entirely sure."*

When the plumber proceeded to suggest to the householder that he used a water butt for rainwater collection, the householder then explained to the plumber: "*It is not compulsory you have a water meter…it is a request [that a customer has to make] … to me there should be set laws saying if you do such a thing or have such a thing, you should have a water meter*."

It must however be said that the understanding of metering held by both Plumber 1 and Householder 1 was not in line the water utility's metering policy. Essex & Suffolk Water states that it "*informs its customers that if they wish to use a garden sprinkler or install a swimming pool or pond above the stated capacity that they will need to have a meter installed*." (ESW, 2014a: 247). Again, this scenario brings to the fore how the plumbers' lack of knowledge about wider water efficiency strategies in the water utility and in the industry can pose barriers to water efficiency engagement.

Collectively, the research findings discussed in this subsection demonstrate the heterogeneous rationality for customers who engage with or disengage from metering and are reflective of the heavy water consumption and knowledge deficit barriers to water meter uptake identified in the literature (Owen *et al.*, 2009; Montginoul and Vestier, 2018).

Also, the research findings confirm existing knowledge that where there is high household occupancy, the households' perceived and actual water usage may differ (Beal *et al.*, 2013; Sønderlund *et al.*, 2014), thus impeding the potential to increase metering which many authors argue is essential for water efficiency in any water utility (Arlosoroff, 1999; Fielding *et al.*, 2012).

Findings in this subsection are therefore support several authors recommending targeted water education programmes to provide feedback and social marketing to counter such barriers to water efficiency (Aitken *et al.*, 1994; Beal *et al.*, 2013). These recommendations were also espoused in Plumber 2's reply to Householder 6:

> *"… Someday even if it is five years from now, there will be regulations in place to say everyone must be on a water meter, so it is better to train your brain now [to have water efficient behaviours]."*

The observations about unbothered publics therefore stimulate questions for Essex & Suffolk Water's future consideration, namely: how can metering be effectively promoted during home visits and how can unbothered publics' interest in water efficiency be awakened?

9.5.5 Zero-price chasers

The research findings revealed certain publics who were uninterested in the education aspect of their home visits but were merely interested in the free water efficient devices and plumbing services offered by Essex & Suffolk Water. These kinds of publics characterised as zero-price chasers, are described by Plumber 2 and Plumber 3 respectively:

"Have no interest in the scheme, no interest in saving water… all they are interested in is what they can get out of it."

"Are more roped in [signed up for a home visit] thinking they are doing something for nothing, it is a freebie."

In few cases, some of the residents observed to have zero-price chasing tendencies were expecting free plumbing services during the home visits and were less participative in water efficiency conversations initiated by the plumbers. Such customers displayed commonalities with the segment of the public which Owen *at al.* (2009) refer to as the 'disengaged.' The authors described disengaged customers as unlikely to be appealed to by conservation measures with no financial incentives, and unlikely to engage with water efficiency principles.

Such zero-price-chasing dispositions were observed during Home Visit 2 where the householder was not interested in holding conversations with the plumber, made requests for free water efficient devices repeatedly, and once informed that there were not many free devices to obtain due to her decision to leave certain water systems untouched, she walked away saying: "*I shall leave you [the plumber] to it [get on with audit around the house]*."

Water efficiency education has been recommended by the plumbers to tackle zero-price chasing tendencies as such publics may need to be persuaded to engage in water efficiency conversations.

In addition, publics need to be clearly informed to expect water efficiency education during home visits. In relation to this, Plumber 3 recommended that whilst trying to increase sign-ups by 'hard-selling' home visits to customers via phone conversations, face to face campaigns and via literature dissemination, the water utility should do more to be "*honest*." Again, this brings to the fore how lack of clarity around information communicated by the water utility to its publics can pose barriers to water efficiency engagement.

Plumber 3's recommendation brings to the fore a situation that arose during Home Visit 1 where it became clear that the water utility ought to have been more transparent about education being the core of the home visits, rather than other marketed benefits that had shaped the householder's expectations.

During the home visit, Householder 1 informed Plumber 1 that he was persuaded over the phone by a call centre representative to sign-up for a home visit on the basis that his house will be retrofitted

with free devices. The plumber then informed the householder that there was no need to retrofit most water systems in his home as they were already water efficient.

At the end of the home visit, Householder 1 reiterated that he told the call centre representative that it will be a pointless home visit, stating thus: "*I just feel like I have wasted your time [despite the behavioural change conversations]*" to which the plumber replied: "*No, of course you have not – it [this visit] still gives you the insight on all you can do [behavioural change to reduce water use*]."

Clarifying that some publics have 'false' expectations for home visits, Plumber 3 explained:

> *"I often feel that a misconception is given…because it says you are getting a qualified plumber come around, you get a free plumbing service and all these sort of stuff [expected benefits as depicted earlier in Figure 16*] *… I suppose saying everything is free and it can save you money on your bills is the incentive, most people will probably turn their thinking to it as soon as you say, 'save money'."*

Furthermore, speaking on why customers may have false expectations of their home visits, Essex & Suffolk Water's Demand Planning Project Manager explained that "*some people expect you to just fit [free water efficient devices] and go…it is almost like a requirement*."

When asked whether some customers' sole interest in the free products is a conjecture due to how the programme was 'sold' to the public (promoting the freebies available to participating households), the Manager explained:

> *"Potentially yes, or maybe it is not what has been sold to them [customers] but that is how they [the customers] have taken it or want it to be because they are not interested in talking. They are just interested in… what they think is going to save them the water [water efficient devices] when actually that does not necessarily mean it [water efficient devices only will achieve efficiency]."*

It is thus clear from the water utility's Demand Planning Project Manager's explanation that there are uncertainties around publics' behaviours and highlighting the dispositions encountered in the field could help the water utility to better understand its publics including why they behave the way they do.

However, despite Essex & Suffolk Water's effort to be customer-centric in various areas of the business, the Demand Planning Project Manager admits that when it comes to home visits, the water

utility "*does not know a huge amount about the customer as most of our data is collected at the home visit*."

This admission is a reminder of the barrier of poor information sharing between areas of the business involved in water efficiency and the lack of communication mechanisms for information sharing between the plumbers and the water managers which stifle the development of insights about publics in the water utility (discussed earlier in section 9.4).

The observations about zero-price chasers discussed in this subsection therefore stimulate a question for Essex & Suffolk Water's future consideration, namely: how can the marketing of home visits be better designed to inspire communal action and motivate water efficiency beyond individual benefits of a home visit?

Collectively, this section has demonstrated that whilst sociodemographic classification could have benefited water resources planning during the post-WRMP period, sociocultural factors and household materiality are more relevant predictors of water efficiency in practice, and water efficiency engagement strategies could benefit from paying attention to these influencers. Having illustrated the learning that plumbers could – and frequently already do – achieve about the households they visit and the publics they engage, there is a wealth of customer insight that Essex & Suffolk Water could mine from home visits to better understand its publics and enhance future water efficiency engagement activities. The next section reflects on the factors identified in this chapter as aiding or stifling practice in the water utility.

9.6 Discussion and conclusion

This chapter concerned findings from Phase 2 of the empirical analysis. This phase of the analysis relates to the case study of water efficiency engagement in Essex & Suffolk Water. It addressed the second research objective which is about identifying the factors that aid or stifle water efficiency engagement in a utility that is seriously water-stressed.

Table 14 presents a summary of the evidence generated from this Phase 2 analysis, followed by a discussion of the findings, and drawn conclusions.

Table 14 Contribution of Phase 2 empirical chapter to the thesis.

<table>
<tr><th colspan="5">Influences on water efficiency engagement during the home visit campaign</th></tr>
<tr><th>Message</th><th colspan="2">Audience</th><th colspan="2">Channel</th></tr>
<tr><th>Utility's motivations for the campaign</th><th>Utility's expectations of publics</th><th>How residents could be understood after engagement, using observed dispositions</th><th>How engagement was delivered</th><th>Factors that aided or stifled engagement</th></tr>
<tr><td>Low rainfall was the main entry point for conversations in households, which was linked to climate change impacts. Other drivers were contextualised population growth and climate change impacts.</td><td>Water managers placed responsibility on publics to change their behaviours around water use regardless of strategy.</td><td rowspan="4">Keen - influenced by communal environmentalism, make rational decisions for the environment, have the tendency to refer friends for home visits; Money-centric – influenced by metering and the water bill but may only find cost-savings appealing when metered; Unaware – affected by knowledge deficit and socioeconomic disadvantages, participation in water efficiency complexed by agencies' bureaucracies; Unbothered – influenced by affordability, household occupancy or the absence of a water meter, likely unmetered but not vice-versa; Zero-price chaser - with unflinching interest in individual benefits, hard to engage, showed little interest in behavioural change, and felt misinformed or found utility not to be trustworthy when expectations for freebies were not met.</td><td>Plumbers adopted a 'follow the space' approach for home audits in patterns that appeared to attempt linking space, water systems, practices, and water efficiency messaging.</td><td rowspan="4">Barriers:

Plumbers' knowledge about and skills for engaging are deficient; insufficient insights about publics to aid plumbers' preparation for home visits; poor customer insight development culture; covert misinformation of publics via marketing; weak water efficiency education strategy for plumbers.

Opportunities for improvement: training & upskilling plumbers; transparent marketing; feedback mechanisms between water managers and plumbers; improving information sharing and lesson learning culture.</td></tr>
<tr><td>Message frames used to promote water efficiency</td><td>Self-reported motivations to engage/reduce usage</td><td>Plumbers as channels for communicating water efficiency</td></tr>
<tr><td>Marketing focused on publics' self-interests and the plumbers promoted communal appeals more. Plumbers used visual illustrations of usage, comparation of value of water with other beverages caught residents' attention. Resonance creation and myth-dispelling undermined was lacking.</td><td>Individual interests, communal interests, and the need for validation.</td><td>There was a noticeable binary of expertise (technical and social) required to deliver successful water efficiency engagement. While plumbers had the former due to the nature of their trade, the latter was found to be an uncharted territory for them.</td></tr>
</table>

From Table 14, the following findings are deduced:

Whilst findings from the analysis of the WRMPs in Chapter 7 suggest that the water efficiency engagement in areas of serious water stress was motivated by regulation and increasing demand, this chapter has indicated that other underlying factors also shaped Essex & Suffolk Water's response to the issue of demand-supply imbalance: inter-organisational restructuring, historical policy, population growth, environmental challenges such as drought events, and a realisation that retrofitting alone could not deliver desired water savings. Also, the case study revealed that conversations during the home visits in Essex & Suffolk Water were in line with findings from the analysis of WRMPs which suggested that during the post-WRMP period, seriously water-stressed utilities would relay messages to their publics about population growth, climate change, and the need for water efficiency as a contrast to the individual benefits around which the home visit campaigns would be marketed.

In contrast to the marketing of water efficiency in seriously water-stressed utilities, the contextualisation of the problem of demand-supply imbalance around climate change impacts (e.g., reduced rainfall, nudging people to take action to protect the environment) during the delivery of home visits is particularly laudable because the existing literature suggests that the public is more drawn to conversations that remind them of past events such as droughts and find such messages more appealing than those highlighting the bigger picture of climate change or water stress (Icaro Consulting, 2013; Benzoni & Telenko, 2016; Long & Pijanowski, 2017).

Whilst the findings from the analysis of the WRMPs suggest that sociodemographic factors shape the understanding of the public in areas of serious water stress, the case study demonstrates that a deeper understanding of publics in fact resided with the water utility's personnel who engage directly with the public, but this value was unexplored and underutilised.

More importantly, whilst the analysis of WRMPs (in Chapter 7) revealed that seriously water-stressed utilities planned to deliver a combined pattern of water efficiency engagement (as described earlier in section 4.4), the case study suggests an improved direction of travel whereby to increase water efficiency, Essex & Suffolk Water took a flexible path that employed multiplicity in its strategy, used multiple measures, was constantly reshuffling its rhetoric and messaging tactics, and technical and educational engagement strategies as and when needed throughout the water efficiency campaign. This flexible approach differed from the combined approach because it moved beyond merely distributing or installing water efficient devices and communicating water efficiency information to seeking to increase the chances to achieve household water efficiency through multiple ways, for example, the plumbers attempted to understand and address the sociocultural and material conditions of residents and their households respectively and tried to adapt conversations depending on the segments of the public being engaged and the line of action that they wanted them to take.

However, there were limitations that posed barriers to water efficiency engagement. The key finding from the Phase 2 analysis is therefore the factors that aided or stifled water efficiency engagement in Essex & Suffolk Water. By identifying the barriers and opportunities to water efficiency engagement discussed below, this chapter provides one step towards practice improvement in the utility and more widely, in areas facing serious water stress.

Three factors aided water efficiency engagement in Essex & Suffolk Water:

1. Having skilled plumbers was beneficial to the water utility in terms of retrofitting and talking to residents about this aspect of the home visit.

2. Conducting a plumbers' training workshop was useful for the plumbers. Although to a limited extent, the training enabled plumbers to begin incorporating conversations about water efficiency into their engagement practices during the home visits. For instance, in line with strategies for motivating water efficiency (see Shu *et al*., 2007; Koop *et* al., 2019), some plumbers demonstrated how water is undervalued to residents by comparing the cost of drinks consumed every day to the cost of potable water, used the shower timer to trigger residents to spend less time showering, used drought events to awaken them to water scarcity, tailored conversations to residents' circumstances (e.g., health conditions) during closure of home visits, or encouraged residents to participate in the decision making process for applying for a water butt. However, to maximise effectiveness, there is an opportunity for the water utility to enhance the water efficiency education aspect of the plumbers' training, ensure soft-skills and communication training for the plumbers, and increase the frequency of training.

3. Robust collection of installation data during home visits was beneficial for understanding measured water savings. However, one recurrent theme in this chapter is the utility's limited understanding of its publics and the value that field insights about residents can offer. It emerged that although the plumbers formed their own understanding of the residents encountered during home visits, these insights were lost due to the absence of feedback mechanisms between they and the water managers. There is therefore an opportunity for the water utility to begin focussing on the process of water efficiency engagement as much as it focuses on measured water savings.

Eight factors stifled water efficiency engagement in Essex & Suffolk Water:

1. Lack of communication between the plumbers and the water managers. This barrier is linked to contracting business arrangements in the utility and the EDC water efficiency campaign

being a cost-intensive and seasonal project that does not give the plumbers the opportunity to interact with the utility after the project is delivered. The contracted plumbers were far removed from the utility's wider vision and there were middlemen (WSP managers) between the plumbers and the water managers which discouraged a culture of communication. A further aspect of this barrier is disjointed practices in Essex & Suffolk Water due to the absence of a feedback mechanism between the plumbers and the water managers which meant that the utility's understanding of its customers remained limited and practice improvement in terms of targeting communication for future campaigns was inhibited. For instance, the utility designed water efficiency messages in its marketing literature based on ownership of a garden and water meter but then distributed the literature materials randomly rather than to targeted households. And during the home visits, the plumbers were able to identify households with a garden but did not feed this information back to the Water Efficiency Team.

2. Lack of preparation for the water efficiency education aspect of each home visit. This barrier arose due to the Water Efficiency Team not providing contextual information about residents to the plumbers. For instance, although Essex & Suffolk Water was one of the few water utilities that used customer segmentation tools to better understand their publics' usage behaviours during the pre-WRMP period, its water efficiency engagement practices did not apply the knowledge of such segmentation during its post-WRMP period. The water utility's ACORN classification did not inform the content of its plumbers' training. This also meant the plumbers did not use the insight to reorganise conversations with residents during the home visits and insights about publics gained in the field were underdeveloped and underutilised.

3. The plumbers' inability to engage with residents effectively using communication tactics due to their limited soft skills. For instance, the plumbers faced pushbacks during the home visits particularly, in relation to metering and people's perception of rainfall and water abundance in the UK. Such responses from some of the residents concerned how visible and intense rainfalls during the summer discounted water scarcity. This is reflective of a widespread belief that the UK experiences high rainfall (Icaro, 2013). However, Essex & Suffolk Water had missed an opportunity in not having trained or informed the plumbers about how to dispel myths or address such public perceptions expressed during home visits.

4. The plumbers' inability to engage with residents about wider water efficiency agendas in the utility and the UK water sector due to insufficient knowledge. For instance, because home visit campaigns in previous years focused more on retrofitting, water efficiency education through

conversation was a new territory for the plumbers and the plumbers did not actively know about or promote metering as part of the agenda even though most homes visited were unmetered.

5. The plumbers' inability to weave water efficiency messaging into their follow-the-space approach for delivering home audits. Inconsistencies were evident in this pattern of conducting water efficiency audits and communication about residents' water usage practices and behaviours. The linkages between spaces within the household and residents' habitual routines and everyday water usage practices were therefore not maximised. For example, the plumbers gave residents the 5-minute shower timer or offered a water butt to 'excite' them either on arrival at or on departure from households, rather than incorporating these instruments into water efficiency conversations in the spaces where they can be used to modify usage practices. And a further aspect of this barrier was the disconnect between the plumbers and the water managers which stymied communication for feedback, knowledge sharing, and lesson learning about how to improve such engagement practices.

6. The plumbers' inability to recognise or record insights about residents' dispositions towards water and engagement due to their technically focused training and technological limitations, respectively. For instance, when older residents assumed that their water bill would rise if they became metered, the plumbers could not probe them further to understand their perceptions and highlight other factors that indicate whether they may in fact have a low usage such as low household occupancy, collecting rainwater, or having shower patterns that are not water consuming.

7. Residents not trusting the water utility due to unmet expectations during their home visits. For example, if they felt that the home visit had been mis-sold to them as an opportunity to get freebies rather than as a water efficiency education experience.

8. Lack of virtual engagement. Whilst the home visit campaign was promoted through multiple channels, high-cost channels such as the post and telephone produced more signups than low-cost channels such as websites and social media. The virtual channels of engagement were under-utilised and were only used for statutory engagement during planning or within a marketing capacity prior to delivery of home visits. For example, although Essex & Suffolk Water planned to promote water efficiency on its website, the water efficiency team did not monitor traffic to the website contents to identify the types of information that publics were actively seeking. So, what happens if a situation were to arise where face to face home visits is not possible or feasible?

As Essex & Suffolk Water is considered by industry stakeholders as one of the leading utilities for the promotion of water efficiency in the UK, the findings presented in this section are at the leading edge of practice and are relevant to the other utilities delivering water efficiency engagement in seriously water-stressed areas.

The findings outlined above suggest that not enhancing the role of the plumbers in the planning and delivery of water efficiency engagement through knowledge improvement can stymie practice improvement. And whilst the establishment of the plumbers' role in practice improvement is important, the lack of feedback mechanisms and a collaborative working relationship between the water managers and the plumbers could also render home visit campaigns less effective.

So, having identified the factors that aid or stifle water efficiency engagement in Essex & Suffolk Water in this section, it is necessary to find ways to enhance the field of water efficiency engagement using insights from this chapter. These will be discussed as part of the research's contribution to practice in section 10.2.

To conclude the thesis, the next chapter addresses the third research objective by offering knowledge that furthers the concept of water efficiency engagement and ways to advance practice in the field, using the research findings.

10 Discussion and conclusion

The aim of this doctoral research was to develop a better understanding of water efficiency engagement in seriously water-stressed utilities in the UK, with focus on barriers and opportunities. To fulfil this aim, three research objectives were formulated.

The first research objective sought to understand the intended audiences and processes for water efficiency engagement in UK water utilities operating in areas of serious water stress. These audiences and processes were described and discussed in Chapter 7. In summary, this aspect of the research found that in areas that are seriously water-stressed, the water utilities intended to engage their customers about water efficiency, particularly bill-paying customers, and meter owners. The utilities intended to promote water efficiency to these customers as an opportunity to save money on their water bills, but their desired line of action ultimately was that these customers improve how they use water.

The second research objective was to identify the factors that aid or stifle water efficiency engagement in a seriously water-stressed utility. These factors were described and discussed in Chapters 8 and 9, respectively. In summary, this aspect of the research found that in Essex & Suffolk Water, having plumbers with technical skills was advantageous for retrofitting, the collection of installation data during the home visits was essential for the utility to calculate measured water savings, and the plumbers' training was a good initiative to steer the plumbers to begin thinking about water efficiency education during the home visits. However, there were key factors that stifled water efficiency engagement: insufficient preparation for the educational aspect of the home visit campaign on the part of the water managers and the plumbers, the plumbers' limited knowledge about and skills for water efficiency education and public engagement, technological limitations prohibiting the collection of contextual insights during home visits, and the absence of feedback mechanisms between the water managers and the plumbers. These challenges meant that the plumbers were unprepared for delivering water efficiency education during the home visits, the development of insight about publics was hindered, and lesson learning and practice improvement were stifled.

The third research objective was to further the concept of water efficiency engagement and support practice in the field using the knowledge gained about intentions for water efficiency engagement (objective 1) and the case study (Objective 2). The role of this current chapter is to fulfil this third objective, bringing the thesis to a close. To do this, this chapter will unpack what improvements can be made for the advancement of water efficiency engagement, especially for areas facing water scarcity.

The Literature Review Chapters 2 - 4 have demonstrated that theory, policy, and practice continuously influence one another. In this light, in this chapter, the first section contributes to academic knowledge by presenting how the research findings further the concept of water efficiency engagement. The second section supports practice in the field by presenting opportunities to improve water efficiency engagement activities. This is followed by the third section which puts forward policy recommendations. The fourth section reflects on the research methodology including concerns about researcher positionality and consent. The fifth section suggests areas for future research. The thesis culminates with concluding remarks in the sixth section.

10.1 Contribution to knowledge

This research has developed the conceptual understanding of water efficiency engagement, specifically in relation to how message design, the targeting of publics, and the use of communication channels influence initiatives. It has drawn on policy prescriptions (Ofwat, 2011a) and models that outline the fundamental elements that shape mass communication and marketing processes, relating to namely the message, audience, and channel (Lasswell, 1948; Lammers, 2011; Berger & Iyenger, 2014). It has used these elements to develop the Message Audience Channel (MAC) heuristic for understanding water efficiency engagement.

Within this research, the MAC heuristic served as an analytical framework to characterise water efficiency engagement practices in areas of serious water stress. In terms of the message element, applying the MAC heuristic meant the examination of contents of utilities' water efficiency communications delivered through printed literature, communicated during face-to-face interactions, and implied by actions such as the installation of water efficient devices and water meters. With respect to the audience element, applying the MAC heuristic meant the analysis of the publics targeted with water efficiency messaging by utilities and the examination of the assumptions that the utilities are making about them. In terms of the channel element, applying the MAC heuristic meant the analysis of how and when utilities promote water efficiency and their implications.

Discussions in section 9.1 indicated that two decades ago, water managers used light-touch public engagement strategies to achieve water efficiency. This current research shows that this is no longer the case. However, new findings demonstrate that although contemporary water management theory puts information sharing, learning and communication with people at the heart of its practices through a socio-technical approach (Pahl-Wostl *et al*., 2007; Herrick *et al*., 2013), even the most exemplary UK water utilities still fall behind these high standards. This tells us that socio-technical water efficiency engagement is an aspirational approach in water management as learning systems are yet

to be built into the utilities' processes to make the application of the MAC elements in their engagement approach fully socio-technical. The comparison between this best practice example and the MAC heuristic contributes to knowledge by highlighting three areas in which contemporary water efficiency practice might need to advance to meet the expectations of socio-technical practice: (1) feedback between water managers and agents delivering water efficiency engagement, (2) foregrounding the responsibility for action that lies with water utilities, and (3) furthering the concept of water efficiency engagement. These contributions are discussed in turn.

10.1.1 Feedback mechanism between water managers and agents delivering engagement

A key finding in the research was that water efficiency engagement in Essex & Suffolk Water was stifled due to the absence of a feedback mechanism between the water managers and the plumbers. This prevented the plumbers from informing the water managers about insights gained during the home visits. The Personal Digital Assistant device used for data entry during home visits was designed to accommodate quantitative data, but not so much contextual data. Hence, the potential to use contextual insights from engagement activities to better understand publics was diminished because those contexts were retained with plumbers who were not aware of defined ways to communicate them to the water managers. This research therefore uncovers the challenges in water efficiency engagement created by the absence of feedback between water managers and agents delivering water efficiency initiatives on their behalf, and it foregrounds the need for collaborative working between the parties. This collaborative working is in line with co-productive ideals favoured by practice theorists who advocate reflexivity amongst different stakeholders to develop practical initiatives for effecting change (Watson *et al.*, 2020). In other words, multiple stakeholders collaborating to identify and develop a variety of changes that can result in sustainable practices.

10.1.2 Moving the focus on responsibility for water efficiency from publics to water utilities

The normative position taken in this research was that public engagement in water issues is beneficial for water management. However, in relation to addressing water scarcity, critiques of public engagement in water efficiency sometimes argue that unlike in the past when water utilities took complete responsibility for creating resilience, current governance of water demand increasingly absolves water utilities of responsibilities. Although Ofwat is pushing for water utilities to motivate their publics to engage in water efficiency, companies cannot just expect publics to do so following minimal engagement, for example, after receiving a once-in-a-lifetime home visit delivered by contractors (Hamling *et al*., 2018). In this light, what this research has uncovered is that whilst current water governance puts more expectation on water utilities to increase household water efficiency,

their engagement practices need to be monitored and evaluated, with focus on understanding the support that they provide to the public and opportunities to improve such activities. As Lu (2020) argues, such attention to monitoring and reflection on practices is important to enhance water efficiency engagement.

Collectively, the research findings have demonstrated that the message, audience, and channel elements of engagement are interdependent and there is a fluidity in how they are used for water efficiency engagement even in a leading water utility operating in areas of serious water stress. These MAC elements have proven beneficial to consider when characterising water efficiency engagement approaches as they help contextualise individual comprising strategies. The MAC heuristic serves as a contribution to knowledge because it provides a framework through which water managers or researchers of water efficiency can critically assess water efficiency activities. This is particularly useful because the problem of increasing water demand is compounded by water utilities' unclear water efficiency engagement strategies which then make evaluation and scholarly study of initiatives to be challenging. And such assessments are important because while there are many studies examining water efficiency initiatives from the angles of how many water meters are installed, how many water efficient devices are fitted, and the quantity of water savings recorded, there is no existing contextual study wherein the message, audience, and channel components of the planning and delivery of water efficiency engagement in the UK are collectively examined from a processual standpoint. In this light, the MAC heuristic contributes to growing a significant field which holds water utilities to account for water efficiency engagement as a feature that requires skilled operation.

The newness of the water efficiency education aspect of engagement means that methods of examining it are still developing and are likely to be important in this emerging field of scholarship. The methodological use of interview and observation methods in this current research allowed the delving into the thoughts and actions behind water efficiency engagement and further supported the water utility's personnel to reflect on their practices rather than deducing their perspectives from technical activities. And the use of the MAC heuristic - an alternative non-quantitative framework for understanding water efficiency engagement moves the focus of analysis from statistical outcomes to being on processes in project planning and engagement practices in the utility. Specifically, the understanding of processes developed through Table 6, shows patterns in the delivery of water efficiency engagement. The identified barriers to and opportunities for water efficiency engagement provide routes through which water utilities can work to become more socio-technical in their approach to engagement, and hence provide a key knowledge contribution (see section 9.6).

It will therefore be in water utilities' interest to engage academics and experts in applying frameworks such as the MAC heuristic to the planning and evaluation of their water efficiency engagement activities to move towards co-creating a learning culture within their organisations. However, it must be noted that to execute this effectively, adjustments may need to be made to the MAC heuristic and the associated patterns of water efficiency engagement. This is because socio-technical water efficiency engagement can be situated as a broader aspiration of contemporary management of water demand. This means that there is a continuous extension of what produces water efficiency which now includes the intangible interactions between complex socio-material factors such as the public's habits, values, and norms that relate to usage, and water systems, household material goods, as well as institutions such as water utilities, local authorities and housing associations (these points of interaction that produce wastage or efficiency are identified as 'change points' in the practice literature; see Watson *et al*., 2020). So, whilst the review of literature has produced a rigorous analytical framework for examining engagement, what has been described as ideal socio-technical water efficiency engagement comprises of conceptual reference points which do not always lend themselves to systematic analysis.

Nevertheless, the MAC heuristic's novelty lies in its identification and exploration of a set of parameters to structure non-conventional evaluation of water efficiency engagement. Despite recent emphasis on the issue of household water demand in the literature, it seems that most research have focused on individualistic paradigms of behavioural change and isolated communication theories and institutional mechanisms from the discourse. It might be because the theories appear too fundamental and generic for applied studies. The heuristic therefore serves as a bridge between communication theories and water efficiency and gives water utilities a more substantial and consequential role in water efficiency engagement. It also responds to critiques by authors such as Lu (2020) that in the handful of water efficiency experiments in the UK, water utilities communicated about water conservation with the public but the role of these companies in the achievement of household water efficiency is currently unaddressed. Clearly, the main implication of the MAC heuristic resides in the conceptual understanding of practices in the field that it offers, thus addressing some of the drawbacks of existing studies and it should be differentiated from these studies in that it disrupts the scholarly direction of water efficiency engagement evaluation.

10.1.3 Furthering the concept of water efficiency engagement

Here, I further the understanding of the concept of water efficiency engagement. This builds on the existing literature about water efficiency reviewed in Chapter 4 which suggests the anticipated patterns of water efficiency engagement (Table 6) and indicates that the management of water

demand in the UK has been dominated by technical (metering and retrofitting) and educational water efficiency engagement but water utilities are now implementing the combined water efficiency engagement approach, particularly using home visit campaigns, wherein public water efficiency education is delivered as an appendage to technical interventions. Further, the literature indicates a tincture of socio-technical ideals of water efficiency engagement which move beyond merely combining the technical and educational water efficiency interventions. It suggests that the socio-technical approach seeks to address other influences of water consumption such as institutions, norms, resources, environment, technology, and household water systems and material goods, however it could be enacted in practice is yet to be understood.

The heuristic developed earlier in the thesis (Table 2) posed questions, which if answered, could help us further the concept of water efficiency engagement. These questions concern water utilities' intended audience for water efficiency engagement, mediums used for engagement and what these tell us about the approach being taken by the utilities and the public's line of action desired by them.

Using the three elements of the MAC heuristic to line up findings from the systematic review of intended audiences and processes for engagement in areas of serious water stress (Phase 1) with insights from the case study (Phase 2) helps further the concept of water efficiency engagement in the UK landscape engagement. Table 15 builds on Table 6 developed earlier in Chapter 4 to expand on the practice of water efficiency in the landscape, including developments on the socio-technical concept:

Table 15 Components of water efficiency engagement approaches

Approach		Channel		Explicit One-way message	Explicit Two-way message	Implicit message	Rhetoric	Audience
Flexible (tinkering between the technical, educational, and combined approaches throughout water efficiency campaigns)	Technical	Technology that has implications for water efficiency	Water efficient devices	Never	Never	Always	Promotion of individual interests such as reduced water bills, free water efficient device, and free plumbing services.	Residents
			The water meter	Never	Never	Always		Metered bill-paying customers
	Educational	Communication activities that are asynchronous	Leaflets, posters, literature materials, media campaigns, websites, the water bill.	Always	Never	Sometimes	Promotion of individual interests as above and communal interests such as water savings and environmental protection.	The general public (or customers, if delivered with the bill)
	Combined	Consultation and technology	Workshops, exhibitions, community outreach events, accompanied with the distribution of water efficient devices to the public.	Sometimes	Sometimes	Sometimes, if water efficient devices are given or posted to households.		The general public
Socio-technical (the liaison between people, technology, and institutions to co-produce water efficiency through stakeholder engagement communication, feedback sharing, collaboration, learning, and practice improvement.		Home visits with targeted marketing and awareness campaigns to address multiple influences of per capita consumption.		Always	Always (conversation is tailored to household space, materiality, environment, residents' usage practices and norms)	Never, as retrofitting is always accompanied with water efficiency conversation.	Individual and communal interests as and when needed but promotion of collective and collaborative action, knowledge improvement, and lesson learning actions are more prominent.	Diverse water users e.g., publics who are keen, money-centric, unaware, unbothered, zero-price chasers etc.

The cells shaded grey in Table 15 show that the UK water industry is currently technocratic and heavily reliant on water efficient devices and water meters to target water efficiency while it uses educational activities for generic and light-touch promotion of water efficiency.

Because water utilities operating in areas of serious water stress heavily evidence plans to deliver technical water efficiency engagement with supplementary water efficiency education during the post-WRMP period, it might appear that they are delivering the combined water efficiency engagement approach. However, combined water efficiency engagement is only ever achieved when water utilities distribute water efficient devices to households and accompany the products with water efficiency literature materials. The current 'fit-discuss-and-go' approach being purported as the combined approach is in fact, an attempt to find flexible ways to move further away from the combined approach to a socio-technical approach. This flexible water efficiency engagement approach uses multiple technical and educational strategies as and when needed throughout the lifecycle of water efficiency initiatives and differs from the combined approach because it moves beyond merely joining technical and educational water efficiency activities to seeking to increase the chances to achieve household water efficiency through multiple ways. However, this approach still means that at any given point, either technology or education is a dominant in the engagement process.

More importantly, Table 15 further demonstrates how water efficiency engagement could be better delivered, with the socio-technical approach. In an effort to understand how water efficiency engagement activities can move away from being contained within technical or educational constraints, and serve to feed into socio-technical change, I have arrived at a three-point framework of important elements that need to be present and interlinked in the engagement process: (1) people, (2) water systems and material goods, and (3) institutions. Whilst the role of people and water systems in water efficiency has been well established literature (discussed earlier in section 4.2.2 and section 4.3), most frameworks that analyse how people change their usage patterns assume that usage behaviours are decided by the individual, often failing to recognise that they can be constrained or influenced by institutions. There is therefore a need for increased representation of institutions in water efficiency especially organisations having functional responsibilities for the environment, engagement, and for water systems and material goods in households. For example, the Government, NGOs, water utilities, partners delivering water efficiency engagement on behalf of utilities, Building and Housing Associations, and manufacturers of water systems and material goods. These institutions have functional responsibilities and agency that may be exercised in form of policies, strategies, production, and service provision.

Collectively, the extent of water demand depends partly on people's water usage practices (for example, how many washing loads does one do), and partly on functionalities of water systems and material goods (for example, the water consumption of one's washing machine). Hence, the reasons why sociotechnical change might suffer in principle may be due to the habitual nature of people, and the inefficiency of material goods, or both. In any particular case, two of these elements – people and systems – prove significant. However, the third – institutions' proactive response to the people and the water systems elements is always crucial to socio-technical change.

This proactive institutional response for socio-technical change calls for system-wide learning. This means that organisations seek to address water usage before it becomes a problem of high-water demand. For example, Government legislating policies that ensure water efficiency, developers designing homes that feature water efficient technology, manufacturers designing water systems and material goods that require less water consumption to function, water utilities increasing efforts to support household water efficiency, organisations such as housing associations and Energy Saving Trust liaising with utilities to retrofit properties, utilities and partners delivering water efficiency engagement working together to train agents (such as plumbers) to improve their knowledge about water efficiency education and enhance their engagement strategies in the field (e.g., the follow-the-space strategy which agents use to link household spaces, habitual usage practices, and water efficiency messaging during home visits), and these stakeholders communicating and working closely and collaboratively to plan, develop, monitor, and improve the influences of water consumption that they affect.

For instance, amongst the existing insights from the literature, we know that publics can find it empowering when involved in addressing water issues (elements – people and institutions). For example, Sofoulis (2015: 13) reported that rainwater tanks made people feel more responsible for their own water in a way that they did not feel for other utilities such as transport or energy. We know that people are more likely to modify their usage-related behaviours and practices in response to water efficiency communications when they trust their immediate community and water utility (Sofoulis, 2005; Jorgensen *et al*., 2009) (elements – people and institutions). Also, people who feel morally obligated to have environmentally friendly behaviours and those who actively search for information about water are more likely to be water efficient (see Dolnicar *et al*., 2012) (elements – people and institution (values and resources)). It is also clear that home ownership, garden ownership, age, and experiences such as water restrictions affect people's engagement with water efficiency (Dean *et al*., 2016) (element – people and institutions (socioeconomic conditions, environment). More recently, some social scientists have highlighted that diverse patterns of daily water usage heavily influence per capita consumption. Browne *et al.* (2013: 1031) gave an example that 'it is possible that hotter

summers, combined with current societal standards of freshness and an aversion to sweat, might lead to an increase in water used for laundry and showering in the UK' (elements - people and systems (habits and norms)). In fact, the aforementioned authors call the attention of public communication strategies around water efficiency to these insights. In principle, the theoretical ideals about socio-technical water management suggest that water managers and organisations would then pay attention to such insights about the public and water efficiency and collaborate with multiple stakeholders to address or negotiate these change points for water efficiency. In practice, a socio-technical approach in the example given could mean increased communal water management, enhanced customer relations on the part of utilities, increased provision of water efficiency information and resources available to the public, improving urban home designs to aid water efficiency, utilities working with the public to address norms around showering and laundering practices etc.

As an important aspect of this sociotechnical approach is learning from practice, water managers will benefit from continuous stakeholder engagement directed at sharing reflections and feedback, identifying challenges, and reworking strategies that could be used in future practice to produce desired results. Such processes should be built on listening and inclusivity – valuing the contributions of diverse actors irrespective of perceived hierarchy in water management (such as publics, personnel responsible for engaging directly with the public, and external organisations) and responsiveness, and should be driven by ongoing communication that is facilitated and coordinated by the collective. An indication that system-wide learning processes are beginning to be embraced in practice is Essex & Suffolk Water's development of its plumbers' forum to facilitate communication, feedback sharing, learning, and collaboration between its water managers and the plumbers delivering its water efficiency engagement after the case study for this research was conducted in the utility (discussed earlier in section 9.4.4).

Currently, for water efficiency engagement, water utilities brandish free water efficient devices and focus on promoting individual benefits such as free plumbing service, free water efficient devices, and bill reduction. However, the current intensive focus on the influence of the water bill or freebies especially by marketing and awareness overshadows the need to invest in other ways to collaborate for water efficiency and encourage public engagement and change in behaviours for water efficiency. If other perceived motivations are going to influence the way water efficiency campaigns are marketed and delivered, water utilities will need to work closely with partners to take a multi-stakeholder approach towards water engaging their publics more closely to better understand what motivates them to participate in water efficiency and how and why futile efforts to be water efficient in their households can be addressed.

If the institutions and systems elements are in place and interact effectively, socio-technical change then means that water managers no longer deliver marketing generically as a prerequisite for increased signups for home visits or engage during home visits on a whim. Rather, they use their sociodemographic data to methodically identify customers who have individual interests and then design campaigns that speak to them while also targeting other segments of customers who may have other interests in water efficiency, for example, developing a gardening campaign that caters to the interests of garden owners in water efficiency, delivering a forum for customers who are already water efficient but want to have their actions validated by their utilities, and using home visits to focus on water users regardless of whether they are bill-payers. Water efficiency home visits can then serve as means for shared learning, knowledge improvement by focusing on: (1) engaging residents in conversations to challenge and influence the values and norms that shape their water usage behaviours and practices, (2) increasing shared knowledge and learning for the utility and publics, and (3) reducing leakage. This means that retrofitting is positioned to complement conversation that constantly reshuffles rhetoric and communication tactics depending on the segment of the public being engaged and the line of action that the utilities want the publics to take. In doing so, water utilities can bring about socio-technical change, achieve other forms of efficiency, and sociocultural insights about their customers and develop more effective ways to support their water efficiency journey.

Having outlined the knowledge contributions made by the research in this section, the next section will highlight opportunities for practice improvement and propose recommendations that utilities can implement to move water efficiency engagement further towards socio-technical change.

10.2 Contributions to practice: socio-technical water efficiency engagement

Part of the third research objective was to support practice in the field of water efficiency engagement. Having identified the factors that stifle water efficiency engagement practice in the previous chapter (section 9.6), this section offers opportunities to address them as a step towards practice improvement.

Based on the research findings, water efficiency engagement can be enhanced if water utilities move further from merely combining technical and educational water efficiency measures to taking an approach that is more robust. Improved water efficiency engagement therefore points to a socio-technical approach which: (1) uses diverse message rhetoric to appeal to the public, (2) seeks granularity in the understanding of the public, and (3) enhances the use of communication channels to fully support water efficiency. These will now be discussed in turn.

10.2.1 Opportunities to diversify the rhetoric

There were two key findings in relation to barriers to maximising the message element of water efficiency engagement. First, although the need to save water to protect the environment was a prominent feature in water resources planning, all the water utilities focused on financial motivations for publics to reduce usage during PR14 rather than focusing on the influences of water usage practices. Second, the plumbers' use of communication tactics to promote water efficiency especially in relation to behavioural change was lacking.

Indeed, Essex & Suffolk Water's marketing of its home visits commodified water up until when engagements were delivered at which point the communal appeal came to the fore. While it is important to acknowledge that unmetered customers could reduce their energy bills if they reduced hot water use, a reduction in energy bills is hardly the focus of any water utility. And since Essex & Suffolk Water supplied water at a cost less than £1 daily as at summer of 2019, the self-interest in water bill reduction may not have significantly appealed to publics who could afford water. So, the water utility's shift in focus from financial appeals to the other motivating factors such as the environmental appeal is necessary, especially in unmetered households where water bills would have remained unaffected by any reduction in usage.

What is however important to also highlight here is that the findings indicated that water utilities constructed their messages as an absolute binary: to appeal to their publics' individual-interest in financial benefits and freebies or to appeal to their communal interest in saving water to protect the environment. However, there are other publics to whom these appeals do not resonate strongly. For example, some other publics who may want to be engaged to validate their water efficiency efforts or to gain new knowledge about water efficiency and small actions for change. These nuanced differences between public motivations are still underexplored.

The current climate of intensively focusing on the water bill, financial benefits, and retrofitting overshadows the public's usage practices and the need to diversify rhetoric in water efficiency engagement. To fully support socio-technical change, there is a need to shift the focus of home visits from being on retrofitting to the water efficiency education aspect in a way that supports utilities to better understand their publics. This approach would allow plumbers to share information and equally listen to publics to gain and document insights about them. This would not only allow water utilities to increase their understanding of publics and innovate engagement but would also push them to develop their social science as an area of skill and invest in training their plumbers about how to communicate water efficiency effectively. There are resource implications for such a fuller approach

to water efficiency engagement to be implemented, and data collection objectives, processes, and analyses would need to be factored into the work of the plumbers and the water managers.

10.2.2 Opportunities to granularize the understanding of the public

One key finding in relation to barriers to maximising the audience element of water efficiency engagement was that utilities' understandings of their publics during water resources planning were based on sociodemographic data. In the same light, Essex & Suffolk Water's ACORN classification of its publics during its water resources planning was based on the publics' economic and psychologic variables.

However, Essex & Suffolk Water's engagement during the home visit campaign demonstrated that the plumbers were given no access to these classifications and hence did not apply such insights during the post-WRMP period. Also, the water managers were challenged by their lack of precision in considering who they were targeting. Whilst some water managers suggested that the priority audience in water efficiency engagement was the bill-payer, others indicated that the priority audience was defined by the space in which they were engaged, or by who uses water, or was indeed unknown. But studies which subscribe to the practice paradigm have proven that these sociodemographic factors do not strongly shape how people use water (see Pullinger *et al.*, 2013b).

The findings in this research have brought the heterogeneous dispositions of publics to the fore and have illustrated that publics can indeed be better identified and understood in Essex & Suffolk Water. While the segmentation of publics in the water efficiency literature (Gilg and Barr, 2006; Owen *et al*., 2009; Dean *et al.*, 2016; UKWIR, 2016) is based on characteristics self-reported by the public, this current research highlights the potential for the utility to pursue non-technical granular insights about its publics based on characteristics observed by external agents (e.g., plumbers) which are not captured in the literature. Such contextual and local insight can be documented alongside the statistical data collected in the PDA device and can help the utility identify publics who have or lack links in their communities or are likely to want to be ambassadors for water efficiency, or recommend other publics for engagement, or are difficult to engage. Such non-technical information could however become personal data. Data protection implications of documenting information about publics will therefore need to be considered and factored into the collection and usage of such insights.

It must however be noted that the water managers in Essex & Suffolk Water were not fully aware of how the plumbers' observations of public dispositions developed over time, partly because there were no feedback mechanisms between the parties as previously discussed in section 9.4.1.

Whilst the plumbers observed customers' dispositions towards water efficiency, these were not carefully thought through or harnessed by the water managers for practice improvement. This is significant to point out because Essex & Suffolk Water's use of some of its customer insight to promote water efficiency was found to be limited in some ways. For example, when the plumbers visited homes with gardens, they did not inform residents of a separate gardening event organised by the Water Efficiency Team. Also, they did not inform the Analyst planning the event of the homes that were found to have a garden or in which residents requested a water butt. This information which the Analyst would have benefitted from knowing was not held anywhere else within the business. Ideally, these residents could have been target invitees for the gardening event.

Water efficiency engagement cannot be effectively planned when insights about residents encountered during home visits, however limited, are not recognised by the plumbers and are unknown to the water managers. Historically, during home visits, Essex & Suffolk Water has focused on gathering data to measure whether there has been change in per capita consumption following home visits. So, the plumbers were not required to recognise and value insightful information about residents in households. Also, the PDA device used by the plumbers to record installation data during home visits was designed for quantitative data entry, not contextual data collection.

These findings confirm the continued existence of a gap highlighted by McKenzie-Mohr (2000) decades ago that water managers are yet to widely access or use psychological knowledge in the planning of programs despite knowledge of its value. There is therefore an opportunity for a cultural shift in the water utility to focus on how publics see and use water as much as on per capita consumption. This could include upgrading the PDA device to accommodate the entry of contextual data and qualitative notes.

For water utilities operating in areas of serious water stress, the lack of feedback mechanism between the plumbers and the water managers means that customer insight is not maximised for better planning of water efficiency engagement, insights remain unreported or become entirely lost, and in most cases, the public remains poorly understood.

These insights are important when Pullinger *et al*.'s (2013b) findings about water usage across the south and southeast of England are put into perspective. The authors found variants of water usage practices in households and asserted that usage patterns take diverse trajectories because they are influenced by norms, shared skills and knowledges, resources, technology, environment, and systems of provision that are not strongly related to sociodemographic characteristics. Therefore, the water

sector's current understanding of publics being heavily influenced by customer segmentations such as the ACORN classification should not be considered robust.

It is clear thus that the understanding of the public in the water efficiency landscape in the UK is still underdeveloped partly because water utilities have not fully explored existing opportunities to maximise their knowledge about their publics' diversity for sociological meanings.

To fully support socio-technical change, new segments of publics need to be understood and targeted with tailored water efficiency messages. However, the targeting of publics with specific messages can only be achieved when those messages are developed methodically using insights from delivered home visits.

Establishing ways to share feedback between the plumbers and their water managers during and after home visit campaigns, increasing the involvement of the plumbers in project planning work, and addressing conflicts in the quality of the service delivery which arise due to contracting out engagement activities are steps towards addressing this challenge. Doing these could help ensure that insights gained by the plumbers in the field are documented and shared with their water utilities. Future water efficiency engagement activities in water utilities should therefore be planned systematically to study publics to understand their complexities and develop targeted interventions.

10.2.3 Opportunities to enhance the use of communication channels

There were two key findings in relation to barriers to maximising the channel element of water efficiency engagement. First, water utilities' strategies for water efficiency education were not clearly defined during water resources planning. Second, the research findings showed that during the home visits, Essex & Suffolk Water relied on technical water efficiency engagement, with water efficiency education as an appendage. Further aspects of this challenge were the disjuncture between the utility's engagement approach and its anticipated outcomes, the inability for face-to-face engagement tactics during the home visits to fully support socio-technical change, and the unclear rationality for using multiple high-cost communication channels during the planning and delivery of the home visit campaign, with underutilisation of virtual channels of engagement.

Browne *et al*. (2019) pinpoint that water efficiency interventions currently tinker with retrofitting and reproduce individualistic paradigms of behavioural change. There are some claims in the literature that metering can transform publics from being passive into active consumers and has in fact reshaped the relationship between water utilities and publics in the south-eastern region of England (Zetland, 2016; Loftus *et al*., 2016), and that water efficient devices have delivered substantial water savings

in the Global North (Roccaro *et al.*, 2011; Lee *et al*., 2013). Yet, we cannot ignore the evidence which show that reductions in household water usage achieved through retrofitting may not be sustained long-term if utilities do not maintain engagement in a way that supports residents to understand the purpose and function of the retrofits (Knamiller *et al*., 2006).

Standalone technical water efficiency engagement can be problematic because its 'fit and forget' nature does not address the underlying factors that influence usage (Medd and Chappells, 2008). And when interventions do not target these factors, a displaced water demand may occur when there is a change in the household dynamic, for example, in economic status, water systems, or in physical residence.

Sociological studies have thus shown that water use, and water efficiency are not dependent on technology alone (Stewart *et al.,* 2013; Harou *et al*., 2014) but also on social and infrastructural factors that shape usage practices which may not change rapidly (Shove, 2003; Sofoulis, 2005). There are design researchers who advocate the use of devices to change people's environmental behaviours (Shu *et al*., 2017. For instance, Matos *et al.* (2014) who argue for technical water efficiency engagement because the design of water systems such as the wash basin, kitchen sink, toilet flush, bathtub, dishwasher, and washing machine have significant impact on the level of daily water use and retrofitting them can help achieve water efficiency. Likewise, there are social scientists who champion the use of information for promoting environmental behaviours (Owen *et al*. 2009). But there are also practice theorists favouring an encompassing socio-technical approach (Sheehy & Dingle, 2005; Shove, 2010; Watson *et al*., 2020), advocating water efficiency interventions to be refocused into appropriate measures that target usage practices and the entire systems of provision (see Shove, 2003; Medd & Chappells, 2008; Strengers, 2011; Fielding *et al*., 2012; Browne *et al*., 2013; Vieira *et al*., 2017).

In this current research, neither the WRMPs nor the case study of Essex & Suffolk Water suggest that current water efficiency engagement practices typify a full socio-technical approach. So, to fully support change that can result in the aspirations for water efficiency engagement being met, it is proposed that water utilities embrace the socio-technical approach which goes beyond merely combining technical interventions and educational features, but addresses the multiple influences of water efficiency including norms, values, usage practices, water systems, institutions etc.

This brings to the fore findings from the case study of water efficiency engagement in Essex & Suffolk Water which revealed: (1) the plumbers did not have access to contextual information about residents and their households that could have helped them prepare better for the home visits; (2) the

utility did not take advantage of its other virtual channels of engagement for the home visit campaign; and (3) the plumbers had a pattern of 'following the space' when delivering engagement in households but they sometimes overlooked the linkages between residents' interactions with their water systems and their water usage and (in)efficiency. For instance, some plumbers assumed that everyone knew how to use a dual flush toilet system and therefore did not underscore the household space being audited and the water systems therein with messages that could speak to the residents' norms and usage practices. This can be problematic for water efficiency engagement as having a modern dual flush system does not necessarily imply that residents are aware of its essence and it is more logical and effective to show residents how to operate the buttons on their toilet whilst telling them the differential water usage on each button than to raise the subject in the kitchen whilst rounding up the home visit. Two ways to begin addressing these barriers include providing the plumbers with the tools to better prepare for home visits and enhancing their training to address their knowledge deficit and ineffective engagement tactics.

Thus, for water utilities operating in areas of serious water stress, the delivery of water efficiency education as part of the home visit campaign needs to be requiring methodical planning, skills, and expertise just as is the case for metering and retrofitting. To support socio-technical change and improve the effectiveness of home visit campaigns, utilities can rely on best practices that: (1) maximise virtual water efficiency engagement; and (2) ensure that the plumbers and contractors (in this case, Groundwork) who are responsible for delivering the education aspect of engagement are upskilled and better supported to engage with the public.

First, seriously water-stressed utilities' plans for water efficiency engagement via virtual channels are underdeveloped in comparison to other sectors where the internet and online space are being harnessed for continuous engagement with customers. There is therefore an opportunity for utilities to address the absence of digital engagement channels. It is recommended that this begins with the mapping out of their customer contact points and customer journeys to develop a golden thread that aids voluntary and low-cost water efficiency engagement. This can give rise to the development of a platform that can cater to engagement about water scarcity and other issues such as flooding, river quality, sewer blockage etc. For instance, in efforts to support Essex & Suffolk Water to begin to think about this, a year after field work for this research was conducted, the author supported the utility (as part of a three-month voluntary work programme) to preliminarily map out what a joined-up water efficiency engagement through digital and virtual channels can begin to look like (see Appendix 2).

Second, the water utilities need to expand the realm of communication channel beyond retrofitting and metering to motivate water efficiency in households. In so doing, the role of plumbers in water efficiency engagement needs to be enhanced. This could include increasing information sharing with plumbers prior to home visits to alleviate some of the challenges that are due to unpreparedness for engagement. This is because the person who requests the home visit, the bill-payer, and the residents present during the home visit are not always the same. Better preparation for home visits using information from water managers can therefore help reconcile their expectations of publics as a team to maximise the effectiveness of engagement. Taking proactive measures (such as improved information sharing and project preparation) has been suggested by de Bruin and Bostrom (2013) for better communication about subjects such as climate change, but it is certainly applicable to water efficiency.

Third, through upskilling, there is an opportunity to improve the 'follow the space' approach used by the plumbers to deliver engagement during the home visits by giving more training consideration to how people interface with their existing technology (Fielding, 2012) because people's interaction with water systems also determines usage (Shove and Warde, 2002; Shu *et al*., 2017). Water efficiency education should not be positioned as all-knowing water utilities telling their publics how to be water efficient. Rather, it should concern water utilities and their publics supporting one another to achieve water efficiency through information sharing and lesson learning. In this light, upskilling plumbers as a channel for communicating water efficiency could enable them to be able to: make those socio-technical connections during engagement, recognise insightful data in conversations with residents, turn conversations into leads to tailor water efficiency advice for residents, and appreciate the essence of documenting such insights. This recommendation is in line with suggestions made by Gumbo *et al*. (2004) and Kampragou *et al*. (2011) that people who plan and deliver water management need to be equipped with the right skills and knowledge to do so. If executed effectively, this could foster plumbers' coordination of water efficiency messaging with usage practices, water systems and the retrofitting of water efficient devices during home visits. This can be particularly important for example, for residents who do not know how to use dual flush toilets.

It is also important to note that this socio-technical approach to water efficiency engagement draws upon claims by authors such as Watson *et al*. (2020) that 'empirical research informed by practice theories has repeatedly revealed how everyday actions are constituted across multiple sites and moments of doing, involving the convergence of different institutions, norms, materials, meanings and competencies.' Such studies demonstrate the need for 'nuanced and reflexive initiatives that engage in the distributed and non-linear processes that shape everyday action.' They also imply that more is needed to be done in terms of looking at different institutions and organisations and their

multiple different influences, rather than most of the request for change being visited upon the water user. Enhancing the utility of channels of communication for water efficiency engagement should therefore not be separated from wider changes for water efficiency taking place in other organisations, for example, manufacturers and suppliers of gardening and DIY products. Rather, socio-technical change should recognise how household usage practices are also shaped by design and availability of certain systems, and partnership workings should be encouraged between organisations to achieve change.

This section has presented the research's contributions to practice, including proposed recommendations. Knowing that regulatory policy motivated the seriously water-stressed utilities to increase their water efficiency engagement, the next section puts forward some recommendations for policy change that can advance the field.

10.3 Implications for policy

Understanding challenges with water policy can help researchers find ways to drive adaptation beyond supply-side interventions (Zeitoun *et al*., 2016). Therefore, unpacking the problems with water efficiency engagement policy or the lack thereof can open opportunities for regulatory reform in the water efficiency landscape.

The research findings, whilst useful in establishing that policy drove water utilities operating in areas that are seriously water-stressed to act to reduce household water demand, also bring to the fore the need to consider reforming the approach to customer engagement taken by Ofwat and DEFRA.

There are multiple challenges facing UK water resources, for example, flooding, water quality issues, water scarcity, sewer blockage etc. Increasing water demand is a challenge which the Ofwat's customer engagement policy was not developed to exclusively address because the policy is not dogmatic or tailored to support water efficiency engagement.

Existing research suggest that water efficiency strategies such as retrofitting and water efficiency education deliver substantial water savings (Dworak *et al.*, 2007; Russell and Fielding, 2010; Landon *et al*., 2018; Orr *et al.*, 2018). However, the current regulatory framework is geared towards planning technical water efficiency engagement and evidencing the resultant water savings whilst there seems to be less scrutiny of the planning and delivery of water efficiency education or socio-technical activities.

A consequence of this problem is that there is a disjuncture between how educational or socio-technical water efficiency engagement is planned, delivered, and evaluated. Often, water utilities do not document or publish sufficient information about project processes, and wherever done, criticality is lacking as polished information is shared or celebrated while failures or shortcomings remain unknown. This lack of 'warts and all' assessments of water efficiency initiatives may be linked to the competition between water utilities wishing to avoid unfavourable financial settlements from the regulator, Ofwat.

Nevertheless, this lack of dedicated policy is problematic for the advancement of water efficiency engagement as a field because there is no regulatory demand for accountability for educational or socio-technical engagement and this neither fosters lesson-learning from successes or failures nor does it encourage wider replication of such strategies across the water sector.

At a time when water policy in the UK appears to have widened the possibility for public participation and mandates water utilities to collaborate with the public on water issues (Heims & Lodge, 2016), providing a definite framework for public engagement to tackle water demand is essential. Mandating specificity around the documentation and evaluation of water efficiency engagement is a step towards ensuring that water utilities act with intentionality.

As an initial step towards advancing the field, a recommendation is therefore put forward for a review of the complexity of water efficiency engagement beyond technical interventions. This review should account for the interconnected nature of people, water efficient technologies, and materiality in households. If successful, such review could inform a tailored policy guide and an evaluation framework for water efficiency engagement.

Having discussed the research's conceptual, practice, and policy contributions thus far in this chapter, the next section retrospectively reflects on key methodological and ethical considerations in the research.

10.4 Reflections on the research methodology

This section relates to my personal reflections on the research process so I will be writing using the first-person pronoun.

As discussed in the Methodology Chapter, one of the UK water industry's critiques of academia was that academic solutions are not being co-created with industry practitioners and do not address the current challenges that they face. Through the constructivism paradigm, I sought to address the

research questions of '*whats, hows, and whys*' using a qualitative methodological approach and by working in close partnership with water efficiency managers and plumbers in the case study utility. This approach comprised of: (1) a systematic review of intentions for water efficiency engagement in seriously water-stressed utilities; and (2) a case study of practices in one of the utilities. Broadly, I am content with the research design which served to provide both the context about broader plans for water efficiency promotion and the detail about what was occurring in a specific case study water utility. I will now reflect on my experience in the research and some dilemmas which I faced.

10.4.1 Unlearning conditioning from academic background

My academic background is in the earth sciences. Although prior to this current research, I had previously ventured into the social sciences during my masters and professional work, those were light-touch in comparison to a doctoral study. Because I had been accustomed to spaces where sociology as a science is openly questioned, I was still very much 'scientifically' inclined. This made it difficult for me to embrace sociological research concepts and rules in the beginning. The need to explain most situations using social theories sometimes felt overcomplicating especially in an industry that is technical. And I found language to be particularly challenging because terms which are loosely used by practitioners in the water industry sometimes have entirely different meanings in social science.

But as some methodologists argue, the standards for judging physics may not be appropriate in other areas; as in social sciences, the knowledge produced itself constitutes a key aspect of what is being studied (Scârneci -Domnișoru, 2018). So, I eventually came around to embracing the constructivist paradigm and other methods for producing scientific knowledge in social research. This is because I found the constructivist paradigm helpful to develop an understanding of the context around water efficiency engagement practices, rather than relying solely on quantitative methods to evidence the impact of those practices. This opened me up to a different perspective about how indeed reality can be subjective and socially constructed by actors. So, in my view, the new meanings that I derived from the research approach of combining an overview study and a detailed study has been advantageous.

10.4.2 Maintaining dual positionality as a researcher and change agent

Like for most constructivist research, my positionality was a matter that warranted attention. As mentioned earlier in section 6.8.4, the empirical work comprised of an informal action research component which meant that alongside gathering data in the field, I supported Essex & Suffolk Water to make few real-time improvements to its engagement practices.

I acknowledge that an action research wherein the researcher assumes the position of a change agent can prioritise the client's interests even when they are not necessarily beneficial to the research (Rapoport, 1970). In retrospect, my desire to give back to the research subjects and identify potential areas for immediate practice improvement led to my participation in the utility's internal processes.

However, my concerns about positionality were always addressed by keeping my participation to a measured level. For instance, whilst I participated in the plumbers' training, I mostly observed the training sessions and gave feedback when requested. Similarly, for the mystery-shopper exercise to observe the Witham town centre marketing event for the home visits, I did not disclose my identity to the personnel on the frontline and only shared feedback with the water managers in the aftermath.

Although outside the research scope, my contribution to the plumbers' training was adjudged beneficial to the utility in the sense that it helped introduce the water efficiency education aspect of the home visit campaign to the plumbers. I also found that being involved in the plumbers' training helped increase my knowledge about the water utility because the more the water managers and the plumbers saw me as 'part of the team,' they became much more open about their challenges and ideas for practice improvement. This goodwill that I earned helps to support the potential for my research to have impact. For example, to be able to return to the water utility in subsequent years to support the improvement of their water efficiency engagement work.

10.4.3 Assuring confidentiality to the plumbers

Initially, I used pseudonyms to anonymise the plumbers' perspectives in the research. In hindsight, although pseudonymisation was deemed important and sufficient in the beginning, it turned out to be unwanted by the plumbers.

It emerged in conversations with the plumbers that ownership or concealment of their views was not a concern, rather they were keen to publicise their views to improve water efficiency engagement processes and practices in Essex & Suffolk Water. The precaution that was taken in the research to protect the plumbers' identities more than anything else thus seemed to have catered to the need to demonstrate ethical responsibility and comply with the University of Sheffield's ethics guidelines.

Also, the plumbers explicitly expressed that they were not concerned about anonymity but were keen to use the research to bridge the communication gap between they and the water managers. In retrospect, this brings to fore how stating ethical considerations upfront as part of fulfilling the University's ethical requirements can add procedures that turn out to be unnecessary.

10.4.4 Ensuring privacy for the residents

Of importance is the fact that privacy was recognised in the research as a principle valued by many participants, and violation in any form was avoided.

While the residents' privacy and anonymity were respected during the home visits by not taking photographs or audio-recording the visits, the extent to which residents in the home visits truly consented to their home visit deserves consideration. This is because the residents' granting of consent in advance of their home visit hinged on their understanding of their role in the observation and on the assumption that their right to privacy was waived. It appeared that Essex & Suffolk Water presented the home visit observations to its customers as focusing on the interactions initiated by the plumbers. However, my observation of the home visits was equally focused on interactions initiated by all residents as well as their physical spaces. So, whilst the aim of the observation was fully understood by the plumbers, Essex & Suffolk Water may not have overtly explained the purpose of the observation to the residents. However, if I were repeating the work, I would ensure that residents gave informed consent.

These ethical concerns bring some questions to the fore: (1) were residents aware that they had a right to rescind their consent to be observed after observation took place? (2) were residents aware that they could have repealed consent to be observed or for engagement in their homes to be documented if they felt that certain interactions invaded their privacy? (3) were residents aware that they could have repealed consent to be observed if they did not want their demeanours and perspectives referenced in research outputs?

First, it was impossible to present all the residents with extensive information to enable them to decide on consent prior to observation due to the chain of actors involved (Essex & Suffolk Water made the agreement for observation with the residents over the phone to minimise the risk of low take-up rate of home visits).

Second, the nature of the conversations between the plumbers and the residents were not sensitive, and in most cases, the residents also assumed an observatory role relational to the plumbers. The residents were addressed sensitively by being informed that the author was observing their home visits with the aim of developing insights that can lead to the improvement of water efficiency engagement in Essex & Suffolk Water. A safe assumption was therefore made that the mere act of residents welcoming the author into their homes meant that they were not put off by any invasion of their privacy and they permitted any or all forms of participation in the research.

Third, the anonymity and privacy of the residents were respected despite the likelihood that no harm was expected to come to them because of engaging in this research. During the home visits, no audio and graphic records of observations were taken in the residents' 'limited domain' – a tactic which Crow and Wiles (2008) suggest for reducing the risk of compromising anonymity. In retrospect, this was a reasonable approach to take at the time to gain the residents' trust, alleviate any inhibitions arising from having strangers in their homes, and to reduce any potential for Hawthorne effect resulting from the observation of their movements, utterances, and the materials in their private space. Rather, to document observations, I took hand-written notes about verbal and non-verbal cues observed.

Having reflected on the methodology in this section, the next section recommends areas to be explored in future research.

10.5 Future research

This current research has produced insights about factors that stifle water efficiency engagement and ways that practices can be improved. The thesis demonstrates that technical, educational, and combined forms of water efficiency engagement are currently delivered in areas of serious water stress in the UK. Combined water efficiency is predominant in the sector due to desires to maximise household water savings. However, it falls short for stereotyping publics based on sociodemographic identifiers, having unclear strategy for water efficiency education, inadequately skilling personnel delivering engagement activities, and for ineffectively using rhetoric.

Based on the findings, it was recommended that the water utilities operating in areas of serious water stress should seek socio-technical change. This socio-technical change is in no way a panacea for water efficiency engagement but can be achieved by recognising and investing in water efficiency education as an aspect of engagement requiring expertise, granularizing the dispositions of the public towards water, and diversifying and tailoring water efficiency rhetoric for engagement.

Further, it was recommended that the water utilities should upskill personnel delivering engagement activities and establish effective feedback mechanisms and foster collaborative work between these personnel and water managers. Enhancing data collection technologies to accommodate contextual insights gained in the field were also identified as ways to support socio-technical change. These practice improvements will help water utilities move beyond merely combining technical and educational measures to delivering water efficiency engagement that considers the multiple influencers of domestic water usage such as norms, technology, water systems, skills, knowledges, values etc.

If water utilities are to develop and learn from these innovations, they could strongly benefit from designing and evaluating initiatives in collaboration with social researchers. Some specific ideas for new social research on water efficiency engagement follow.

First, a follow-on study which granularly examines water efficiency engagement using a 'follow-the-engagement' approach is called for. The literature and current research findings suggest that water utilities can potentially impact the acceptability of engagement and the importance of water efficiency as perceived by the public (see Lu, 2020). This future study can therefore usefully apply the MAC heuristic to delve into the intricacies of water efficiency engagement practices. If executed effectively, more meaningful knowledge about practice in the field would be created. Several increases in scale are proposed, for example, longitudinal (in terms of examining more households and/ or their water utility's evolving engagement approach over several years) or case studies (in terms of comparing water efficiency engagement between multiple water utilities). Particularly, such longitudinal study can examine the causes, influences, and evolution of water efficient behaviours and line this up with a standardised test of the influence and effectiveness of personnel as communication channel and messaging used during water efficiency education. This will be valuable for practice improvement. Amongst other things, this test can examine the applicability of behaviour influencing tactics in engagement, the interconnection of water efficiency messaging with spaces and usage practices and the degree to which messages remain with residents after engagement, other components of engagement that residents are getting motivation to be water efficient from, their perception about the role of their water utility's personnel in communicating water efficiency, and unintended effects of engagement activities.

In addition to engaging publics in households, there are other spaces that embody collectiveness wherein people can be accessed, and where usage is and can be influenced by peculiar values. Such spaces include community assets such as churches, mosques, temples, community centres, associations, and institutions. Targeting community assets for water efficiency engagement can guarantee access to publics who share common values and are motivated by similar interests.

Second, conducting a scaled 'follow-the-public' research in the future that maximises these community assets for household water efficiency is therefore recommended. It is suggested that such research is designed in the sense of developing baseline insights about publics and determining messages that can resonate with certain values and usage practices. This study can proof beneficial to the planning and delivery of future water efficiency engagement because it can help improve local customer insight, provide future projects with deeper understandings of publics' behaviours that relate to water usage and how they evolve, aid the tailoring of future initiatives, and it offers an avenue for

continuous and close engagement with water users. It is imperative to note that this type of study can have limitations in terms of scale and can be resource intensive and time-consuming. This is because it will require prolonged face to face or digital engagement using data collection and analysis techniques that are context driven. However, such a study can benefit from collecting data anonymously and then mining the information for insights such as certain publics' dispositions towards water and engagement in a way that allows findings to be generalised to their local communities. This will be invaluable to the reform of water efficiency engagement strategies in seriously water-stressed utilities.

10.6 Concluding remarks

Overall, this thesis advances ongoing discussions about how water utilities design and deliver activities promoting efficient water usage and how the achievement of household water efficiency could be influenced by their engagement practices. The research moves these discussions forward by responding to questions about how seriously water-stressed utilities might maximise its practices, whether through enhanced training of their plumbers, increased information sharing and learning between the plumbers and the water managers or embracing socio-technical engagement.

The thesis' fundamental contribution is the proposal of socio-technical change as a tool for water utilities operating in areas of serious water stress to expand their realm of engagement practices and to inform future initiatives that optimise techno-efficiency and edu-efficiency. The research undertaken demonstrates the usefulness of this approach in understanding the meanings and implications of engagement practices for household water efficiency by examining the empirical findings through the lens of the message, audience, and channel (MAC) heuristic. Collectively, the research findings demonstrate that the message, audience, and channel components of water efficiency engagement are inextricably linked. These MAC elements combined with the advocacy for socio-technical change offer a lens for the critical evaluation of water efficiency engagement that better reflects the complexity of the practice than the conventional focus on and evaluation of measured water savings (discussed in section 5.2). The research approach thus illustrates the value of utility-based inquiry in providing in-depth detail about the complex engagement processes that influence the public's ability to act for change.

Evolving by examining and learning is an important feature of a contemporary water utility. This research demonstrates that enhancing water efficiency engagement strategies could be challenging in the water industry, as the lack of understanding of the multiple and diverse influences of engagement stifles improvement. Therefore, ideas within this thesis are likely to add to the understanding of

barriers to engaging the public about water efficiency or other water issues in areas that are seriously water-stressed. And the research's focus on everyday engagement practices in the water utility offers a robust approach to learning that could be usefully adopted for future collaborative research between academia and the water industry.

This thesis contributes to theory, policy, and practice, drawing the linkages between regulatory developments and conceptual ideals of engagement and applying these to the examination of engagement intentions and practices as well as identifying opportunities for improvement through socio-technical change. Supplementing the analytical detail with insights from communication and marketing models and knowledge from applications of social science in the water sector thus advances the considerations for water efficiency engagement beyond the scope of measured water savings typical of water efficiency research outcomes.

Appendix 1: summary of systematic review of water efficiency engagement contents in WRMPs.

MAC model units of analysis	**Framing household water efficiency messages (Message)**		**Publics prioritised for water efficiency engagement (Audience)**		**Public engagement channels (Channels)**		**Planned initiatives and measures of success**	
Indicators	Motivation for household water efficiency promotion	Incentives planned to motivate publics	Type of targeted publics	Expected role of publics	Channels of engagement during WRMP	Channels of engagement post-WRMP	Planned household water efficiency measures	Indicators of performance of plans
Affinity Water	*Reduction in abstractions from some groundwater sources; customers' preferences for water efficiency over increasing abstraction from rivers; consumer Council for Water's expectation to support customers ; impacts of climate change - hydrological drought; increasing population; increasing PCC;*	*Fair charging; cost savings; sustainable abstraction; incentivising tariffs.*	*3.5 million customers: customers; residents; communities; primary schools; secondary schools; visitors; demographic and geographic customer groups; large families; customers with specific medical needs; metered households; unmeasured households.*	*Minimise water wastage; better use of water; learn about importance of water and the environment.*	*Consultations- 5,250 online questionnaires; online panels of 949 members; deliberative forums; Willingness to pay studies; bill acceptability studies; Let's Talk Water Campaign; community drop-in events; local press advertising; news events; website; focus groups; 900,000 pamphlets accompanying bills.*	*Bushey; education centre; local school; information to customers on their water use, both as part of their bills or through website; Automated meter readings (AMR); awareness campaign; water efficient products; in-home audits.*	*Install water meters; educational awareness through in-home water efficiency audits; water efficient devices.*	*PCC reduction.*

	increasing availability of water using devices – dish washers, pressure washers, pumped power showers; changing behaviours of customers; Ofwat's water efficiency target (WET).							
Anglian Water	*Population and housing growth; climate change; growing environmental needs; need to restore abstraction to sustainable levels; low rainfall; Government policy - Ofwat's WET.*	*Opportunity to reduce bills; mitigate drought risk.*	*2 million household customers: Customers; measured customers; unmeasured customers; vulnerable customers.*	*Reduce water consumption; be aware of the value of water; think responsibly about water; adopt more responsible 'water behaviours'; support meter installation.*	*15 focus groups; Discuss Discover Decide interactive website; social media campaign; Willingness to Pay Survey; Acceptability Research; customer engagement forum.*	*Love Every Drop campaign – water efficiency audits and installation of water efficient devices.*	*smart household meter installation; water efficiency audits; water efficient devices.*	*PCC reduction.*
Essex & Suffolk Water	*Lack of new intrinsic water resources; increasing demand; uncertainty*	*Opportunity to reduce bills; save water.*	*1.7 million customers: measured households; unmeasured households;*	*Change behaviour long-term*	*Shopping centre adverts; radio adverts; newspapers and magazines; leaflet drops; posters;*	*ecoFIT retrofit audits; self-audit packs; campaigns; website communications*	*Water efficiency retrofit audits; free water efficient devices e.g., cistern displacement*	*PCC reduction; customers' perception of their behavioural change.*

	from climate change.		*occupants; residents; community; school pupils; Acorn segments- Wealthy a Achievers, Urban Prosperity, Comfortably Off, Moderate Means; Hard Pressed.*		*websites; Good Water Habits research; talks; promotional events.*	*; water efficiency news publication; water efficiency talks and promotional events; meters.*	*devices, Save-A-Flush, water butts; customer engagement - Little Green Riding Hood campaign in schools; gardening campaign; optional meter installation.*	
South East Water	*Growing population; increase in housing; changing climate; increasing household demand*	*Cost savings; appropriate action for the environment.*	*2.1 million customers: customers; communities.*	*Reduce water use; change behaviour to water use*	*Research; media activity; website; surveys;*	*Education in schools and direct to customers via the bill, website, community talks and other events and campaigns; metering; free cistern displacement devices; water butts; shower regulators; water efficient devices installed at utility sites.*	*Metering; water education; awareness campaign; white goods discount vouchers; retrofitting using displacement devices, water butts, shower timers, tap and shower inserts*	*PCC reduction.*
Southern Water	*Climate change; population and housing growth.*	*Protect the environment; water security; getting value for money*	*1 million household customers: customers; primary and*	*Permanently change water behaviour*	*Online survey of 1,000 customers; water re-use study; research; focus groups; telephone interviews; online*	*Website; water saving products*	*Water audits in customers' homes; 'education' programmes in schools;*	*PCC reduction.*

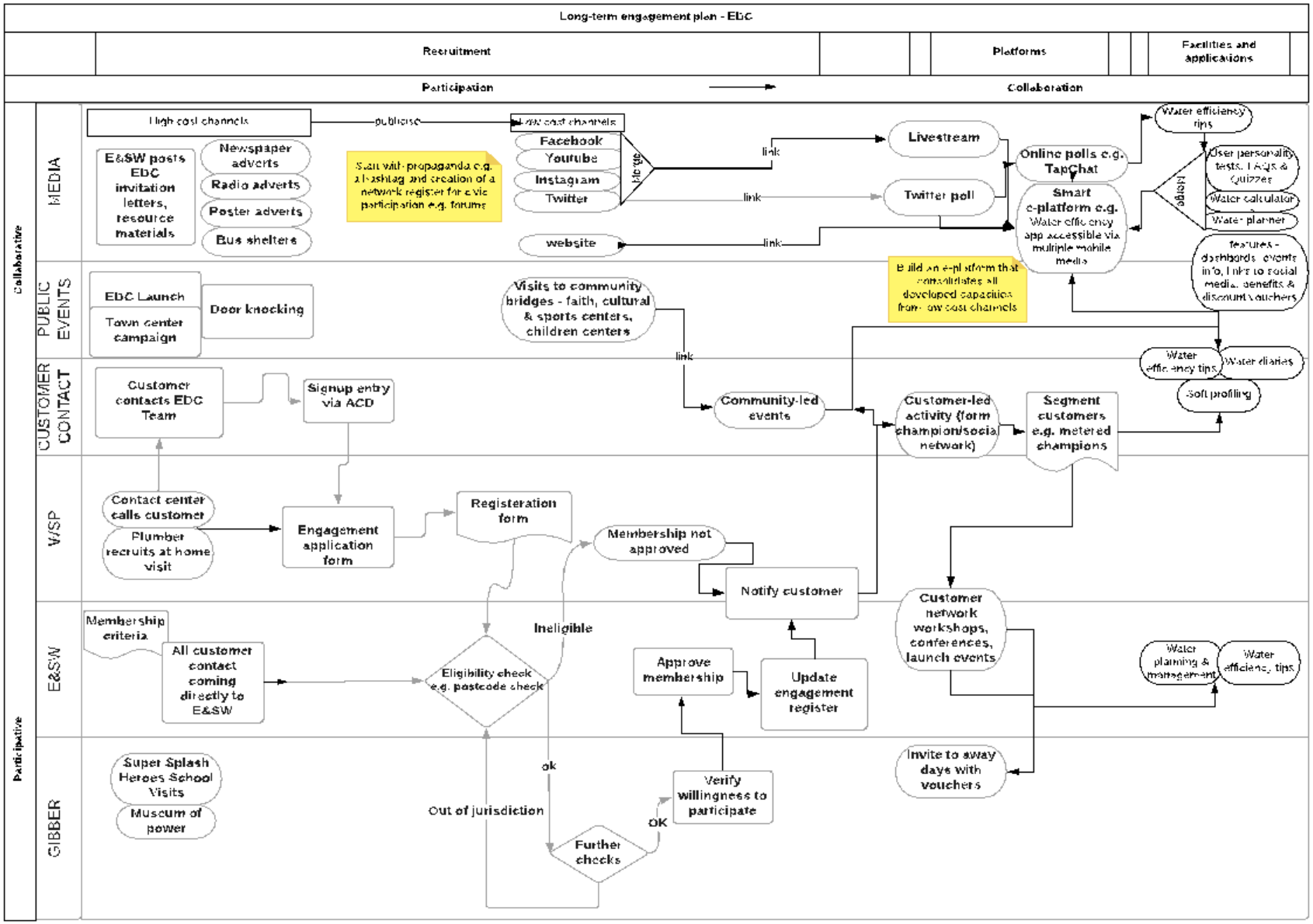
			secondary schools;		*surveys; twitter; Have Your Say emails to customers; workshops;*		*discounting water efficient devices; ongoing campaigns; metering.*	
Sutton & East Surrey Water	*Increasing demand; impact of climate change; the need to protect the environment; Government policy priorities, Customer preferences for metering as the fairest way to charge.*	*Save a precious resource; reduce bills; save energy; protect the environment by reducing abstraction, sewerage contribution.*	*675,000 consumers: customers; measured customers; unmeasured customers; schools; households; elderly care homes; teachers; high consumption customers.*	*Use water wisely; reduce water wastage; normalise water efficient behaviours.*	*Questionnaires; telephone interviews; face-to-face discussions; online panels; Willingness to Pay Survey; telephony survey 'Customer Tracker'*	*Water efficient devices e.g., flush toilets, low flow shower heads, push taps; metering.*	*Selective metering; fitting water efficient devices; information on water bills, customer magazines, e-newsletters, website; events; talks; Water Energy Calculator; tours; workshops; assemblies; project in schools; high consumption visits.*	*PCC reduction.*
Thames Water	*Climate change; customer's preference for* water efficiency*; DEFRA's demand reduction directive.*	*Save water; avoid environmental damage; keep bills as low as possible*	*13.5 million customers: customers; households.*	*Reduce water wastage and inefficiency; save water; understand their water use.*	*Telephone survey.*	*Educational campaign; visitor centres; metering; water efficiency promotion; distribute water efficient devices.*	*Progressive metering.*	*PCC reduction, number of meters installed.*

Appendix 2: long-term engagement with EDC customers

Public engagement is emerging as one of the effective approaches for achieving behavioural based influence on household water efficiency. However, customer diversity and scale and multiplicity of communication channels pose challenges for deciding target customers for water efficiency promotion and the facilities to sustain the water efficiency engagement between the water user and the water utility. Thus, public engagement and 'education' in water management is still evolving, meaning that that there are opportunities to improve the planning process.

Largely based on the concept of social learning, there is huge advocacy for public participation which more ambitiously may morph into public collaboration in water management (Basco-Carrera *et al*., 2017). These two extents of public involvement are ideally ongoing civic processes wherein the former stems from cooperative intent on the part of the public and the latter involves co-creation and joint action. In the promotion of household water efficiency, participation can be demonstrated by increasing water awareness to improve water use efficiency to reduce household water demand (Da-ping *et al*. 2011); whilst in the continuum collaboration may emerge through water users actively seeking involvement in water management for example through initiating interactions with the utility, or leading community initiatives to tackle water problems.

In the context of developing a long-term engagement approach for the Every Drop Counts (EDC) programme, I suggest that not one solution fits all. The various customer contact points within the programme's remit including Essex & Suffolk Water and its partners need to be exploited starting with the low-cost channels e.g., a hashtag, a focus group etc. and then progressing to high-cost channels e.g., an e-platform hosting multiple applications. Using knowledge of contact points, on page 2 I map out some multiple engagement platforms that can be created and make suggestions for water efficiency engagement scenarios that can also be fostered on or via these platforms to maintain customer-involvement for long-term.


Long-term engagement plan - EDC
Recruitment
Platforms
Facilities and applications
Participation
Collaboration
Collaborative
Participative
MEDIA
PUBLIC EVENTS
CUSTOMER CONTACT
WSP
E&SW
GIBBER
High cost channels
publicise
Low cost channels
E&SW posts EDC invitation letters, resource materials
Newspaper adverts
Radio adverts
Poster adverts
Bus shelters
Start with propaganda e.g. a hashtag and creation of a network register for civic participation e.g. forums
Facebook
Youtube
Instagram
Twitter
Hertz
website
link
Livestream
Twitter poll
Online polls e.g. TapChat
Smart e-platform e.g. Water efficiency app accessible via multiple mobile media
Water efficiency tips
User personality tests, FAQs & Quizzes
Water calculator
Water planner
Hotlink
features - dashboards, events info, links to social media, benefits & discount vouchers
Build an e-platform that consolidates all developed capacities from low cost channels
EDC Launch
Town center campaign
Door knocking
Visits to community bridges - faith, cultural & sports centers, children centers
Water efficiency tips
Water diaries
Soft profiling
Customer contacts EDC Team
Signup entry via ACD
Community-led events
Customer-led activity (form champion/social network)
Segment customers e.g. metered champions
Contact center calls customer
Plumber recruits at home visit
Engagement application form
Registeration form
Membership not approved
Notify customer
Membership criteria
All customer contact coming directly to E&SW
Eligibility check e.g. postcode check
Ineligible
Approve membership
Update engagement register
Customer network workshops, conferences, launch events
Water planning & management
Water efficiency tips
Super Splash Heroes School Visits
Museum of power
Out of jurisdiction
ok
Further checks
OK
Verify willingness to participate
Invite to away days with vouchers

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